EPA's Clean Air Act:
Pretending air pollution is worse than it is

By Steve Milloy[1]
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I. Executive Summary

The U.S. Environmental Protection Agency (EPA) continues to tighten air quality standards at considerable societal expense under the guise that new standards are necessary to protect public health. Focusing on the EPA's proposed Clean Air Transport Rule (CATR), this analysis shows that:

- America's air is already safe to breathe and it is much better than the EPA would have the public believe; and that

- The EPA relies on health studies that exaggerate harm and economic studies that understate regulatory costs in order to maintain the fiction that its ever-more stringent regulations are providing meaningful public health benefits.

Some of this analysis' notable points include:

- Among the 32 Midwest and Eastern states that would be covered by the CATR, the daily air quality standard for fine particulate matter (i.e., soot) was violated less than one-tenth of a percent of the time (0.096%) in 2009.

- According to the most recent data for ground-level ozone (i.e., smog), the 8-hour ozone standard was violated only 1.3 percent of the time in the 32 CATR states.

- There is no tangible scientific evidence that current air quality standards are not already more than sufficiently protective of public health. Data has been hidden from the public by the agency and by a clique of EPA-funded researchers. The EPA's scientific research has not been systematic or comprehensive despite the availability of data to the agency. Purported links between exposures to particulate matter and ground-level ozone, and health effects range from the entirely hypothetical to the subclinical (i.e., temporary changes that are physiologically detectable, but not otherwise meaningful).

- EPA's economic analysis of its air quality rules is utterly fantastic. The EPA claims, for example, that the estimated $7 billion in one-time costs of the

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CATR may produce economic benefits that equate to as much as $840 billion *annually* or 5.7 percent of U.S. GDP for 2009. The EPA claims that its implementation of the Clean Air Act produces monetized health benefits amounting to $1.3 trillion *annually*, or about 9 percent of 2009 U.S. GDP.

- There is no meaningful or independent oversight of the EPA's implementation of the Clean Air Act by Congress or the courts.

Congress should amend the Clean Air Act to better manage the current state of U.S. air quality, instead of allowing the EPA to pretend that it is still 1970 and air quality is poor and emissions are unregulated.

II. Introduction

Although U.S. air quality has dramatically improved over the last 50 years, the U.S. Environmental Protection Agency continues efforts to tighten air quality standards seemingly without end at societal costs estimated to range from the tens of billions to the trillions of dollars per year.

The EPA claims that these costs are more than offset by the value of the public health benefits obtained by the tighter standards. But new standards are proposed and implemented before existing standards are meaningfully or independently evaluated.[2]

At a minimum, actual and significant costs are being imposed on society for benefits that are, at best, unknown and, at worst, entirely hypothetical. Since Clean Air Act regulation affects the construction, energy, manufacturing and transportation sectors of the economy, this situation should be of concern to policymakers, especially in a time of high unemployment and a struggling economy.

A looming example of this situation is the so-called "Clean Air Transport Rule" (CATR) that the EPA proposed in August 2010.[3] Omitting discussion of the proposal's complex history,[4] the claimed purpose of the CATR is to reduce the interstate transport of air emissions from Midwest power plants that the EPA claims cause or contribute to air quality problems downwind in 32 Eastern states.[5]

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[2] While the Clean Air Act requires the EPA to review its national ambient air quality standards (NAAQS) every five years, these in-house reviews are more akin to the rubberstamping of agency's previous work, often leading to a further tightening of standards, as opposed to critical and independent evaluation of the NAAQS' merits.
[3] 75 *FR* 45210, August 2, 2010.
[4] For a detailed discussion of this history, *see* 45 *FR* 45221-45225.
[5] The rule would affect 31 states and the District of Columbia, collectively referred herein as "32 states." The 31 states are: Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland,

The EPA says that reducing emission of nitrogen oxides (NO_x) and sulfur dioxide (SO_2) from the power plants would help the 32 target states attain and maintain compliance with the agency's air quality standards for fine particulate matter (i.e., $PM_{2.5}$ or soot) and ground-level ozone (i.e., smog).

The EPA estimates that CATR will cost roughly $4 billion in 2012 and another $3 billion in 2014 — costs that the EPA describes as "modest" in light of the $111 to $294 billion *annual* public health benefits the agency claims the CATR will produce.

But if it's true that an EPA regulation costing on the order of $7 billion can produce societal benefits equating to about two percent growth in GDP annually, then EPA and its air quality regulations would seem to be a cure for our ailing economy, and the agency should be further empowered to implement more such regulations that lay golden eggs.

Before we do, however, it behooves us to consider the state of air quality in the U.S., what it means to public health and how the EPA comes up with its utterly implausible cost and benefit estimates.

III. Air Quality

According to the EPA's own monitoring data, ambient air quality today is better than ever in the 32 states subject to the CATR, as compared by EPA's 24-hour and annual standards.[6] But that's not what the EPA would have us believe.

A. Fine particulate matter (PM2.5)

The EPA presents the graph below on its web site to describe the national trend in air quality for $PM_{2.5}$. The shaded band shows the distribution of $PM_{2.5}$ levels among the trend sites, displaying the middle 80 percent. The white line represents the average among all the trend sites. Ninety percent of sites have concentrations below the top line, while ten percent of sites have concentrations below the bottom line.

Based on the graph, national air quality with respect to $PM_{2.5}$ would seem to be well within the existing annual $PM_{2.5}$ standard of 15 micrograms per cubic meter (μg/m3) as of 2009. Moreover, $PM_{2.5}$ air quality is steadily improving.

Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia and Wisconsin.

[6] The 24-hour standard is 35 mg/m^3. To comply (or be in attainment) with this standard, an air monitor reading may not exceed this value. The annual standard is 15 mg/m^3. To be in attainment with this standard, the average of the fourth highest daily monitor reading for the preceding three years may not exceed this value.

Yet, this is how the EPA describes air quality for $PM_{2.5}$ in the preamble to the proposed CATR:[7]

> The $PM_{2.5}$ ambient air quality monitoring for the 2006–2008 period (most recent available) shows significant improvements. Nonetheless, areas that continue to violate the 15 $\mu g/m^3$ annual PM2.5 standard are located across a significant portion of the eastern half of the United States, in parts of California and one county in Arizona. Based on these nationwide data, 23 counties have at least one monitor that violates the annual $PM_{2.5}$ standard.
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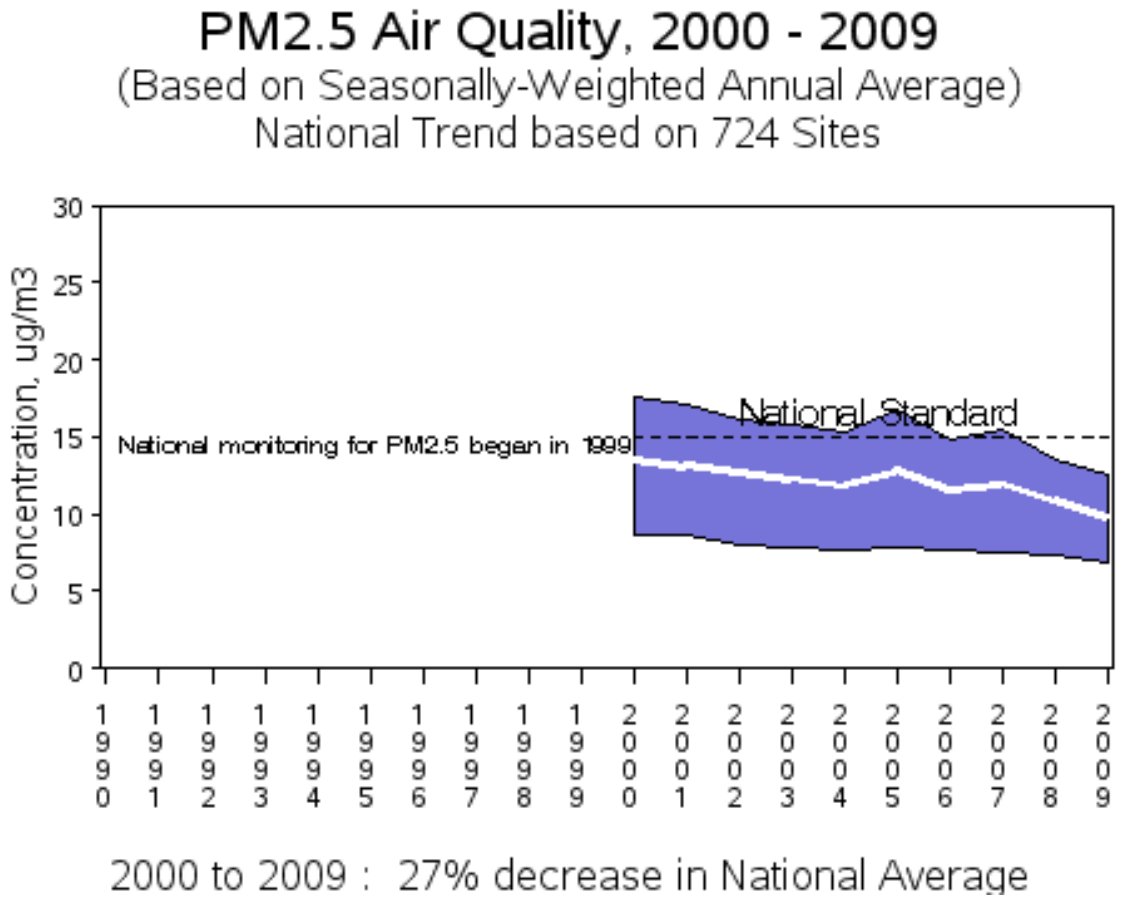
> The PM2.5 ambient air quality monitoring for this same 2006–2008 time period shows that areas violating the 2006 24-hour $PM_{2.5}$ standard of 35 $\mu g/m^3$ (i.e., the revised 2006 standard for 24-hour $PM_{2.5}$) are located across much of the eastern half of the United States, in parts of California, and in some counties in several other western states—Alaska, Washington, Oregon, Utah, and Arizona. Based on these nationwide data, 52 counties have at least one monitor that violates the 24-hour $PM_{2.5}$ standard.



[7] 75 *FR* 45219.

First, more recent data exist than the EPA-cited 2006-2008 data. The EPA now has in its possession the data for 2007-2009. These more recent data, however, indicate that only 6 (vs. 23 claimed by EPA) out of 655 counties have monitors that measured violations of the annual $PM_{2.5}$ standard.[8] Moreover, only two of these counties are in states subject to the CATR.[9]

The notable points regarding attainment of the annual $PM_{2.5}$ standard here are that:

- Annual $PM_{2.5}$ air quality standards during 2007-2009 were violated in:
    - Less than one percent (0.91%) of all U.S. counties; and
    - Less than one-half percent (0.42%) of counties in the CATR states.
- In justifying its CATR proposal, the EPA in effect exaggerated the number of relevant counties exceeding the annual $PM_{2.5}$ standard by more than 10 times or 1000 percent (2 vs. 23).

With regard to the 24-hour $PM_{2.5}$ standard, the EPA once again relies on old data and conflates and confuses national attainment of the standard with attainment in the CATR states. Though the EPA states that 52 counties were in nonattainment for 24-hour $PM_{2.5}$ on a national basis during 2006-2008, for 2007-2009, the number of counties in nonattainment was 35. This number dropped to a mere five counties among the CATR states.[10]

A novel and perhaps better way of considering air quality is to look at how often the 24-hour $PM_{2.5}$ standard is violated according to the most recent data. Consider the data presented in Table 1 for the 32 CATR states.

Table 1: How often is the 24-hour PM 2.5 standard violated in the CATR states?

Year	**2007**	**2008**	**2009**
# Daily exceedances	1156	432	269
# Monitors	771	771	771
# Annual opportunities to exceed standard (# Monitors x 365)	281,415	281,415	281,415
Amount of time standard is violated	0.41%	0.16%	0.096%

The two key points these data make are:

[8] The six counties (with $PM_{2.5}$ measurements in $\mu g/m^3$) that violated the annual PM $_{2.5}$ standard for 2007-2009 are: Houston (AL), 15.3; Allegheny (PA), 17.0; Fresno County (CA), 17.1; Kings County (CA), 17.3; Tulare County (CA), 18.8; and Kern (CA), 22.6.

[9] The two counties are Jefferson (AL), 15.3 $\mu g/m^3$ and Allegheny (PA), 17.0 $\mu g/m^3$.

[10] The five counties (with $PM_{2.5}$ measurements in $\mu g/m^3$) that violated the 24-hour PM2.5 standard for 2007-2009 are: Allegheny (PA), 50; Muscatine (IA), 38; Brooke (WV), 37; Milwaukee (WI), 37; and Cuyahoga (OH), 36.

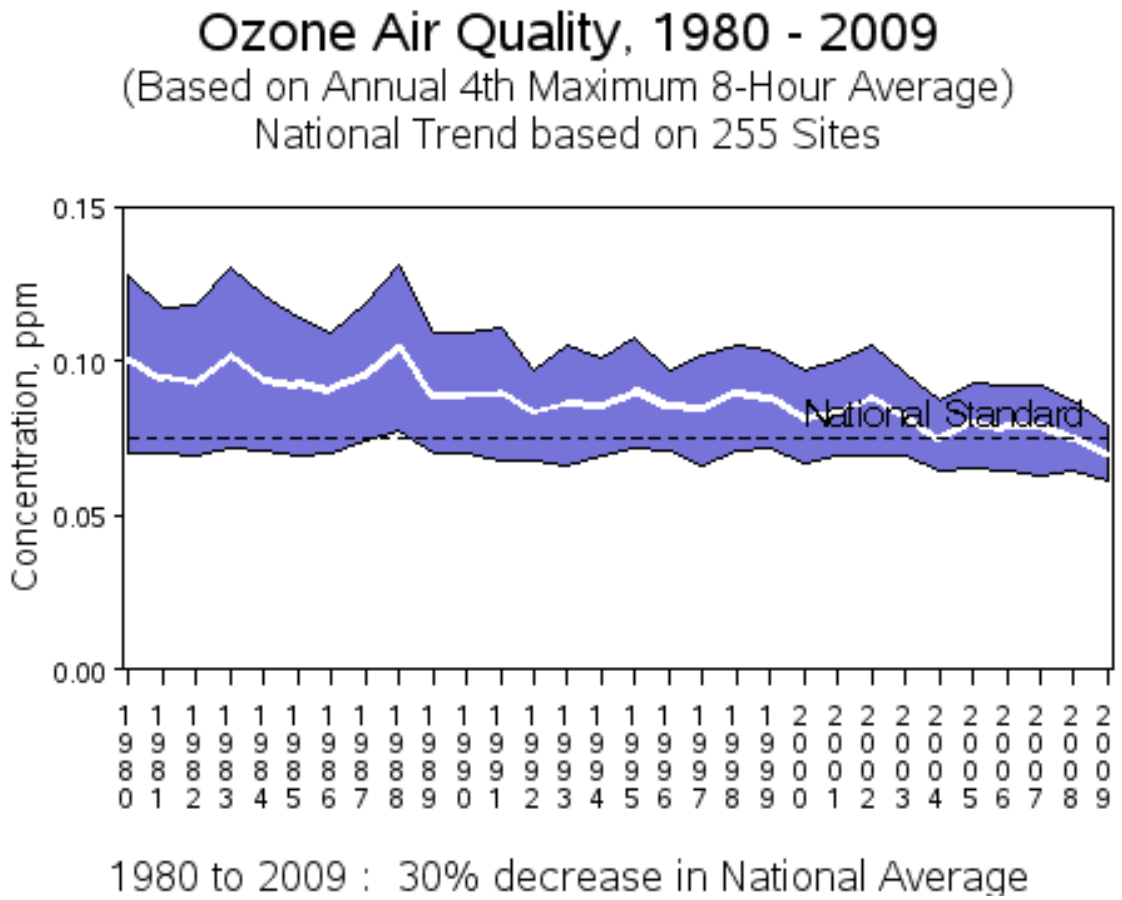
- Air quality in the CATR states, as measured by attainment of the 24-hour $PM_{2.5}$ standard, continues to improve — 76 percent fewer monitoring areas violated the standard in 2009 than 2007; and

- Air quality in the CATR states violates the 24-hour $PM_{2.5}$ standard less than one-tenth of one percent of the time (0.096%).

It should be noted that there is no evidence that these exceedances have any discernible or meaningful impact on public health. Certainly if the air quality standards were set at levels representing actual threats to health, then there would be zero exceedances nationally. $PM_{2.5}$ is clearly not a significant air quality problem on either a 24-hour or annual basis on a national level or in the CATR states.

B. Ground-level Ozone

The EPA presents the graph below on its web site to describe the national trend in air quality for ground-level ozone. The shaded band shows the distribution of ozone levels among the trend sites, displaying the middle 80 percent. The white line represents the average among all the trend sites. Ninety percent of sites have concentrations below the top line, while ten percent of sites have concentrations below the bottom line.



Based on the graph, ozone levels are declining on a national basis and the vast majority of the nation air meets the ozone standard.

Yet this is how the EPA describes ozone air quality in the preamble to the CATR:

> [In 2005], wide geographic areas, including most of the nation's major population centers, experienced ozone levels that violated the 1997 NAAQS of 8-hour ozone 0.08 ppm (effectively 0.084 ppm as a result of rounding). These areas included much of the eastern part of the United States and large areas of California… 112 areas were designated as nonattainment. As of December 2009, significant emissions reductions have allowed 58 of the original 112 nonattainment areas to be re-designated to attainment. In addition, a number of areas still designated as nonattainment ozone monitoring data for 2006–2008 (most recent data available) show levels below the standard.

So something less than 54 counties, on a national basis, still fail to meet the 8-hour ozone standard, according to the EPA. In addition to the EPA's lack of specificity, there is no mention of nonattainment specifically among the CATR states.

But consider the 8-hour ozone attainment data for 2008 on a national basis and the CATR states as presented in Table 2.

Table 2: How often was the 8-hour ozone standard violated during 2008?

Region	National	CATR states
Ozone monitors	1,201	796
Exceedances of standard	5,320	2,167
Required monitoring days	302,186	184,292
Actual monitoring days	260,471	169,596
Monitoring coverage	86.2%	92%
Time in nonattainment	2%	1.3%

This analysis indicates that, during 2008, the nation failed to meet the 8-hour ozone standard only 2 percent of the time, and that figure fell to 1.3 percent when the analysis is limited to the CATR states. While it should be noted that these figures are based on only partial monitoring (i.e., 86.2 percent, nationally, and 92 percent in CATR states), they nevertheless fail to indicate a significant ozone problem across the country or in the CATR states specifically.

As noted in the case of $PM_{2.5}$, there is no evidence that these exceedances have any discernible or meaningful impact on public health. Certainly if the air quality standards were set at levels representing actual threats to health, then there would be zero exceedances nationally.

IV. EPA's Air Quality Standards

The foregoing analysis indicates that EPA air quality standards are not violated to any significant extent overall, particularly in the CATR states. But this fact begs the question as to what the standards represent in the first place.

The agency maintains that these standards are necessary to protect public health. But how much of an actual public health threat is caused by violations of the $PM_{2.5}$ and ozone standards?

A. PM2.5 Standards

The EPA first set $PM_{2.5}$ air quality standards in 1997, and then updated them in 2006. The EPA's annual standard of $15\mu/m^3$ may be visualized as an ounce of material dispersed in the volume of a one-story building that is one-half mile long and one-half mile wide.

The science underlying these standards, however, has always been controversial. Although the nature of the controversy can be quite technical and complex, several of its indisputable points include:

- **Medical history mystery.** Although the EPA claims that $PM_{2.5}$ causes tens of thousands of premature deaths per year, in the 15 or so years that researchers have been studying $PM_{2.5}$, not a single one of these deaths has ever been individually identified and medically attributed to $PM_{2.5}$. Moreover, no one knows the precise medical cause or explanation of any of the deaths in any of the studies on which the EPA relies. The EPA's practice is essentially to assume that if someone dies of a respiratory or heart condition, then air quality was the cause regardless of that person's lifestyle, genetic background and work history.

- **Exposure mystery.** No one knows how much actual exposure to $PM_{2.5}$ any study subject has had. The studies rely on EPA air monitoring data and the assumption that all study subjects in a geographic area are equally exposed to the $PM_{2.5}$ levels at the monitors. This assumption ignores the great variations in actual exposures, e.g., some people spend more time outdoors than others and, presumably, have higher exposures to $PM_{2.5}$, also people will be exposed to different levels of $PM_{2.5}$ depending on their relative location to an air monitor.

So the EPA would have the public believe that current ambient levels of $PM_{2.5}$ are a significant killer even though no one knows how much $PM_{2.5}$ any study subject was actually exposed to or what they actually died from. It is impossible to draw a conclusion about a causal relationship between exposure to $PM_{2.5}$ and any health

effect based on the sorts of the studies that have been done to date — and the EPA has wantonly disregarded this fact.

There are two other key issues to note.

- **Secret science.** It should be noted that the $PM_{2.5}$ air quality research has largely been carried out by a clique of EPA-funded scientists. The most recent effort (2009) to update the "science" of $PM_{2.5,}$, for example, was carried out by a private organization called the Health Effects Institute, which is 50%-funded by the EPA. To date, there have been only very limited independent analyses of the $PM_{2.5}$ data — all which contradict the EPA's position[11] — because the EPA's researcher clique, with the assistance of the EPA, refuses to make the data available to the public. In 1997, the agency even refused to provide the data to the House Energy and Commerce Committee.

- **Enron-style accounting.** The agency claimed its 1997 standard would prevent 15,000 premature deaths. Although $PM_{2.5}$ air quality has since significantly improved, the agency now estimates that the CATR will save between 14,000 to 36,000 premature deaths annually. Are these new premature deaths avoided in addition to the original 15,000 estimate? As there seem to be few $PM_{2.5}$ attainment problems in the 32 transport states, how will eliminating those few attainment problems save so many lives?

It should also be noted that the EPA has never evaluated whether its 1997 $PM_{2.5}$ standards reduced premature mortality or improved public health. The EPA continues to take regulatory actions to tighten the $PM_{2.5}$ standard in utter ignorance of whether such actions are accomplishing anything significant or even discernible for public health.

Keeping in mind that there is no specific disease caused by air pollution, all the deaths projected by the EPA are computer-generated and that one-half of all deaths are "premature," it is likely, that current ambient $PM_{2.5}$ levels cause no adverse health effects at all. If so, the existing standards, much less any tightening or further $PM_{2.5}$ regulation, cannot be justified in terms of public health benefits.

B. Ozone Standard

The EPA set the 8-hour ground-level ozone standard at 80 parts per billion (ppb) in 1997.[12] This standard was tightened to 75 ppb in 2008. The EPA is now proposing, in a rulemaking separate from the CATR, to further tighten the standard in the 60-70 ppb range. There are two primary types of scientific studies that the EPA relies on to justify changes to the ozone standard: (1) chamber studies and (2) field studies.

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[11] *See* http://scientificintegrityinstitute.org/enstrom121510.pdf.

[12] While 80 ppb was the official standard, the effective standard was 85 ppb, as EPA rounded up to the nearest 10 ppb.

1. Chamber Studies

Chamber studies involve human study subjects exercising in a controlled environment, exposing them to both "clean air" and ozone-containing air and then measuring changes in lung capacity and expiration. A study recently published by EPA researchers serves as a good example of the shortcomings of these studies as a means of setting air quality standards.

EPA researchers had 59 healthy young adults (ages 19-35) exercise in a zero ppb ozone ("clean air") chamber and, a week or so later, had them exercise again in a 60 ppb ozone chamber. Study subjects spent 6.6 hours in the chamber each time, engaging in 50 minutes of exercise (alternating bike/run) with a 10-minute break per hour. Spirometry measurements (forced expiratory volume in one second, FEV1, and forced vital capacity, FVC) were taken before and after the chamber exposures.

The researchers reported that, when exposed to 60 ppb ozone while biking/running for 6.6 hours, study subjects had a mean decline in FEV1 of about 1.75 percent, and a decline in FVC of about 1.19 percent when compared with exercising in zero ppb ozone. These small declines were statistically significant. The results were reported in the media as, "Healthy young adults can suffer lung damage at the lowest level of ozone pollution being studied by U.S. EPA as the agency prepares stricter limits on smog…"[13]

But the reality is that the reported reductions in FEV1 and FVC not meaningful either in a clinical or practical sense. That is, the slight and temporary declines in FEV1 and FVC do not constitute an adverse health effect, according to medical standards. For one thing, study participants can't subjectively detect such small changes in lung function. From a clinical perspective, changes in FEV1 and FVC only begin to be significant at levels ranging from 15-20 percent, not 1-2 percent. In no way do these tiny, temporary, subjectively unnoticeable changes in lung function constitute "lung damage".

To the extent that any of the study subjects suffered a 10 percent or even a 20 percent decline in FEV1 or FVC, chamber studies are the equivalent of four or five consecutive gym workouts. Yet even these "sensitive" study subjects don't show clinically significant effects until after four or five hours of exercise and exposure (i.e., the equivalent of their fourth or fifth workout). This sort of experimental protocol renders the experiment irrelevant to air quality since the conditions are so unrealistic. Indeed, these studies are done with fit young adults because children, asthmatics, and the elderly — supposedly the most "sensitive" to ozone — can't exercise intensely enough for long enough to produce any effects on FVC or FEV1 with ozone levels as low as 60 ppb (or even 80 ppb).

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[13] *See* "Lung damage from smog could be worse than previously thought – study", E&E News PM, January 13, 2011.

Underscoring the meaninglessness of the changes reported by the EPA researchers, is that spirometry is not so precise that such small changes can be reliably detected and attributed to anything other than how much effort the subjects put into inhaling and exhaling.

It is interesting to note, for example, that the reported results inexplicably differed for men and women. The margins of error reported for the men's results indicate the ironic possibility that the 60 ppb ozone exposure may actually have increased their FEV1 and FVC. Since ozone is unlikely to have increased men's lung function, the explanation likely lies in the unreliability of spirometry to measure such minute changes.

Moreover, even if these changes in FEV1 and FVC were demonstrably caused by ozone, it should be noted that they are transient and reversible.

There is one other significant issue to consider with chamber studies. Although the study subjects were exposed to ozone at a level of 60 ppb in the laboratory, this does not equate to 60 ppb of ozone in the ambient environment. As it turns out, chamber exposures to ozone actually equate to considerably higher levels of ozone as measured by air quality monitors in the ambient environment.

As explained by air quality expert Joel Schwartz,

> … [the] ozone concentrations measured at the ambient monitors used to determine Clean Air Act compliance are much higher—at least 65 percent higher, on average—than the concentrations in the air people actually breathe in. Several factors contribute to the discrepancy between monitored ozone levels and personal exposures. Ambient monitors are often placed several feet above typical human head-height to avoid interferences from people and surfaces near the ground. However, ozone deposition on surfaces (such as clothing or the ground) reduces the levels in the air that people actually breathe in. Levels also tend to be lower near roads, due to destruction by nitric oxide emitted by vehicles…

Schwartz also observed that,

> In addition to using personal exposures that are too high, laboratory studies also use "background" ozone exposures that are too low. To determine the health effects of ozone, researchers compare subjects' lung function while breathing ozone with their lung function while breathing "clean" air—that is, air representing some background exposure level. All studies to date have used ozone-free air for this background level. This too is unrealistic, because there is always some natural background ozone in air due to natural emissions of ozone-forming pollutants from vegetation, lightning, and occasional transport of ozone to ground level from the stratosphere… This background level of ozone is a matter of controversy, but it is certainly not zero.

So although the EPA researchers exposed the study subjects in the chamber to 60 ppb ozone, that exposure more realistically equates to at least 92 ppb measured by an outdoor monitor measuring ambient ozone. That exposure level is 22 percent higher than the existing 75 ppb standard set by the Bush administration and more

than 50 percent higher than the tightest level proposed by the Obama administration.

Further, during 2008 only 51 of 1,201 counties (4.2 percent on a national level) had ozone levels that would have violated a 92 ppb standard according EPA methods for determining attainment. Among the 32 CATR states, that level dropped to one of 796 counties (0.12%).

2. Field studies

In contrast to chamber studies, field studies are intended to study the effects of real-world, ambient exposures to ozone. The study to be considered here is one that the EPA apparently considers to one of the best, if not the best conducted field study supporting its proposal to reduce the ozone air quality standard to 60-70 ppb.[14]

Here's how the EPA described the study in the preamble to its proposal:

> The results of one large study of hikers (Korrick et al., 1998), which reported outcome measures stratified by several factors (e.g., gender, age, smoking status, presence of asthma) within a population capable of more than normal exertion, provide useful insight. In this study, lung function was measured before and after hiking, and individual ozone exposures were estimated by averaging hourly ozone concentrations from ambient monitors located at the base and summit. The mean 8-hour average ozone concentration was 40 ppb (8-hour average concentration range of 21 ppb to 74 ppb ozone). Decreased lung function was associated with ozone exposure, with the greatest effect estimates reported for the subgroup that reported having asthma or wheezing, and for those who hiked for longer periods of time.

Here are some more details from the study authors:

> During the summers of 1991 and 1992, volunteers (18-64 years of age) were solicited from hikers on Mt. Washington, New Hampshire. Volunteer nonsmokers with complete covariates (n = 530) had pulmonary function measured before and after their hikes. We calculated each hiker's post-hike percentage change in forced expiratory volume in 1 sec (FEV1), forced vital capacity (FVC), the ratio of these two (FEV1/FVC), forced expiratory flow between 25 and 75% of FVC (FEF 25-75%), and peak expiratory flow rate (PEFR).

Despite EPA's characterization of these almost 20-year-old measurements and study results as reporting "decreased lung function," the researchers only reported an average 2.6 percent decline in FEV1 and a 2.2 percent decline in FVC for every 50 ppb increment in ambient ozone. As in the case of the chamber study (above), these results are not clinically significant. The results remain clinically insignificant even at an ambient ozone level of 100 ppb, a level that occurred in only 35 counties of 1,201 on a national basis (2.9%), and not at all (0%) in the CATR states during 2008.

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[14] This is assumed to be the case because it is the first field study that the EPA presents and, presumably, it is the first because the EPA believes it to be the strongest.

These studies raise questions as to exactly what is being accomplished by further tightening of the ozone standard. Although exposure to ozone may slightly reduce lung capacity, the reduction does not seem to be clinically significant. Even if it were significant, the ambient exposures at which such effects occur are infrequent.

V. Costs and Benefits

The EPA asserts that the Clean Air Act produces far more in benefits than it costs. For the period 1970 to 1990 the EPA states:[15]

> Using a sophisticated array of computer models, EPA found that [without the Clean Air Act] by 1990… an additional 205,000 Americans would have died prematurely and millions more would have suffered illnesses ranging from mild respiratory symptoms to heart disease, chronic bronchitis, asthma attacks, and other severe respiratory problems. In addition, the lack of Clean Air Act controls on the use of leaded gasoline would have resulted in major increases in child IQ loss and adult hypertension, heart disease, and stroke. Other benefits which could be quantified and expressed in dollar terms included visibility improvements, improvements in yields of some agricultural crops, improved worker attendance and productivity, and reduced household soiling damage.
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> When the human health, human welfare, and environmental effects which could be expressed in dollar terms were added up for the entire 20-year period, the total benefits of Clean Air Act programs were estimated to range from about $6 trillion to about $50 trillion, with a mean estimate of about $22 trillion (in 2006 dollars). These estimated benefits represent the estimated value Americans place on avoiding the dire air quality conditions and dramatic increases in illness and premature death which would have prevailed without the 1970 and 1977 Clean Air Act and its associated state and local programs. By comparison, the actual costs of achieving the pollution reductions observed over the 20-ear period were $523 billion, a small fraction of the estimated monetary benefits.

Keeping in mind that the U.S. gross domestic product during 1970-1990 amount to about $120 trillion (2005 dollars),[16] the EPA claims that Clean Air Act regulation produced monetized health benefits somewhere between 5 percent to 42 percent, with a mean estimate of 18 percent, of GDP for that period. Moreover, these benefits were a bargain, according to the EPA as they were only purchased for $523 billion, or about $25 billion per year.

The EPA estimates that the Clean Air Act currently provides $1.3 trillion in benefits annually, or about 9 percent of GDP as of 2009. The EPA further estimates that the Act will provide $2 trillion in annual benefits by 2020. The EPA estimates the present value of the Clean Air Act is in the range of $1.4 trillion to $35 trillion, with a mean estimate of $12 trillion.

For the CATR the EPA claims that,[17]

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[15] See http://www.epa.gov/air/sect812/design.html.
[16] See http://www.eia.doe.gov/emeu/aer/txt/ptb1601.html.
[17] This analysis will limit its focus to the EPA's projections for premature mortality

> In 2014, we estimate that PM-related annual benefits of the proposed remedy include approximately 14,000 to 36,000 fewer premature mortalities, 9,200 fewer cases of chronic bronchitis, 11,000 fewer hospitalizations (for respiratory and cardiovascular disease combined), 10 million fewer days of restricted activity due to respiratory illness and approximately 1.8 million fewer work-loss days.

The agency's mean estimate of benefits produced by the CATR is $290 billion annually, with a range of $26 billion to $840 billion annually — this upper end estimate represents a sum equal to about 5.7 percent of the U.S. GDP for 2009.

The problem with the EPA's estimates, however, is that while the costs are "actual" to some degree, the benefits are largely hypothetical, if not simply made up.

The EPA estimates benefits using two basic inputs:

- Estimates of the incidence of various health effects caused by air quality — e.g., premature deaths, hospital admissions dues to cardiovascular or respiratory causes, or asthma attacks; and

- Estimates of the value accrued to society by avoiding the hypothesized health effects.

As an example, the EPA estimated in 1996 that its proposed $PM_{2.5}$ air quality standards would prevent 15,000 premature deaths per year. The agency assigned a value of $5 million to each premature death avoided, and so went on to estimate that the regulation would provide $75 billion (15,000 x $5,000,000) in annual benefits from premature mortality avoided.

But the 15,000-deaths figure is an entirely hypothetical figure, which assumes that ambient $PM_{2.5}$ actually causes or contributes to real deaths. As discussed previously, this is unlikely. The EPA itself refers to these hypothetical deaths as "statistical" lives, meaning that the deaths are merely statistical estimates as opposed to actual body counts.

It is not at all clear that typical ambient levels of $PM_{2.5}$ cause any significant health effects whatsoever, much less kill anyone. Even for the sake of argument and giving the EPA the benefit of the doubt that $PM_{2.5}$ does cause or contribute to premature death, the agency's methodology for estimating at the 15,000-deaths figure is

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since, as the agency admits, they account for "over 90 percent of total benefits," and in fact, they may account for nearly 96% of the rules total estimated benefits. *See* 45 *FR* 45347-8.

inappropriate.[18]

The EPA's valuation of premature deaths avoided is also specious. Here is the EPA's explanation for how it values the avoidance of a premature death:

> Because people are valuing small decreases in the risk of premature mortality, it is expected deaths that are inferred. For example, suppose that a given reduction in pollution confers on each exposed individual a decrease in mortal risk of 1/100,000. Then among 100,000 such individuals, one fewer individual can be expected to die prematurely. If the average individual's WTP for that risk reduction is $50, then the implied value of a statistical premature death avoided in that population is $50 x 100,000 = $5 million.

As is evident from this explanation, this is a rather dubious method for determining the value of a life — people are surveyed for what they would be willing to pay to reduce their risk of premature death by 1/100,000. The survey question is hypothetical and the responses are arbitrary, as no one is actually paying to achieve the purported reduction in risk.

In 1999, the EPA estimated the value of avoiding a premature death at $4.8 million.[19] In 2010, the EPA used a value of $8.9 million.[20] Both values were determined by essentially picking a middle value of the willingness-to-pay estimates reported by various studies offering such estimates. To influence the EPA estimate upward or downward, then, all that need be done is to publish an estimate. So the EPA's valuation process is hardly a scientific one.

It should come as no surprise that just as the EPA exaggerates the hypothetical monetized benefits of its actions; it also understates the predicted costs.

VI. Conclusion

How clean is clean enough? That was a key question during the 1990s' controversy over the Superfund law and the clean up of so-called "toxic waste sites." Addressing that question is what finally got the Superfund program moving — i.e., cleaning up sites in a reasonable manner at reasonable costs for reasonably foreseeable future uses.

It is time that the "how clean is clean enough" question is asked of the Clean Air Act.

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[18] The EPA estimates the number of deaths associated with PM2.5 through the use of statistical associations (or correlations) reported in epidemiologic studies. This methodology (called "attributable risk") is entirely inappropriate since the statistical associations merely indicate how strongly exposures correlate with health effects. These correlations are not risk estimates and cannot be used to estimate the number of health effects in a population.

[19] See http://www.epa.gov/air/sect812/1990-2010/fullrept.pdf, Appendix H.

[20] See http://www.epa.gov/air/sect812/aug10/fullreport.pdf, Table 5-3.

If typical U.S. air quality was a public health problem prior to the Clean Air Act, it has certainly dramatically improved over the past 50 years. While there may be some areas of the U.S. where air quality can and should be improved, these are relatively few in number and are not at all indicative of typical U.S. air quality. This is especially true in the 32 states subject to the CATR.

But instead of recognizing this success and focusing on areas of environmental improvement where actual and "bigger bangs for the buck" can be achieved, the EPA continues without end to tighten air quality standards on the basis of shoddy and cherry-picked science and economics.

Congress should update the Clean Air Act to reflect current environmental and economic conditions, and scientific knowledge, and should conduct more rigorous oversight of the Act's implementation by the EPA. At the very least, regulated entities and individuals should be given meaningful access to the courts to challenge the EPA's actions, including their scientific and economic rationales.

As it currently stands, the EPA's scientific and economic analyses, for example, are essentially unreviewable by courts.[21] This legal situation gives the agency virtually unchallengeable and limitless latitude to act in what it claims to be the public health.

Given that the EPA: (1) funds environment-related research; (2) reviews and validates that research; (3) proposes and finalizes regulations; and (4) enforces its regulations, the agency has been empowered to act as a sort of environmental police, prosecutor, judge, jury and executioner, all rolled into one with no meaningful oversight by Congress or the courts. The EPA is like a business that gets to decide how much of its products consumers must buy and how well its products perform. We wouldn't accept this from a private business and Congress should not accept this from the EPA.

In an era of diminishing returns from ever-more costly environmental standards, it is incumbent upon Congress to reconsider how air quality regulations are developed and implemented so as to avoid regulatory overkill and, even, abuse.

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[21] *See* 467 U.S. 837 (1984). Under the 1984 Supreme Court decision in *Chevron USA, Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837 (1984), as long as the EPA offers virtually any rationale for an action, regardless of the rationale's merits, that action will then not fail the "arbitrary and capricious" standard of the Administrative Procedures Act.