Think Locally, Act Globally
How Curbing Global Warming Emissions Can Improve
Local Public Health

Michael R. Bloomberg, Rohit T. Aggarwala

Global climate change is, of course, just that: global. Its effects are seen around the world. The increase in carbon dioxide can be measured in the atmosphere at the North and South Poles; ice sheets are seen collapsing in Antarctica and glaciers melting from Peru to Switzerland; and increasingly violent storms are seen from New Orleans to Myanmar.

Cities account for a disproportionate amount of the world’s carbon emissions. New York City and many other cities have taken the position that cities can, and must, take the lead in adopting low-carbon strategies, from managing traffic better to making the buildings more energy efficient.

Action must be collective; no one city, no one state, no one nation can prevent climate change. If others do not act, we will still face the same fate of an increasingly hostile climate and extreme weather patterns. When any city reduces its carbon emissions, the whole world will share in the benefits of its action, because the climate change impacts of carbon emissions are felt only on the global level.

New York City’s sustainability plan—PlaNYC: A Greener, Greater New York—recognizes that global climate change is a very local issue. New York City has over 500 miles of coastline, and sea levels have risen by nearly a foot in the last century as measured at the southern tip of Manhattan. Average temperatures in New York City have also been rising in recent years, and storms have been getting more intense. Further, the activities that contribute to global warming have direct local costs. The consumption of electricity, heating oil, and natural gas that contributes 79% of the city’s greenhouse gas emissions costs New Yorkers over $13 billion annually in energy bills. And the vehicles that contribute the remaining 21% cause traffic congestion that costs the New York area an additional $13 billion each year. With these local issues in mind, our proposals for climate change mitigation have already turned the standard phrase on its head: we need to think locally, and act globally.

However, there is another equally important and equally compelling local benefit from climate change mitigation that has not been as thoroughly noted. Most of the strategies that reduce greenhouse gas emissions also have direct benefits to improved public health. Most local-source air pollution comes from the burning of fossil fuels—and local air pollution is directly linked to mortality, cardiovascular diseases, and respiratory illnesses, including asthma among young children. Promoting walking and bicycling instead of driving reduces not only automobile emissions but also obesity—and obesity is linked to chronic diseases such as heart disease and diabetes. Promoting dense, transit-oriented urban environments that get people out of their cars also reduces the traffic fatalities that are a major cause of death in many parts of the world among otherwise healthy adults and young people. Carbon-reduction efforts can have a significant impact on public health.

Health is not a minor fringe benefit. The illnesses we can prevent through transportation and other policy changes that reduce combustion emissions—obesity-related, respiratory, and cardiovascular problems—are among the most prevalent and expensive diseases in many developed countries. If we can improve public health in our cities, we can grow our economies and reduce our carbon emissions at the same time. Here in New York City, we estimate that a modest 10% reduction in particulate matter pollution, a by-product of fossil-fuel combustion, would result in 400–500 fewer deaths each year (Bureau of Environmental Surveillance and Policy, NYC Department of Health and Mental Hygiene, unpublished analysis, March 2007).

Air Quality, Greenhouse Gases, and Public Health

Carbon dioxide—the gas that makes up 77% of the world’s greenhouse gas emissions—is not a direct hazard to human health in atmospheric concentrations. However, the fact is that most of these greenhouse gases are a result of the burning of fossil fuels, as is most air pollution. In the U.S., the three main consumers of fuel—power plants, buildings, and vehicles (Table 1)—account not only for 92% of greenhouse gases, but also for 95% of the sulfur oxides (SOx) that cause acid rain and create particulate matter, and for 99% of the nitrogen oxides (NOx) that form smog.

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The relationship between air quality and public health has been clear for a long time. Air pollution causes respiratory disease, triggers asthma attacks, and contributes to premature mortality. Improvements in air quality—caused by policies related to the burning of fossil fuels—can have a direct impact on local public health. In New York, 40% of our carbon footprint comes from the heating fuels burned in the buildings, and another 39% comes from fossil fuels burned in power plants that provide electricity. Making our buildings more efficient is therefore a major part of our strategy to reduce carbon emissions. But it can also reduce air pollution: in New York City, nearly one third (29%) of locally produced particulate matter in the air comes from the fuel used to heat the buildings.

Public health can improve quickly from efforts to improve air quality and building efficiency. In 1990, the city of Dublin, Ireland, banned the sale and burning of coal. Coal burning is a leading cause of both carbon emissions and smog. The impacts on health were even greater and more rapid than expected. Within a matter of months, cardiovascular deaths decreased by 10%, respiratory deaths decreased by 15%, and total deaths decreased by nearly 6%. Overall, the ban prevents over 350 deaths each year.

Similarly, getting people out of their cars is an important part of a carbon-reduction plan, and reducing automobile congestion can have direct positive impacts on public health. During the 1996 Summer Olympics, the city of Atlanta GA implemented aggressive traffic management policies to get people out of their cars. For the 2-week period of the Olympics, vehicular traffic in Atlanta during peak periods declined 22.5%. And, again, public health improved immediately. During those same 2 weeks, ozone levels decreased, and healthcare visits for episodes of asthma among children declined by 11% to 44%. After the Games were over, both traffic and episodes of asthma returned to their previous levels.

The same thing happened in Busan, South Korea during the 2002 Summer Asian Games. Stringent traffic controls reduced air pollution by up to 25% on some days, and the rate of hospitalization for all causes decreased measurably. After the Games were over and the controls were lifted, hospitalization rates returned to normal.

Both greenhouse gases and pollutants are emitted precisely in proportion to the amount of fuel being used (or forestland being burned); any steps that increase fuel efficiency or reduce demand will also reduce air pollution. Whether it is improving the heating and cooling efficiency of the buildings and power plants, improving the fuel efficiency of the cars, or reducing the amount of electricity consumed, most greenhouse gas–reduction strategies will pay off in terms of reduced local air pollution as well as improved public health.

### Urban Sprawl, Obesity, and Automobile Crashes

Another area where greenhouse gas policies coincide with public health benefits is in the promotion of walking and bicycling. Low-density urban sprawl makes public transportation less effective and creates distances that are too far to walk easily; once wealth increases enough to allow most citizens to own a car, this leads to cities in which people rarely walk. In cities like Copenhagen, London, and Singapore, clear policies are in place to promote better urban design—with a mix of commercial and residential land uses that reduces sprawl and promotes walking, transit, and biking.

Sprawl and automobile dependence are still problems primarily for the developed world. Today, transportation accounts for only 13% of global greenhouse gas emissions, mainly because automobile ownership in many of the world’s largest countries is still at relatively low levels.

The rest of the world, however, is catching up. Any visitor to Beijing who also saw the city a decade ago immediately sees that, while European and American cities are seeking to promote bicycle use, Beijing has nearly completed the switch in the opposite direction. Other cities are working on the same unfortunate transition: in Delhi, India, more than a thousand cars are added to the city’s traffic every day, even as Tata Motors has introduced an automobile that will sell for $2500, doing for India what Ford’s Model T did for the U.S. in 1908.

More walkable, transit-oriented cities that are less dependent on automobiles, such as Copenhagen and

### Table 1. Greenhouse gas (GHG) and criteria pollutant emissions in the U.S. as a percent (%) of total

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![Figure 1. Greenhouse gases (GHG) per capita for several world cities (metric tons per person) (Source: Table 2)](https://www.ajpm-online.net)
Tokyo, have lower per capita carbon emissions than sprawling, automobile-oriented cities like San Diego and Dallas (Figure 1). Less driving, more walking, and more transit ridership means less carbon introduced into the atmosphere, and less local air pollution.

At the same time as our cities are expanding and traffic congestion is worsening, our waistlines are growing. Today, two thirds of all adult Americans are overweight or obese. With clear linkages to diabetes, cardiovascular disease, and other illnesses, it is estimated that obesity accounts for 6% of all U.S. healthcare expenditures, producing more than $75 billion in healthcare costs in the U.S. in 2004.

The problem is not uniquely American; from 1991 to 2004 the percentage of Chinese adults who were overweight or obese increased from 12.9% to 27.3%. Among countries in the WHO’s European Region, 30%–80% of adults are now overweight, with obesity growing at a rate ten times that in the 1970s. As economies get wealthier, many factors are contributing to the obesity epidemic, including higher-calorie diets and less physical activity during work and leisure. But as city sprawl increases with population growth, it will only become more difficult to reverse the trend toward more sedentary lifestyles, and the impact, on both our bodies and our economies, will worsen.

Obesity and automobile-oriented, sprawling settlement patterns are clearly related (Figure 2). Walking is a critical component of daily exercise, and the need to walk to get around is the easiest type of exercise a person can engage in on a daily basis. One study in Atlanta showed that each additional hour spent in a car per day is associated with a 6% increase in the likelihood of obesity, and, unsurprisingly, each additional kilometer walked per day is associated with an almost 5% reduction in obesity. Climbing at least 20 floors per week—something that most people who work in an office on the second floor could easily do—has been associated with a 20% lower risk of stroke or death from all causes, as well as an increase in good (HDL) cholesterol. Overall, the residents of sprawling cities drive more, weigh more, and contribute more carbon dioxide to the atmosphere.

Better urban design, better transit, and pro-walking policies can clearly make a difference. Several studies have shown that transit riders also walk more, because they usually complete at least one part of their trip on foot. Overall, an American who switches to mass transit for his or her daily commute can be expected to reduce his or her lifetime medical expenses by $5500.

Strikingly, there’s an even greater public health benefit that transit-oriented cities get from shifting away from the automobile: a reduction in vehicle-related fatalities. In addition to contributing significantly to greenhouse gas emissions, the built environments of suburban and exurban areas in the U.S. are associated with the highest rates of traffic fatalities. Sprawl is clearly linked with traffic fatalities; the higher an American city or county ranks in terms of sprawl, the greater the rate of pedestrian fatalities due to traffic incidents. In part, drivers in walking-friendly cities are more conscious of pedestrians. Additionally, speed is a critical factor in traffic fatalities, and traffic speeds are generally slower in denser areas, with streets often designed to accommodate...
date pedestrians safely. More importantly, however, cities that are less automobile-dependent have, quite simply, fewer vehicles on the road per person, which reduces overall exposure; thus, the WHO has found that measures to reduce the numbers of motor vehicles, ranging from congestion pricing to telecommuting, can reduce injuries as well. Those American cities with less sprawl, more transit usage, and more walking have fewer automobile fatalities.

In New York, this trend is particularly conspicuous. The average New York City resident drives only one third the amount that the average American drives. And, there is a public health benefit from that: The rate of fatal motor-vehicle crashes in New York City is 71% lower than the national average.

This, too, is an opportunity of global importance. Worldwide, traffic crashes kill almost 1.2 million people and injure as many as 50 million annually; with the increase in automobiles in emerging economies, this is likely to grow. Safety standards must be increased, and drivers must adopt safer practices. There too, alternative transit policies can make a difference; the new mass transit system in Bogotá, Colombia, has significantly improved mobility in that city, while also reducing the number of traffic-related injuries.

Greenhouse Gases, Economic Growth, and Public Health

Considering all the reasons why a lower-carbon life leads to a healthier population, why is the reduction of
carbon emissions not a key public health strategy, especially among developing nations? The answer is that national wealth continues to be the key indicator of overall public health. That stands to reason: A wealthier nation will generally be healthier and spend more on health care. A nation whose people are well-fed, well-housed, well-educated, and have the luxury of thinking about more than just the next day’s meal will be healthier. And so it makes sense that life expectancy is correlated to gross domestic product (GDP; Figure 3) and healthcare expenditures per capita (Figure 4) until fairly high levels are reached. Above what might be considered “developed country” standards, however, that correlation fades and actually reverses.

Further, when nations such as China and India argue that their economic growth must not be restrained by climate change–mitigation policy, the unfortunate fact is that—at first glance—the data would appear to be on their side. Overall, among the same Organization of Economic Co-operation and Development group, per capita GDP does rise somewhat ($R^2=0.24$) with per capita greenhouse gas emissions (Figure 5). Differences among nations are obvious: Western Europe is more compact and efficient, while the extent and high dependence on coal of nations like the U.S., Canada, and Australia all suggest that they are of a different sort than other countries. (This might be comforting until we realize that China and India are also nations of huge distances and large coal reserves.)

This indicates that a nation does not need to be a major producer of greenhouse gases in order to be wealthy—a notion expressed in the measurement of greenhouse gas intensity, which indicates how much greenhouse gas is produced to fuel each $1 in GDP. For example, a nation that has a low standard of living will likely have a low per capita footprint but may well have

### Table 4. Source data for national economic, health, and emissions

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Table 5. Calculated data for national economic, health, and emissions, based on data in Table 2

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aMexico greenhouse gas (GHG) data are for 2002.14
bKorea data are estimated based on total 2005 greenhouse gas emissions of 591 million tons reported by the Associated Press (March 21, 2008) and proportions of energy-related CO₂ and land use–related greenhouse gas emissions reported for 2001.15

GDP, gross domestic product; Gg, gigagrams; GHG, greenhouse gases; OECD, Organization for Economic Co-operation and Development.
a high greenhouse gas intensity, if its industries and vehicles are inefficient, and if it is relying on dirtier fuels. Similarly, a nation with a higher per capita greenhouse gas footprint could well be much more efficient in its creation of greenhouse gases, yielding more economic activity from every ton of greenhouse gas by having cleaner power plants, more efficient cars, and walkable cities (Figure 6).

Figure 4. Life expectancy at birth in Organization of Economic Co-operation and Development (OECD) countries compared with healthcare expenditure per capita, 2005 (Source: Tables 4 and 5)

Figure 5. Gross domestic product (GDP) per capita for Organization of Economic Co-operation and Development (OECD) countries compared with greenhouse gas emissions per capita, 2005 (Source: Tables 4 and 5)
What stands out is that there does seem to be a correlation between greenhouse gas efficiency and public health. Overall life expectancy and healthy average life expectancy increases with greenhouse gas efficiency among comparable nations, and mortality rates among people aged 15 to 60 years declines in the same way (Figure 7). While the correlation is not ironclad—and any public health expert will point out that overall life expectancy is affected by myriad causes—there is enough of a correlation to make it seem that greenhouse gas efficiency is, indeed, a factor in public health, at least among societies of comparable wealth.

Conclusion

So, what does this all mean? First, advocates of climate change–mitigation policies should start talking about the sizeable public health benefits that many of those policies can create. Even a politician who is convinced that global warming is a scientific fraud, or who refuses to work to save the world unless every other nation does so first, cannot ignore proposals that will directly improve the health of his or her constituents.

Second, to do this, climate change and public health advocates will also need to take each other’s priorities into account as they shape their proposals. Some potential approaches to climate change—switching cars from gasoline to diesel fuel, for example—can reduce greenhouse gas while increasing air pollution. The opposite is also true, as some biofuels are proving to have air quality advantages but overall negative greenhouse gas effects. But these conflicts are the exceptions. The overlapping areas—in more efficient buildings, cleaner sources of electricity, fewer cars, and more transit—offer such great opportunities that wise advocates should be willing to make common cause even if some specific proposals must be sacrificed.

Finally, it offers us hope that those nations that are most important to the global fight against climate change will find it in their self-interest to join that fight. Polls show that in the U.S., voters are highly concerned with healthcare costs, which are only increased by carbon-intensive policies. China, India, and other fast-growing economies are increasingly confronting the chronic health problems of the West, including obesity, cardiovascular illness, and respiratory disease. As their prosperity grows, their citizens will demand a greater focus on public health, and they may see that a focus on greenhouse gas efficiency can accommodate growth while also improving public health and contributing to the global effort that so needs their participation.

Figure 6. Greenhouse gas intensity (GHG emissions per unit of gross domestic product) for Organization of Economic Co-operation and Development (OECD) countries compared with GHG emissions per capita, 2005. Metric tons of CO2e (CO2 equivalent), excluding impacts from land use. (Source: Tables 4 and 5)
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**References**