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# Secondary Health Benefits of Carbon Reduction in the Transport Sector

## Policy summary

In countries with ambitious programmes of economic development, such as the Lesser Developed Countries, it can prove difficult politically to justify carbon reduction policies based solely on arguments of climate change. Even in developed countries, climate change policies are better supported if there are clear secondary benefits. Our research demonstrates that the secondary benefits of improved human health can be significant in the area of transport policy, including economically important savings in health care costs and increased worker productivity. Failure to incorporate these savings into estimates of the impacts of climate change policies on national economies can cause a nation to incorrectly forego carbon reduction strategies.

## The Setting

Traffic in modern cities contributes up to a third of greenhouse gas emissions, as well as appreciably degrading ambient air quality. In the cities of developing nations such as Bangkok in Thailand, this contribution is particularly strong due to overcrowding and a reliance on older vehicles—including two-stroke engines— which emit particulates and other air pollutants. The health impacts of these pollutants are well established, and are related primarily to respiratory and cardiovascular diseases that reduce the quality of life, reduce productivity of workers, and lead to premature death.

Emission Source	1997		2002	
	Emission Rate (tons/year)	Percentage of Emission Rate (%)	Emission Rate (tons/year)	Percentage of Emission Rate (%)
Point Source	3,735	9.78	3,246	8.84
Mobile Source	20,602	53.94	19,735	53.77
Area Source	13,855	36.28	13,724	37.39
<b>Total</b>	<b>38,192</b>	<b>100.00</b>	<b>36,705</b>	<b>100.00</b>

Air pollution in a mega-city can be dominated by emissions from traffic (mobile sources). This table shows the contributions in Bangkok for emissions of particulate matter (PM).

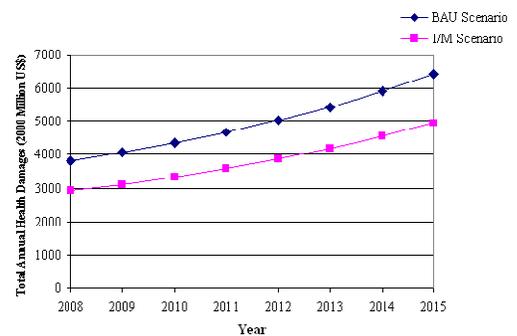
Nations are also seeking ways to contribute to the global climate change challenges. In developing nations, policies that reduce carbon emissions are likely to be viewed as putting a brake on economic development. Hence, abatement of greenhouse gases tends to be postponed until economic development is fully established. Arguments for improved air quality and human health, however, generally proceed due to the quite evident effect of the pollutants on quality of life. This has led to increased linking of carbon reduction and human health in developing and justifying policies, a link called the “secondary benefits” of carbon reduction. These secondary benefits occur when a policy that reduces carbon dioxide emissions, such as improvements in the Transport sector, leads also to reduction in emissions of toxic air pollutants, which in turn improves human health, reduces health care costs, and improves economic performance.

## The Analysis

Our approach was to simulate the impact of different traffic-related policies on the air quality of Bangkok, using data from the Air Pollution Control Division. Policies related to a switch away from two-stroke vehicles, enhanced programmes of vehicle inspection and maintenance, and improvements in fuel efficiency as the current fleet is replaced over time by more modern vehicles, were each examined. Simulations were performed for both the current conditions in Bangkok and the projected growth of Bangkok over the next several decades—growth that would bring more people and vehicles. Each policy was simulated to calculate the ambient air concentration of PM as a function of time, the exposures to the population of the city, the respiratory and cardiovascular diseases that would result, and the health care costs of treating those diseases.

## Conclusion

Our results show that the health care costs in Bangkok alone are appreciable. For the baseline year of 2000, there were estimated to be 1682 deaths attributed to PM emissions from vehicles, and health care costs that result in a total economic loss of 2.7 billion 2000 U.S. dollars (2.4% of Thailand's GDP for that year). These numbers are projected to increase by 140% by 2015 if current transport policies are retained. Simulating the influence of different policies, we find that emissions reductions from mobile sources on the order of 50% can be achieved, resulting in a savings of between 1 and 2 billion U.S. dollars annually by 2015. The study further shows that costs of implementing and maintaining these programmes are less than the savings in health care for policies that reduce emissions by as little as 4%.



Traffic-associated health care costs in Bangkok over time both with a Business as Usual policy (BAU Scenario) and with a significantly enhanced vehicle inspection and maintenance programme (I/M Scenario). The difference between the two curves is on the order of 1 billion U.S. dollars per year.

As to greenhouse gas emissions reduction, the benefits are on the same order as the reduction in PM. Policies examined above would reduce the carbon dioxide emissions from the Transport sector of Thailand by similar values of between 4% (the minimal reduction needed for the benefits to outweigh the costs) and 50% (the largest value likely under the policies examined). Clearly, the secondary benefits of greenhouse gas reductions in the Transport sector have significant implications for a developing nation assessing policies that reduce both greenhouse gas and air toxics emissions simultaneously.

The Cambridge Centre for Climate Change Mitigation Research (4CMR) studies the interconnected economic, energy and environmental policies at the heart of climate change policy.

This Briefing Paper was developed by Dr. Douglas Crawford-Brown of 4CMR based on research conducted by and with Dr. Ying Li of the University of North Carolina.



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