

# Chapter 1. Policies that Improve the Environment and Environmental Public Health

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## **1 Introduction: Policies that Improve the Environment and Environmental Public Health**

Chapter 1 presents policies that would reduce the transportation system’s impacts on the environment and environmental public health, chiefly through reducing the negative effects of transportation-related emissions. This can be accomplished through two approaches: reducing the amount of emissions that are generated and reducing exposure to these emissions when they do occur.

Tailpipe emissions, which are the by-products of fuel combustion, and emissions from electricity-generating sources (in the case of electric-powered vehicles) have the most direct impact on the environment and human health. Their health effects are well-documented—higher incidence of:

respiratory disease (such as asthma and chronic obstructive pulmonary disease), cardiovascular disease, and adverse pregnancy outcomes. Pregnant women, children, and the elderly are the most vulnerable.<sup>1,2</sup>

Yearly costs incurred to treat related diseases and the costs incurred by the premature deaths associated with exposure to these emissions range from \$50 to \$80 billion adjusted to 2008 dollars.<sup>3</sup> In addition to financial costs, there are losses in productivity; one impact indicator is missed days at school or at work. In 2008, 58.7 percent<sup>4</sup> of all child asthma sufferers and 33.2 percent<sup>5</sup> of adult asthma sufferers missed some school or work that year as a result of an attack.

On the larger-scale level of environmental health, one of the largest impacts from transportation-related emissions is the generation of greenhouse gases—carbon dioxide, primarily—which are associated with climate change.

### **Opportunities for Improving the Environment and Environmental Public Health**

Very substantial progress can be achieved by reducing emissions and reducing exposure to emissions when they occur. We have identified nine policies within three areas where substantial improvements in environmental health can be made. The three areas are:

- Reduce human exposure to transportation-related emissions
- Reduce transportation's contribution to climate change
- Promote a reduction in vehicle-miles travelled through pricing mechanisms

### **Reduce Human Exposure to Transportation-Related Emissions**

Transportation-related emissions with the most direct effect on human health include carbon monoxide, nitrogen dioxide, ozone (the primary ingredient in smog), particulate matter, sulfur dioxide, and toxins such as lead.<sup>6</sup>

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<sup>1</sup> Boothe, V. and D.G. Schendell. 2008. Potential Health Effects Associated with Residential Proximity to Freeways and Primary Roads; Review of the Literature 1999-2006. *Journal of Environmental Health*, 70 (8): 33-41, 55-56.

<sup>2</sup> Friedman, M.S., K.E. Powell, et al. 2001. Impact of Changes in Transportation and Commuting Behaviors During the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma. *The Journal of the American Medical Association*, 285 (7): 897-905.

<sup>3</sup> American Public Health Association. 2010. *The Hidden Health Costs of Transportation*. Available at: <http://www.apha.org/NR/rdonlyres/F84640FD-13CF-47EA-8267E767A1099239/0/HiddenHealthCostsofTransportationShortFinal.pdf> [accessed April 21, 2011].

<sup>4</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. 2008. National Health Interview Survey. *Proportion of Children Aged 5 to 17 Years with Asthma Who Miss School Days, Percent*. Available at: [http://www.healthindicators.gov/Indicators/Missedschooldays\\_1410/Profile/Data](http://www.healthindicators.gov/Indicators/Missedschooldays_1410/Profile/Data) [accessed April 25, 2010].

<sup>5</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. 2008. National Health Interview Survey. *Proportion of Adults Aged 18 to 64 Years with Asthma Who Miss Work Days, Percent*. Available at: [http://www.healthindicators.gov/Indicators/Missed-work-days\\_1411/National\\_0/Profile/Data](http://www.healthindicators.gov/Indicators/Missed-work-days_1411/National_0/Profile/Data) [accessed June 13, 2011].

<sup>6</sup> U.S. Environmental Protection Agency. 2011. *National Ambient Air Quality Standards*. Available at: <http://www.epa.gov/air/criteria.html> [accessed May 22, 2011].

Short-term exposure to these pollutants can exacerbate existing symptoms for those with asthma and chronic obstructive pulmonary disease, along with other respiratory diseases.<sup>7</sup> Populations that are exposed over longer terms—people living near high-traffic roadways, for example—experience excess rates of cardiopulmonary mortality,<sup>8,9</sup> as well as adverse pregnancy outcomes such as pre-term birth and low birth weight.<sup>10,11</sup>

The adoption of advanced emission control devices and clean-engine technologies, in addition to tighter fuel efficiency standards, have resulted in reduced vehicle emissions, but until the economic downturn, the total number of vehicle-miles traveled was steadily increasing, counteracting some of these technological and regulatory gains.<sup>12</sup>

Steps to reduce exposure to transportation-related emissions include: improving air quality monitoring systems to give individuals and communities the information they need to make healthier choices; separating high-polluting facilities—especially those that have high rates of “fine” particulates, those that measure 2.5 micrometers across or less (PM<sub>2.5</sub>)—from vulnerable populations; and further reductions in tailpipe emissions and improvements in fuel efficiency.

### **Reduce the Transportation System’s Contribution to Climate Change**

Greenhouse gases in the atmosphere trap heat and contribute to rising surface temperatures. This can trigger a multitude of mechanisms—including weather patterns and sea level rise—that can have adverse environmental health effects.<sup>13</sup> From 1990 to 2009, transportation’s total greenhouse gas emissions (nearly all of which were carbon dioxide) rose 17 percent.<sup>14</sup> Put another way, in 2009, transportation was responsible for 33 percent of total carbon dioxide emissions, nearly 64 percent of which were from gasoline consumption for personal use.<sup>15</sup>

Converting transportation to low-carbon power, such as natural gas, hydrogen, and wind-, solar-, or natural gas-generated electricity will decrease transportation’s contribution to climate change.

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<sup>7</sup> Brunekreef, B. and S.T. Holgate. 2002. Air Pollution and Health. *The Lancet*, 360 (9341): 1233-1242.

<sup>8</sup> Gan, W.Q., L. Tamburic, et al. 2010. Changes in Residential Proximity to Road Traffic and the Risk of Death from Coronary Heart Disease. *Epidemiology*, 21 (5): 642-649.

<sup>9</sup> Ostro, B., M. Lipsett, et al. 2010. Long-Term Exposure to Constituents of Fine Particulate Air Pollution and Mortality: Results from the California Teachers Study. *Environmental Health Perspectives*, 118: 363-369.

<sup>10</sup> Wu, J., M. Wilhelm, J. Chung and B. Ritz. 2011. Comparing Exposure Assessment Methods for Traffic-Related Air Pollution in an Adverse Pregnancy Outcome Study. *Environmental Research*, 111 (5): 685-92.

<sup>11</sup> Brauer, M., C. Lencar, et al. 2008. A Cohort Study of Traffic-Related Air Pollution Impacts on Birth Outcomes. *Environmental Health Perspectives*, 116 (5).

<sup>12</sup> U.S. Environmental Protection Agency. 2011. *2011 U.S. Greenhouse Gas Inventory Report*. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009. Chapter 3. Available at: <http://www.epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Chapter-3-Energy.pdf> [accessed May 17, 2011].

<sup>13</sup> Centers for Disease Control and Prevention. 2009. *Policy on Climate Change*. Available at: [http://www.cdc.gov/climatechange/pubs/Climate\\_Change\\_Policy.pdf](http://www.cdc.gov/climatechange/pubs/Climate_Change_Policy.pdf) [accessed 21 April 2011].

<sup>14</sup> U.S. Environmental Protection Agency. 2011. *2011 U.S. Greenhouse Gas Inventory Report*. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009. Chapter 3. Available at: <http://www.epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Chapter-3-Energy.pdf> [accessed May 17, 2011].

<sup>15</sup> Ibid.

Additionally, decreasing the size disparity in the motor vehicle fleet will bring down the overall consumption of fuel and reduce greenhouse gas emissions. Finally, shifting travelers' behavior from driving alone to carpooling, vanpooling, and using active transportation and public transportation is an important way to reduce carbon emissions.

### **Promote a Reduction in Vehicle-Miles Traveled Through Pricing Measures**

The overwhelming number of vehicle-miles traveled (VMT) in the U.S. are made in motor vehicles—some 3 trillion miles in 2007.<sup>16</sup> In 2009, 83 percent of all trips made by the American public were in private vehicles.<sup>17</sup> The other three modes—railroads, transit, and domestic air carrier—account for 11.5 billion VMT combined; by contrast, motor vehicle VMT was more than 3 trillion.<sup>18</sup>

Between 1990 and 2009, the total VMT for passenger cars and light-duty trucks in the U.S. increased by 39 percent, as a result of population growth, economic growth, increasingly dispersed land use practices, and relatively low fuel prices.<sup>19</sup>

To reduce VMT and its impacts, some motor vehicle trips can be replaced by alternatives, such as transit, carpooling, walking, or bicycling; or they can be made when there is less congestion; or trips can be combined. Changing the price of operating a motor vehicle through user fees or other charges; changing the price of access to road facilities depending on time of day and other factors (while providing adequate support for alternatives); and changing the price of access to parking depending on time of day and demand, can all promote changes in behavior that result in fewer VMT.

## **Chapter 1 at a Glance**

In this chapter, we examine three policies that improve the environment and environmental public health:

### **1.1 Reduce Human Exposure to Transportation-Related Emissions**

### **1.2 Reduce Transportation's Contribution to Climate Change**

### **1.3 Promote a Reduction in Vehicle-Miles Traveled Through Pricing Measures**

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<sup>16</sup> Research and Innovative Technology Administration Bureau of Transportation Statistics. 2009. *Transportation Statistics Annual Report. U.S. Vehicle-Miles: 1998-2007*. Available at: [http://www.bts.gov/publications/transportation\\_statistics\\_annual\\_report/2009/html/chapter\\_01/table\\_01\\_02\\_10.html](http://www.bts.gov/publications/transportation_statistics_annual_report/2009/html/chapter_01/table_01_02_10.html) [accessed April 21, 2011].

<sup>17</sup> Federal Highway Administration. Summary of Travel Trends: 2009 National Household Travel Survey. Available at: <http://nhts.ornl.gov/2009/pub/stt.pdf> [accessed July 8, 2011].

<sup>18</sup> Research and Innovative Technology Administration Bureau of Transportation Statistics. 2009. *Transportation Statistics Annual Report. U.S. Vehicle-Miles: 1998-2007*. Available at: [http://www.bts.gov/publications/transportation\\_statistics\\_annual\\_report/2009/html/chapter\\_01/table\\_01\\_02\\_10.html](http://www.bts.gov/publications/transportation_statistics_annual_report/2009/html/chapter_01/table_01_02_10.html) [accessed April 21, 2011].

<sup>19</sup> Ibid.