

The External Air Pollution Costs of Industrial Production

H. Scott Matthews, Chris Hendrickson, Lester Lave

Introduction:

Despite many years of environmental regulation, significant levels of air pollution are generated by the provision of goods and services in the United States. In 1992, these externalities caused an estimated \$180 billion of such damages in the U.S.

To reduce environmental damage, analysis tools such as Life Cycle Assessment (LCA) have been developed to better understand the total impacts of products and processes. These tools consider the effects associated with every stage in the life of a product, including raw materials extraction, component fabrication, assembly, delivery, use, and disposition. However, LCA methods are hindered by boundary problems, circularities among industries, and the difficulty of assessing emissions inventories for decision making.

Approach:

We use the EIO-LCA model developed at Carnegie Mellon to solve the boundary problem. EIO-LCA is a Leontief input-output (IO) model augmented by environmental impact information to determine the direct and total supply chain effects resulting from the production of the 500 commodity sectors contained in the Department of Commerce's 1992 IO table. Toward this effort, we have generated a substantial data set linking releases of criteria pollutants and greenhouse gases with manufacturing activities in each sector. The result is an assessment, rather than simply an inventory, of environmental effects.

The total air pollution releases found for each commodity are combined with a range of environmental damage valuation studies to estimate the external costs of these activities. We concentrate on air pollution because consistent valuations are not available for other environmental effects. Our results include consideration of supply chain effects as well as the direct effects from producing commodities.

As shown in the following table, the production of electricity generates 34 cents of external costs per dollar of production, but the average commodity generates less than 4 cents. These values could be incorporated into an accounting or pricing system to show corporate decision makers or policymakers the full costs of materials, product, and process choices. A web site has been created at <http://www.eiolca.net/> that shows users the supply chain impacts of production in both economic and environmental terms. The external cost estimates are shown as well.

Commodity Sector	External Cost	1992 Output
	Percentage	(billions)
Electric services (utilities)	34%	\$171
Petroleum refining	11%	\$132
Crude petroleum / natl gas	12%	\$105
Natural gas distribution	15%	\$77
Trucking services	6%	\$157
Retail trade	2%	\$523
Wholesale trade	1%	\$569
Industrial chemicals	7%	\$89
Blast furnaces and steel mills	14%	\$42
Eating and drinking places	2%	\$281
Average over all 500 sectors	4%	\$22

When these results are combined with the Consumer and Producer Price Indices as well as the Consumer Expenditure Survey to determine the external costs associated with buying and selling commodities, we find that the average dollar spent by consumers generates about 3 cents of external cost, while producers generate 5 to 9 cents. The results show that the average American household's spending generates roughly 40 tons of carbon dioxide equivalent releases per year. Such a method could be followed by governmental agencies to adjust for environmental damage in the publication of such indices.

Finally, using our data set of current emissions, and the findings above, we compare the effects of various policies to reduce emissions, including command and control and market-based initiatives. Market-based initiatives are projected to save billions of dollars in expenditures if enacted for sulfur dioxide, nitrogen oxides, and volatile organic compounds. In addition, if new regulations were set to reduce external costs, significant improvements over current levels would result with savings in the billions of dollars.

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For more information contact:

H. Scott Matthews
(412) 268-3645
Email: hsm@cmu.edu

Chris Hendrickson
(412) 268-2941
Email: cth@cmu.edu

<http://www.ce.cmu.edu/GreenDesign/>
<http://www.eiolca.net/>



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