

Economic Impact and Regulatory Flexibility Analysis of the Regulation of VOCs from Consumer Products

Final Report

Submitted to

Bruce Madariaga
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emissions Standards Division
Standards Development Branch
Research Triangle Park, NC 27711

Prepared by

Brian C. Murray
Craig D. Randall
Center for Economics Research
Research Triangle Institute
Research Triangle Park, NC 27709

EPA Contract Number 68-D4-0099
RTI Project Number 6029-13

August 1995



EPA Contract Number
68-D4-0099

RTI Project Number
6029-13

Economic Impact and Regulatory Flexibility Analysis of the Regulation of VOCs from Consumer Products

Final Report

August 1995

Submitted to

Bruce Madariaga
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emissions Standards Division
Standards Development Branch
Research Triangle Park, NC 27711

Prepared by

Brian C. Murray
Craig D. Randall
Center for Economics Research
Research Triangle Institute
Research Triangle Park, NC 27709

This report contains portions of the economic impact analysis report that are related to the industry profile.

SECTION 1

INTRODUCTION, REGULATORY BACKGROUND, AND INDUSTRY PROFILE

1.1 INTRODUCTION

Under Title I of the Clean Air Act of 1990, the U.S. Environmental Protection Agency (EPA) is developing regulations to reduce volatile organic compound (VOC) emissions from various consumer and commercial products. The specific products subject to the regulation analyzed in this report are 24 product categories targeted primarily for use by household consumers (hereafter referred to as "consumer products"). The consumer products are a subset of the broader category, "consumer and commercial products," as defined below. The individual consumer products subject to the regulation are listed in Table 1-1. VOC emissions from certain other categories of consumer and commercial products are being controlled through separate regulations.

This report analyzes the economic impacts of these proposed Federal regulatory strategies. Section 183(e)(1)(B) of the Clean Air Act Amendments of 1990 defines a consumer or commercial product as

any substance, product (including paints, consumer and commercial products, and solvents), or article (including any container or packaging) held by any person, the use, consumption, storage, disposal, destruction, or decomposition of which may result in the release of volatile organic compounds.

TABLE 1-1. ESTIMATED EMISSIONS REDUCTION FROM
CONSUMER PRODUCTS

Product category	Proposed VOC limit (percent)	Emissions (tons/yr)		Emission reduction	
		Baseline	Controlled	Tons/yr	Percent
Aerosol cooking sprays	18	2,720	1,768	952	35
Air fresheners ^a					
(single phase)	70	8,078	6,139	1,939	24
(double phase)	30	12,372	10,764	1,608	13
(liquid and pumps)	18	8,029	8,029	0	0
(solid and gels)	3	397	151	246	62
Auto windshield washer fluids ^b	10, 35 (cold)	80,522	53,145	27,377	34
Bathroom and tile cleaners	5, 7 (aero)	1,356	949	407	30
Carburetor and choke cleaners	75	5,873	4,522	1,351	23
Charcoal lighter materials ^c	d	3,961	2,971	990	25*
Dusting aids (aerosols)	35	345	169	176	51
(other forms)	7	276	185	91	33
Engine degreasers ^d	75	2,860	2,317	543	19
Fabric protectants	75	1,097	878	219	20
Floor polishes and waxes ^e		3,860	2,895	965	25*
(Flexible)	7				
(Nonresilient)	10				
(Wood)	90				
Furniture maintenance products	25	3,585	3,083	502	14
General purpose cleaners	10	1,413	579	834	59
Glass cleaners ^f	8, 12 (aero)	15,461	6,648	8,813	57
Hair sprays	80	179,613	150,875	28,738	16
Hair mousses	16	2,421	1,743	678	28
Hair styling gels	6	622	174	448	72
Household adhesives ^g		67,608	50,706	16,902	25*
(aerosol)	75				
(contact)	80				
(constr/panel)	40				
(general purpose)	10				

See footnotes at end of table.

(continued)

TABLE 1-1. ESTIMATED EMISSIONS REDUCTION FROM
CONSUMER PRODUCTS (continued)

Product category	Proposed VOC limit (percent)	Emissions (tons/yr)		Emission reduction	
		Baseline	Controlled	Tons/yr	Percent
Insecticides					
(crawling bug)	40	17,179	7,215	9,964	58
(flea and tick)	25	3,739	1,196	2,543	68
(flying bug)	35	5,753	2,646	3,107	54
(foggers)	45	3,663	2,234	1,429	39
(lawn/garden)	20	8,799	2,376	6,423	73
Laundry prewash					
(aerosol and solid)	22	529	354	175	33
(other forms)	5	337	337	0	0
Laundry starch products	5	6,033	3,740	2,293	38
Nail polish removers ^h	85	6,287	5,595	692	11
Oven cleaners	5, 8 (aero)	1,825	1,022	803	44
Shaving creams	5	95	60	35	37
Underarm antiperspirant ⁱ					
(aerosol)	60	5,456	5,347	109	2
(others)	0	18,264	18,264	0	0
Underarm deodorant ⁱ					
(aerosol)	20	1,364	1,146	218	16
(others)	0	4,566	4,566	0	0
All categories		486,358	364,788	121,570	25

Note: This table adapted from Table 2-1 in U.S. Environmental Protection Agency. Study of Volatile Organic Compound Emissions from Consumer and Commercial Products. Office of Air Quality Planning and Standards. Research Triangle Park, NC.

* These categories were assessed assuming a reduction of 25 percent based on reduction calculations for the remaining categories.

^a Air fresheners category does not include toilet deodorant blocks.

Current California Air Resources Board (CARB) standard for single-phase air fresheners is 70 percent; standard is reduced to 30 percent 1/1/96, but reductions were calculated based on 70 percent limit.

^b Windshield washer emission reduction estimate was calculated assuming that half of the products are formulated for "cold" areas or seasons. Either a geographic or seasonal applicability provision would need to be developed.

^c The CARB charcoal lighter emission standard is 0.020 lb VOC per start, based on test method specified in South Coast Air Quality Management District Rule 1174, February 27, 1991. No estimate of emission reductions was made.

^d Current CARB engine degreaser standard is 75 percent. This limit is reduced to 50 percent 1/1/96, but reductions were calculated based on 75 percent standard.

(continued)

TABLE 1-1. ESTIMATED EMISSIONS REDUCTION FROM
CONSUMER PRODUCTS (continued)

-
- ^e EPA survey data on floor waxes and polishes are not separated by type of flooring. No estimate of reductions was made.
 - ^f CARB standard for nonaerosol glass cleaners is reduced to 6 percent 1/1/96, but reductions were calculated based on currently effective 8 percent limit.
 - ^g EPA survey data on adhesives is separated into ten categories that do not correspond with CARB categories. No estimate of reductions was made.
 - ^h Current CARB standard is 85 percent. Standard is reduced to 75 percent effective 1/1/96, but calculation was based on 85 percent. Acetone, the principal ingredient, is currently being considered by EPA for exemption from the VOC definition.
 - ⁱ The CARB standards for underarm antiperspirants and deodorants refer to content of "high volatility organic compounds" (i.e., those VOCs with a vapor pressure of greater than 80 millimeters of mercury [mmHg] at 20° C). Because aerosol propellants are the only ingredients of these products with such high vapor pressures, this measure is, in effect, a limitation on the propellant content of the products.

Thus, the general purpose of the regulation is to reduce the flow of VOCs into the atmosphere from consumption and disposal of products that contain VOCs. Figure 1-1 shows the dissipative emissions and the disposal emissions into the air that are the target of this regulation.¹ These emissions are distinguished from the manufacturing-related emissions that are controlled by other forms of regulation (as are emissions to land and water). The proposed regulatory structure and an overview of the regulated industries are presented, respectively, in the sections that follow.

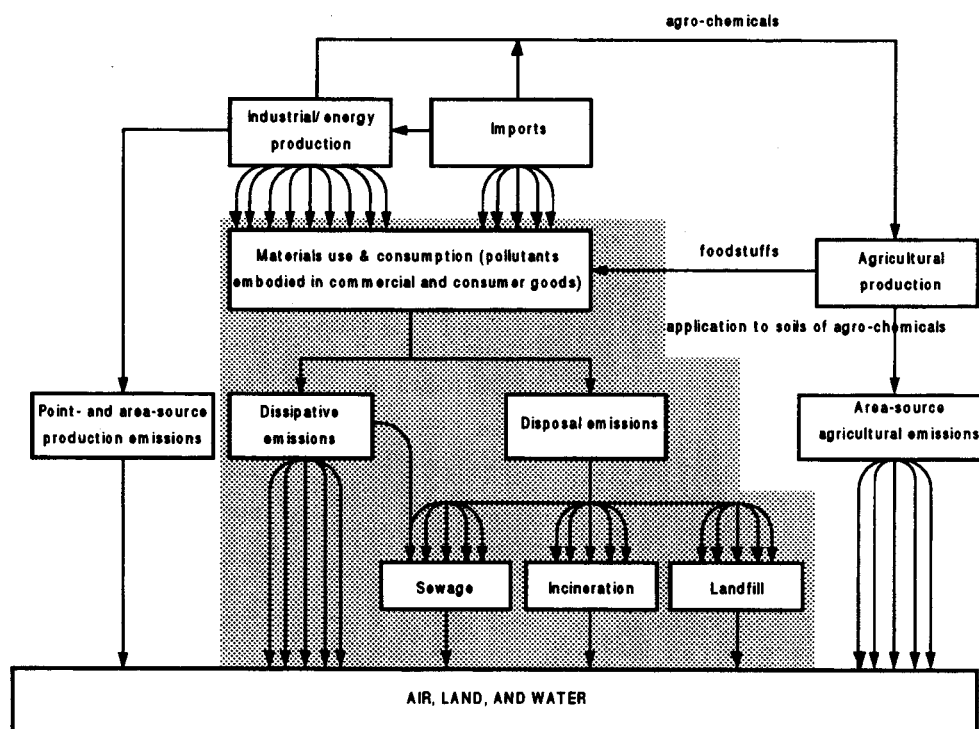


Figure 1-1. Comprehensive classification of emissions from consumer and commercial products.

Source: Adapted from Stigliani, William M. Chemical Emissions from the Processing and Use of Materials: the Need for an Integrated Emissions Accounting System. *Ecological Economics* 2(4):325-341. 1990. (Figure 2).

1.2 REGULATORY BACKGROUND

Section 183(e)(3)(A) directs the EPA to create categories of consumer or commercial products whose use accounts for at least 80 percent of VOC emissions in ozone nonattainment areas. The EPA has divided this category list into four groups and establish priorities for regulation.

The design of regulatory strategies to reduce VOCs emitted by consumer products is shaped in specific ways by the Clean Air Act as amended. Two components of the legislation are of particular importance:

- determining regulated entities, and
- establishing best available controls.

Regulations developed under Section 183(e) may be imposed only with respect to "manufacturers, processors, wholesale distributors, or importers of consumer or commercial products for sale or distribution in interstate commerce in the United States." The definition of regulated entities excludes retailers and users.

The regulations affecting consumer products will require best available controls. The EPA Administrator, on the basis of "technological and economic feasibility, health, environmental, and energy impacts," will determine the desired degree of emissions reduction that

is achievable through the application of the most effective equipment, measures, processes, methods, systems or techniques, including chemical reformulation, product or feedstock substitution, repackaging, and directions for use, consumption, storage, or disposal. (Section 183[e][1])

The requirement for best available controls establishes the general environmental goal of regulation, not the means by which regulated entities will comply.

1.2.1 Regulatory Structure

The EPA surveyed producers of consumer and commercial products to estimate baseline (1990) VOC emissions from these sources.² Based on "the survey," EPA determined that approximately 28 percent (3.3 million tons) of VOC emissions in ozone nonattainment areas originated with consumer and commercial products. Approximately 500,000 tons of VOCs (roughly 4 percent of VOC emissions in ozone nonattainment areas) were emitted from the "consumer products" group considered in this regulation.

The main component of the proposed regulations is a set of VOC content limit standards, which are proposed to go into effect in 1996, to regulate the emissions from the 24 consumer products considered in this report. Table 1-1 includes the proposed Table of Standards (TOS) for consumer products. All such products manufactured after a specified date in 1996 cannot be sold in the U.S. unless the VOC content of the product falls at or below the limits established in the TOS.

In addition to compliance with the TOS, the proposed regulations include administrative requirements for code-dating products to identify the product and its date of manufacture.

This report includes an overview of the consumer products industry and an analysis of economic impacts on the affected entities. An economic model of the consumer products industry was developed and applied to baseline data for the industry to obtain estimates of the potential market price and quantity effects associated with imposing the proposed TOS on consumer products producers. In addition, a Regulatory Flexibility Analysis was performed to estimate the impacts of the regulation on small businesses that produce consumer products.

1.3 INDUSTRY OVERVIEW

In this section we present a descriptive and statistical overview of the consumer products industry to provide some context for baseline conditions prior to the proposed regulations.

1.3.1 Consumer Products and VOC Content

Table 1-1 includes a list of the consumer products subject to the regulation, along with the baseline emissions estimates from the consumer and commercial products emissions survey.

Consumer products comprise just under 500,000 tons of baseline (1990) emissions per year, which is approximately 15 percent of the total VOC emissions from all consumer and commercial products--and 4 percent of total VOC emissions from all sources--in ozone nonattainment areas. The proposed regulations are expected to achieve a 25 percent reduction in VOC emissions from these sources.³

The largest single emissions category is hair sprays, accounting for approximately 180,000 tons/yr, or 37 percent of the total emissions for consumer products. Other large sources include auto windshield washer fluids (81,000 tons/yr) and household adhesives (68,000 tons/yr).

1.3.2 Baseline Statistics for the Affected Product Markets

Table 1-2 reports the baseline market value data for all product groups subject to the regulation. These data are from the 1992 U.S. Census of Manufactures and are reported as value of shipments and quantities where that data are available (four cases).

TABLE 1-2. BASELINE MARKET VALUE DATA BY PRODUCT

Product	SIC code	Value of shipments (\$MM)	
		1992	1990 ^a
Aerosol cooking sprays	20791-51 ^b	214.0	239.6
Air freshener	28423-81 (85)	512.8	430.8
Single-phase			
Double-phase			
Liquids/pump sprays			
Solids/gels			
Automotive windshield washer fluids	28423-15	29.4	24.7
Cold climate areas			
All other areas			
Bathroom and tile cleaners	28423-30	122.8	103.2
Aerosols			
All other forms			
Charcoal lighter material (mm/gal)	28995-93	61.1	58.7
Carburetor-choke cleaners	NA	NA	NA
Dusting aids/furniture maintenance products	28424-15	185.1	155.5
Aerosol			
All other forms			
Engine degreasers	NA	NA	NA
Fabric protectants	NA	NA	NA
Floor polishes/waxes (mm/gal)	28424-21 (23) (25)	288.0	241.9
Products for flexible flooring mats			
Products for nonresilient flooring			
Wood floor wax			
General purpose cleaners	28412-04 (05) (06)	503.6	518.7
Glass cleaners	28423-11	256.6	215.5
Aerosols			
All other forms			
Hair sprays	28443-63 (64)	774.7	712.7
Hair mousses	28443-26	139.4	128.2
Hair styling gels	28443-41	132.2	121.6
Household adhesives ^c	2891	2,293.2	2,224.4
Aerosol			
Contact			
Construction and panel			
General purpose			
Insecticides	28799		
Crawling bug	28799-12 (17)	415.6	386.5
Flea and tick	28799-45	133.9	124.5
Flying bug	28799-21 (24)	84.4	78.5
Foggers	28799-86 ^b	81.8	76.1
Lawn and garden	28795	191.2	177.8
Laundry prewash (mm/lb)	28412-61	72.7	74.9
Aerosols/solids			
All other forms			

See footnotes at the end of table.

(continued)

TABLE 1-2. BASELINE MARKET VALUE DATA BY PRODUCT
(continued)

Product	SIC code	Value of shipments (\$MM)	
		1992	1990 ^a
Laundry starch products	28423-48	49.4	41.5
Nail polish removers	28447-45	46.9	43.1
Oven cleaners	28423-21	64.6	54.3
Aerosols/pump sprays			
Liquids			
Shaving creams	28441-49	270.1	248.5
Deodorant/antiperspirant			
Aerosol	28447-31	176.1	162.0
Nonaerosol	28447-35	1,019.0	937.5
Total		8,118.5	7,580.7

Source: Dodge Construction Potentials as reported in the Statistical Abstract of the United States, 1992 (Table 1208, p. 708).

- ^a Adjusted based on ratio of 1990 and 1992 Value of Shipments at 4-digit SIC level.
- ^b Value of Shipments for Aerosol Cooking Sprays was estimated by taking the value of shipments for all cooking oils (SIC 20791-52 (53) (54) (59) (98) and (00)) and multiplying by the estimated cooking spray share of all cooking oils revenues (.1659). Efforts to derive to cooking spray share from secondary sources and trade groups were unsuccessful; therefore, the share was estimated through primary data collection at supermarkets in Durham, NC, in July 1995.
- ^c Value of Shipments for Household Adhesives was computed by taking the value of shipments for General Adhesives and Sealants (SIC 2891) and multiplying this value by the ratio of new residential floorspace to all new floorspace constructed from 1980 to 1990 (.6103).

Total market value for all of the regulated consumer products is approximately \$7.6 billion (1990 \$). The highest value of shipments category is household adhesives (\$2.2 billion), followed by all insecticides combined (\$843.4 million), then Hair Sprays \$712.7 million).

1.3.3 Consumer Products Market Flow and Potential Regulatory Influences

Figure 1-2 depicts the process by which economic forces bring consumer products to the market. Focusing first on supply factors, raw materials and other inputs are combined in the manufacturing stage. The manufacturing process involves mixing the materials according to specific formulae and producing a product with distinct performance characteristics. The manufactured product is then packaged and distributed to outlets for consumer purchase.

The demand for consumer products is fundamentally the result of household consumption decisions. These decisions are made based on tastes and preferences of household members for different (potential) items in the household "commodity bundle," subject to the prices of consumption items and an overall budget constraint. The price of a consumer product relative to both the price of other commodities and the budget will determine how much of the product a household will demand (possibly zero). With rare exceptions, we would expect to see a reduction (an increase) in the quantity demanded of a product if its price rises (falls), all else equal.

Product demand can be viewed as the collective decision-making of all relevant households regarding consumption of the product in question. Product supply can be viewed as the collective decisionmaking of all relevant firms regarding the production of the product in question. Product demand and supply interact in the marketplace, where prices are estab-

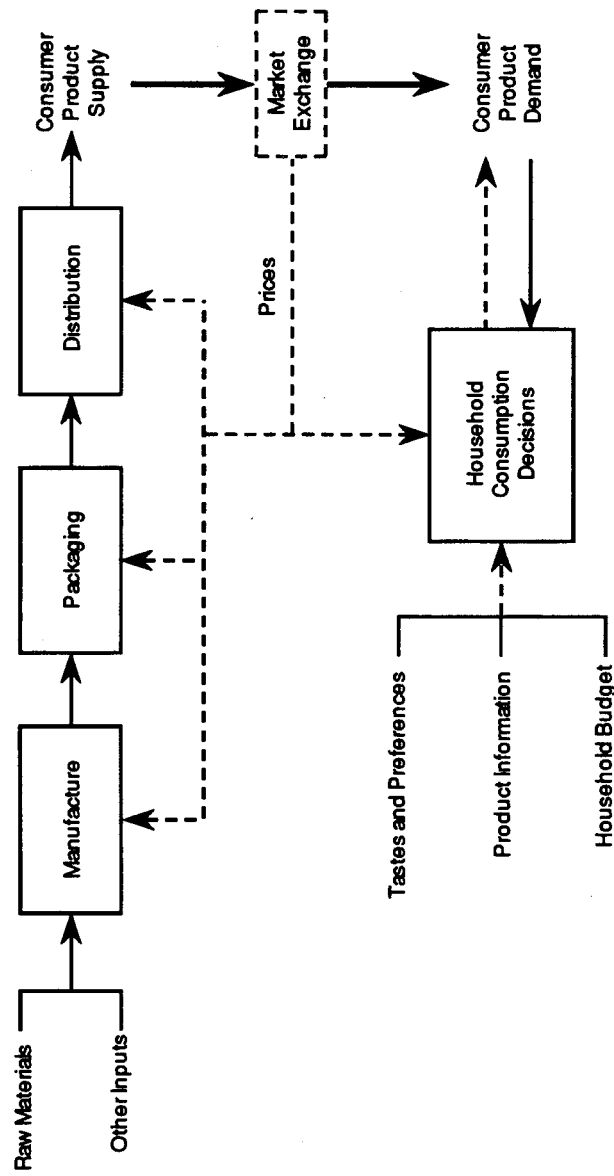


Figure 1-2. Consumer products process flow.

lished that equate the quantity supplied by firms with the quantity demanded by households.

Firms in the consumer products industry may engage in one, two, or all three stages shown on the production side of Figure 1-1. In many cases, one firm will market and distribute a product that it contracts to have made by an independent manufacturing firm. The larger companies are likely to be integrated through all stages of production.⁴ The existence of different firm structures is relevant in assessing firm-level impacts of the proposed regulations.

The proposed regulation prohibits the sale of a consumer product after a certain date if the VOC content exceeds the product category limit. Thus, this restriction's direct "point of impact" for the industry falls on the distribution stage. However, this restriction works its way through the other channels of production. For instance, while the regulation does not explicitly prohibit the manufacture of noncompliant products, it would be pointless to manufacture products that cannot be sold. Thus, either a new formula would have to be developed for manufacturing the products or the products would be pulled from the market.

Reformulation involves an investment in research and development (R&D) to create a new formula that allows the manufactured product to comply with VOC standards and possess market-valued performance standards. Since the formula is a fixed input into the manufacturing stage, the cost of reformulating a specific product would seem to fall on the firm controlling the manufacturing stage. If that firm is different from the firm controlling the distribution stage--on whom the sales restriction falls directly--the issue of who bears the cost is a little less clear.

In the section that follows, the potential cost and economic impacts are estimated within the context of a market model. These impacts are then evaluated in terms of their effects as small producers.

SECTION 4

REFERENCES

1. Stigliani, William M. Chemical Emissions from the Processing and Use of Materials: The Need for an Integrated Emissions Accounting System. Ecological Economics 2(4):325-341. 1990. (Adapted from Figure 2.)
2. U.S. Environmental Protection Agency. Study of Volatile Organic Compound Emissions from Consumer and Commercial Products: Report to Congress. Office of Air Quality Planning and Standards. Research Triangle Park, NC. EPA-453/R-94-006-A. March 1995.
3. Reference 2.
4. Telecon with Cosmetic Toiletries and Fragrance Association. June 9, 1995. Murray, Brian, RTI, Harrison, Rob, Radian Corporation. Moore, Bruce, US EPA.
5. Radian Corporation. Volatile Organic Compounds Emissions from Consumer and Commercial Products Underarm Deodorants and Antiperspirants. Prepared for U.S. Environmental Protection Agency, QAQPS. December 1991.
6. Telecon. Epperson, David, Radian Corporation, with Murray, Brian, RTI. July 7, 1995. Survey database protocol.
7. Reference 5.
8. U.S. Department of Commerce. 1995. Implicit Price Deflators for Gross Domestic Product, 1959-1994.
9. U.S. Environmental Protection Agency. VOC Emissions Survey for Consumer and Commercial Products. Office of Air Quality Planning and Standards. 1993.
10. Personal communication. Letter from Fratz, D. Douglas, Chemical Specialties Manufacturers Association to Madariaga, Bruce, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, July 20, 1995.

11. Viscusi, W. Kip, John M. Vernon, and Joseph E. Harrington, Jr. Economics of Regulation and Antitrust. Lexington, MA, D.C. Heath and Company. 1992.
12. Infotrac. Investext. Foster City, CA: Information Access Company.
13. U.S. Department of Commerce. 1992 Census of Manufactures: Statistics for Industry Groups and Industries. Washington, DC, U.S. Government Printing Office. 1992.
14. Reference 8.
15. Tirole, Jean. The Theory of Industrial Organization. MIT Press. 1988