SWT-2016-9 JULY 2016

TRANSPORTATION EMISSIONS IN THE CONTEXT OF EMISSIONS FROM OTHER ECONOMIC SECTORS: 1990-2014

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Report No. SWT-2016-9
July 2016

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
SWT-2016-9		

4. Title and Subtitle	5. Report Date
Transportation Emissions in the Context of Emissions from Other Economic Sectors: 1990-2014	July 2016
	6. Performing Organization Code 383818

7. Author(s)	8. Performing Organization Report No.
Michael Sivak and Brandon Schoettle	SWT-2016-9

9. Performing Organization Name and Address	10. Work Unit no. (TRAIS)
The University of Michigan Sustainable Worldwide Transportation 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.	11. Contract or Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
The University of Michigan Sustainable Worldwide Transportation	14. Sponsoring Agency Code

15. Supplementary Notes

Information about Sustainable Worldwide Transportation is available at http://www.umich.edu/~umtriswt.

16. Abstract

This report examines long-term trends in the contribution of transportation to total greenhouse gas emissions in the United States, in the context of the other sources of emissions (industry, commercial, residential, and agriculture). Also of interest in this study are the relative contributions of various transportation modes, both to transportation emissions and to total emissions. The period examined was from 1990 through 2014. The raw data came from the U.S. Environmental Protection Agency.

The following are the main findings:

(1) The relative contribution to total emissions of the largest emitter—industry—decreased during the period examined, while those of the transportation, commercial, residential, and agricultural sectors increased.

(2) The relative contribution of emissions from medium- and heavy-duty trucks to total emissions from all sources increased substantially, while those from passenger cars and light-duty trucks increased only slightly, and those from commercial aircraft stayed about the same.

There are two main implications of this study. First, because of the major progress in reducing emissions from industry during the period examined, we can expect an increased emphasis on reducing emissions from the other economic sectors, including transportation. Second, because of the large increase in the contribution of medium- and heavy-duty trucks to total emissions, we can expect an increased emphasis on reducing emissions from these classes of vehicles.

17. Key Words	18. Distribution Statement
Greenhouse gases, long-term trends, transportation, driving, flying, industry, commercial, residential, agriculture, cars, trucks	Unlimited

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
None	None	14	

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Introduction

This report examines long-term trends in the contribution of transportation to total greenhouse gas emissions in the United States, in the context of the other sources of emissions (industry, commercial, residential, and agriculture). Also of interest in this study are the relative contributions of various transportation modes, both to transportation emissions and to total emissions. The period examined was from 1990 through 2014. The raw data came from the U.S. Environmental Protection Agency.

Method

The analysis used data covering a 25-year period from 1990 through 2014 (EPA, 2016). The following three sets of percentages were calculated:

(1) Greenhouse gas emissions from the five economic sectors (industry, transportation, commercial, residential, and agriculture) as percentages of total emissions.[1]

(2) Greenhouse gas emissions from different modes of transportation as percentages of **transportation** emissions.

(3) Greenhouse gas emissions from selected modes of transportation as percentages of **total** emissions.

[1]Emissions from the U.S. territories were excluded from the total emissions.

Results

Breakdown of total emissions by economic sector

Table 1 and Figure 1 present U.S. greenhouse emissions by economic sector from 1990 through 2014. The main findings are as follows:

(1) The relative contribution of the largest emitter—industry—decreased during the period examined. In 1990, industrial emissions represented 35.6% of all emissions, compared with 29.4% in 2014.

(2) The relative contribution of the second largest emitter—transportation—first increased from 24.4% in 1990 to 27.5% in 2006, then decreased, representing 26.6% of total emissions in 2014.

(3) The relative contributions of the commercial, residential, and agricultural sectors also increased during the period examined. Specifically, emissions increased from 15.2% to 17.2% for the commercial sector, from 15.0% to 16.8% for the residential sector, and from 9.8% to 10.1% for the agricultural sector.

Table 1
U.S. greenhouse gas emissions by economic sector, 1990-2014.
The entries are percentages of total emissions.

Year	Industry	Transportation	Commercial	Residential	Agriculture
1990	35.6	24.4	15.2	15.0	9.8
1991	35.3	24.0	15.5	15.4	9.8
1992	35.6	24.4	15.2	15.1	9.8
1993	34.6	24.6	15.3	15.6	9.9
1994	34.8	25.1	15.3	15.3	9.5
1995	34.3	25.3	15.3	15.3	9.8
1996	34.0	25.4	15.2	15.7	9.7
1997	34.2	25.5	15.6	15.4	9.2
1998	33.6	25.9	15.6	15.3	9.6
1999	33.1	26.7	15.6	15.6	9.0
2000	32.2	26.7	16.1	16.1	8.9
2001	31.0	27.0	16.4	16.3	9.3
2002	30.5	27.4	16.3	16.5	9.3
2003	30.3	27.1	16.5	16.9	9.2
2004	30.3	27.2	16.5	16.5	9.5
2005	29.7	27.4	16.9	17.0	9.1
2006	30.0	27.5	16.8	16.3	9.4
2007	29.4	27.1	17.2	16.8	9.5
2008	29.2	26.5	17.6	17.1	9.6
2009	27.5	27.1	17.9	17.2	10.3
2010	28.5	26.4	17.5	17.5	10.1
2011	28.9	26.5	17.4	17.1	10.3
2012	29.3	27.1	17.0	16.0	10.6
2013	29.5	26.6	17.1	16.6	10.2
2014	29.4	26.6	17.2	16.8	10.1

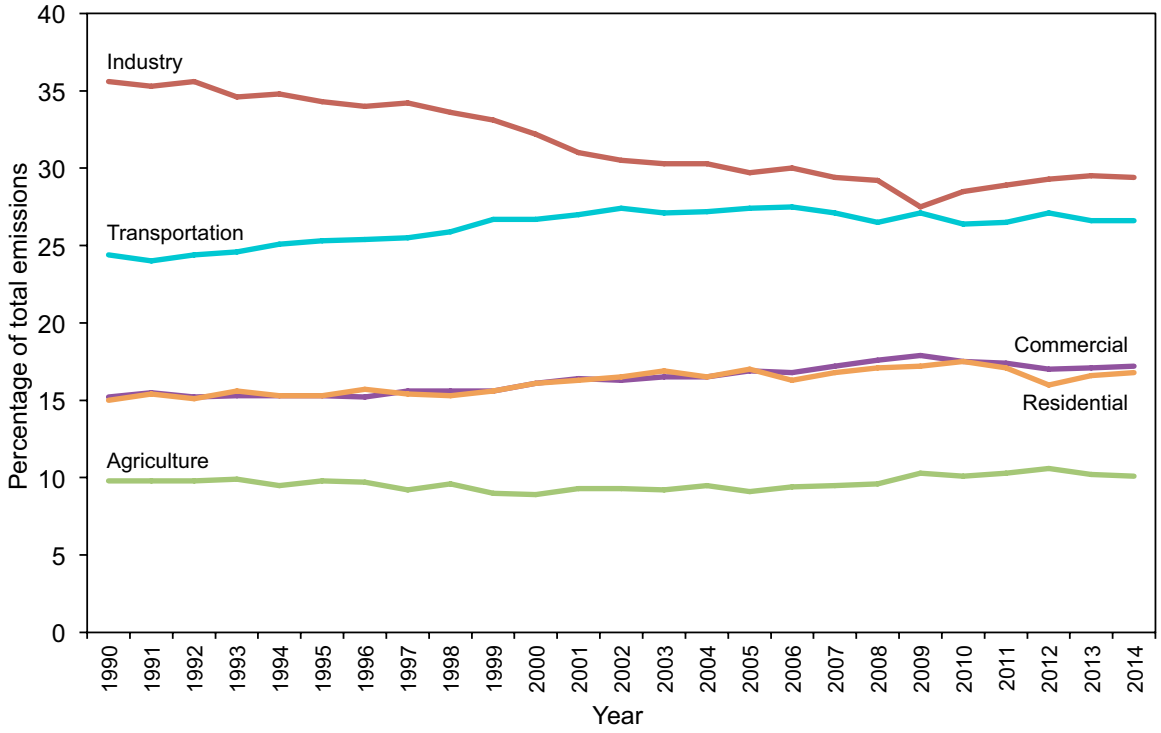

Figure 1. U.S. greenhouse gas emissions by economic sector as percentages of total emissions, 1990-2014.

Breakdown of transportation emissions by transportation mode

Table 2 and Figure 2 present breakdowns of U.S. transportation emissions by transportation mode from 1990 through 2014. The main findings are as follows:

(1) The relative contribution of passenger cars and light-duty trucks first increased from 63.8% in 1990 to 65.0% in 2003, then decreased, representing 60.7% of transportation emissions in 2014.

(2) The relative contribution of medium- and heavy-duty trucks increased from 14.9% in 1990 to 22.5% in 2014.

(3) The relative contribution of commercial aircraft decreased from 7.1% in 1990 to 6.4% in 2014.

(4) The relative contribution of other aircraft decreased from 5.0% in 1990 to 1.9% in 2014.

(5) The relative contribution of other modes of transportation decreased from 9.1% in 1990 to 8.5% in 2014.

Table 2
U.S. greenhouse gas emissions by transportation mode, 1990-2014.
The entries are percentages of **transportation** emissions.

Year	Passenger cars and light-duty trucks	Medium- and heavy-duty trucks	Commercial aircraft*	Other aircraft†	Other‡
1990	63.8	14.9	7.1	5.0	9.1
1991	64.9	15.0	6.9	4.6	8.6
1992	65.0	15.1	6.8	4.1	8.9
1993	64.8	15.5	6.8	3.9	8.9
1994	64.1	16.0	6.9	3.9	9.1
1995	63.8	16.2	6.8	3.6	9.5
1996	63.7	16.4	6.8	4.0	9.1
1997	64.0	17.0	7.0	3.7	8.4
1998	64.6	17.3	6.6	3.9	7.5
1999	64.5	17.7	7.0	3.5	7.3
2000	62.9	18.0	7.3	3.1	8.7
2001	64.1	18.1	6.6	3.6	7.7
2002	64.0	18.4	6.3	3.4	7.8
2003	65.0	18.4	6.4	3.0	7.2
2004	64.4	18.5	6.3	3.3	7.5
2005	62.9	19.9	6.7	3.0	7.6
2006	62.4	20.4	6.9	2.4	7.9
2007	60.6	21.6	7.1	2.1	8.7
2008	60.5	21.8	6.8	2.5	8.4
2009	62.7	20.6	6.6	2.0	8.0
2010	61.8	21.3	6.2	2.2	8.5
2011	61.3	21.5	6.4	1.9	8.8
2012	61.3	21.8	6.4	1.8	8.7
2013	60.6	22.1	6.4	1.9	9.0
2014	60.7	22.5	6.4	1.9	8.5

* Domestic operations.
† General aviation and military aircraft.
‡ Includes buses, motorcycles, ships and boats, rail, pipelines, and lubricants.

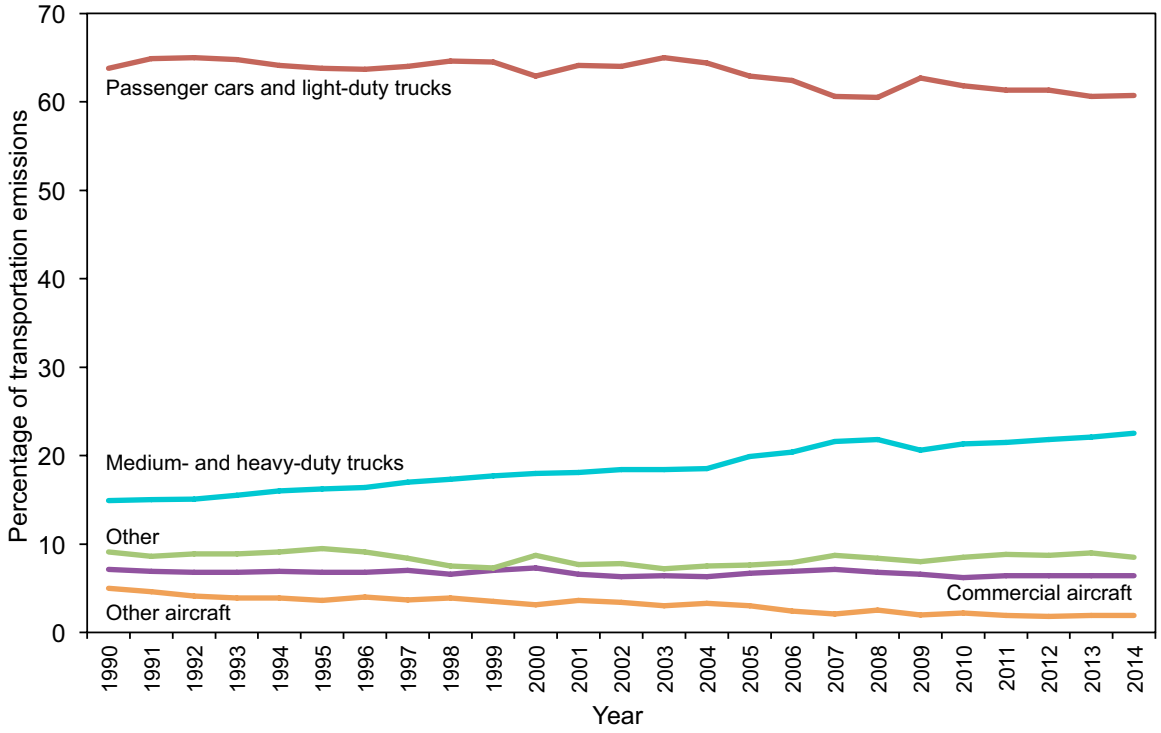

Figure 2. U.S. greenhouse gas emissions by transportation mode as percentages of transportation emissions, 1990-2014.

Emissions from different transportation modes in the context of total emissions

Table 3 and Figure 3 present emissions from different transportation modes as percentages of **total** emissions for 1990 through 2014. The main findings are as follows:

(1) The relative contribution of passenger cars and light-duty trucks first increased from 15.6% in 1990 to 17.6% in 2003, then decreased, representing 16.1% of total emissions in 2014.

(2) The relative contribution of medium- and heavy-duty trucks increased from 3.6% in 1990 to 6.0% in 2014.

(3) The relative contribution of commercial aircraft stayed approximately the same during the period examined, representing 1.7% of total emissions in both 1990 and 2014.

(4) The relative contribution of other aircraft decreased from 1.2% in 1990 to 0.5% in 2014.

(5) The relative contribution of other modes of transportation stayed about the same (2.2% in 1990 and 2.3% in 2014).

Table 3
U.S. greenhouse gas emissions by transportation mode, 1990-2014.
The entries are percentages of **total** emissions.

Year	Passenger cars and light-duty trucks	Medium- and heavy-duty trucks	Commercial aircraft*	Other aircraft†	Other‡
1990	15.6	3.6	1.7	1.2	2.2
1991	15.6	3.6	1.7	1.1	2.1
1992	15.8	3.7	1.7	1.0	2.2
1993	15.9	3.8	1.7	1.0	2.2
1994	16.1	4.0	1.7	1.0	2.3
1995	16.2	4.1	1.7	0.9	2.4
1996	16.1	4.2	1.7	1.0	2.3
1997	16.4	4.3	1.8	0.9	2.1
1998	16.7	4.5	1.7	1.0	2.0
1999	17.2	4.7	1.9	0.9	1.9
2000	16.8	4.8	1.9	0.8	2.3
2001	17.3	4.9	1.8	1.0	2.1
2002	17.5	5.0	1.7	0.9	2.1
2003	17.6	5.0	1.7	0.8	2.0
2004	17.5	5.0	1.7	0.9	2.0
2005	17.2	5.4	1.8	0.8	2.1
2006	17.2	5.6	1.9	0.7	2.2
2007	16.4	5.9	1.9	0.6	2.4
2008	16.1	5.8	1.8	0.7	2.2
2009	17.0	5.6	1.8	0.5	2.2
2010	16.3	5.6	1.6	0.6	2.2
2011	16.2	5.7	1.7	0.5	2.3
2012	16.6	5.9	1.7	0.5	2.4
2013	16.1	5.9	1.7	0.5	2.4
2014	16.1	6.0	1.7	0.5	2.3

* Domestic operations.
† General aviation and military aircraft.
‡ Includes buses, motorcycles, ships and boats, rail, pipelines, and lubricants.

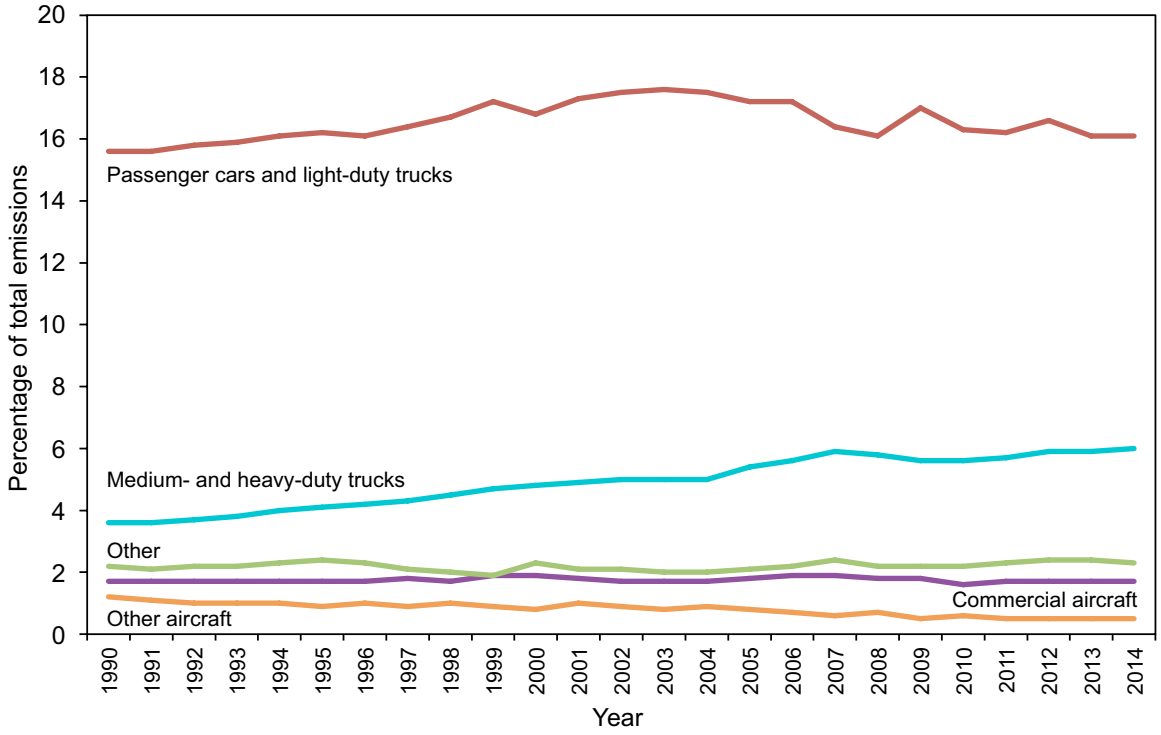

Figure 3. U.S. greenhouse gas emissions by transportation mode as percentages of total emissions, 1990-2014.

Discussion

Trends in the relative contributions of different economic sectors to total emissions

From 1990 to 2014, the relative contribution to total emissions decreased substantially for the industrial sector (from 35.6% in 1990 to 29.4% in 2014), but increased for the transportation, commercial, residential, and agricultural sectors. These overall trends occurred because of two underlying trends: First, absolute emissions from the industrial sector decreased by 11.4% during the period examined, despite increases in population and GDP. Second, absolute emissions from the transportation, commercial, residential, and agricultural sectors increased by 16.7%, 21.2%, 20.1%, and 10.0%, respectively. (Total emissions for the United States increased by 7.3% during this period.)

Trends in the relative contributions of different transportation modes to transportation emissions

The major finding here is that the relative contribution of medium- and heavy-duty trucks increased substantially compared with other modes of transportation (from 14.9% in 1990 to 22.5% in 2014). This trend is due mostly to the large (76.3%) increase in absolute emissions from medium- and heavy-duty vehicles. At the same time, the relative contributions of passenger cars and light-duty trucks, and commercial and other aircraft decreased.

Trends in the relative contributions of different transportation modes to total emissions

The trends observed for the relative contributions of different transportation modes to *total* emissions do not all follow the same pattern as for *transportation* emissions. This is because the relative contribution of the transportation sector to total emissions increased during the period examined.

With that proviso in mind, the relative contribution of medium- and heavy-duty trucks to total emissions increased substantially (from 3.6% in 1990 to 6.0% in 2014). At the same time, the contribution of passenger cars and light-duty trucks increased only slightly (from 15.6% to 16.1%), despite a large (31.7%) increase in the number of vehicles [FHWA, 2016]. The contribution of commercial aircraft stayed approximately

the same (at 1.7%), while the contribution of other aircraft decreased (from 1.2% in 1990 to 0.5% in 2014).

Implications

There are two main implications of this study. First, because of the major progress in reducing emissions from industry during the period examined, we can expect an increased emphasis on reducing emissions from the other economic sectors, including transportation. Second, because of the large increase in the contribution of medium- and heavy-duty trucks to total emissions, we can expect an increased emphasis on reducing emissions from these classes of vehicles.

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