## 5.16 Waste Disposal

*This chapter describes external costs associated with disposal of vehicle wastes.*

### 5.16.1 Chapter Index



### 5.16.2 Definition

*Waste disposal* external costs include damage costs associated with the inappropriate disposal of used tires, batteries, junked cars, oil and other harmful materials resulting from motor vehicle production and maintenance. It can also include any public costs devoted to the proper disposal of such materials.

A separate but related issue is uncompensated costs and risks associated with the transport of hazardous materials. These external costs are not considered in this chapter.

### 5.16.3 Discussion

Motor vehicles produce various harmful waste products that can impose externalities.[1] Many junked cars sit for years before they are recycled and some must be disposed of at public expense. Tire piles create environmental and health hazards, especially when they catch fire.[2] Although efforts are underway to find uses for waste tires, none have eliminated landfill waste disposal.[3]

About 80% of cars can be recycled at the end of service life, mainly the metal parts. The remaining 20 percent includes plastics, rubber, glass, and metal pieces and adds up to about five million tons per year which is mainly disposed of in landfills.[4]

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[1] USEPA (1999), *Indicators of the Environmental Impacts of Transportation*, Office of Policy and Planning, US Environmental Protection Agency (www.epa.gov).
[2] Washington DoE (1993), *1992 Washington State Waste Characterization Study*, Washington Dept. of Ecology (www.ecy.wa.gov).
[3] EDF (1999), *Green Car; End-of-Life Vehicle Management*, Environmental Defense Fund (www.edf.org).
[4] EPA (2008), *Wastes - Resource Conservation - Common Wastes & Materials: Automotive Parts* (www.epa.gov); at www.epa.gov/epawaste/conserve/materials/auto.htm.

Motor vehicle wastes are the major source of moderate-risk wastes produced in typical jurisdictions, as indicated below.[5]

| **Moderate Risk Waste** | **Percent** |
|---|---|
| *Used Oil (Primarily Automobile)* | *50%* |
| *Batteries (Primarily Automobile)* | *15%* |
| *Antifreeze (Primarily Automobile)* | *7%* |
| Cleaners, Paints, Adhesives | 21% |
| Pesticides, Other | 7% |

These wastes impose various economic, human health, environmental and aesthetic costs. Costs result from improper disposal, residual impact even when proper disposal is observed, and because some disposal efforts are subsidized by general taxes. Some new laws and policies are intended to internalize these costs. Crankcase oil recycling is encouraged, vendors are required to recycle used car batteries, and in some states a tire tax is dedicated to tire disposal. It is uncertain to what degree these policies reduce external disposal costs. Although electric vehicles do not create waste oil, they do produce used batteries, hulks and tires, which may have disposal problems.[6]

There is potential overlap between water quality costs described in the previous chapter and waste costs described here, since both include waste crankcase oil. Water quality costs cover impacts of oil and other fluids that drip during vehicle use. Waste costs address impacts of oil and other fluids after their useful life, during disposal. A review of the previous chapter will show that there is no overlap in calculating these costs.

## 5.16.4 Estimates:

- Douglass Lee estimates the following external disposal costs.

***Table 5.16.4-1*** **Automobile External Waste Disposal Cost Estimate**[7]

| Product | Annual Volume | Unit Costs |
|---|---|---|
| Waste Oil | 960 million quarts | $0.50 |
| Scrapped cars | 2.82 million | $25 |
| Tires | 300 million | $1 |

*Added together this totals $850 million; adjusting for inflation by consumer price index results in a total of $1.16 billion in 2007 dollars.*

[5] Washington DoE (1990), *Problem Waste Study (Moderate Waste)*, Washington Department of Ecology (www.ecy.wa.gov), p. 12.
[6] Frank Kreith, Paul Norton and DenaSue Potestio (1995), "Electric Vehicles: Promise and Reality," *Transportation Quarterly*, Vol 49, No. 2, Spring 1995, pp. 5-21.
[7] Douglas Lee (1995), *Full Cost Pricing of Highways*, USDOT Volpe National Transportation Systems Center (www.volpe.dot.gov). p. 31.

- According to the US Environmental Protection Agency 130 million tires were burned for fuel and 27 million went to landfills in the US in 2003.[8] The EPA also reports that only 12% of antifreeze is recycled, although the percentage recycled is increasing.[9]

- About five million tons of *automotive shredder waste*, non-recycled materials from scrap cars including plastics, rubber, glass, and metal pieces, is disposed of in landfills in the US each year.[10]

- Lead is toxic. Long-term exposure can cause brain damage, kidney damage, and learning problems in children. The automobile industry is responsible for about 41% of lead releases and transfers in Canada and the USA, including about 43,000 tonnes of lead in batteries disposed of in landfills and 16,500 tonnes of lead in automotive shredder waste.[11]

### 5.16.5 Variability

Impacts depend on vehicle size, design, construction and waste management standards. Europe may have lower costs than North America and other regions due to tighter waste stewardship regulations.

### 5.16.6 Equity and Efficiency Issues

Waste disposal externalities are an external cost, and therefore inequitable and inefficient. Automotive waste processing and recycling facilities are likely concentrated in low-income areas both regionally and globally, so impacts such as lead contamination are likely distributed inequitably as well.

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[8] EPA (2008), *Wastes - Resource Conservation - Common Wastes & Materials - Scrap Tires* (www.epa.gov); at www.epa.gov/epawaste/conserve/materials/tires/basic.htm

[9] EPA (2008), *Wastes - Resource Conservation - Common Wastes & Materials: Antifreeze* (www.epa.gov), updated August 28, 2008; at www.epa.gov/epawaste/conserve/materials/antifree.htm

[10] EPA (2008), *Wastes - Resource Conservation - Common Wastes & Materials: Automotive Parts* (www.epa.gov), Updated August 28, 2008; at www.epa.gov/epawaste/conserve/materials/auto.htm

[11] Jeff Gearhart, Dean Menke, Charles Griffith, and Kevin Mills (2003), *Getting the Lead Out: Impacts and Alternatives for Automotive Lead Use*, Environmental Defense (www.environmentaldefense.org); at www.environmentaldefense.org/go/lead

## 5.16.7 Conclusions

Waste disposal is a significant problem of automobile production and use, although a problem of lesser magnitude than some other impacts. Based on Lee's estimates for waste oil, scrap cars, and tires we use an estimate of $1.2 billion per year in the US. Although it may overstate some waste costs if new management efforts are successful, it excludes other wastes altogether. $1.2 billion divided by the annual milage in the US, 3,000 billion miles, results in a per-mile cost of $0.0004. This cost is applied equally to all motor vehicles, including electric cars. As described in chapter 5.15 (Water Pollution), although public transit buses and trams may produce more waste per vehicle, their waste tends to be managed better than those of private vehicles, so costs are considered equal.

***Table 5.16.7-1 Estimate* Waste Disposal Costs** ($2007 US per Vehicle Mile)

| Vehicle Class | Urban Peak | Urban Off-Peak | Rural | Average |
|---|---|---|---|---|
| Average Car | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Compact Car | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Electric Car | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Van/Light Truck | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Rideshare Passenger | 0.00 | 0.00 | 0.00 | 0.00 |
| Diesel Bus | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Electric Bus/Trolley | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Motorcycle | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Bicycle | 0.00 | 0.00 | 0.00 | 0.00 |
| Walk | 0.00 | 0.00 | 0.00 | 0.00 |
| Telework | 0.00 | 0.00 | 0.00 | 0.00 |

### Automobile Cost Range

Due to the uncertainty of this cost and its relatively small magnitude, the minimum cost is zero. The maximum is 2.5 times the estimate used here.

| Minimum | Maximum |
|---|---|
| $0.00 | $0.001 |

## 5.16.8 Information Resources

*Climate Change Evaluation Tools* (www.epa.gov/climatechange/wycd/waste/tools.html), by the U.S. Environmental Protection Agency, identifies the greenhouse (GHG) impact of manufacturing, and waste management actions.

The *Basel Action Network* (www.ban.org) provides information on the impacts of improper transfers of toxic waste, including lead acid batteries and the electronic components of automobiles, for recycling and disposal.

FHWA (1999), *The Environmental Guidebook*, Federal Highway Administration (www.fhwa.dot.gov), FHWA-99-005.

Jeff Gearhart, Dean Menke, Charles Griffith, and Kevin Mills (2003), *Getting the Lead Out: Impacts and Alternatives for Automotive Lead Use*, Environmental Defense (www.environmentaldefense.org); at www.environmentaldefense.org/go/lead

Douglas Lee (1995), *Full Cost Pricing of Highways*, USDOT Volpe National Transportation Systems Center (www.volpe.dot.gov).

USEPA (1999), *Indicators of the Environmental Impacts of Transportation*, Office of Policy and Planning, USEPA (www.epa.gov).

*USEPA Waste Division* (www.epa.gov/osw/) provides information on various types of waste related to transportation, including antifreeze, batteries, crude oil, drip pads, industrial wastes, solvents, tires, underground storage tanks and used oil.

Zero Waste, *Tire Dumps* (www.zerowasteamerica.org/Tires.htm).