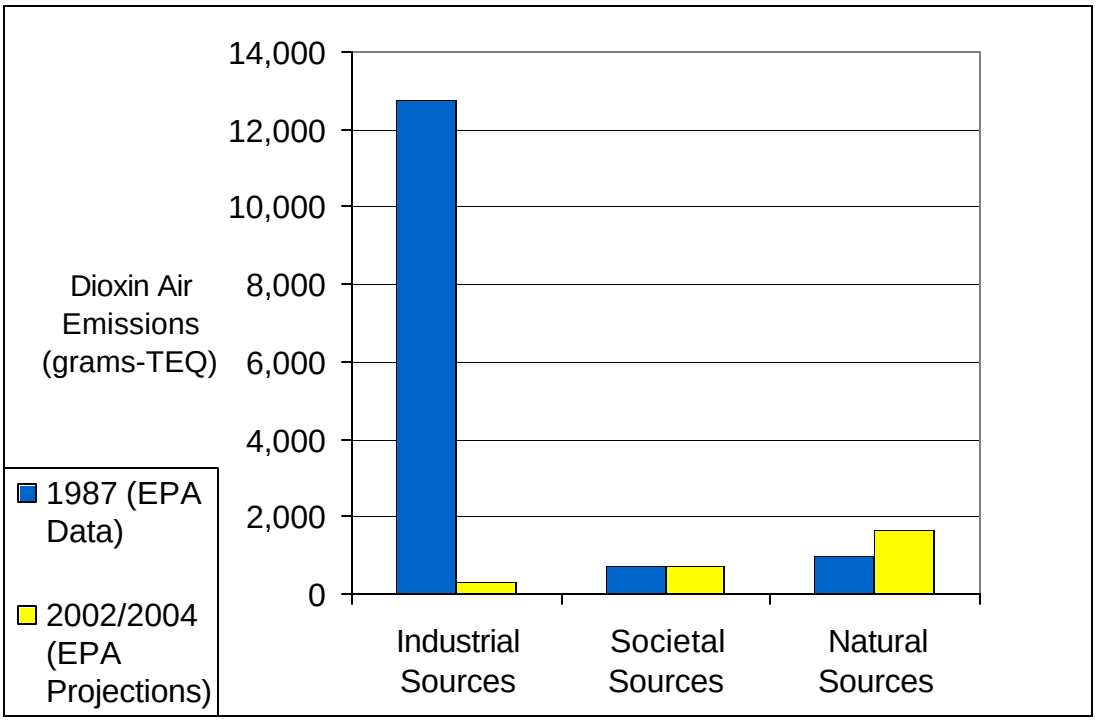
A Comparison of Dioxin Air Emissions From Industrial, Societal and Natural Sources Between 1987 and the Present



Dioxin is emitted into the air from numerous diverse sources which may be divided broadly into three categories: industrial (*e.g.*, manufacturing), societal (*e.g.*, backyard trash burning) and natural (*e.g.*, forest fires). While industrial and societal sources of dioxin may be controlled through environmental regulations and voluntary industry and citizen initiatives, natural dioxin air emissions, such as those from forest fires, are largely uncontrollable by humans, and depend greatly upon natural factors, such as weather in the case of forest fires.

According to U.S. Environmental Protection Agency (EPA) data[i], since 1987 the greatest progress in reducing dioxin air emissions has been made in the category of industrial sources. Industrial activities that inadvertently generate dioxin as a by-product include municipal and medical waste incineration, coal-fired utilities, various types of manufacturing and industrial wood burning. The graphic above shows that dioxin air emissions from industrial activities declined 98% from 1987 to the present. This significant decrease is attributed to successful environmental regulations and industry initiatives to control dioxin emissions. Municipal and medical incineration contributed 70% and 20%, respectively, to 1987 air emissions. Currently these sources are estimated to contribute only 4% and 2%, respectively, of quantified industrial dioxin air emissions.

Societal activities that produce dioxin air emissions are backyard trash burning, residential wood burning, unleaded gasoline use and cigarette smoking. Among

these, backyard trash burning constituted 86% of societal dioxin air emissions in 1987, and is estimated to be the source of 90% of current societal dioxin air emissions. In contrast to steep declines in industrial dioxin air emissions, emissions from societal activities have remained relatively constant, a reflection of the fact that backyard trash burning continues to be a common means of waste disposal, especially in rural areas.

Finally, dioxin is produced naturally in forest fires and certain types of wetlands[ii]. According to new research by EPA scientist Dr. Brian Gullett[iii], forest fires may be a huge source of dioxin. It is the only natural source represented in the graphic above, as quantitative data from other natural sources are unavailable. The difference in dioxin emissions from forest fires between 1987 and the present reflects the variation in acres of U.S. forest land burned in wildfires in 1987 and 2002 (2002 acreage includes all land affected by wildfires between January 1 and November 15, 2002). The data for this category were calculated from national wildfire statistics[iv] and are based on research by Dr. Gullett[v]. The graphic demonstrates that more dioxin may be emitted currently from forest fires than from either industrial or societal activities.

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[i] Data for 1987 are from the "US Environmental Protection Agency Inventory of Sources of Dioxin-Like Compounds in the United States—1987 and 1995" http://cfpub.epa.gov/ncea/cfm/dioxindb.cfm?ActType=default .
The 2002/4 data are EPA projections assuming full compliance with regulatory levels by this period and the closure of a copper smelter (personal communication, Dwain Winters, US EPA, 9-9-02).

[ii] Silk, P.J., Lonergan, G.C., Arsenault, T.L. and Boyle, C.D. (1997). Evidence of natural organochlorine formation in peat bogs. Chemosphere 35, 2865-2880.

[iii] Personal Communication, Dr. Brian Gullett, EPA, 9-18-02.

[iv] National Interagency Fire Center, http://www.nifc.gov (accessed 1-21-03). According to this website, total U.S. land area burned in 1987 was 4,152,575 acres. Total U.S. land area burned as of November 15, 2002 was 7,112,733 acres.

[v] In calculating dioxin emissions from forest fires, a middle-range dioxin emissions factor suggested by Dr. Brian Gullett was used (25 ng-TEQ/kg biomass). Dr. Gullett's low-range emissions factor (2 ng-TEQ/kg biomass) yields dioxin air emissions of 78.3 g-TEQ in 1987 and 134.1 g-TEQ in 2002. Dr. Gullett's high-range emissions factor (55 ng-TEQ/kg biomass) yields dioxin air emissions of 2,152 g-TEQ in 1987 and 3,688 g-TEQ in 2002.