Volatile Organic Compounds - VOCs

Last Updated: 25 August 2017

< Carbon monoxide - CO

Acid equivalent - Aeq >

Associated topic: greenhouse effect, photochemical pollution

Emissions monitoring period: since 1988

Data source: CITEPA / SECTEN format - April 2017

Source of the pollutant

A volatile organic compound (VOC) is a compound containing at least one atom of carbon together with atoms of hydrogen, oxygen, nitrogen, sulphur, halogens, phosphorous and silicon. Due to their physico-chemical properties, these compounds may be present in the atmosphere in the form of vapour. Hydrocarbons are included in the VOC group and often mistakenly equated with it. This is probably because VOCs are often expressed as total **methane**- or propane-equivalent hydrocarbons. **Methane** (CH_4), which is a specific VOC and a GHG naturally present in air, is often considered apart from the other VOCs, which are referred to as NMVOCs (non-**methane** volatile organic compounds).

VOCs are released by:

- combustion,
- the evaporation of solvents in paints, inks, glues, stain removers, cosmetics, etc.
- the evaporation of organic compounds from petrol for example,
- biological reactions.

There are a great many sources of VOC emissions. They are released by certain industrial processes involving the use of solvents (production of base and refined chemicals and parachemicals, metal cleaning, application of paints, printing, glues and adhesives, rubber, cleaning products, perfumes and cosmetics, etc.), and others not involving solvents (petroleum refining, production of alcoholic beverages, bread, etc.). Fuel combustion in the industrial and tertiary sectors contributes slightly to emissions but in very much smaller proportions than emissions of SO_2 and NO_x.

However, small wood-fired boilers are a major source of VOC emissions, as are forests.

Effect of the pollutant

VOCs have a great many effects on health. They can cause various problems when inhaled (aromatic substances and olefins for example) or through contact with the skin (e.g. aldehydes). They can also cause cardiac, digestive, kidney and nervous disorders. Finally, some VOCs, such as benzene, are carcinogenic, teratogenic or mutagenic. Concentrations in the environment

are low.

In the environment, solar radiation causes VOCs to react with **nitrogen oxides**, forming tropospheric ozone (**photochemical pollution**). This type of ozone, which is in the air we breathe, is harmful to health (breathing problems, irritation of the eyes, etc.). VOCs are also indirect **greenhouse gases**.

Classification of the sub-sectors with the highest emission levels* in 2015

Classification	Sub-sectors	Share of sub-sector in total national emissions in mainland France
1	Residential sector including:	45% including:
	Combustion of heating appliances (boilers, inserts, closed and open fireplaces, stoves, etc.)	*23%*
	Domestic use of solvents	*21%*
	Non road mobile machineries - Household and gardening	*0.5%*
	Open burning of household garden wastes and other (vehicle burning, etc.)	*0.5%*
2	Construction	10%
3	Other manufacturing industries	8.4%
4	Food processing, beverages industry	5.8%

**: one sector (out of six: energy transformation, manufacturing industry, residential/tertiary, agriculture/forestry, road transport and other transport) is broken down into sub-sectors.*

Emissions and trends

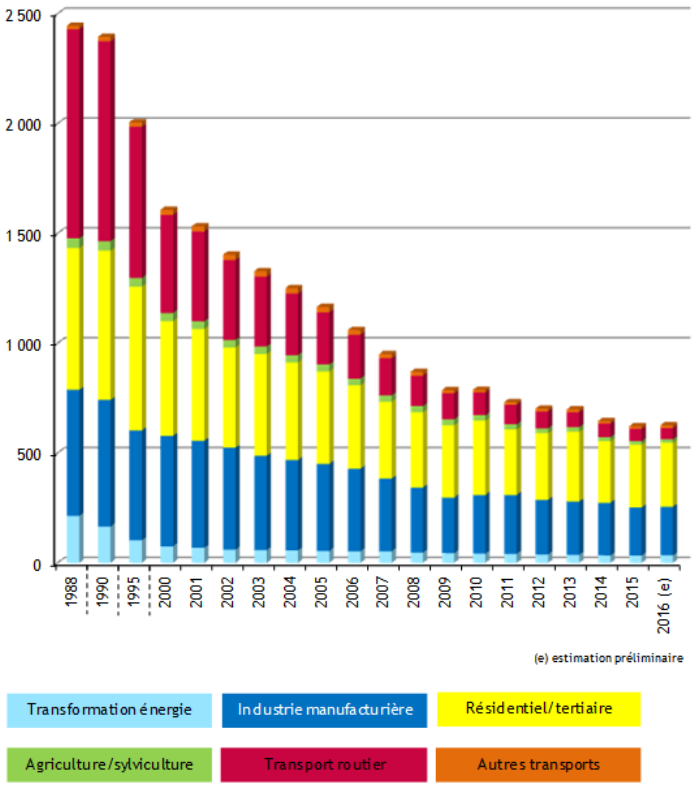
Minimum observed:	**623 kt in 2015**
Maximum observed:	2 445 kt in 1988
Emissions in 2015:	623 kt
Trends 2015/1990:	-74.0%
Trends 2015/maximum:	-74.5%
Trends 2015/minimum:	0%

Measurement unit: kt (kilotonne)

Source CITEPA / SECTEN format – April 2017

COVNM

Emissions atmosphériques par secteur en France métropolitaine
en kt



Source CITEPA / SECTEN format – April 2017

COVNM

EMISSIONS DANS L'AIR EN FRANCE METROPOLITAINE

Source CITEPA / format SECTEN - avril 2017 CITEPA-AEP-secteur-d/COVNM.xls

Gg = kt	Transformation énergie	Industrie manufacturière	Résidentiel / tertiaire	Agriculture/ sylviculture	Transport routier	Autres transports (*)	TOTAL	Hors total (*)
1988	214	573	645	44	952	16	**2 445**	1 350
1990	165	577	681	42	910	21	**2 395**	1 552
1995	103	500	655	39	688	22	**2 007**	1 605
2000	75	502	523	38	446	24	**1 608**	1 572
2001	68	487	509	35	408	24	**1 532**	1 532
2002	61	464	456	35	363	25	**1 403**	1 500
2003	58	430	463	34	318	25	**1 329**	1 908
2004	57	411	445	33	280	26	**1 251**	1 552
2005	54	397	421	32	238	25	**1 166**	1 661
2006	53	376	380	30	200	23	**1 061**	1 790
2007	53	331	350	29	169	20	**951**	1 475
2008	47	296	342	28	139	17	**870**	1 453
2009	44	253	329	26	118	15	**786**	1 584
2010	42	267	339	24	104	12	**788**	1 491
2011	41	268	299	23	89	12	**732**	1 583
2012	38	249	304	21	77	12	**702**	1 538
2013	36	243	318	20	69	12	**699**	1 547
2014	34	240	281	18	62	12	**646**	1 568
2015	34	219	285	16	56	13	**623**	1 658
2016 (e)	34	222	292	16	51	13	**627**	1 658

(*) Following UNECE/NEC definitions : emissions classified "except total" are not included, i.e. emissions from international maritime, emissions from domestic and international air transport cruise (≥ 1000 m), emissions from agriculture and forestry biogenic sources and emissions from non-anthropogenic sources.
(e) preliminary estimate

Analysis

Whichever the sector (residential/tertiary or manufacturing industry), the main source of NMVOC emissions is... (to read more, **consult the SECTEN report online via your login and password**)

Data source: CITEPA / SECTEN format - April 2017