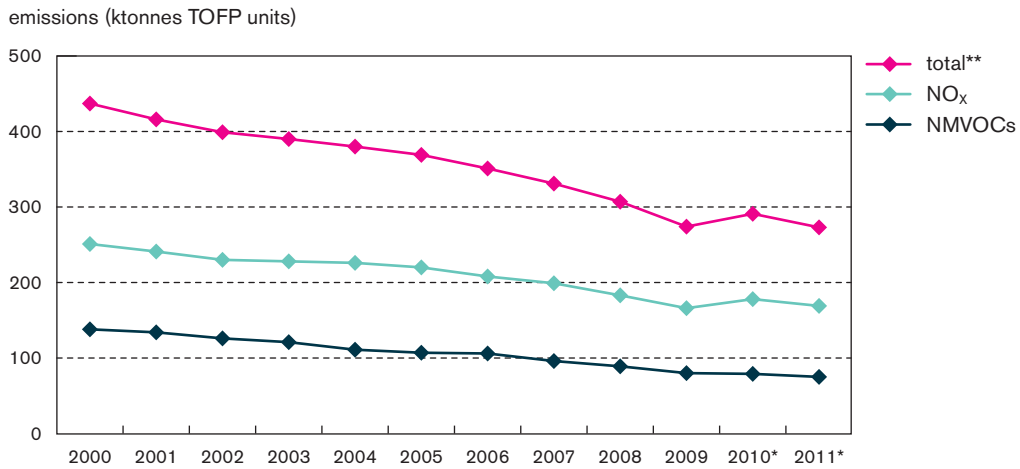
😐 Emission of ozone precursors into the air

DPSIR



* emissions from road traffic for 2010 are not comparable with 2000-2009 series due to model modifications; emissions from road traffic for 2011 assumed identical with those for 2010
** including CO and CH_4 contribution
Because the different ozone precursors have a different share in the tropospheric ozone formation, the photochemically relevant sum of the precursors is expressed in TOFP (tropospheric ozone-forming potential) units.

Source: VMM

NO_x emissions must decrease further

Ozone precursors, mainly NO_x (NO and NO_2), NMVOCs and to a lesser degree CO and CH_4, play a role in photochemical air pollution. Because of the complexity of the photochemical processes, there is no clear linear relationship between the emissions of ozone precursors and the resulting ozone formation.

The emission of ozone precursors decreased by 37 % between 2000 and 2011. The NMVOC emissions target for stationary sources, 64.0 ktonnes by 2015, as formulated in the MINA plan 4 (2011-2015), has already been attained since 2009. Further efforts are needed to reach the NMVOC emissions target for non-stationary sources (3.9 ktonnes) and especially the NO_x emissions target (110.4 ktonnes) by 2015.

The transport sector accounts for almost half of the NO_x emissions, and diesel cars emit more NO_x than petrol cars. The still increasing dieselisation of the passenger car fleet (62.2 % in 2011) therefore adversely affects the NO_x emissions. The Flemish Air Quality Plan for NO_2, which was approved by the Flemish Government on 30 March 2012, aims to control the share of diesel cars. For the energy sector, the NO_x emissions in 2011 decreased by 24 % in comparison with 2010. This is mainly due to the decrease in power production and the resultant reduction in NO_x emissions from conventional thermal power plants. For households and trade & services, both NO_x and SO_2 emissions decreased in comparison with 2010, due to the lower heating demand in 2011.

Flanders has a VOC-sensitive ozone production regime, meaning that a limited decrease in the NO_x concentration initially leads to more ozone, because less NO is available for the ozone degradation. A sustainable reduction of the ozone concentration, therefore, requires a significant and global emission reduction of the precursors. Compared with Europe, the NO_x emissions in Flanders between 1990 and 2011 decreased slightly less fast (-43 % versus -49 % in Europe) and NMVOC emissions slightly faster (-63 % versus -57 % in Europe).

emissions (ktonnes TOFP units)	2000	2007	2008	2009	2010*	2011*
NO_x	251	199	183	166	178	169
NMVOCs	138	96	89	80	79	75
*total TOFP amount***	*437*	*331*	*307*	*274*	*291*	*273*

😐 Exceedance indicator (NET60$_{ppb}$-max8h)

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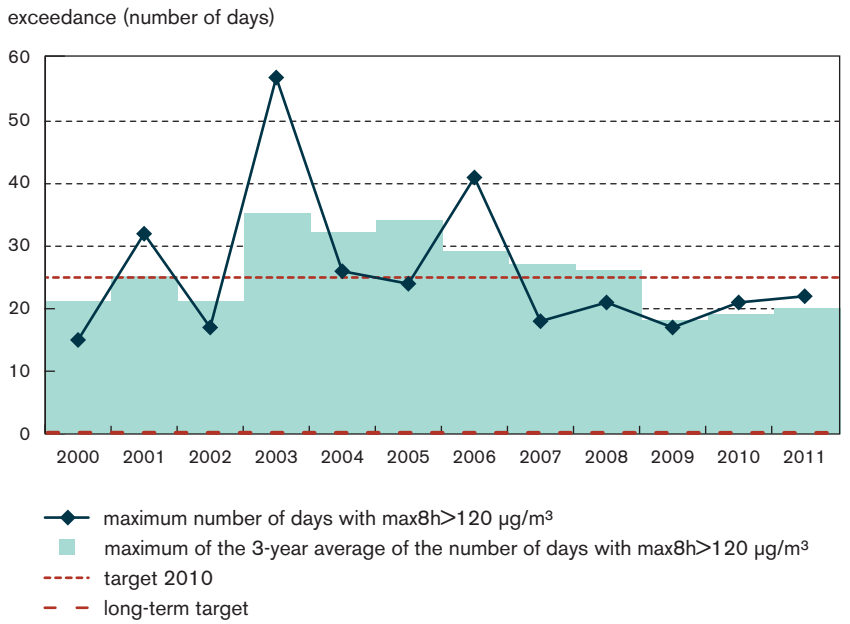

The annual maximum number of days on which the maximum 8-hour average exceeds 120 µg/m³ is determined by interpolating each year the number of exceedance days per 4x4 km grid cell over the whole of Flanders. The highest interpolated value in Flanders is then used. This time series has been recalculated using the RIO interpolation model, version 3.4, and can, therefore, differ slightly from previous reports.

Source: IRCEL, interregional air database

Target 2010 remains feasible thanks to favourable ozone year 2011

Because of its highly oxidising power, ozone can have an acute effect on health, such as respiratory problems, (temporary) lung function reduction or inflammatory reactions in the lungs. The European Air Quality Directive (2008/50/EC) sets targets for ozone concentrations for the protection of public health. As the long-term target, the maximum 8-hour average ozone concentration in the ambient air must not exceed 120 µg/m³ on any one day. The target for 2010 is a maximum of 25 exceedance days per calendar year, averaged over the years 2010, 2011 and 2012 (NET60$_{ppb}$-max8h). The MINA plan 4 (2011-2015) adopts these targets for 2015.

The number of exceedance days fluctuates from year to year and, in particular, follows the annual variation in sunshine and temperature. The quality of the summer has a major impact. 2011 was a favourable ozone year with a maximum of 22 exceedance days. Because the last few years were meteorologically favourable, the sliding 3-year average number of exceedance days reached a value of 20 days in 2011. The European target will probably be met, as the summer of 2012 was meteorologically favourable. An unfavourable summer, such as in 2003, in the coming years could imply that the European target is exceeded after 2010. Moreover, the European long-term target was not reached anywhere in Flanders. To reach the targets throughout Europe on a lasting basis, all of the European countries must implement sustainable measures to further reduce emissions of ozone precursors. The further reduction of NO_x emissions, in particular, requires additional efforts.

	2000	2007	2008	2009	2010	2011
maximum number of days with max8h>120 µg/m³	15	18	21	17	21	22
maximum of the 3-year average of the number of days with max8h>120 µg/m³	21	27	26	18	19	20

😐 Annual excess indicator ($AOT60_{ppb}$-max8h)

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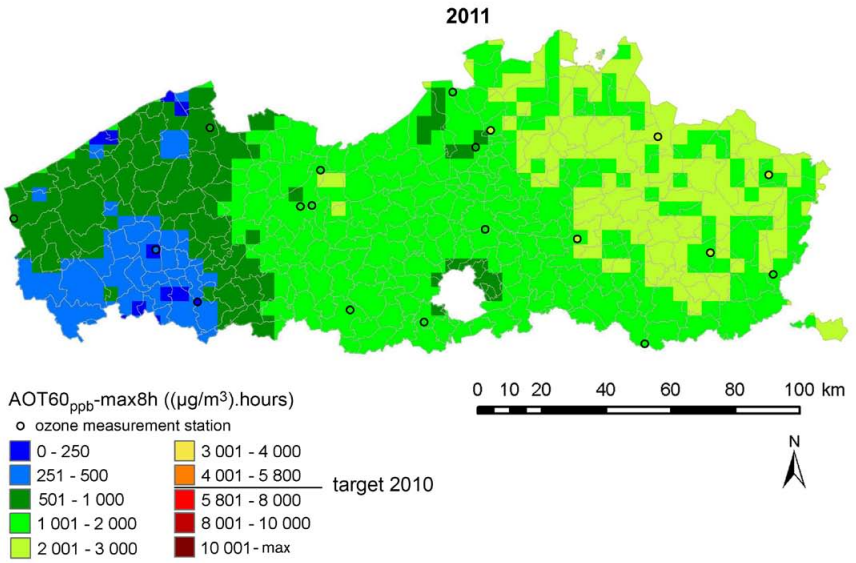

The geographical distribution is calculated by interpolation (RIO model) of the measurements from all ozone measurement locations in the telemetric monitoring network of the three federal regions. Only the VMM ozone measurement stations in Flanders are shown on the map.

Source: IRCEL, interregional air database

Only limited ozone effect on health in 2011

The annual excess indicator gives an indication of the effect of the excess ozone on health. This indicator also takes into account the magnitude and duration of the exceedance with respect to an ozone threshold of 120 µg/m³ and is, therefore, supplementary to the exceedance indicator. In the EU model calculations that were used as basis for both the European National Emission Ceilings and the Ozone Directives, a maximum annual excess of 5 800 (µg/m³).hours was proposed as the target for 2010. This target was not adopted in the European Air Quality Directive (2008/50/EC). The indicator is, however, monitored under the MINA plan 4 (2011-2015). No target has been set for 2015, but the aim is to ensure a favourable development in the period 2010-2015.

The annual excess fluctuates and mainly follows the annual variation in sunshine and temperature. 2011 was a favourable year in terms of ozone excess for human health, with an average value across Flanders of 1 439 (µg/m³).hours. The highest ozone excess was recorded in Limburg and the lowest in West Flanders, where a minimum of 120 (µg/m³).hours was reached. The higher excess in the northeast of Flanders has to do with the higher temperatures and the lack of atmospheric dilution processes such as e.g. a land or sea breeze at the coast. The target of 5 800 (µg/m³).hours was respected everywhere in Flanders. According to the European long-term target, the maximum 8-hour average ozone concentration is not to exceed the threshold value of 120 µg/m³ on any one single day. This long-term target was not met anywhere in Flanders. If a sustainable solution to the ozone issue is to be found, the emissions of ozone precursors, NMVOCs and especially NO_x will need to be reduced further, both in Europe and worldwide.

😐 Seasonal excess for vegetation ($AOT40_{ppb}$-vegetation)

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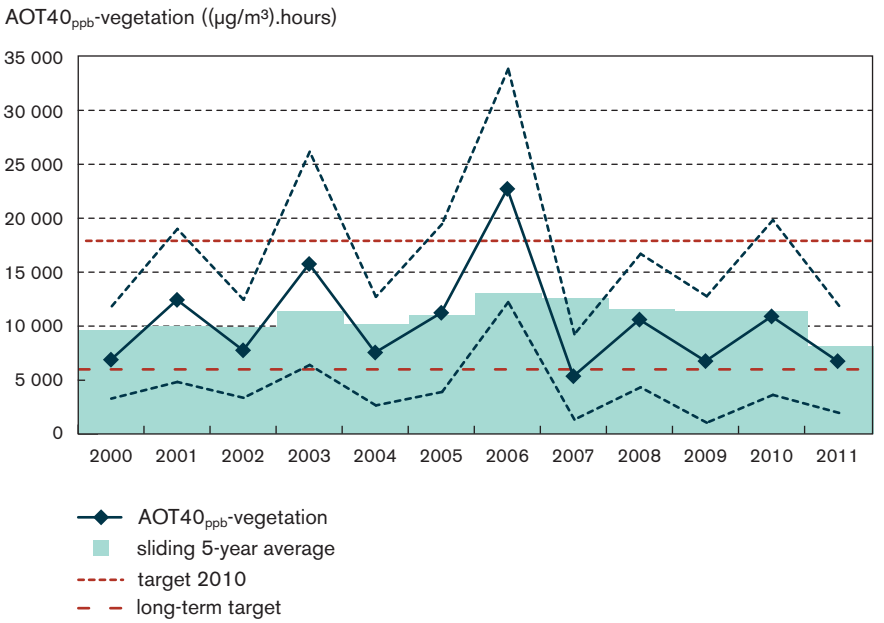

The points on the solid line show the average value for each year, weighted using the vegetation fraction, in Flanders. The dotted lines indicate the lowest and the highest annual values. The calculation method has been optimised, so these results can differ slightly from previous reports.

Source: IRCEL, interregional air database

Limited excess for vegetation in 2011

Natural ecosystems, arable crops and semi-natural vegetation can suffer damage from exposure to ozone. This leads to a reduction in yield and loss of quality in crops. For the protection of vegetation, a status indicator '$AOT40_{ppb}$' was defined in the European Air Quality Directive (2008/50/EC), the seasonal excess. This indicator shows the excess above 80 µg/m³ of all hourly ozone concentration values between 8 am and 8 pm (Central European Time) during the months of May, June and July. The European target for 2010 is 18 000 (µg/m³).hours and the long-term target is 6 000 (µg/m³).hours. The indicator is monitored under the MINA plan 4 (2011-2015). No target has been set for 2015, but the aim is to ensure a favourable development in the period 2010-2015.

Averaged for Flanders, the target for 2010 was not exceeded at any time except in the meteorologically unfavourable year 2006. As a result, the 5-year average of the seasonal excess for vegetation (except forests) also remains well below the target for 2010. The long-term target, by contrast, was exceeded in 2011 on 66 % of Flemish land with vegetation. To reach the long-term target in varying meteorological conditions, the emissions of ozone precursors, NMVOCs and especially NO_x, must decrease further in Europe and also worldwide.

(µg/m³).hours	2000	2007	2008	2009	2010	2011
$AOT40_{ppb}$-vegetation	6 904	5 363	10 648	6 772	10 946	6 765
5-year average of $AOT40_{ppb}$-vegetation	9 564	12 583	11 544	11 384	11 316	8 099