Air quality standards (limit values, target values etc.)

Pollutant & averaging	EU 2005	EU 2010	US	Japan	WHO[1]	China I[2]	China II[2]	China III[2]	Switzerland
SO_2 ($\mu g/m^3$)									
1 hour average *Statistics*	350 *24 per year*			262		150	500	700	100 *½-hour ave., 95 percentile*
3 hour average *Statistics*			1310 *1 per year*						
24 hour average *Statistics*	125 *3 per year*		365 *1 per year*	104	125	50	150	250	100 *1 per year*
Annual average *Statistics*	20 *Annual and winter ave.*		79		50	20	60	100	30
NO_2 ($\mu g/m^3$)									
1 hour average *Statistics*		200 *18 per year*			200	120	120	240	100 *½-hour ave., 95 percentile*
24 hour average *Statistics*				75-113		80	80	120	80 *1 per year*
Annual average *Statistics*		40	100		40	40	40	80	30
PM_{10} ($\mu g/m^3$)									
1 hour average *Statistics*				200					
24 hour average *Statistics*	50 *35 per year*	50 *7 per year*	150 *1 per year*	100[3]		50	150	250	50 *1 per year*
Annual average *Statistics*	40	20	50			40	100	150	20
$PM_{2.5}$ ($\mu g/m^3$)									
24 hour average *Statistics*			65 *98 percentile*			50	150	250	
Annual average			15			40	100	150	

[1] WHO values are guideline values.
[2] China: Zone 1: residential areas; Zone 2: commercial areas; Zone 3: industrial areas
[3] Suspended particulate matter

Pollutant & averaging	EU 2005	EU 2010	US	Japan	WHO[1]	China I[2]	China II[2]	China III[2]	Switzerland
CO (μg/m^3)									
1 hour average *Statistics*			40000 *1 per year*		30000	10000	10000	10000	
8 hour average *Statistics*	10000		10000 *1 per year*	22900	10000				
24 hour average *Statistics*				11500		4000	4000	4000	8000 *1 per year*
Ozone (μg/m^3)									
1 hour average *Statistics*	180/240[4]		240			120	160	200	120[5] *1 per year*
8 hour average *Statistics*		120 25 days/year[6]	160		120				
24 hour average *Statistics*									
AOT40[7] *Statistics*		18000[7] May-July							
Benzene									
Annual average *Statistics*		5		3					

[4] There is an information threshold of 180 μg/m^3, and a warning threshold of 240 μg/m^3. For a warning to be issued, the value must be exceeded during three consecutive hours.

[5] Switzerland has also a limit for ½-hourly values: For each month, 98% of halfhourly values should be below 100 μg/m^3.

[6] 120 μg/m^3 is a target value for 2010, to be understood in the following way: For each day, calculate the largest running 8-hour average during the day, and assign that value to the day. As an average over three years, there should be no more than 25 days per year with larger values that 120 μg/m^3. Further, as a long-term objective for 2020, this value of 120 μg/m^3 should be exceeded no more than 1 day per year.

[7] AOT40 is defined as the sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g. for forest and crops. The limit value here is given in the units μg/m^3*hours. The EU has set a target value of 18,000 μg/m^3*hour for 2010, and a long-term objective of 6,000 μg/m^3*hour for 2020.

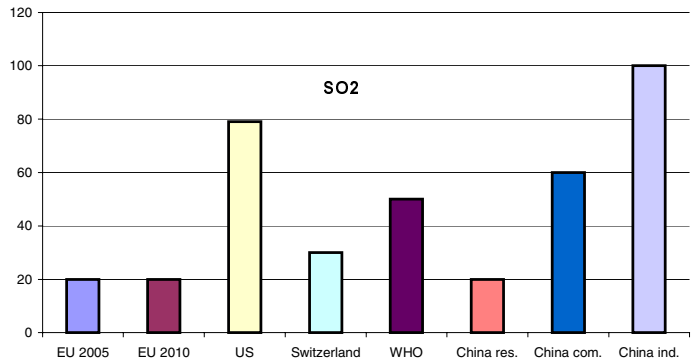
Pollutant & averaging	EU 2005	EU 2010	US	Japan	WHO[1]	China I[2]	China II[2]	China III[2]	Switzerland
Lead									
Annual average *Statistics*	0.5		1.5 *Quaterly ave.*		0.5	1	1	1	0.5
Benz(a)pyrene									
Annual average *Statistics*		(0.001) Proposal				0.010	0.010	0.010	

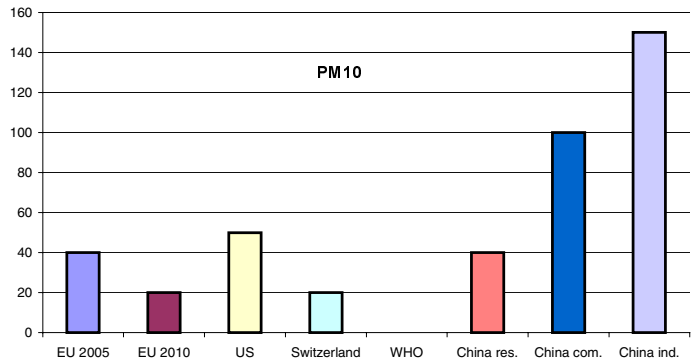
Notes

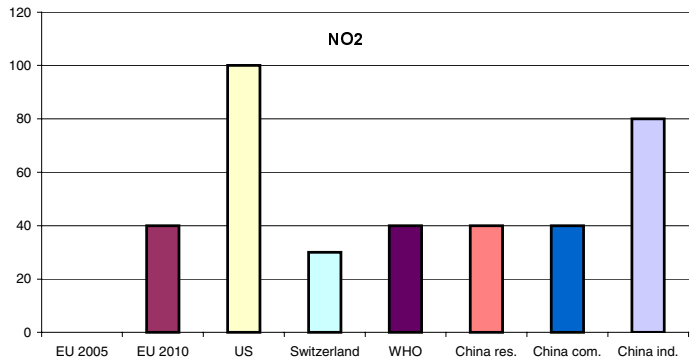
- In the "Statistics" line, e.g. "24 per year" means that 24 exceedances per year are permitted
- Some values have been converted from an official value given in ppm. This may result in slight inaccuracies. For information on conversion factors, see the reference document "Conversion between ppb and other units" (part of the data base, you may search for the text "conversion").

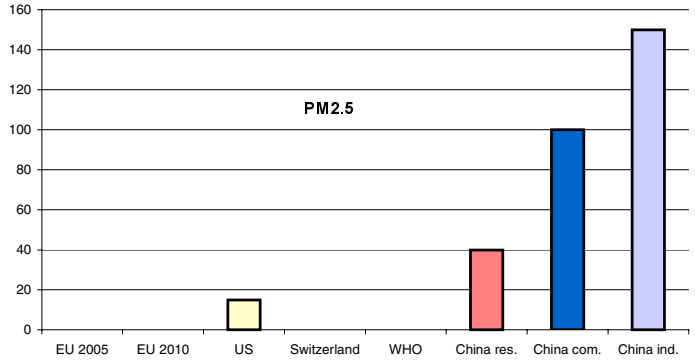
References

- US: http://www.epa.gov/ttn/naaqs/
  National Ambient Air Quality Standards (NAAQS)
- EU: A description of the very important "Air Quality Framework Directive" (EC 96/62/EC) and its Daughter Directives can be found on the page http://europa.eu.int/comm/environment/air/ambient.htm (there are links to the directives from that page). There is a an overview of other directives related to air pollution on the page http://europa.eu.int/comm/environment/air/legis.htm
- Switzerland: http://www.umwelt-schweiz.ch/imperia/md/content/luft/fachgebiet/d/stab/Immissionsgrenzwerte.pdf
- Japan: http://www.env.go.jp/en/lar/regulation/aq.html
- China http://www.vecc-sepa.org.cn/eng/news/news_detail.jsp?newsid=e00397
  SEPA, Vehicle Emission Control Center
- WHO Air Quality Guidelines for Europe: http://www.who.dk/InformationSources/Publications/Catalogue/20010910_6
- Other countries: The World Bank has a list, but it is not up to date: http://www.worldbank.org/html/fpd/em/power/standards/airqstd.stm
- In the Annexes of the case studies conducted under the current project on *Assessment of the effectiveness of European air quality policies and measures*, there are sections entitled "Legislation and Measures Implemented". These sections describe how and why standards have developed in EU, US, and to some extent Canada and Japan.

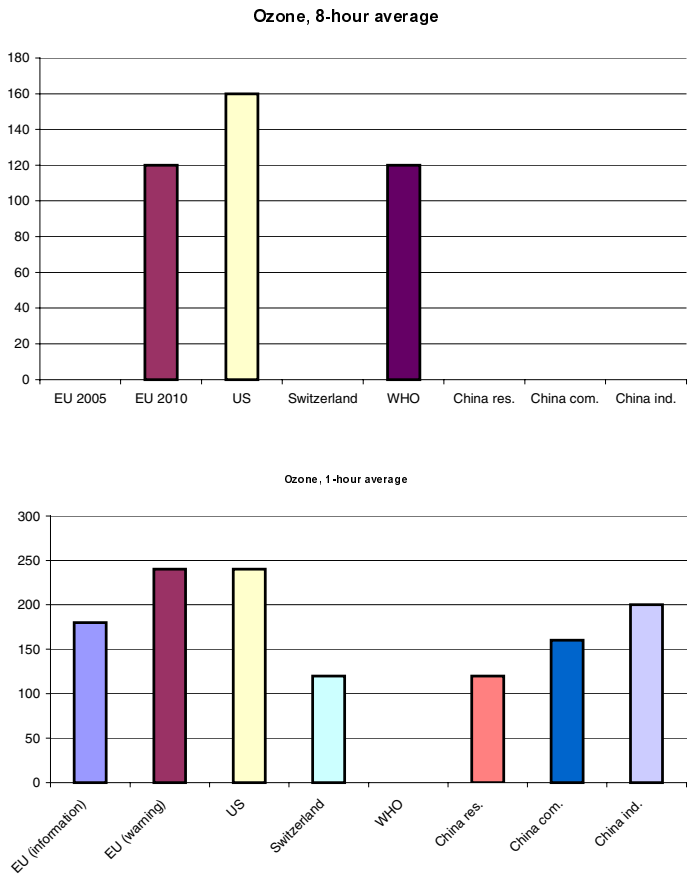








Comparison of air quality limit values for *annual averages* for various regions. Unit $\mu g/m^3$.



Comparison of air quality limit values for ozone. This graph displays air quality standards/target values for 8-hour averages (on top) and for 1-hour averages (bottom). The table and the footnotes to it explain how the limit values should be understood..