

# High concentration of fine dust due to fireworks

On August 1 - 2, 2007 (Switzerland's national holiday)

## Fireworks and the air that we breathe

On August 1 - 2, the contaminant loads of the air in Switzerland literally hit off like a rocket as a result of the many fireworks that were ignited to celebrate the national holiday on August 1. The concentration of fine dust exceeded the immission limit value many times over. - Fine dust/PM10 (Particulate matter smaller than 10 microns): Coarse-grained particles can reach the upper parts of the respiratory tract and even the lungs. Finer and finest particles can easily travel to the deeper ramifications of the lung and reach the alveoli. From here, they get into the blood stream and into the lymph channels.

The statistics on the fine dust data that were measured on August 1 - 2 give clear evidence of the fact that fireworks are predominantly an issue of fine dust.

*Considering the serious consequences to one's health which result from short-term increases of fine dust particles, the question, certainly justified, is raised: when will fireworks finally be prohibited?*

Some facts:

- There are larger sources of fine dust than that generated by fireworks, but there is not one single that causes such a tremendous load within the shortest time, as fireworks do. When igniting fireworks, the fine dust limit can be exceeded by a thirty-fold and even higher!
- The Swiss Federal Office for the Environment FOEN estimates that an annual average of 1500 - 2000 tons of fireworks caused nearly 400 tons of fine dust. And that's only for a small country like Switzerland: only try and imagine the large clouds of fine dust which come down on our world on a holiday such as New Year's Eve...
- Not only does fine dust worsen existing diseases, it also causes new ones. As such, the problem of fine dust matters to all of us and cannot be seen as a problem for just some few people.
- The first ones to suffer from fine dust are
  - unborn babies and newborn, as well as infants
  - persons with respiratory diseases (asthma, COPD/Chronic Obstructive Pulmonary Disease, pulmonary emphysema, lung cancer etc.) and cardiovascular diseases
  - persons with Persistent Hyperreactivity (multiple chemical sensitivity, TILT/Toxicant-Induced Loss of Tolerance, CFS/Chronic Fatigue Syndrome, Fibromyalgia etc.) and Low-Dose RADS/Reactive Airways Dysfunction Syndrome as well as the
  - elderly people over the age of 65 - they all face severe health impairments.

- An acutely increased exposure to fine dust particles can cause the following health impairments: infections and aggravating intolerance reaction of the lungs with equally serious reactions of other organs, negative impact on the cardiovascular system (e.g. cardiac disorder), an increase in medication usage, a significant increase in hospitalization because of respiratory and cardiovascular diseases and a considerably higher mortality.
- The coarse fraction of PM10 is strongly linked to coughing, asthma attacks and respiratory fatality (especially acute implications), whereas the finer particles are more associated with cardiac rhythm dysfunctions and cardiovascular mortality.
- In time series analysis, the effects on the respiratory mortality are on the rise one day after the peak in particle exposure. The impact on cardiovascular mortality is at its peak about 4 days later.
- The fissured surface of the fine dust particles favours the accretion of even more toxic substances that get into the body. The health impairment is thereby strongly augmented. Heavy metal amalgamations are predominantly on the agenda on those holidays that are celebrated with fireworks.
- The size of the particles determines its residence time in the atmosphere. Whereas PM10 disappears from the atmosphere within hours - thanks to sedimentary deposition and condensation - PM2.5 can hover on for days and weeks. Consequently, these particles can travel very long distances.
- Meanwhile, the Swiss authorities recommend people suffering from respiratory and cardiovascular diseases to avoid fireworks. But fine dust finds its way through each and every crack of our buildings. As long as our houses cannot be 100% sealed, staying indoor with doors and windows shut - as a shield against the emission of fireworks - is very often not sufficient for those concerned.
- A threshold value for fine dust that does not imply any effect at all has hitherto not been found.
- German citizens suffering from high fine dust exposures have "The right of clean air" - which is enforceable by the court. September 2007, this was decided by the German Federal Administration Court in Leipzig. Although it is related to long-term fine dust exposures (traffic), it is arguable whether the subjective "right of clean air" should also be applied to short-term increased fine dust emissions - such as those from fireworks.
- Some individuals consider the "right to launch fireworks" to be a personal liberty. However, "liberty" is not an absolute privilege that anyone is entitled to - with no limits and with no consideration of other members of society. This means: the liberty of those who spread out a multitude of chemicals as well as fine dust into the (breathing) air, stops at the very point where the right of clean air starts for all the people who do not want to be compelled to inhale these hazardous substances. Manufacturers, vendors and buyers of fireworks are not the only ones that have rights: people with illnesses and people who prefer to stay healthy, have rights too!

Sources:

- "Fine Particulate Air Pollution and Hospital Admission for Cardiovascular and Respiratory Diseases", Francesca Dominici et al., JAMA 2006;295:1127-1134
- "Health Aspects of Air Pollution. Results from the WHO Project 'Systematic review of health aspects of air pollution in Europe'", June 2004, <http://www.euro.who.int/document/E83080.pdf>
- "Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide", Report on a WHO Working Group, Bonn/Germany, 13 - 15 January 2003, <http://www.euro.who.int/document/e79097.pdf>
- "Feinstaub macht krank", Bundesamt für Umwelt, Wald und Landschaft (BUWAL), <http://www.bafu.admin.ch/php/modules/shop/files/pdf/phpVyjqgR.pdf>
- "Feinstaub PM10. Fragen und Antworten zu Eigenschaften, Emissionen, Immissionen, Auswirkungen und Massnahmen", Bundesamt für Umwelt, Wald und Landschaft (BUWAL), 2005, [http://www.clean-life.ch/pdf/presse/buwal\\_fragenantwortenpm10.pdf](http://www.clean-life.ch/pdf/presse/buwal_fragenantwortenpm10.pdf)
- "Aussenluftverschmutzung und Gesundheit", 2005, <http://pages.unibas.ch/ispmb/LuG/Uebersicht05.pdf>
- "Wie der Feinstaub in der Luft die Gesundheit schädigt", Faktenblatt EURO/04/05, <http://www.euro.who.int/document/mediacentre/fs0405g.pdf>
- Press release "Wende im Feinstaubstreit", 27.9.2007, Deutsche Umwelthilfe, [http://www.duh.de/pressemitteilung.html?&tx\\_ttnews\[tt\\_news\]=1176&tx\\_ttnews\[backPid\]=6](http://www.duh.de/pressemitteilung.html?&tx_ttnews[tt_news]=1176&tx_ttnews[backPid]=6)

**A rise of the PM10-concentration (fine dust) in the air by 10µg/m<sup>3</sup> only (ten micro gram per cubic meter of air) can cause**

- **symptoms in the respiratory tracts (cough, excessive flem, shortness of breath)**
- **bronchitis, asthma, arrhythmia**
- **emergency visits to doctors and emergency rooms at hospitals**
- **hospitalisation because of pneumonia, asthma attacks, cardiac disorder and other respiratory and cardiovascular diseases**
- **job absences with economic implications**
- **and in the worst case, fatalities as a result of these diseases.**

*About the table below:*

The detected fine dust data correlate with the local position of the measuring stations (related to the place where the fireworks were let off) and with the direction and the strength of the wind. In the table below, only measuring stations where the fine dust data exceeded 100µg/m<sup>3</sup> on August 1-2 2007 were considered. However, also an increase in fine particles below 100µg/m<sup>3</sup> is excessive. At each of the measuring stations mentioned below (sole exception: Basel-Binnngen), we listed both the average hour value on August 1, 18.00 hours, and the peak value on the night of August 1. At a few measuring stations (albeit not at all), we listed more than one high hourly value to depict the fact, that elevated values do endure for many hours. The decimal places of the increase factor were adjusted upward and downward.

The increase factor of fine dust puts the data measured at 18.00 hours in relation to the average hourly values that were measured later on. It gives an indication as to how much the fine dust value has risen.

Threshold value of PM10 in Switzerland: the average daily value of  $50\mu\text{g}/\text{m}^3$  may only be exceeded once per year ("Immissionsgrenzwerte der Luftreinhalte-Verordnung", Bundesamt für Umwelt BAFU, [http://www.bafu.admin.ch/luft/00632/00634/index.html?lang=de#sprungmarke0\\_7](http://www.bafu.admin.ch/luft/00632/00634/index.html?lang=de#sprungmarke0_7))

Measuring stations of fine dust particles	Date/Time of measurement	Fine dust [ $\mu\text{g}/\text{m}^3$ ] average hourly value	Increase factor of fine dust
Arbon Bahnhofstrasse <sup>5)</sup>	1.8.2007; 18:00	13	
	2.8.2007; 00:00	159	12,2
Baden <sup>1)</sup>	1.8.2007; 18:00	14.2	
	1.8.2007; 22:00	204.8	14,4
	1.8.2007; 23:00	288.7	20,3
	2.8.2007; 00:00	279.8	19,7
	2.8.2007; 01:00	193.2	13,6
Basel-Binningen <sup>2)</sup>	31.7.2007; 18:00	10.8	
	31.7.2007; 22:00 *	242	22,4
	31.7.2007; 23:00	59.1	5,4
	1.8.2007; 18:00	14.4	
	1.8.2007; 23:00	79.9	5,5
Bern Brunng. <sup>3)</sup>	1.8.2007; 18:00	25.3	
	1.8.2007; 23:00	373.2	14,8
	2.8.2007; 00:00	422.3	16,7
	2.8.2007; 01:00	380.9	15
	2.8.2007; 02:00	244.5	9,7
Bern Bollwerk <sup>2)</sup>	2.8.2007; 03:00	102.1	4
	1.8.2007; 18:00	21.7	
	1.8.2007; 22:00	114.6	5,3
	1.8.2007; 23:00	261.8	12
	2.8.2007; 00:00 **	410	18,9
Biel <sup>3)</sup>	2.8.2007; 01:00	235.1	10,8
	1.8.2007; 18:00	19.2	
	1.8.2007; 23:00	107.0	5,6
Brigerbad <sup>6)</sup>	1.8.2007; 18:00	16.3	
	1.8.2007; 22:00	212.5	13
	1.8.2007; 23:00	265.8	16,3

Dornach <sup>4)</sup>	1.8.2007; 18:00	20.9	
	1.8.2007; 22:00	405.9	19,4
	1.8.2007; 23:00	392.4	18,8
	2.8.2007; 01:00	275.4	13,2
Dübendorf/ZH <sup>2)</sup>	1.8.2007; 18:00	16.1	
	1.8.2007; 23:00	292.3	18,1
	2.8.2007; 01:00	199.1	12,4
	2.8.2007; 03:00	106.6	6,6
Egerkingen <sup>4)</sup>	1.8.2007; 18:00	17.9	
	2.8.2007; 00:00	288.8	16,1
	2.8.2007; 02:00	180.8	10,1
Frauenfeld Bahnhofstrasse <sup>5)</sup>	1.8.2007; 18:00	14	
	2.8.2007; 01:00	155	11,1
Frutigen <sup>3)</sup>	1.8.2007; 18:00	23.9	
	1.8.2007; 22:00 **	379	15,9
	1.8.2007; 23:00	198.9	8,3
Härkingen <sup>2)</sup>	1.8.2007; 18:00	20.6	
	1.8.2007; 23:00	177.9	8,6
	2.8.2007; 00:00	193.7	9,4
	2.8.2007; 03:00	131.8	6,4
Ittigen <sup>3)</sup>	1.8.2007; 18:00	16.1	
	1.8.2007; 22:00	187.4	11,6
	1.8.2007; 23:00 **	269	16,7
	2.8.2007; 00:00 **	264	16,4
	2.8.2007; 03:00	121.8	7,6
Lausanne <sup>2)</sup>	1.8.2007; 18:00	21.6	
	2.8.2007; 00:00	103	4,8
Luzern Museggstrasse <sup>1)</sup>	1.8.2007; 18:00	19.2	
	1.8.2007; 23:00	134.7	7
	2.8.2007; 00:00	164.1	8,5
Muttenz, A2 Hard <sup>4)</sup>	1.8.2007; 18:00	18.6	
	2.8.2007; 00:00	105.8	5,7
Olten <sup>4)</sup>	1.8.2007; 18:00	26.7	
	1.8.2007; 22:00	134.3	5
	2.8.2007; 03:00	164.4	6,2
Rapperswil Tüchelweier <sup>5)</sup>	1.8.2007; 18:00	15	
	2.8.2007; 00:00	143	9,5
	2.8.2007; 01:00	114	7,6

Schwyz <sup>1)</sup>	1.8.2007; 18:00	20.7	
	1.8.2007; 23:00	201.3	9,7
Sedel <sup>1)</sup>	1.8.2007; 18:00	19.4	
	2.8.2007; 00:00	122.8	6,3
Sion <sup>6)</sup>	1.8.2007; 18:00	20.1	
	1.8.2007; 22:00	197.5	9,8
	1.8.2007; 23:00	146.1	7,3
Solothurn Altwyberhüsli <sup>4)</sup>	1.8.2007; 18:00	15.9	
	1.8.2007; 22:00	241.0	15,2
	1.8.2007; 23:00	576.2	36,2
	2.8.2007; 00:00	510.0	32,1
Solothurn Werkhofstrasse <sup>4)</sup>	1.8.2007; 18:00	15.9	
	1.8.2007; 23:00	275.9	17,4
	2.8.2007; 00:00	412.8	26
	2.8.2007; 01:00	356.7	22,4
Stans <sup>1)</sup>	1.8.2007; 18:00	5.5	
	1.8.2007; 23:00	161.8	29,4
	2.8.2007; 00:00	158.0	28,7
St. Gallen Rorschacher Str. <sup>5)</sup>	1.8.2007; 18:00	11	
	2.8.2007; 00:00	208	18,9
Suhr <sup>1)</sup>	1.8.2007; 18:00	17.2	
	1.8.2007; 23:00	278.9	16,2
	2.8.2007; 00:00	175.8	10,2
Tänikon <sup>2)</sup>	1.8.2007; 18:00	17.5	
	1.8.2007; 23:00	131.2	7,5
Thun <sup>3)</sup>	1.8.2007; 18:00	16.6	
	1.8.2007; 22:00	147.9	8,9
	1.8.2007; 23:00	140.9	8,5
Wallisellen Dietlikonerstrasse <sup>5)</sup>	1.8.2007; 18:00	25	
	2.8.2007; 02:00	141	5,6
Wettswil Weieraecher <sup>5)</sup>	1.8.2007; 18:00	17	
	2.8.2007; 00:00	138	8,1
Winterthur Obertor <sup>5)</sup>	1.8.2007; 18:00	13	
	2.8.2007; 00:00	269	20,7
	2.8.2007; 01:00	225	17,3
Zürich Schwamendingen <sup>5)</sup>	1.8.2007; 18:00	15	
	2.8.2007; 00:00	107	7,1
	2.8.2007; 03:00	145	9,7

Zürich Stampfenbachstrasse <sup>5)</sup>	1.8.2007; 18:00	13	
	1.8.2007; 23:00	173	13,3
	2.8.2007; 00:00	234	18
	2.8.2007; 05:00	108	8,3
Zürich Kaserne <sup>2)</sup>	1.8.2007; 18:00	19.4	
	1.8.2007; 23:00	282.3	14,6
	2.8.2007; 01:00	265.7	13,7
Zug <sup>1)</sup>	1.8.2007; 18:00	14.5	
	1.8.2007; 23:00	236.6	16,3
	2.8.2007; 00:00	158.9	11

\* In Basel, the official fireworks for the public usually take place on 31.7.

\*\* data that were missing in the archives and therefore were asked for directly from the measuring stations

<sup>1)</sup> Common air measurement network of the Cantons Argovia, Lucerne, Nidwalden, Obwalden, Schwyz, Uri and Zug, enhanced data sampling <http://www.in-luft.ch>

<sup>2)</sup> National observation network for xenobiotics (NABEL), data sampling <http://www.bafu.admin.ch/luft/00612/00625/index.html?lang=de>

<sup>3)</sup> Kanton Bern, Volkswirtschaftsdirektion, beco Berner Wirtschaft, Aktuelle Luftmesswerte, <http://www.vol.be.ch/site/home/beco/beco-imm/beco-imm-1-aktluft.htm>

<sup>4)</sup> Air measurement network of the Cantons Baselstadt, Baselland and Solothurn, <http://blso.innetag.ch/?origin=so>

<sup>5)</sup> <http://www.ostluft.ch>

<sup>6)</sup> Measurement network Resival, <http://www.vs.ch/Navig/navig.asp?MenuID=6861>

[www.stop-fireworks.org](http://www.stop-fireworks.org)  
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