Ambient PM_{10} and $PM_{2.5}$ Measurements in Dakar, Senegal

H. Laupsa*, C. B. B. Guerreiro, B. Sivertsen
Norwegian Institute for Air Research, P.O. Box 100, N-2027 Kjeller, Norway
***hel@nilu.no • www.nilu.no**

The Norwegian Institute for Air Research (NILU) is assisting the Senegalese authorities in establishing an **Air Quality Management Centre**. As part of the present project, a comprehensive measurement campaign of air pollution was conducted between October 2005 and January 2006 in order to collect background information for designing a permanent air quality monitoring programme.

Methodology

As a part of a screening study, PM_{10} and $PM_{2.5}$ were monitored in one heavily trafficated street. Some samples of PM_{10} and $PM_{2.5}$ were analysed for trace elements, EC/OC and water-soluble components to provide knowledge on the chemical composition of the particulate matter.

Results and Discussion

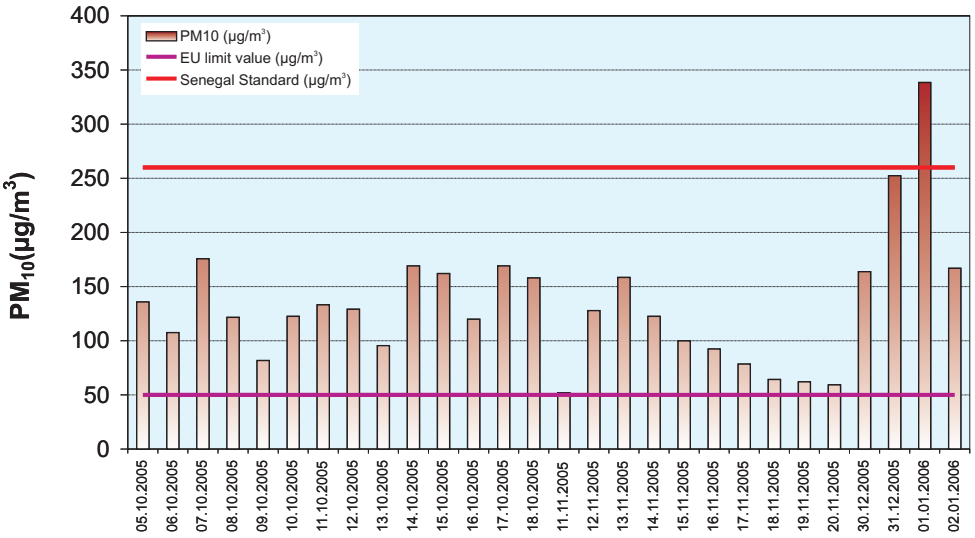
The daily concentrations of PM_{10} exceeded the daily EU limit value (*EC, 1999*) every day of the sampling period. The PM_{10} values ranged from 52 to 338 µg/m^3, with an average value of 133 µg/m^3. The $PM_{2.5}$ levels in Dakar were also high compared to concentration levels observed in other urban areas in the world (*WHO, 2005*). The average $PM_{2.5}$ concentration in the 4 weeks sampling period was 38 µg/m^3.

The analysis of trace elements identified no exceedances of EU limit and target values (*EC, 1999; EC, 2004;*) and WHO guideline values. The elemental carbon/total carbon (*EC/TC*) ratios indicate that the fine particles in Dakar originate mainly from combustion sources. The average percentage of water-soluble components was 18% for PM_{10} and 15% for $PM_{2.5}$.

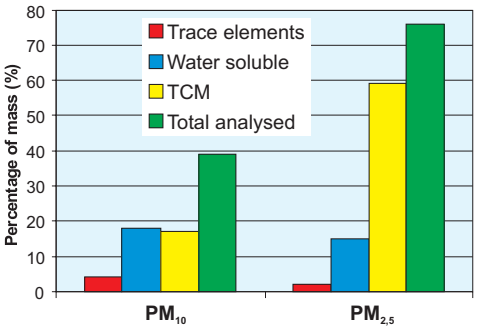
Conclusions

The measured daily averages of PM_{10} concentration were 2 to 7 times higher than the EU limit values and the daily averages of $PM_{2.5}$ were also high. A large fraction of the $PM_{2.5}$ originates from combustion sources, while a large part of the PM_{10} coarse fraction is soil dust and sea salts. This screening study shows that the major air pollution source in Dakar is traffic, although industry is also an important source in some areas.

Daily PM_{10} values (µg/m^3) at an urban traffic site in Dakar



PM_{10} concentrations exceeded WHO guideline values every day.



Water-soluble components:
NO_3, SO_4 and NH_4
Na, K, Mg, Ca and Cl

Trace elements:
Al, Pb, Cd, V, As, Cu, Zn, Cr, Ni, Co
No exceedences of WHO guidelines

The chemical composition of particles was analysed to determine its origin and potential health impact. Elemental Carbon/Total Carbon ratios (0.30-0.36) show that Carbon originates mainly from combustion sources means greater health impact!

References

- European Commission (1999) Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogens, particulate matter and lead in ambient air. *Official Journal L 163/1999.*
- European Commission (2004) Council Directive 2004/107/EC of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (2004/107/EC) *Official Journal L 23/2004.*
- World Health Organization (2005) Global ambient air pollution concentrations and trends, in: Air quality guidelines: 2005 Update. Draft report. *WHO Bonn Office, European Centre for Environment and Health. October 2005.*

Kleinfilter SEQ sampler for daily PM_{10} and $PM_{2,5}$