Particulate matter in outdoor air pollution

Summary and

recommandations

for protecting health

July
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Contents

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Christophe DECLERCQ, Magali CORSO and Mathilde PASCAL, for the mortality impact in scenarios of reduction in particulate matter concentrations in nine French cities, InVS, Saint-Maurice, 2012.

Summary and recommendations

Context and objectives of the referral

The Directorate General for Health (Ministry of Labour, Employment and Health) made a request to the *Haut Conseil de la santé publique* (HCSP, or High Council for Public Health) jointly with the Directorate General for Energy and the Climate (Ministry of Ecology, Sustainable Development, Transport and Housing), on May 12, 2010 to:

- provide a scientific advice on the pertinence in France, in terms of public health, of the information, recommendation[1] and alert[2] standards for outdoor air particulate matter (PM) with an average aerodynamic diameter less than or equal to 10 µm (PM_{10}) and suggest, if needed, new standards for the PM_{10} and if possible for $PM_{2.5}$;

- develop health recommendations adapted to the various target populations including susceptible and vulnerable subgroups, considering behaviours, knowledge of the impact of indoor air quality and the typology of the sources of PM emissions (motor vehicle traffic, wood combustion, industries, agriculture, etc.) and provide advice on the methods of communication in order to reach each target group;

- establish prevention and management scenarios for local situations (major roads, industrial sites, agricultural activities, collective or domestic wood-burning heating, etc.) and the involved populations.

This referral ("*saisine*" in French) is also the result of the necessity for the French government to accelerate its policy for combating air pollution from suspended particles, in particular by initiating revisions of the "Plans for Protecting the Atmosphere (PPA)" of the concerned zones which has consisted so far in the lowering - provisionally - of the information, recommendation and alert standards for the PM_{10} via decree 2010-1250 of October 21, 2010 concerning air quality. The daily information and recommendation standard has changed from 80 µg/m^3 to 50 µg/m^3, thus reaching the level of the European

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[1] Information and recommendation standard: level of the concentration of the air pollutant in the atmosphere beyond which a short-term exposure represents a risk for human health for susceptible groups, requiring immediate and adequate information (Definition given in decree 2010-1250 of 21 October 2010)

[2] Alert standard: level of the concentration of the air pollutant beyond which a short-term exposure represents a risk for human health for the entire population or a degradation of the environment requiring emergency intervention measures (Definition given in decree 2010-1250 of 21 October 2010)

Commission limit value, not to be exceeded more than 35 times per year, and that of the guideline value of the World Health Organisation (WHO), not to be exceeded more than three days per year. The daily alert standard changed from 125 µg/m^3 to 80 µg/m^3.

In order to respond to the referral, the HCSP created the working group "Particulate matter in outdoor air pollution" within the "Environmental health Expert Committee".

With the purpose of providing arguments in choosing the standards for PM_{10} and $PM_{2.5}$ and new health recommendations, the work of the HCSP consisted in**:**

- reviewing the national system for monitoring PM in the outdoor air and its involvement in the information and alert procedures, in the perspective of new regulations;
- updating the knowledge on the health impact of PM using the most recent articles published after the 2009 Afsset (presently Anses) report[3], especially in terms of health benefits observed or expected after PM abatement, with the addition of an evaluation of the specific health impact of $PM_{2.5}$ and of PM_{10} in France, for the period 2008-2009;
- comparing the relative share of PM_{10} and $PM_{2.5}$ in the daily and annual exposure of the population and in the associated health impacts respectively;
- a study of the procedures set in other countries to inform the population and act on the emission sources of PM when standards are exceeded in the short term, as well as health messages for susceptible groups of the population;
- a communication strategy was discussed on this basis.

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[3] Particulate air pollution: Summary of health elements for the purpose of supporting the development of information and public alert thresholds for particles in the ambient air. Expertise report of the French Agency for Environment and Occupational Health Safety (Afsset, presently Anses for French Agency for Food, Environment and Occupational Health Safety), March 2009

Methodology

In its discussions on the criteria that should govern the choice of the standards for PM_{10} and $PM_{2.5}$ to be suggested to the public authorities, the HCSP took two facts into consideration:

- the public health impact of outdoor air pollution linked to PM, which is much more influenced by average concentrations over the long term than by "peak" episodes of particulate pollution, even when repeated. This observation, amply demonstrated in the international literature, is also expressed in the scientific advice of the Afsset (Anses) on March 20, 2009 on particulate pollution in the outdoor air;

- the recent lowering in the French regulation of the information, recommendation and alert standards for PM_{10} during PM pollution episodes, in the context of European litigation; a lowering which objectives are (i) a better protection for vulnerable people; (ii) a strengthening in the awareness of the population as to the importance of air quality; and (iii) a reduction in the number of days exceeding the daily European limit values (currently 50 µg/m^3, not to be exceeded more than 35 days).

To render its reasoning explicit and intelligible, and to substantiate its proposals with an objective analysis with figures of the various scenarios of air quality "standards", in the short term (the duration of time retained by the regulations for PM is the day) and in the long term (the year), the HCSP followed an approach consisting of 3 steps: (1) the study of the existing link between the average annual PM concentrations (respectively PM_{10} and $PM_{2.5}$) and the frequency that such a daily value is exceeded in French urban centres; (2) the analysis of the impact of the suppression of high daily values on annual PM_{10} and $PM_{2.5}$ levels and vice-versa; and (3) the comparative evaluation of the health impact of reducing PM below various daily or annual values, respectively for the short and long term. For this latter point, a Health Impact Assessment (HIA) was conducted by the *Institut de Veille sanitaire* (InVS, or French Institute for Public Health Surveillance) at the request of the HCSP, using data collected in France in nine and seven cities respectively according to PM size by the InVS within the framework of the European programme Aphekom[4,5]. The HCSP did not evaluate the economic consequences of its recommendations, as an economic analysis has already been produced by the Commission of the accounts and the economy of environment[6].

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[4] Bordeaux, Le Havre, Lille, Lyons, Marseilles, Paris, Rouen, Strasbourg and Toulouse; www.aphekom.org

[5] Short-term effects of $PM_{2.5}$ not covered in the herewith enclosed HIA will be implemented in a second stage.

[6] Commission of the accounts and the economy of environment ; "Health and air quality", provisional version of the report of 16 january 2012 ; on line: http://www.oree.org/actualites-sante-etenvironnement.html

Distribution of particulate pollution (PM$_{10}$ and PM$_{2.5}$) in France

According to PM$_{10}$ concentrations from the BDQA[7] database on 31/12/2010, for the period 2007 to 2010, the number of cities with more than 100,000 inhabitants where the EC annual limit standard for PM$_{10}$ (50 µg/m^3) was not complied with changed from 27 in 2007 to 15 in 2010 respectively. PM$_{2.5}$ measurements available in 2009 and 2010 show that the number of cities with at least one background site exceeding 20 µg/m^3 as an annual average was 8 in 2009 and 11 in 2010 respectively[8]. This same database shows that over the totality of urban areas, there is a strong link between the annual average values and the frequency over the course of the year in which daily values deemed high were exceeded, both for PM$_{10}$ and PM$_{2.5}$.

With PM$_{10}$, a **smoothing** of the upper values at 50 µg/m^3 would only result in a slight reduction of the annual average. For example, in the Paris area, in 2010 this smoothing over all the background sites would lead only to a decrease of 1 µg/m^3 in the annual average. Even a smoothing at 40 µg/m^3 would not be very effective (decrease of 2 µg/m^3 over the annual average in 2010 in this same zone). A policy centred on managing "peaks" therefore would have little impact on the long-term exposure to particulate pollution of the population.

On the contrary, a decrease **in the annual average** of **PM$_{10}$** from 26 µg/m^3 (situation observed in 2010 in Paris) to 20 µg/m^3 would reduce the number of days in which at least one urban background site in the city exceeds 50 µg/m^3 as a daily average by nearly one-third (from 29 to 20 days). The reduction in the number of days exceeding 40 µg/m^3 would be even greater, i.e. 44% (respectively 72 and 40 days exceeded).

With regards to **PM$_{2.5}$,** in 15 cities in 2009 and 2010 where the annual average was less than or equal to 15 µg/m^3, namely, the daily value of 35 µg/m^3 never exceeded more than 35 times in the year. Instead of, out of the 43 cities where in 2009 and 2010 PM average was between 15 and 20 µg/m^3, 6 towns experienced at least 35 days exceeding the concentration of 35 µg/m^3.

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[7] Database on air quality
[8] Target standard for national regulations

Health impact of particulate air pollution (PM_{10} and $PM_{2.5}$) in France[9]

The health impact assessment was conducted by considering the 9 French cities (i.e. for a total of over 12 million inhabitants) that had participated in the Aphekom project and included short-term all causes non-accidental mortality for PM_{10} and long-term all causes mortality and long-term life gain in years for $PM_{2.5}$ according to various scenarios of daily concentrations and mean decrease respectively in relation to the situation observed in 2008-2009 in France.

In the case of short-term impact of PM_{10}[10]:
- Smoothing the daily concentrations of PM_{10} to 40 µg/m^3 would result in the reduction of the short-term non-accidental mortality by an average of 88 cases per year. This number would be reduced to 45 deaths avoided on the average per year, if it is decided to comply with the current limit value of 50 µg/m^3;
- a decrease in the average levels of PM_{10} for non-accidental mortality: by 7 (for 30 µg/m^3) to nearly 550 (for 15 µg/m^3) deaths avoided per year according to the scenario.

In the case of long-term impact of $PM_{2.5}$[11]:
- smoothing the daily levels of $PM_{2.5}$ to 35 and 15 µg/m^3 respectively will avoid between 357 to 1911 premature (including accidental causes) deaths in average per year;
- a decrease in the average level of $PM_{2.5}$ to 20 and 10 µg/m^3 respectively will result in 179 to 2864 in average premature deaths avoided per year. A reduction of $PM_{2.5}$ to the concentration of 15 µg/m^3 as annual average would result in a gain in life expectancy varying from 0.5 months in Toulouse to 8.6 months in Lyons for persons 30 years of age and older. The impact in terms of a gain in life expectancy at 30 years can reach up to 13 months in Lyons in the case of a decrease to 10 µg/m^3.

It is therefore in the case of long-term effects that the health impact is the greatest**.**

To sum up, a reduction of $PM_{2.5}$ to the concentration of 15 µg/m^3 as annual average in the 7 urban areas that participated in the Aphekom project, compared to the actual situation observed in 2008-2009, would avoid 1345 annual deaths and would result in a gain in life expectancy varying from 0.5 months in Toulouse to 8.6 months in Lyons for persons 30 years of age and older. This represents 1.7% of all the deaths in subjects over the age of 30 years in the 7 urban areas under consideration. In order to achieve such a gain, in terms of

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[9] The health impact assessment (HIA) covers the period 2008-2009, a period for which series of corrected PM data is available.

[10] For the 9 towns.

[11] For the 7 towns for which the data was available: Bordeaux, Le Havre, Lyons, Paris, Rouen, Strasbourg, Toulouse.

the annual number of premature deaths avoided, it would be necessary, if the actions implemented concerned only the factors that influence the daily variations, smoothing all the daily average levels to less than 21 µg/m^3. This objective cannot be achieved in the short term. Note that smoothing the daily concentrations of PM$_{10}$ to 40 µg/m^3 would result in the reduction of the short-term mortality by only 88 cases in the 7 cities. This number would even be reduced to 40 deaths avoided, if it is decided to comply with the current limit value of 50 µg/m^3.

Choosing information, recommendation and alert standards

The obtained results confirm the clear advantage of employing air quality management that aims to reduce average PM long-term values over PM short-term values via the sole control of the extent of the daily variation. Because of this, and with a concern for consistency[12], the air quality objectives[13], the information, recommendation and alert standards [14] recommended by the HCSP are as follows:

Information, recommendation and alert standards

	$PM_{2.5}$	PM_{10}
Air quality objectives ($\mu g/m^3$) [annual]	15	25
Information and recommendation standard ($\mu g/m^3$) [daily]	30*	50
Alert standard ($\mu g/m^3$) [daily]	50*	80

* Subject to confirmation after the supplemental analyses of the InVS

For the annual average, the value of 15 $\mu g/m^3$ in $PM_{2.5}$ corresponds to the objective defined during the Grenelle Environment Round Table in 2007 in France. The US-EPA[15] confirmed this value for the United States in 2006. However, in the WHO/Euro[16] published "Air quality guidelines" in 2005 the objective defined for $PM_{2.5}$ is 10 $\mu g/m^3$. In 2010, 40 cities in France exceeded the value of 15 $\mu g/m^3$ for $PM_{2.5}$. The proposed objective of 25 $\mu g/m^3$ for PM_{10} was slightly exceeded as an average annual value in 22 cities in 2010. These are therefore objectives that can be achieved in the middle term.

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[12] Ensure that: 1) for PM_{10} as well as for $PM_{2.5}$, the concentrations are in a ratio that is compatible with the distribution of the values observed in the various French towns between the annual averages and the highest values of the daily averages; 2) the concentration ratios between PM_{10} and $PM_{2.5}$ are close to the ratios observed in the databases for monitoring air quality, for annual averages as well as for the highest values of the daily averages; 3) the health impacts which will be used as support in defining the alert values, which are based on the risk to which the general population is exposed, are in the same order of magnitude as those which are associated with the information limit values, based on the induced risks for the vulnerable segments of the population by the atmospheric pollution.

[13] "Quality air objectives": values recommended by the HCSP for the annual averages.

[14] "*Information and recommendation threshold"* or "*alert threshold"*: values recommended for the daily averages for which exceeding will trigger a device, respectively, for information, recommendation or alert.

[15] United-States Environmental Protection Agency

[16] Regional Office of the World Health Organisation (WHO) for Europe.

The daily standards recommended by the WHO/Euro in its "Air quality guidelines" are respectively 25 and 50 µg/m^3 for PM$_{2.5}$ and PM$_{10}$. Thereafter, the information and recommendation standards proposed by the HCSP are not far from these numbers.

The HCSP recommends the term of 2015 for reaching these values as guideline values, and 2020 as imperative standards. These values and standards should be reviewed and modified according to the available scientific literature and the debate initiated within the framework of the revision of the European directives on air quality.

Recommendations concerning informing the public during pollution episodes

The recommendations concern the procedures and the information circuits as well as the health messages.

In terms of procedures and information circuits on particulate pollution episodes, the HCSP recommends maintaining the current basic system but suggests the following improvements.

- Phasing in two stages, based on forecasting episodes[17]: a first "pre-positioning" message would be communicated in the afternoon two days before (D-2) an expected episode (whether it is the information or the alert standard that is exceeded) for the following targets: persons in a situation to act on the main sources, whether fixed or mobile, of PM emissions; health professionals and those in charge of departments that receive vulnerable populations. The first will take position in order to run the systems that are planned aimed at reducing the emission of pollutants; and the second group can disseminate the preconceived information, of which they will be reminded, to the final targets. A second message, the day before (D-1) would confirm (or invalidate) the pollution episode and would trigger the dissemination of the information in order to effectively implement the actions for reducing the sources and information for the public. The mass media with high responsiveness (radio, television) are also informed.

- This cascade of information will certainly trigger a demand for personalised advice, with the first concern being for health protection. The ARS and/or the Cire concerned will have identified a health-environment referral person who will be in charge to respond to calls from individuals or departments in charge of vulnerable people.

The emergency communication plans must be designed in close coordination with the local authorities (prefectures, Regional Health Agencies - ARS, Regional Directorates for Environment, Development and Housing - DREAL, local governments...) and identify all of the local relays necessary in order to disseminate in an emergency the health messages, similar to the communication plans developed each year upstream from the summer within the framework of the heat wave plan. These health messages will be systematically associated with recommendations intended to lower the emission in the long terms as well as in the short term.

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[17] This recommendation from the HCSP is based on experience in the Walloon Region;
http://www.wallonie.be/fr/citoyens/sante-prevention-et-securite/sante-et-environnement/index.html

In the middle term, an effort must be made, thanks to developing modelling tools (air pollution dispersion models…) at a finer special scale, in order to be able to deliver local information to the population. This localised information will have to be set up at the same time as the information and alert system that incorporates the "over-exposed" zones, i.e. the portions of the country that continually experience the highest concentrations in particles (or other pollutants) due to their proximity to sources of emission or their geographical location[18]. The HCSP recommends that the population that risks such an over-exposure be characterised, in each urban area, by different local monitoring stations (AASQA), through modelling work, which will make it possible to determine the percentage of the population concerned as well as the extent of this chronic over-exposure. A map of these zones would be established and would be available publically, similar to the noise maps. This concerns the annual concentrations as well as the forecasts of episodes, in order to make the population, the various professionals and the local media aware who play an important role in the pedagogy of such a complex subject.

In the objective of making populations and local decision-makers aware of the local situation with the quality of the air, the HCSP also recommends that the one-off information supplied in the event of a pollution peak be accompanied with information in the annual values of the pollutants in the zone under consideration and the health impacts generated by chronic exposure to these pollution levels.

In order to place air quality management into a long-term perspective on a day-to-day basis, the HCSP is suggesting an approach to information that takes into account the PM levels reached over the last 365 days on the background sensors, by means of a "journal on daily standards exceeded". This journal incorporates the coherency sought by the HCSP between the daily standard for information for short-term management and the value recommended for long-term management. This will entail adding up the number of days that have exceeded, as an average value over 24 h, the objective defined above during this period of reference over at least one of the background sensors in the urban area under consideration. A colour code will reflect this cumulative number.

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[18] These over-exposed portions of the country are usually taken into consideration by so-called "proximity" monitoring sensors.
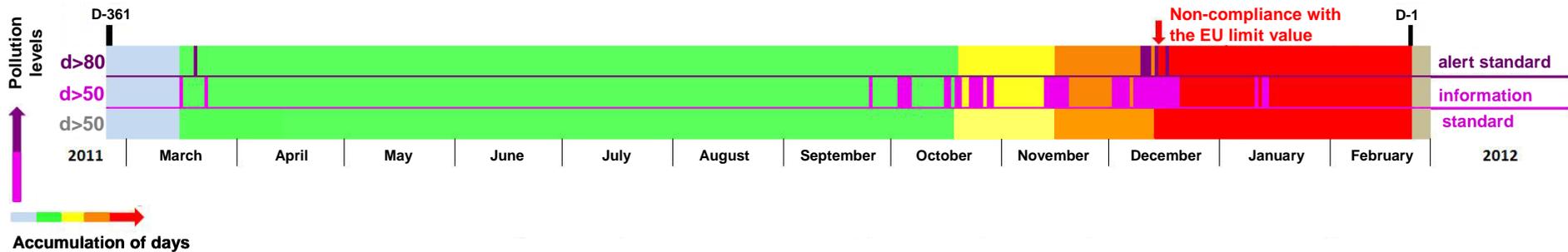
Journal on daily standards exceeded: a colour code is proposed for different frequencies of exceeding the value of PM information and alert standards, during a reference period of 365 days in a city (fictive data; the months are provided here for the purposes of illustration only, for the year ending on February 21, 2012).

Legenda :

as long as no daily PM10 average has exceeded 50 µg/m3 in the past 365 days

as soon as the PM10 average of 50 µg/m3 has been exceeded one day and as long as the total number of exceedance days is less than 10 in the past 365 days

between 10 and 20 days of exceedance of 50 µg/m3 of the daily PM10 average

at least 20 days of exceedance of 50 µg/m3 of the daily PM10 average

at least 35 total days of non-compliance with the objective of not exceeding (OND) the information standard (50 µg/m3) over the elapsed year

exceedance of information standard (50 µg/m3); the colour code changes respectively for the day or days under consideration and the violet colour is recorded in the chronology

exceedance of alert standard (80 µg/m3); the colour code changes respectively for the day or days under consideration and the violet colour is recorded in the chronology

Of note, exceeding 35 days or more, during the year, of the concentration of 50 µg/m^3 for PM$_{10}$, in a given town is a violation of the European Directive, which is shown by the vertical arrow when the colour changes to red

Communication can take place at two levels:

- information for the general population, via the general media, in order to maintain the pedagogy on the quality of the air, and provide a better access to the air quality index (example: the ATMO index), promote a responsible behaviour concerning the emissions of pollutants, provide more information on the health risks and in particular allow vulnerable populations to identified themselves as such;

- information for professionals dealing with small children and the elderly, as well as for health professionals and patients' associations in order to facilitate the adoption of a preventive behaviour (from a health standpoint (protection) as well as from an emissions-reduction standpoint) by populations that in principle are vulnerable.

In terms of health messages, the HCSP recommends that during PM pollution episodes, the following health messages be disseminated by the relays identified with the various target populations, according to the PM level reached. Note that, due to similar particulate concentration levels in buildings and outdoors (contrary to the situation concerning ozone), confinement during particulate pollution peaks has not been considered as necessary[19].

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[19] Excluding of course situations concerning industrial accidents which are not addressed in this report.

Health advise pertaining to PM levels

PM level	Value	Health messages for groups at risk and the general population	
		Sensitive population*	**General population**
Low	PM_{10}: less than 50 µg/m^3 and $PM_{2.5}$: less than 30 µg/m^3	Practice your normal activities.	Practice your normal activities.
Moderate	PM_{10}: 50-80 µg/m^3 and/or $PM_{2.5}$: 30-50 µg/m^3	Adults and children with heart or pulmonary problems **who experience symptoms** should **consider reducing** intensive sport and physical activities.	Practice your normal activities.
High	PM_{10}: greater than 80 µg/m^3 and/or $PM_{2.5}$: greater than 50 µg/m^3	Adults and children with heart or pulmonary problems and the elderly should **reduce and even avoid** intensive sport and physical activities. People with asthma may feel the need to use their inhaled medication more frequently. Follow your doctor's usual advice.	**Reduce** physical exertion, especially if symptoms such as coughing, wheezing, short-windedness or sore throat occur.

*People, adults and children, with chronic heart or pulmonary problems are more at risk for symptoms linked to air pollution. Small children and the elderly are also more vulnerable on the average.
It is important to periodically broadcast messages aiming to enable every one to identify oneself or others as particularly sensitive to air pollution and acquire the habit of consulting and making the best use of the ATMO index.

Note 1: The communication systems set up to combat the health impact of heat waves can be adapted and reused for information on pollution peaks.
Note 2: Regardless of the levels of particulate pollution, exposure is comparable inside and outside of buildings, contrary to ozone for example, where the levels outdoors are much higher than indoors. Confinement is therefore unnecessary when there are particulate pollution peaks.

Perspectives

The state of the daily and annual PM concentrations for the period 2000-2009 in France shows a highly unsatisfactory situation and which warrants serious attention. The HCSP underlines that a policy focusing on managing "peaks" has little impact on the long-term exposure of the population, so that priority should be given to reducing chronic exposures. Communication on the quality of the air and on the efforts aimed at guaranteeing it must be regular, with the occurrence of daily "peaks" able to be considered as an opportunity to reactivate the vigilance in order to achieve this objective. The HCSP suggests procedures, tools and circuits for information for this purpose for various relays and populations and formulates health messages intended respectively for vulnerable people and for the entire population.

Some of the lacks in the knowledge will have to be lifted via research programmes. In the future, estimating the health impact of PM will have to take into account the nature and the composition of PM as well as the contribution of the geographical scales of the pollution observed in a location. Research should be dedicated to carbon black and ultrafine PM, for which the harmful effects on human health are starting to be documented, making it possible to decide on more targeted future regulations. In the middle term, the effort to be engaged in developing modelling tools on a finer spatial scale will allow for local information on the situations concerning the over-exposure of populations that are close to sources of pollution. Reducing the population's exposure will entail in particular the primary sources stemming from combustion processes (automobile traffic, industrial emissions, etc.); it also entails development policies which ensure that buildings and premises that receive vulnerable populations are not located in the vicinity of PM emission sources, especially busy roads. In parallel, the instruments needed to assess the effectiveness of the recommendations according to the various target groups, as well as how the communication is perceived must be developed.

Finally, these recommendations from the HCSP with a health and social purpose have to be intended as a sustainable development approach, i.e. a properly conducted pollution clean-up that contributes in restoring the economy and the environment.

Glossary

ASPA   *Association agréée pour la surveillance de la qualité de l'air en Alsace* (Approved association for monitoring the quality of the air in Alsace)

AASQA   *Association agréée pour la surveillance de la qualité de l'air* (Approved association for monitoring the quality of the air)

Ademe   *Agence de l'environnement et de la maîtrise de l'énergie* (French Agency for Environment and Energy Management)

Afsset   *Agence française de sécurité sanitaire de l'environnement et du travail* (French Agency for Environmental and Occupational health safety)

Anses   *Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail* (French Agency for Food, Environmental and Occupational Health Safety)

Aphekom   *Amélioration des connaissances et de la communication sur la pollution de l'air et la santé en Europe* (Improving knowledge and communication for decision making on air pollution and health in Europe)

ARS   *Agence régionale de santé* (Regional Health Agency)

BDQA   *Base de donnée sur la qualité de l'air* (Database on air quality)

CNRS   *Centre National de la recherche scientifique* (French national center for scientific research)

DGS   *Direction générale de la santé* (Directorate General for Health)

EHESP   *Ecole des hautes études en santé publique* (School of Public Health)

GMES   Global Monitoring for Environment and Security

HCSP   *Haut Conseil de la santé publique* (High Council for Public Health)

HIA   Health Impact Assessment

IFSTTAR   *Institut français des sciences et technologies des transports, de l'aménagement et des réseaux* (French Institute of Science and Technology devoted to Transport, Planning and Networks)

Inpes   *Institut national de prévention et d'éducation pour la santé* (French National Institute for Prevention and Health Education)

INERIS   *Institut National de l'EnviRonnement Industriel et des RisqueS* (National Institute for Industrial Environment and Risks)

Inserm   *Institut national de la santé et de la recherche médicale* (French National Institute for Health and Medical Research)

InVS   *Institut de veille sanitaire* (French Institute for Public Health Surveillance)

IRSET	*Institut de recherche sur la santé, l'environnement et le travail* (Research Institute for Health, Environment and Labor)
LCSQA	*Laboratoire central de surveillance de la qualité de l'air* (Central Laboratory for Monitoring Air Quality)
LHVP	*Laboratoire d'Hygiène de la Ville de Paris* (Hygiene Laboratory of Hygiene of the City of Paris)
WHO	World Health Organisation
WHO/Euro	Regional Office of the World Health Organisation for Europe
PM$_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 µm
PM$_{10}$	Particulate matter with an aerodynamic diameter less than or equal to 10 µm
US-EPA	United-States Environmental Protection Agency

Particulate pollution in the outdoor air

Summary and recommendations for protecting health

Air pollution includes particulate matter (PM) with a size less than or equal to 10 µm (PM_{10}) and 2.5 µm ($PM_{2.5}$). Their impact on health in the short and long term is well-known. French regulations define the daily information and recommendation (50 µg/m^3) and alert (80 µg/m^3) standards for PM_{10}. A European Directive also prescribes values that are not to be exceeded over a day or the year for this air pollutant.

The HCSP recommends:
- air quality objectives (annual average): 15 µg/m^3 for $PM_{2.5}$; 25 µg/m^3 for PM_{10};
- information and recommendation standards (daily average): 30 µg/m^3 for $PM_{2.5}$; 50 µg/m^3 for PM_{10};
- alert standards (daily average): 50 µg/m^3 for $PM_{2.5}$; 80 µg/m^3 for PM_{10};

These recommendations are based on the state of knowledge on the effects of PM on health using the most recent publications and on an evaluation of the health impact of various scenarios for decreasing particulate pollution in France. The HCSP underlines that a policy focusing on managing "peaks" has little impact on long-term exposure of the population to both $PM_{2.5}$ and PM_{10}, and that priority has to be given to reducing chronic exposures to these air pollutants.

It suggests various improvements in current procedures, tools and circuits for information and formulates health messages intended for both vulnerable people and the entire population, according to the PM concentrations in the air.

The HCSP recommends a representation of PM levels measured over the last 365 days by using a "journal on daily standards exceeded", providing good public readability of the quality of the air in a city and allowing for comparisons over time and between cities. It reiterates that communication on air quality and on the efforts aimed at guaranteeing it must be regular, and the occurrence of daily "peaks" should be considered as an opportunity to reactivate the vigilance in order to achieve this objective. Procedures should be implemented in order to inform the populations that reside in zones that are most exposed to local sources of pollution, as soon as the modelling tools will allow it.