Spotlight on Clean Air and Health
87% of Europeans feel that air quality-related respiratory diseases are a serious problem in their country. Given that even short-term increases in air pollution have been associated with respiratory symptoms and temporary lung function decreases, there is good reason for their concern. So much so, that according to the OECD, air pollution will be the biggest environmental cause of premature death by 2050.

ERS calls for renewed commitment from all those concerned to strengthen EU air quality standards. To increase awareness of the health effects of air quality, ERS published its “10 Principles for Clean Air” in the European Respiratory Journal (the official journal of the ERS). These principles form the basis of this Spotlight, which provides solutions to tackle these health impacts.

CLEAN AIR – IT’S OUR RIGHT

The Charter of Fundamental Rights of the European Union states that “a high level of environmental protection and the improvement of the quality of the environment must be integrated into the policies of the Union”. Article 11 of the Treaty on the Functioning of the EU further indicates that “environmental protection requirements must be integrated into the definition and implementation of the Union’s policies and activities”. However, the reality is that millions of Europeans live in areas where simply breathing the air around them is damaging to their health. Air pollution reduces people’s lifespan and causes serious heart and lung disease. It is estimated that poor air quality in Europe leads to an average loss of 8.6 months of life expectancy. Current exposures to particulate matter from anthropogenic sources lead to an average loss of 8.6 months of life expectancy in Europe.

These pollutants result in increased deaths especially in sensitive population groups, such as the elderly, or those suffering from respiratory ailments. Indeed, recent studies show that in times of high air pollution, there is a marked increase in hospital admissions for respiratory and cardiovascular conditions.

EU legislation sets limit values for these pollutants, which are not to be exceeded throughout the EU, providing an equal minimum level of protection across Europe. However, to adequately protect the health of European citizens, stricter limits are needed – the Ambient Air Quality Directive must be revised, as it currently affords weaker protection than recommended by the world’s foremost experts – the WHO.

THE HEALTH THREAT IN EUROPE TODAY

The pollutants of most concern for human health across Europe are airborne particulate matter (PM) and ground-level ozone (O3). Inhalation of PM causes irritation and damage to the lungs. PM is classified in sizes from 10 microns to the smaller 2.5 microns. Smaller particles can travel further into the lungs and respiratory system and even the blood stream causing damage to lung tissue and interfering with gas exchange inside the lungs. Fine particle pollution (PM2.5) is estimated to account for some 5 million lost years of life in the EEA-32 countries every year. Chronic exposure can contribute to the development of cardiovascular and respiratory diseases, including lung cancer.

Excessive O3 in the air triggers asthma, reduces lung function, causes breathing problems and even causes lung disease. Exposure to ground-level ozone concentrations above critical health levels is associated with more than 20,000 premature deaths in the EU-25 annually.
EUROPE MUST ACT NOW TO CURB EMISSIONS OF SERIOUS POLLUTANTS

The respiratory effects of air pollution depend on the type and mix of pollutants, the concentration in the air, the length of exposure, how much is inhaled and how deep into the lungs pollutant penetrates. One aspect is certain, and that is the urgent need to reduce the level of pollutants. In order to reduce their levels, Europe must act now to combat the emissions which are the source of these pollutants – through legislation regulating source emissions such as the National Emission Ceilings (NEC) Directive – the cornerstone of EU legislation on air pollution. These emissions (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia) can be tackled by promoting measures such as cleaner industry and a switch to green energy – also for households.

A revised NEC Directive should include ambitious targets which go beyond the revised Gothenburg Protocol and help to achieve the long term objective of the 6th Environment Action Plan – “levels of air quality that do not give rise to significant negative impacts on and risks to human health and the environment”.

SPECIFIC POLLUTANTS IN PARTICULAR AREAS

Roadside pollution poses a particular health threat that cannot be adequately addressed by regulating fine particle mass or ozone. There are other pollutants that should be considered in future research. Two such pollutants that often exist in the air around the roadside close to where people live and commute are black carbon and ultrafine particles. For example, modelling studies suggest that urban cycling is associated with an increased inhaled dose of fossil fuel-derived black carbon.

In addition, non-tailpipe emissions pose a health threat for road users and subjects living close to busy roads. Air particles can also come from the erosion of materials such as tarmac on the roads and the wear of brakes or tyres from vehicles.

Short-term exposure to nitrogen dioxide (NO₂) can result in lung function changes in sensitive population groups and increased susceptibility to respiratory infections due to long-term exposures. In addition, nitrogen oxides lead to the formation of O₃ and PM.

The increased use of diesel vehicles, especially newer diesel vehicles, is of concern. Technologies used in modern diesel vehicles are producing significantly more nitrogen dioxide in the real world than when tested in the laboratory. This becomes critical in light of the recent classification of diesel exhaust fumes as class 1 carcinogenic.

EU action is needed on specific sectors such as shipping, non-road mobile machinery, road transport, agriculture and small-scale combustion installations. Source legislation in all those sectors would be the most cost-effective way of improving air quality.

National authorities must make air quality an integral part of their traffic management and planning processes. Simple measures such as providing footpaths and bike lanes away from busy roads, as well introducing low emission zones and limiting traffic in residential areas can help limit citizens’ exposure to these elements and also reduce pollutant levels.

CLIMATE CHANGE AND AIR POLLUTION

The link between climate change, air pollution and human health has become clearer. Several air pollutants are also climate forcers – having a potential impact on the planet’s climate and global warming in the short term. Moreover, climate change is expected to alter the concentration and distribution of pollutants in the atmosphere, which could have important health consequences.

Increased concentrations of ground-level ozone due to climate change are expected to result in increased respiratory hospital admissions and deaths. An increase in frequency and intensity of summer heat waves is expected to further contribute to the burden of disease and premature deaths.

Action is needed at international, EU, national, regional and local levels to make sure air quality and climate change policies are integrated to maximise the co-benefits of tackling both air pollution and climate change.
HEALTH BENEFITS OF CLEAN AIR POLICIES

The health benefits of clean air policies are far reaching. Studies in a particular urban region estimate that even complying with current EU standards would lower the annual death toll by approximately 1,200 deaths per year, see 600 fewer hospitalisations for cardio-respiratory diseases per year, 1,900 fewer cases of chronic bronchitis among adults, 12,100 fewer cases of acute bronchitis among children, and 18,700 fewer asthma attacks every year in children and adults.15 The current EU Thematic Strategy for Air Pollution estimates that implementing its objectives would lead to health savings of EUR 42 billion per annum.16

WHAT CAN THE EUROPEAN COMMISSION DO?

The European Commission has the competence to bring forward ambitious air quality legislation. The Commission should ensure that the proposal it adopts addresses the concern of European citizens, reflects WHO recommendations and meets international commitments.

WHAT CAN THE EUROPEAN PARLIAMENT DO?

As the directly elected institution of the EU, the European Parliament and its Members (MEPs) should press national governments to ensure the highest level of protection for European citizens and bring together all stakeholders to make the case for health and environmental protection. The Parliament will also play a decisive role in the adoption of any Commission proposal to revise air quality legislation. It is therefore crucial that MEPs ensure – through amendments if necessary – that legislation places the health of European citizens at its core.

WHAT CAN MEMBER STATES DO?

Member States must make air quality an integral part of their transport, industrial and energy policies and ensure that the correct level of governance – national, regional or local – is equipped to tackle the sources of pollution. Member States also need to improve cooperation on transboundary pollution. Ultimately, Member States must undertake to correctly implement and enforce air quality legislation. By acting now, future generations can be protected.

BIBLIOGRAPHY

2] PM10, and children’s respiratory symptoms and lung function in the PATY study European Respiratory Journal 2012 40:538-547
3] http://www.oecd.org/newsroom/environmentactnow/6f6b493e-99f6-4e7a-93e6-0824c0cd8f6c.htm accessed 18/01/13
7] WHO Air Quality and Health Fact Sheet no 313 http://www.who.int/mediacentre/factsheets/fs313/en/index.html accessed 18/01/13
The European Respiratory Society is a professional medical association, seeking to alleviate suffering from respiratory disease and improve lung health by promoting research, medical education, and advocacy.

ERS supports strengthening limits for air pollution, stricter enforcement of EU legislation and notes the need for further research to understand fully the impact of particular factors on human health.
Citizens are entitled to clean air, just like clean water and safe food.

Outdoor air pollution is one of the biggest environmental health threats in Europe today, leading to significant reductions of life expectancy and productivity.

Fine particles and ozone are the most serious pollutants. There is an urgent need to reduce their concentrations significantly.

Roadside pollution poses serious health threats that cannot be adequately addressed by regulating fine particle mass or ozone. Other metrics such as ultrafine particles and black carbon need to be considered in future research and to inform further regulation.

Non-tailpipe emissions (from brakes, tyres and road surfaces, etc.) pose a health threat for road users and subjects living close to busy roads.

Real-world emissions of nitrogen dioxide from modern diesel engines are much higher than anticipated. This may expose many road users, and subjects living on busy roads, to short-term peak concentrations during rush hours and periods of stagnating weather that may impact on health, although to what extent requires further research.

Global warming will lead to more heatwaves, during which air pollution concentrations are also elevated and during which hot temperatures and air pollutants act in synergy to produce more serious health effects than expected from heat or pollution alone.

Combustion of biomass fuel produces toxic pollutants. This is true for controlled fires, such as in fireplaces, woodstoves and agricultural burning, as well as for uncontrolled wildfires. There is a need to assess the real health impacts of air pollution from these sources in many areas in Europe to inform on the need for better control.

Compliance with current limit values for major air pollutants in Europe confers no protection for public health. In fact, very serious health effects occur at concentrations well below current limit values, especially those for fine particles.

EU policies to reduce air pollution are needed that ultimately lead to air that is clean and no longer associated with significant adverse effects on the health of European citizens. The benefits of such policies outweigh the costs by a large amount.
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<th>WHAT ?</th>
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<tr>
<td><strong>OZONE</strong> ($O_3$)</td>
<td>Ozone is a gas composed of three atoms of oxygen.</td>
<td>In the stratosphere the “ozone layer” (15-40 km above the earth’s surface), absorbs harmful ultraviolet radiation preventing it from reaching the earth. Near the ground, ozone becomes problematic – it is made by chemical reactions between the sun’s rays and organic gases and oxides of nitrogen emitted by cars, power plants, industrial boilers, refineries, chemical plants and other sources.</td>
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<td><strong>NITROGEN DIOXIDE</strong> ($NO_2$)</td>
<td>Nitrogen oxides are gases that contain nitrogen and oxygen. Nitrogen dioxide ($NO_2$ – one of the main nitrogen oxides present in the air) is a red-brown gas with a sharp, biting odour, and is a major source of smog.</td>
<td>The main man-made sources of nitrogen oxides include motor vehicles, power plants and other sources that burn fossil fuels. Nitrogen oxides and the pollutants formed from them can be transported over long distances, by the wind and weather.</td>
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<td><strong>PARTICULATE MATTER</strong> (PM)</td>
<td>Particulate matter (PM) is the term used to describe the mix of particles which are suspended in the air we breathe. PM varies in size and composition – it includes substances such as dust and soot, as well nitrates and sulphates.</td>
<td>Natural sources of particulate matter include volcanoes, sea spray, pollens, fungal spores and soil particles. Man-made particles mainly result from industrial processes, construction work or friction from motor vehicles on road surfaces. Particulate matter is also formed in the atmosphere when gases are changed in the air by chemical reactions. Large particles usually settle out of the air quickly, while smaller particles may remain in the air for days or months. Rainfall helps to remove particulate matter from the air.</td>
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<td><strong>SULPHUR DIOXIDE</strong> ($SO_2$)</td>
<td>Sulphur dioxide is a colourless gas, with a pungent, suffocating odour, produced by the burning of sulphur.</td>
<td>Most sulphur dioxide comes from electric industries that burn fossil fuels. Other sources of sulphur dioxide are industries that produce products from raw materials such as coal and crude oil, or that burn coal or oil to produce process heat (petroleum refineries, cement manufacturing and metal processing).</td>
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<td><strong>BLACK CARBON</strong></td>
<td>Black carbon, results from the incomplete combustion of fossil fuels – also known as soot.</td>
<td>BC is produced both naturally and by human activities as a result of the incomplete combustion of fossil fuels, biofuels, and biomass. Primary sources include emissions from diesel engines, cook stoves, wood burning and forest fires.</td>
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