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**Air Quality – an integrated understanding of health risks**  
– closed POST breakfast event

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*0830-1000 on Tuesday 27th October 2015 in Room P, Portcullis House*

The aim of the event was to discuss the science and resulting policy issues relating to new knowledge on the interconnections and pathways between air pollutants and interacting stressors, exposure routes and health effects in humans. In 2014, the Supreme Court ruled that the government must develop air quality plans for the 38 of the 43 UK air quality zones failing to meet the EU limit values for nitrogen dioxide by the 31st December 2015. The event was chaired by the Lady Manningham-Buller, and attendees, including MPs, peers and parliamentary staff, heard briefly from seven speakers during general discussion of the issues:

- [Professor Paul Wilkinson](#), Public and Environmental Health Research Unit, London School of Hygiene and Tropical Medicine, member of the Committee on the Medical effects of Air Pollution (COMEAP)
- [Professor Martin Williams](#), Environmental Research Group, King's College London
- [Professor Michael Depledge](#), Chair of Environment and Human Health, University of Exeter; and Chair of the Board of the European Centre for Environment and Human Health
- [Dr Sotiris Vardoulakis](#), Head of Environmental Change, Public Health England
- [Professor Ian Boyd](#), Chief Scientific Adviser, Defra
- [Andrea Lee](#), Health and Environment Adviser, Client Earth
- [Ruth Calderwood](#), Environmental Policy Officer at City of London.

## **Air Quality Breakfast Briefing Meeting Summary**

- **Professor Paul Wilkinson:** Overall mass of air pollution has decreased since 1950 by two orders of magnitude, but air pollution is still having detrimental health effects. Scientific evidence of effects is strongest for particles, but there is increasing debate over other pollutants such as nitrogen dioxide and Ozone. There is no evidence to suggest that there is a threshold for air pollution under which effects level out, with further improvements in health outcomes if air pollution is decreased below a threshold. The lower the air pollution is the further improvements we see in health outcomes. Globally, 3.7 million deaths can be attributed to air pollution, with the Committee on the Medical Effects of Air Pollution (COMEAP) estimating an effect on mortality equivalent to 29,000 deaths annually as a result of particulate air pollution. There is increasing evidence that air pollution is contributing to illnesses such as cardiovascular and respiratory diseases – on average each person in the UK is losing 6 months off their lifespan because of particulate air pollution, although actual effects will vary greatly between individuals. The source of air pollution is not only traffic in the urban environment, but other sectors such as heating of housing, energy production and agriculture. With agriculture the major source of secondary particulate pollution, which contributes to the long range transport of other particulate air pollutants with greater toxicity. It is very difficult to set emission controls and achieve them, but the move away from fossil fuels and a low carbon economy may be a pathway to achieving a step change in levels of air pollutants. Accelerating the transition to a low carbon

economy and tightening controls surrounding emissions are needed, with emissions from the heating systems of housing an important target

- **Professor Martin Williams:** It is important to emphasise that single studies on health effects of air pollutants do not inform policy, which requires reviews of evidence. The World Health Organization (WHO) undertook a large scale review which found substantial evidence for the effects of particles at lower concentrations than regulatory thresholds and provided stronger evidence for health effects of nitrogen dioxide (previously evidence was weak). Effects of nitrogen dioxide could be as big as particles at high concentrations. WHO also concluded that there were significant adverse health effects from living near heavily trafficked roads, but it is difficult to determine what the most dangerous component of pollutants from traffic were. There is evidence that not only exhaust emissions are harmful, but also non-exhaust from tyre wear, clutch control etc. that produce abraded metal particles that are not subject to any specific regulatory controls. There are short term correlations between air pollution and mortality, particularly myocardium infarction exacerbated by exposure to pollution. The transition to a low carbon and reduced use of fossil fuels will not necessarily equal low pollution; there are clean ways and dirty ways of low carbon transition, some low carbon technologies using biomass have the potential to increase air pollution. Policies to encourage use of electric vehicles will deliver air quality benefits, but the extent of these depend on the generation source for the electricity.

## **DISCUSSION**

### **Socio-economic Gradients**

- People with lower incomes are more likely to be exposed to air pollution and to have underlying health issues that will be exacerbated by this exposure.
- However there is not a strong gradient between effects of air pollution and wealth, and it varies between different parts of the country and within cities.

### **Indoor Air**

- Need to minimise outdoor air pollutants entering buildings and increase levels of indoor air pollutants removed – there are potential dangers of implementing indoor air ventilation badly.
- Improving energy efficiency of housing, e.g. using more insulation, may reduce infiltration of outdoor air.
- However there are particles generated from inside (burning food, tobacco smoke etc.) and the concentrations of these particles could increase due reduced ventilation
- Need to include careful natural ventilation which minimises pollution getting in
- In policy terms indoor air is different to outdoor air and isn't regulated by the same policy

### **Information for Local Authorities (Hope Street, Glasgow and Bath)**

- Local Authorities are generally good at monitoring air pollution levels but have been less effective in implementing measures to reduce traffic emissions.
- Retrofitting public transport – retrofitting buses and taxis with filters and traps to reduce particle and NOx emissions.
- In the longer term, completely overhauling the public transport to run on electricity or compressed gas

- Cutting traffic – Edinburgh have a policy where they close some streets an hour before and after school hours, called school street.
- Do low emission zones actually work? – A recent review has suggested there is a lack of evidence that they do.
- Pollution may not necessarily be produced where concentrations accumulate, some of the pollution in London originates in continental Europe.

### **Air Quality inside Cars**

- The performance of air filters in cars is limited and the air quality inside cars reflects the emissions of the exhausts of the cars in front. However, the level of exposure is no worse than that of pedestrians on busy roads.

### **Association between Air Pollution and Health**

- Can we disaggregate other factors driving trends in health from the effects of pollution on health?
- Current health impacts are assessed by comparing populations around the country with different levels of exposure – could possibly use epidemiological models to tease out the effects of the legacy of previous air pollution but these aren't likely to be substantial compared to current exposure.
- **Professor Michael Depledge:** The population of the UK is concentrated in cities, around 85% of the population live in urban environments. However, cities are highly heterogeneous and the issues with air pollutants vary accordingly. Some of these issues have not yet been well characterised; for example, nanoparticles, smaller than the particulates of current policy concern, which are emitted by combustion, wear and tear of vehicles and in vehicle exhaust may be problematic. Nanoparticles, such as Cerium Oxide, are added to transport fuels to increase fuel efficiency and decrease greenhouse gas emissions. However, the environmental fate and effects of these nanoparticles are uncertain. It has been shown that very high levels of iron nanoparticles can have toxic effects, but information about nanoparticle persistence, toxicity and interaction with the environment remains limited. There is a lack of evidence of how to manage nanoparticles as there no agreed methods for measuring concentrations of nanoparticles in the environment, determining their fate or their toxicity. Current approaches are focussed on the effects of air pollutants on humans but there should be more consideration of the extensive impacts on plants and animals.
- **Dr Sotiris Vardoulakis:** Health effects occur both from long-term exposure to ambient pollution levels, and from short-term episodes of elevated air pollution. Health impacts from air pollution include effects on cardiovascular and respiratory conditions and increased risk of lung cancer. About 5.3% of adult all-cause mortality in England each year can be attributed to particulate air pollution. There is evidence associating exposure to air pollutants with a worsening of asthma symptoms. Traffic-related air pollution may play a role in inducing asthma in some individuals, particularly those who live near busy roads carrying high numbers of heavy goods vehicles. Traffic has a big contribution to air pollution; around 80% of emissions of nitrogen oxides (NO<sub>x</sub>) in areas where the UK is exceeding nitrogen dioxide (NO<sub>2</sub>) limit values are due to road transport, although urban and regional background non-transport sources are still considerable. Everyone has the right to clean air and air pollution needs to be reduced at a local level. Modal shift from

cars to walking, cycling and public transport encouraged through promotion of the multiple health benefits of active travel can help reduce local emissions. For instance, through businesses giving incentives to walk, cycle, carpool and work from home. Implementation and regulation of EURO vehicle standards and vehicle emissions tests to reflect real world driving emissions are crucial, as well as promoting electric vehicles and implementing a national framework for clean air zones.

- **Professor Ian Boyd:** At the moment in the UK, national measurements of pollutants are supplied by a sparse networks of monitoring stations. This data is used in the Pollution Climate Mapping (PCM) model which estimates distribution of pollutants. The model outputs for different areas corresponds with the observed measurements made by local authority monitoring networks, providing confidence that the outputs are accurate. The UK approach is one of the most effective monitoring system in the EU, but these monitoring systems only provide a limited picture, when air pollution is often a detailed local issue down to the street level. In the future, monitoring could be more focused on areas of air pollution within which the general public are exposed to peaks and troughs of pollution. There has been rapid innovation in personal pollution measuring instrumentation which individuals could buy; for example, car manufacturers could fit cars with pollution monitoring systems that would tell the occupants the levels of pollution outside and inside the car. Members of the public can then make informed decisions, which would rapidly change the tenor of the air pollution debate. Air pollution has decreased from the 1970s to the present day, but we need to ask why it has taken so long. There are a few systemic reasons such as public behaviour, capital investment, vehicle turnover, depreciation and replacement. Putting information in the hands of the consumer alone will not solve the issue; a multitude of policies working together will be required. Policies should stimulate and drive change and should be driven by public behaviour, such as individual measurements of the environment.

## ***DISCUSSION***

### **Measuring pollution through devices fitted to cars**

- The characteristics of air pollution have changed and will go on changing, requiring new policy responses.
- People who buy vehicles typically don't look at low emission data on cars, far more likely to look at other factors such as price, fuel efficiency etc.
- General public will adopt alternative technologies if given easy choices, such as appropriately priced electric cars with good performance, but there would need to be a transition to energy generation that does not contribute to air pollution. Some polluting aspects of the transport system will be less easy to replace, including freight vehicles and public transport. .

### **Contribution of Aviation to Pollution**

- The biggest contributor to pollution is transportation of passengers to the airport, via cars and public transport, rather than the planes themselves.
- Planes have large emissions of nitrogen dioxide, but this only contributes to air pollution at ground level during take-off and landing. The emissions scale up with the number of aircraft taking off.

- Aviation and shipping are growing sources of emissions when compared to other transport sectors.
- Persuasive alternative transport choices will be needed to influence individual behaviour to limit emissions if Heathrow airport is to be expanded, but these are unlikely to be enough and a no traffic buffer zone may have to be created around Heathrow airport to limit exposure to air pollutants.

### Low Emission Zones

- When the congestion charge was introduced to central London a lot of money was invested in public transport before the charge was brought in, which enabled a smooth transition. If other low emissions zones were brought in around the country there would need to be both carrot and stick, including viable alternative transportation available beforehand.
- Implementation of ultra-low emission zones in London, although they may prove to be ineffective, are better than nothing.
- Low emission zones require investment in transport infrastructure along with systemic change to address pollution sources from different sectors to create more liveable sustainable cities. Without this pollution levels may not decrease.

### Agriculture

- Emission from the agricultural sector remains one of the unsolved problems in air quality policy, with existing EU policies ineffective.
- Ammonia emissions from agriculture are one of the major components in the formation of secondary particulates in the atmosphere that transport toxic components long distances, and methane is one of the precursor gases involved in the formation of ground level ozone pollution.
- There has been no reductions in ammonia levels over the past three decades and the agricultural sector is resisting any regulatory measures to reduce emissions.
- Agriculture is the biggest contributor to secondary particle pollution (PM 2.5).
- **Andrea Lee:** Action is needed at all levels and everybody has their role to play, but no significant progress can be made without national leadership from governments to provide and facilitate policy solutions at a local, national and European level. Individual behaviour change cannot be relied upon to deliver effective control of air pollution, and putting the onus on individuals who are not in a position to change behaviours and have many other factors such as cost to consider. It will also make little difference if an individual reduces their contribution to air pollution if the majority of their neighbours don't. Measures should also be available to allow individuals to protect themselves from air pollution. Transport is the main contributor of NOx pollution, about 80%, in towns and cities that do not comply with thresholds, but other sectors, such as agriculture, also need to contribute to reductions. MEPs will be voting on revisions to the National Emission Ceiling Directive tomorrow, but controls are unlikely to be placed on the agriculture sector. There is concern that current UK plans are not informed by a clear cross-departmental national approach to tackling air pollution, with responsibility devolved to local authorities with little additional resource and no new powers. A letter has been sent to local authorities reminding them they are responsible for EU air quality fines under the localism, despite local authorities being under resourced. There is also concern what the Comprehensive Spending Review will mean for the implementation of the air quality plans. A nationally designed

network of low emission zones might be effective in encouraging people to change behaviour, as called for by the Healthy Air Campaign, but the current voluntary approach to their implementation is unlikely to deliver results. National government needs to provide policy framework and investment to facilitate low emission lifestyles. If overall levels of motor traffic are to be reduced, it will require a step increase in walking and cycling levels as well as public transport use, and the public need to be properly informed about the risks so they can reduce their contribution and exposure and buy into the tough political measures that will have to happen.

- **Ruth Calderwood:** There have been lots of measures introduced to improve air quality in London but there has overall been no real improvement of air quality within the City of London. Evidence recently published by Kings College London showing the mortality effects of nitrogen dioxide has increased the will of the City Corporation to take local action. City Corporation has already done quite a lot of community engagement work to nudge behaviour. Businesses have changed the way they operate and local residents are being helped to understand the impacts of air quality. This approach does work but is time consuming and resource intensive. A national campaign is needed for air quality giving the general public simple and consistent messages about what they can do to reduce their exposure and to increase willingness to support air pollution policies. More reliable data is needed including on vehicle emissions, with tighter emission control of diesel cars.

#### **DISCUSSION –**

- Some pollutants still have health effects when levels are low.
- A strategic approach will be needed to considering how to address the totality of air quality and greenhouse gas emissions.
- This will include looking at the integrated impacts of air quality and looking at life course exposures and lifestyle choices. Current approaches need to be re-evaluated in the light of social science research, with better integration of social and environmental sciences.
- There are three big issues, climate change, air pollution and health which we can begin to mitigate by moving away from fossil fuels and low activity lifestyles.
- A low carbon economy can also be good for health, but in order for these changes to take place our policy has to be bolder and happening at a greater pace.
- We need a step change in transport system, agriculture and housing.
- Around 20% of all car journeys in the UK are less than 1 mile in length, so there are opportunities to replace some of these car journeys with walking and cycling
- There are other cities in Western Europe that have invested in and implemented sustainable city planning.
- Natural resource depletion is also an important issue that should be added to the other big three challenges.
- This relates to control and demand at a global scale and countries need to act in unison through mechanisms, such as the G7.
- What is the correlations between environment improvement vs. life expectancy and medical technology vs. life expectancy? Clean water, housing and reductions in coal burning have all improved life expectancy but so have medical advances such as immunisation. Life expectancy

will keep improving through medical technology, but improvements in quality of life will require changes in the relationship between humans and the environment, not just reductions in pollutants but also in terms of use of natural resources.

- Towns and cities need to be redesigned to help implement new technology in communities.
- The centralisation of economic activity in particular areas results in higher house prices and people have to travel further to work creating more air pollution.
- Health inequalities are related to environmental inequalities, often causally.
- Air pollution should be considered together with other threats from the environment to health and wellbeing (climate change, microbial pathogens, chemical pollution, etc.) as it is the integrated impact of all of these factors that influence health outcomes.
- A step change is required in communicating the intimate relationship between environmental quality (which includes air quality) and human health (and wellbeing), so that this is more broadly appreciated by politicians and policymakers across the spectrum of government. This strongly relates to debates regarding healthier lifestyles in sustainable environments.
- Tackling air pollution requires a deeper understanding of how the changing climate, weather, heat island effects, and vulnerability of the ageing population interact, and how adverse effects might be mitigated through the provision of green and blue spaces, and building infrastructure to promote walking, cycling, the use of electric vehicles and smart buildings which offer numerous co-benefits for health and the environment.