

## Health of the public in 2040: 'call for input' questions

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### **Response of the Institution of Environmental Sciences**

*This 'call for input' represents a critical stage in the Academy's 'Health of the public in 2040' working group project. It is an opportunity for the working group to hear your views and aspirations concerning the future health of the UK population. The working group will draw on these submissions to begin developing practical recommendations for the future.*

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### **Background**

- The **Institution of Environmental Sciences (IES)** is a membership organisation that represents professionals from fields as diverse as air quality, land contamination and education - wherever you find environmental work underpinned by science. The IES now has over 3000 members and offers both Chartered Scientist and Chartered Environmentalist professional qualifications. A visionary organisation leading debate, dissemination and promotion of environmental science and sustainability, the IES promotes an evidence-based approach to decision and policy making.
- The IES also provides support for the **Institute of Air Quality Management (IAQM)**, administering their financial and membership records. The IAQM acts as a formal committee on air quality within the IES. The IAQM aims to be the authoritative voice for air quality by maintaining, enhancing and promoting the highest standards of working practices in the field and for the professional development of those who undertake this work. Membership of IAQM is mainly drawn from practising air quality professionals working within the fields of air quality science, air quality assessment and air quality management.

### **Consultation response**

- 1.** The working group and various stakeholders have collectively articulated their **aspirations** for the future health of the UK population. These are described in the background document (page 2). Do you share these aspirations? If not, why? What other aspirations do you have?

The Institution of Environmental Sciences (IES) supports these aspirations. The focus of our response reflects that of our membership, whose collective expertise is in the environmental, rather than medical arena. We promote a holistic understanding of socio-environmental systems, whereby the fundamental interconnectedness of humans with the environment is recognised. Such an integrated understanding is vital when considering many public health issues.

The IES also shares the aspiration that wellbeing should be a measure of societal success, but would also add that sustainability is vital to improving standards of living and public health over the long term<sup>1</sup>. Environmental systems and cycles are dynamic over both time and space, but understanding thresholds in these systems and how humans interact with our environment is vital.

**2. What do you think will be the major drivers of change which will influence the population's health over the next 25 years and what are the key uncertainties surrounding these drivers?**

The working group has established an impressive list of drivers of change, in which we are glad to see the natural environment is featured. However, there are several notable factors missing which should have been included. It is of course worth noting that assessments of the significance of environmental impacts (on health) rest on societal definitions of acceptable risk. They are not solely determined in reference to biophysical 'limits'. However, there is evidence to suggest that certain environmental factors are having an impact on health and the impacts of these problems will continue to increase over the next 25 years if robust regulation or mitigation measures are not put in place.

- **Air pollution** – poor air quality is a major public health issue in countries all over the world. A recent WHO report<sup>2</sup> has calculated that indoor and outdoor air pollution cost European economies as much as £1.05 trillion each year in deaths and diseases<sup>3</sup>. It also calculates that air pollution costs the UK economy approximately £54 billion in deaths every year, which represents 3.7% of GDP. Of course, this cannot simply be reduced to economics. A Public Health England report in 2014 calculated that in 2010 there were 28,969 deaths in the UK attributable to long term exposure to anthropogenic air pollution<sup>4</sup>. This represented about 5.6% of premature deaths in 2010. The problem is bigger than these statistics suggest however, as explained by Clare Holman of the Institute of Air Quality Management in a recent Society for the Environment publication<sup>5</sup>: "A recent WHO<sup>6</sup> report states that there are significant health effects, including mortality, due to long term exposure to NO<sub>2</sub> at or below the EU limit value, which is

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<sup>1</sup> In the classic 'Brundtland' sense of the term sustainable development refers to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." However, sustainability can also be considered to incorporate the maintenance of resilient ecological systems and biogeochemical cycles for no immediate human benefit.

<sup>2</sup> WHO, OECD (2015) *Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth*. Copenhagen: WHO. [Online] Available at:

[http://www.euro.who.int/\\_data/assets/pdf\\_file/0004/276772/Economic-cost-health-impact-air-pollution-en.pdf?ua=1](http://www.euro.who.int/_data/assets/pdf_file/0004/276772/Economic-cost-health-impact-air-pollution-en.pdf?ua=1)

<sup>3</sup> [http://www.euro.who.int/\\_data/assets/pdf\\_file/0008/276956/PR\\_Economics-Annex\\_en.pdf?ua=1](http://www.euro.who.int/_data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf?ua=1)

<sup>4</sup> Gowers, A.M., Miller, B.G. and Stedman, J.R. (2014) Estimating local mortality burdens associated with Particulate Air Pollution. Public Health England. [online] Available at:

<https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>

<sup>5</sup> Holman (2015) 'Urgent: A new Air Quality Strategy'. In: SocEnv (ed.) *ENVIRONMENT: Priorities for the next Government*. Society for the Environment, pp18-20 Available at: <http://www.socenv.org.uk/events/priorities-for-the-next-government/>

<sup>6</sup> World Health Organization (2013), Review of evidence on health aspects of air pollution – REVIHAAP Project, Technical Report, Bonn.

widely exceeded across the country. If this pollutant was included in the above estimate, the annual death toll is likely to be closer to 60,000<sup>7</sup>.

- **Water pollution** – water pollution may also have health effects over the next 25 years, if suitable regulation and enforcement is not applied. However, unlike air quality, instances of water pollution impacting health are generally more localised, although where water (or infected products of that polluted water e.g. fish) are distributed to people in other locations for consumption, or is used in agriculture, these impacts can be amplified. As well as cases of acute industrial point-source pollution, other forms of pollution may be harmful to human health after long term exposure, such as heavy metal pollution or other forms of non-point diffuse pollution such as agricultural run-off<sup>8</sup>.
- **Contaminated land/soil pollution** – In the past there has been some uncertainty about the health effects of land contamination in scientific literature, and it is noted that it is still difficult to make clear causal inferences regarding the impact of this form of pollution on health due to assessment and data constraints<sup>9</sup>. However, a wide variety of contaminants which can have a potential impact on health have been identified<sup>10</sup>. Significant health impacts of soil contamination are now also starting to be noted in some other countries, notably China. With the current political drive for house building on brownfield land (which, along with restored landfill sites and other areas) are at risk of being contaminated, this issue may be a driver of change in the coming years. The impact of this pollution on health will depend on the regulatory framework, planning policy, technology for remediation and decontamination, and discovery of potential new or previously unknown contaminants.

The uncertainties associated with these potential drivers of changes in public health to 2040 concern both technological and industrial developments (for better or for worse – i.e. ‘greener’ technology for cars/power plants, or the enhanced use of pollutants in new industrial processes), and regulatory changes. If strong regulation is adequately enforced, the impacts of these forms of pollution on health may decrease.

We would also like to **highlight changes to the amount and configuration of green space in towns and cities** as a potential driver of change. These areas make up urban habitat matrices, which deliver a range of ecosystem services necessary for human health and wellbeing. These include supporting services which provide the basic infrastructure for life (which ultimately we depend on, e.g. soil formation, nutrient and water cycling), regulating services which include climate and hazard regulation, provisioning services such as food production, and cultural services, which refer to the personal, spiritual and cultural benefits humans derive from interactions with nature (which can include

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<sup>7</sup> [www.independent.co.uk/news/uk/home-news/air-pollution-to-blame-for-60000-early-deaths-per-year-government-to-be-warned-9893810.html](http://www.independent.co.uk/news/uk/home-news/air-pollution-to-blame-for-60000-early-deaths-per-year-government-to-be-warned-9893810.html)

<sup>8</sup> Ongley, E.D. (1996) *Control of water pollution from agriculture*. FAO irrigation and drainage paper 55. Rome: FAO. Available at: <http://www.fao.org/docrep/w2598e/w2598e04.htm>

<sup>9</sup> Defra (2009) *Potential Health Effects of Contaminants in Soil: Appendix 1*. SP1002, Available at: <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16185>

<sup>10</sup> Defra (2005) *Sources and impacts of past, current and future contamination of soil*. SP0547, SID 5 Research Project Final Report. Available at: <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=13317&FromS>

mental health benefits)<sup>11</sup>. Each of these categories have importance for human health and an understanding of this concept is important in general, but particularly when considering urban areas. Urban greenspace can impact on local climatic regulation, air pollution levels/exposure, flood mitigation and a range of other issues, so links with a range of public health concerns.

**3.** What are the potential **shocks** or **disruptive events** that might need to be taken into consideration in planning for the future?

Shocks and disruptive events are by their nature unpredictable and may be positive or negative. A key positive might be a technological breakthrough in low-carbon energy, especially in decarbonising transport, which would have a significant impact on the exposure to air pollution of urban populations.

Negative disruptive events include extreme weather events or natural hazards. As studies demonstrate the increasing frequency and intensity of extreme weather events due to climate change all over the world<sup>12,13,14</sup>, these disruptions are likely to have an increasing impact. In the UK this means that flood and heat wave events may become more frequent and intense. In recent years, heat waves across Europe have had major public health impacts, particularly amongst vulnerable segments of the population such as the elderly.

**4.** What **research evidence** is (or will be) needed to address these aspirations and reduce these uncertainties, and to what extent is the required research currently taking place?

Our understanding of the impact of exposure to green-space on health (particularly mental health) is still debated. This area required more research, using large samples, to determine the significance of any health impact.

Our understanding of the impact of pollutants in air and water on health is well established<sup>4,5,6</sup>, as is our understanding in many cases of their dispersal through modelling and extensive surveying. Therefore, this research is either unnecessary or already being undertaken to a large extent. However, the relationship between soil contamination and health does need further research to clearly identify causal links.

Much work is ongoing on categorising the benefits human receive from nature through the ecosystem services concept (see the National Ecosystem Assessment for instance), but to secure public and political buy-in, clearer evidence of these fundamental links, as well as better communication, will be required.

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<sup>11</sup> For more information on the ecosystem services concept see the National Ecosystem Assessment (<http://uknea.unep-wcmc.org/>) or the IES' recent publication, 'The UK NEA: What now?' (<https://www.the-ies.org/resources/uk-national-ecosystem>).

<sup>12</sup> IPCC (2007) *Climate Change 2007: The Physical Science Basis*. [Solomon, S., D. Qin, M. Manning, Z.Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]

<sup>13</sup> Webster PJ et al. (2005) 'Changes in tropical cyclone number, duration and intensity in a warming environment.' *Science* 309, 1844-6.

<sup>14</sup> Cai, W. et al. (2014) 'Increasing frequency of extreme El Nino events due to greenhouse warming' *Nature Climate Change*, 4: 111-116. (doi:10.1038/nclimate2100)

5. Given the above, what needs to be done to support, deliver and realise the value of this research? Particular consideration should be given to:
- Research capacity** (for example, training, workforce, skills, relevant academic disciplines and funding)
  - Research infrastructure** (including physical, virtual and institutional infrastructure)
  - Mechanisms for **translating research** into policy and practice

As established above, to a large extent these problems are already being researched. What is lacking here is investment and political will to make changes. Further investment in research on urban design **to reduce people's exposure to pollutants may be of value, but it should not be forgotten that these problems operate at a range of scales, so local solutions may not suffice.** To increase the impact of research in this area, and to address the public health problems, we also need to invest in communicating the nature of the problem to the public. It may be that it is only through a bottom-up surge of discontent that political capital can be mobilised to develop and enforce strong regulation to protect public health.

Considering institutional and funding infrastructure, the IES does however promote the view that there is a need for more 'systems thinking' in strategic research planning, as well as more support for interdisciplinary research.

- **A systems approach:** We need to promote research which adopts and encapsulates holistic approaches to investigating and tackling societal challenges and problems. Natural systems are complex and inter-connected and a systems approach allows researchers to develop a much more complex and nuanced understanding of human interactions with the natural world, based on an appreciation of the importance of feedbacks and thresholds.
- **Interdisciplinarity:** Further to the need to embed a systems approach in strategic planning, research which embraces interdisciplinarity is vital to understanding socio-environmental systems, and thus to tackling environmental and social problems. As has been increasingly recognised by large groups of leading international researchers – in particular from a growing school of 'resilience thinkers' – understanding the 'tipping points' in highly inter-connected socioecological systems is vital<sup>15</sup>. Studies have shown that "integrated studies of coupled human and natural systems reveal new and complex patterns and processes not evident when studied by social or natural scientists separately"<sup>16</sup>. As such, to best improve both public health and environmental understanding action should be taken to increase cross-disciplinary collaboration in research, mirroring in fact the collaborative governance structures (where environmental, planning and public health departments talk to each other and work in an integrated manner to solve problems) which will be required to deal with many of these issues.

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<sup>15</sup> Folke et al. (2011) 'Reconnecting to the Biosphere' *Ambio* 40(7): 719-738.

<http://link.springer.com/article/10.1007%2Fs13280-011-0184-y>.

<sup>16</sup> Liu et al. (2007) 'Complexity of Coupled Human and Natural Systems'. *Science*. 317(5844): 1513-1516

<http://www.sciencemag.org/content/317/5844/1513.full>

- 6.** Please add any **additional comments**, not covered by the above, which may be of benefit to the Working Group.

We have no additional comments

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