



Group of Chief Scientific Advisors

**Climate change and health: A discussion of the latest international and European reports and the implications for Europe**

**Expert Workshop Report**

**Scientific Advice Mechanism**

*7 June 2019, Brussels*

# Adaptation to climate change-related health effects: A discussion of the latest international and European reports and the implications for Europe

Expert workshop hosted by the Group of Chief Scientific Advisors of the European Commission

7 June 2019, Berlaymont building, Rue de la Loi 200, Brussels

## WORKSHOP REPORT<sup>1</sup>

### Scope and purpose

The Group of Chief Scientific Advisors provides the College of Commissioners with independent scientific advice on specific policy issues. According to the establishing EC Decision [C\(2015\) 6946](#), amended by EC Decision [C\(2018\) 1919](#), the advisors can provide advice upon the request of the College of Commissioners or may on their own initiative suggest that the College requests its advice on a subject, in areas where science advice to European Policy is relevant. Their Scientific Opinions are usually informed by evidence reviews established by SAPEA (Science Advice for Policy by European Academies).

During their 17<sup>th</sup> plenary meeting on 22/23 March 2019, the Advisors decided to provide a Scientific Opinion on “Adaptation to climate change-related health effects in Europe”. The Opinion focuses on adaptation measures that could effectively strengthen the resilience of the European health in view of climate change, with special regard to vulnerable groups, regions and the urban environment, considering specifically impacts heat and heat-waves and from vector-borne infectious diseases.

Over the last years, international and European organisations published major reports where the latest findings on these issues were addressed. The report “The imperative of climate action to protect human health in Europe” was published in June 2019 by EASAC<sup>2</sup>. The reports provide important insights into observed and projected developments and are of major relevance for measures taken at EU level for adapting to the impacts of climate change on health. The objectives of the workshop of 7 June 2019 were to discuss the implications of those reports for public health in Europe and to identify issues that might need further elaboration. The meeting was attended by Chief Scientific Advisors Elvira Fortunato, Nicole Grobert and Carina Keskitalo, as well as

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<sup>1</sup> See meeting agenda and list of participants at the end this document

<sup>2</sup>[https://easac.eu/fileadmin/PDF\\_s/reports\\_statements/Climate\\_Change\\_and\\_Health/EASAC\\_CCH\\_Main\\_Report\\_WEB\\_2August.pdf](https://easac.eu/fileadmin/PDF_s/reports_statements/Climate_Change_and_Health/EASAC_CCH_Main_Report_WEB_2August.pdf)

authors of the above-mentioned reports, representatives of relevant European Agencies, experts in the field nominated by SAPEA, and, as observers, EC officials.

## Background

Scientific evidence demonstrates that global climate is changing. Anthropogenic emissions have largely contributed to global warming with a consequential increase in the adverse effects to human health, an increase in morbidity and mortality and amplification of health risks.

Responding to climate change involves a two-pronged approach: Reducing the emissions of greenhouse gases (GHGs) (mitigation) and adapting to those consequences of climate change that cannot be avoided (adaptation). Translating this in the context of health impacts, the World Health Organisation (WHO) defines adaptation as the process of ‘designing, implementing, monitoring, and evaluating strategies, policies and programmes to manage the risks of climate-relevant health outcomes’<sup>3</sup>.

The October 2018 International Panel on Climate Change (IPCC) special report on the impacts of global warming with the average increase of 1.5 degree celsius of the total temperature underlines that climate-related risks to health will be far greater than expected. The World Health Organisation (WHO 2017) Regional Office for Europe published a report entitled “Protecting health in Europe from climate change: 2017 update” where it describes the current knowledge on impacts in different regions and populations and how appropriate adaptation measures will make the health more sector resilient. The latter has been reflected in a recent WHO special report (WHO 2018). The Lancet Countdown report on health and climate change (Watts *et al* 2018) describes the progress made against 10 global recommendations using the 2018 Lancet Countdown's indicators.

From these reports, it may be concluded that both direct and indirect effects on health are expected from climate change:

- Direct impacts due to increased frequency and intensity of extreme events resulting in heat and cold waves, floods, storms, droughts, and wild fires.
- Indirect impacts such as climate change mediated ecological disruptions, altered risk of infectious diseases due to shifting patterns of distribution and abundance of pathogens, their vectors (such as mosquitoes, ticks) and their transmission dynamics; respiratory diseases due to decreased air quality (ground level ozone and particulate matter) with changing patterns in urban areas; new patterns of aeroallergens and allergic conditions The observed health effects may be exacerbated due to compound effects of air pollution, high temperatures, wild fires, and dust storms.

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<sup>3</sup>WHO guidance to protect health from climate change through health adaptation planning.  
<https://www4.unfccc.int/sites/NAPC/Documents/Supplements/WHO%20H-NAP%202014.pdf>

- Socioeconomic and geopolitical dynamics such as migration responses, due to climate change induced migration, displacement of populations, and resettlement, as well as poverty aggravation, which may further amplify both direct and indirect climate-related health effects.

## On this report

The workshop was organised as part of the process for gathering scientific evidence to support Advisors in developing the Opinion on “Adaptation to climate change-related health effects in Europe”. Very recently, an evidence review report on the topic on “The imperative of climate action to protect human health in Europe” was published by EASAC, and several reports and reviews on the topics of climate change and health are available. Therefore, the Advisors decided not produce a separate evidence review report in support of the Opinion, but to base the Opinion on the existing reports and further expert consultation. The aim of the workshop was to identify key issues, sub-questions and knowledge gaps in support of the further scoping of the Opinion.

This report describes the contributions provided by experts and representatives of EC services during the discussions at the workshop, without the intention of it being an exhaustive and complete review of the topics. The discussions are fully represented, without major synthesis, to avoid bias during the evidence gathering stage.

## Welcoming and Introduction

Elvira Fortunato, Nicole Grobert and Carina Keskitalo (by Video Conference (VC)) welcomed the participants, including the SAPEA experts, representatives of different services of the European Commission (EC), the European Environmental Agency (EEA), the European Centre for Disease Prevention and Control (ECDC) (by VC), the European Food Safety Authority (EFSA), and the Scientific Committee for Health and Emerging Risks (SCHEER), as well as specifically Andrew Haines (former director of the London School of Hygiene & Tropical Medicine), Oliver Schmoll (WHO Regional Office for Europe) and Nicholas Watts (Executive Director of Lancet Countdown), who presented respectively the EASAC, WHO and Lancet Countdown reports.

Johannes Klumpers (Head of Unit RTD Chief Scientific Advisors - SAM, EGE) welcomed the participants. He explained the commission procedures for managing conflict of interest. In this case, prior to having been invited, the responsible administrative Unit of the European Commission carried out a background check on candidate-experts to avoid inviting experts who have an obvious conflict of interest in relation to the scope of the current workshop. The search did not reveal any conflicting interests for the experts who were invited to participate. In addition, he invited all experts to declare any interest they might have with regard to the subject matter that will be discussed during the meeting. It was stressed that declaring (or having) an interest does not automatically mean that an expert will be excluded from the meeting, but rather that appropriate measures can be taken to avoid that interests could reasonably be seen as undermining the impartiality of the expert concerned.

Elvira Fortunato explained the role of Group of Chief Scientific Advisors and the background to their work on the topic on 'Adaptation to impacts from Climate Change on Health', which is an own-initiative topic proposed by the Advisors.

A first meeting between the Group of Chief Scientific Advisors and the European Academies' Science Advisory Council (EASAC) took place on 18 September 2018. During a second meeting between the Advisors and EASAC on 28 February this year, the EASAC draft report on Climate Change and Health was presented and discussed in the presence of several representatives of Commission services.

The scoping paper of the Advisors for this topic had been shared with the participants. The main question of the opinion is

"Which adaptation measures could effectively strengthen the resilience of the health sector in Europe in view of climate change, with special regard to vulnerable groups and regions and the urban environment, considering specifically impacts from vector-borne infectious diseases and the combined effect of climate change (especially heat waves) and air pollution?"

Elvira Fortunato further explained that

- The purpose of the scientific opinion is to provide recommendations directly to the College of the European Commissioners (of the next Commission) and to inform the revised EU's climate change adaptation strategy which will be established by DG CLIMA towards the end of this year.
- The scoping paper proposes to base the scientific opinion on major reports prepared by European and international institutions and organisations (WHO, Lancet Countdown, IPCC, EASAC) as well as other relevant reports, like the reports prepared by the European Environmental Agency (EEA). It is not foreseen to prepare a separate evidence review, but evidence will be collected in workshops and by the analysis of existing reports.
- The Opinion is restricted to human health, with a focus on Europe within a global context. The reason for the focus on human health is that EFSA (here represented by Marta Hugas, Chief Scientist of EFSA, and Tobin Robinson, Head of the EFSA Scientific Committee and Emerging Risks Unit) is conducting a project on Climate Change and Food Safety (CLEFSA), which addresses animal health.

The workshop consisted of presentations of three major international reports (by authors of the EASAC, WHO, and Lancet countdown reports mentioned above) which will inform the scientific opinion followed by a discussion of the reports with experts - introduced by respondents to each presentation. This was followed by a discussion of specific points to be addressed in the scientific opinion of the Group of Chief Scientific Advisors:

- Key findings on health threats
- Evidence on the effectiveness of adaptation measures intended to prevent or attenuate the negative impact of climate change on human health
- Focus on geographical (e.g. urban) and population (e.g. age- or disease-related) vulnerabilities

- Interactions between direct consequences of climate change and other health risks (e.g. between heat waves and air pollution or aeroallergens)
- Co-benefits of mitigation and adaptation measures for health
- Identification of knowledge gaps

## **Presentation - The EASAC report**

*'The imperative of climate action to protect human health in Europe - Opportunities for adaptation to reduce the impacts and for mitigation to capitalise on the benefits of decarbonisation'* (Andrew Haines, EASAC, by video conference)

Andy Haines outlined the key findings described in the EASAC report.

There are different demographic, socioeconomic and other factors that influence the magnitude of the impact of climate change on health.

Action is being taken to reduce greenhouse gas emission, but it is unlikely that the temperature increase can be kept below 1.5 °C. Temperature change is not uniform; the arctic is warming more quickly. The heat wave of 2003 (15000 excess deaths in France) did not only affect the most vulnerable people and could become the norm. There are publications quantifying the number of deaths attributed to anthropogenic climate change (e.g. Viceda-Cabrere et al. 2018)

Health effects of climate change include mental health effects, which are the most important health impact of floods, vector-borne disease due to changes in distribution patterns of the vectors, and allergies, due to the increased distribution of allergens such as ragweed. Impacts on agriculture can also have an effect on health through food scarcity and/or depletion of nutrients.

The first response to climate change impacts on health should be mitigation measures, to attenuate adverse effects in the first place.

As it is unlikely that temperature increase can be kept below 1.5 °C, mitigations measures should be combined with adaptation to capitalise on co-beneficial effects: measures, which help to reduce greenhouse emission and global warming, often also have a positive effect on health. It is important to integrate health considerations in adaptation programmes to avoid unintended adverse consequences. For example, the increase in wetlands or green areas in cities can lead to an increase in vectors such as mosquitos. Planting the wrong kind of trees can lead to an increased abundance of pollen as allergens, etc. Thus, a cross-sectorial approach is needed: Health adaptation should take place in the health sector, but should extend to all other sectors (urban planning, agriculture, water management etc.).

It should be kept in mind that climate change is a global problem, but that many adaptation measures should be tailored to local conditions. For example, heat wave early warning systems should be adjusted to the local temperature profiles, the severity of the heat wave and the population.

## **The main EASAC recommendations**

### **Linking policy development to research outputs:**

- A better quantification of climate change effects on health; there are improved attribution methods that hold a great deal of promise
- The health co-benefits of mitigation and adaptation should be better understood, including economic evaluations
- Clarifying challenges and effective policies for adaptation, ensuring that health is considered across a range of different sectors, and that we avoid maladaptation, which can inadvertently damage health
- Health risk communication: countering misinformation and reframing climate change as a public health threat, not just environmental
- Understanding determinants of individual and institutional behaviour
- Further improvement of early warning systems for extreme weather events and health impacts as well as communicable disease

**Using evidence available** for “Health in all policies”:

- Integrating health in the EU adaptation strategy and clarifying EU-MS roles
- Synthesise evidence of good practice
- Link with strategies outside EU and with SDGs

**Generating new evidence:**

- Filling knowledge gaps by collaborating between sectors, on e.g. vulnerable groups, climate-pollution linkages, and exposure-response relationships
- Increasing monitoring and integration of datasets
- Modelling, non-linearities, tipping points

## Presentation - The WHO Reports

*‘Protecting human health in Europe from climate change: 2017 update’<sup>4</sup> and ‘COP24 special report: Health and climate change’<sup>5</sup> (Oliver Schmall, WHO)*

Oliver Schmall presented two reports of the WHO. The second (COP24 special report) is the result of a collaboration between WHO and the University of Washington.

From the IPCC report “Global warming of 1.5 °C”<sup>6</sup> it is clear that the greater the warming, the greater the risks to overall health. In consequence, actions to limit warming will result in important health gains. The speed of reducing emission will determine how challenging the required adaptation will be.

Within the WHO, climate change is considered more important than ever before, it is one of the top four priorities. The 13<sup>th</sup> General Programme of Work 2019-2023 has three major pillars: health emergencies, more access to universal health coverage, and healthier populations. Climate change will affect all three pillars. Recently a draft WHO global strategy on health, environment and climate change was developed.

<sup>4</sup>[http://www.euro.who.int/\\_data/assets/pdf\\_file/0004/355792/ProtectingHealthEuropeFromClimateChange.pdf?ua=1](http://www.euro.who.int/_data/assets/pdf_file/0004/355792/ProtectingHealthEuropeFromClimateChange.pdf?ua=1)

<sup>5</sup><https://www.who.int/globalchange/publications/COP24-report-health-climate-change/en/>

<sup>6</sup> <https://www.ipcc.ch/sr15/>

The COP24 Special report “Health and climate change”, reached out to negotiators and policy makers that meet at the Conference of the Parties (COP), the main decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC). The report aims at synthesizing knowledge on the interconnection of climate change and health, listing initiatives and tools, and the formulation of recommendations to maximize the health benefits when cutting carbon. The main recommendation is to identify and promote actions to reduce carbon emission and air pollution in nationally determined contributions.

In economic terms, the health co-benefits of mitigation would correspond to approximately twice the costs of the necessary policy measures. Mitigation also results in the prevention of 138.000 premature deaths (annual) in the WHO European region.

Barriers to investment in health should be removed. Although the problem is global, many of the solutions are local. The city majors and subnational leaders are important to initiate actions. However, the question is, how to better connect to the local level.

Health systems should lead by example by developing climate-resilient health systems; the health sector produces between 5 and 10 percent of carbon emissions. Investment in specific infrastructure and knowledge are needed in the health sector. Young doctors may for example not be familiar with some of the re-emerging infectious diseases.

The health sector should be closely involved in the public debate. Health professionals are trusted, and can advocate for adaptation and mitigation with respect to climate change, on personal and societal levels.

The WHO released a report in 2018 on adaptation strategies of EU Member States “Public health and climate change adaptation policies in the European Union”<sup>7</sup>. The progress in tackling health risks from climate change is assessed by analysing adaptation development related to public health in EU countries.

## **Presentation - The Lancet Countdown report**

*‘The 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come’ (Nicholas Watts, University College London)*

Nicolas Watts presented the key findings and recommendations of the 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come.

Impacts from climate change on people are real and large, like heat exposures, lost labor hours, and lives lost to droughts and floods. There are also impacts on food, like yield declines due to shortening of crop duration. It is considered that for 1-degree temperature change yields decline by 2-6 % depending on the crop.

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<sup>7</sup><http://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/publications/2018/public-health-and-climate-change-adaptation-policies-in-the-european-union-2018>



For vector-borne diseases, the Lancet Countdown looks at the climate suitability for the transmission of *A. aegypti* and *A. albopictus*, vectors for yellow fever and dengue. For *Vibrio* infections (e.g. cholera) climate suitability has increased by about 20 %.

The multi-hit scenario should be taken into account in planning and risk assessment (e.g. flood + hospital taken out + infectious disease).

Meteorological and hydrological services provide climate services to the health sector.

Key messages: the impact of climate change on human health is unequivocal. Although this was known for a long time, few measures have been taken. However, there are reasons for optimism. For example, the spending on adaptation for health is increasing.

#### **Comments specific for the Lancet Countdown report:**

It is great to see these global tracking systems (i.e. described in the Lancet report). There are reasons for optimism; two aspects are particularly positive: the engagement of the public health sector, and the signs of global leadership, in particular from the EU and China. In terms of the reporting mechanisms and indicators, it is important to track both direct and indirect effects of climate change.

The European Union has done a lot; the engagement of the health sector has been remarkable. Understanding the effectiveness of interventions is important, but for the monitoring to be possible, there need to be interventions. Monitoring should also include the negative effects of measures. The Lancet Countdown is limited by the lowest common denominator as it acts on a worldwide level. The Lancet Countdown is interested in collaborations, for example with the European Union, to work on a more regional level.

#### **Discussion and comments:**

The discussions after the three main presentations touched upon common themes. Therefore the different contributions have been combined in one chapter. The comments described below represent the views of different experts and discussions between experts.

#### **General comments:**

Mitigation and adaptation need to be carried out in parallel. Adaptation strategies should not counteract mitigation (like air conditioning) and vice versa. Adaptation measures have to be fit for local situations, whereas mitigation measures can be taken at higher level (national, regional, global). Local actors and authorities have to be engaged in adaptation actions.

Unintended negative consequences of mitigation and adaptation should be avoided. For example, insulating houses may lead to an increase in health problems related to heat and in-door air pollution. Therefore, health adaptation to climate change should be seen in a cross-sectorial manner, and health should be considered in all policies.

Communication, particularly on the actions that people can take individually, is important. Communication on the negative aspects of climate change should be revised towards an argumentation about the positive effects of behavioural change on the quality of life of individuals and society. There are important co-benefits of behaviours supporting mitigation and adaptation, like healthier diets, less air pollution, etc.

The terminology on adaptation is not always clear. Concepts used in theoretical frameworks such as forecast, prediction, projection, stress, heat stress, distress, eustress, and the three

concepts of thermal regulation, acclimatisation, and adaptation are sometimes used without clear definition.

Quantitative and mechanistic information can support the design and planning of adaptation measures, the assessment of the effectiveness of adaptation measures. For example for assessment of morbidity and mortality resulting from different health impacts on the one hand, and the documentation of the number of lives saved with the implementation of early warning systems on the other hand. Some literature on that is available. Quantifying effects of climate change on health, as well as the related social and economic cost would provide arguments that mitigation and adaptation may be cost-effective. In the US the global change research programme (USGCRP) provides assessments of human health impacts of climate change<sup>8</sup>. It could be very useful to have a comparable initiative in Europe and to highlight links to work productivity.

Adaptation literature is however to a large extent about decision processes, and how policies work and are implemented, on e.g. the planning systems, building codes, and social sciences aspects on how to implement and communicate adaptation to climate change. Thus, they are mostly not quantitative in nature. The presented reports do not provide much detail on adaptation literature, although some information on adaptation can be found in the grey literature, e.g. the UN adaptation gap report on effectiveness of adaptation strategies<sup>9</sup>. Insights from existing scientific literature on adaptation at different levels and in different sectors, e.g. on planning, on risk communication and on behavioural aspects would help with a better understanding of the effectiveness of health adaptation measures. Literature is for example available on the mobilisation at local level like the Covenant of Mayors initiative.

As there is a large variation amongst health systems in different countries, it may be necessary to look at a relevant range of different systems.

The lack of knowledge or quantification on the effectiveness of adaptation measures should not prevent actions from being taken. It would be relevant for the EU to promote existing networks of cities, and to have a catalogue of experiences. The ClimateADAPT platform has already established a database of case studies.

Climate change can exacerbate health inequalities, for example for the older, very young and socioeconomically deprived people, immigrants and indigenous populations that are more vulnerable.

The EU can play an important role in the improvement of modelling and early warning systems. It is possible to define personal and group vulnerability, and to use biometereological warning systems. Artificial Intelligence may help in the development of these systems.

Adaptation requires attention to today's responses to meteorological conditions. Data on how people experience current meteorological conditions can help to predict the impact of changes. Citizen involvement is crucial. Therefore, information, communication and co-creation technologies can make a big difference. There is also a need to understand how

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<sup>8</sup> <https://www.globalchange.gov/>

<sup>9</sup> <https://unepdpu.org/wp-content/uploads/2019/04/agr-final-version-2018.pdf>

early warning systems are developed in different countries and to consider also the subsequent steps taken in reaction to the alert.

There are technological, behavioural, and physical limits to adaptation, for example in coastal regions. This means that sometimes difficult decisions need to be taken in order to safeguard populations.

Certain health threats are difficult to comprehend, like those resulting from biodiversity or autoimmune diseases as well as health threats mediated via social and economic impacts.

### **Heat and heat waves**

Adaptation to heat and heat waves requires prediction, meteorology and planning, but there is also a lot to be done in the building sector. Most people dying due to heat effect die in buildings. The building sector is focussing on low carbon output, but indoor air pollution and overheating do not receive sufficient attention in literature and building regulations. This has a particular impact on vulnerable people. The need to restructure buildings could be the basis of a large programme of the European Union, for example using structural funds promoting renewal of buildings.

One way to look at the combined effects of heat and air pollution is to look at the short-term effects of air pollution and the modification of these by temperature. There is evidence that hot and cold temperatures exacerbate the effect of particle pollution.

### **Vector-borne disease**

For vector-borne disease, ECDC has a very important role in improving surveillance, as well as for plant and animal diseases and for emerging diseases and zoonoses. Response capacity for vector management should be further developed. The complexity issue is enhanced by globalisation.

### **Vulnerable populations and regions**

A recent paper in Global Environmental Change show a decreasing trend in vulnerability to climate change (<https://www.sciencedirect.com/science/article/pii/S0959378019300378>)

### **Other impacts:**

Flooding and sea level rise are local events with considerable mental health and wellbeing impacts. Choices have to be made, for example, about building defences or re-locating populations. Flooding can cause disruption across multiple sectors. Emergency response systems for extreme events (flooding, fire and outbreaks) are very important, also at EU and cross-governmental level. Separate issues are water scarcity and security, which are dealt with by e.g. EEA, ECDC and EFSA.

Dust storms severely affecting cities will become more common and important with the desertification of the middle east and northern Africa. This requires additional study, also given that adaptation measures are complex and often address multiple stresses.

Climate change impacts outside Europe may lead to migration flows that also have an impact on health.

Issues that were mentioned as having a potential to be relevant for health, but are out of the scope of the scientific opinion to be prepared by the GCSSA:

- Effects of the variability of oxygen in the atmosphere
- The possible effect of nanoparticles below 2.5 nm.

## Discussion with a focus on implications for Europe

Moderator Johannes Klumpers, EC RTD, secretariat of the Group of Chief Scientific Advisors

The intention with this session was to focus ideas from the previous sessions, on the scoping question and on the specific implication for Europe.

The scientific opinion to be established will focus on human health.

On the sub-questions to be addressed in the scientific opinion:

- *Which are the impacts of climate change on health that are most relevant for Europe?*

The most relevant impacts for Europe are both direct impacts like heat and heat waves, droughts and floods, storms and wild fires, and indirect impacts like changes in vector-borne disease, air quality, and biodiversity.

The focus of this opinion is on vector-borne diseases, heat, and interactions between heat and air pollution. Dust storms could possibly fall under this definition. At this point flooding, storms, draughts and other extreme events are not explicitly mentioned deliberately.

The impact from climate change on vector-borne disease can be mediated by different processes. This can also include vector-borne diseases that are mediated by flooding. Infectious diseases related to drinking water and food, or diseases that are not vector-borne, are in principle outside the scope.

- *Is the width of the scoping question adequate, or is there a need to bring in other aspects of relevance for EC policy making or rather to restrict the scope*

The scoping question was specifically targeting the health sector. However, from the discussions at the workshop it may be relevant to address “health in all policies”. The opinion will mostly focus on direct effects of climate change, although indirect effects like agricultural productivity, biodiversity loss, and societal effects will also require adaptation measures. This will be explicitly stated in the scientific opinion. It would be most useful to be specific on the impacts discussed, but generic in the policies to be addressed.

Participants asked for the clarification of the formulation “the combined effects of climate change and air pollution” in the scoping paper. The revised scoping paper will specify that the mutually aggravating effects of air pollution and climate change (in particular heat) will be considered. As explained above, the cross-cutting effects of measures against climate change and air pollution, respectively, should be taken into account. For example, in the diesel scandal mitigation measures resulted in negative effects for air pollution by particles.

- *Is there enough evidence on (the effectiveness of) adaptation strategies and policies?*

Although empirical evidence exists, quantitative data on the effectiveness of health adaptation measures is rather weak. The review of literature on adaptation at different levels and in different sectors could be useful for informing health adaptation measures. Literature is available on the mobilisation at local level such as the initiative of the Covenant of Mayors. It may be necessary to develop a separate evidence review on social adaptation literature.

- *Are there important knowledge gaps?*

Quantitative studies could bring us responses and assessments to understand the effectiveness of adaptation, for all European regions and vulnerable people. Quantitative data related to adaptation are missing because data on climate (e.g. climate projection models) and on public health have to be linked, to areas, which use different procedures and languages. Tools need to be developed to couple these datasets.

### **Policy initiatives and needs identified at the workshop**

The platform ClimateAdapt is the result of a collaboration between the General Directorate Climate Action (DG CLIMA) and the European Environmental Agency (EEA); it is a platform to share data, including on health.

DG Environment (DG ENV, foresight unit) has initiated a process of looking at future challenges and risks, and has asked for input from the Scientific Committee on Health, Environmental and Emerging Risks (SCHEER) of DG Health and Food Safety (DG SANTE). Among these challenges are also the urban risks from heat.

Upon request of the EC the European standardisation community CEN and CENELEC are revising standards in three key sectors, construction, transportation and energy. Heat waves kill people mostly in buildings, so it would be useful to liaise with these committees to see if health aspects are considered in the revisions of these standards.

Concerning droughts, there is a new research project on forest fires, and cardiovascular disease and other health outcomes.

There are different bodies at European level dealing with emergency preparedness, and it was originally not the intention of the Advisors to focus on that. However, it might be considered for example in the context of impacts from flooding and droughts or forest fires.

A concerted approach at European level in terms of monitoring and knowledge is needed, so that local authorities can use the gathered information.

Concerning climate change impacts on food, feed and water, there is a collaboration on this topic between EFSA and ECDC. Waterborne diseases are within the EFSA remit. Non-infectious diseases like those caused by the biological toxins (mycotoxins and marine toxins) should also be considered. There is evidence that these are affected by climate change.

It is important to integrate health in adaptation programmes and to conduct a cross-sectional dialogue. Adaptation measures can have unintended adverse consequences. Actions taken in the direction of a circular economy could introduce new hazards into the food chain. A very wide consultation is needed, as unexpected consequences may come from very different angles. Different areas can be mapped in a systems or 'health in all policies' approach.

### **Comments and Q&A from EU services**

Moderator Sigrid Weiland, EC RTD, secretariat of the Group of Chief Scientific Advisors

An operational question, how will the scientific findings translate into policy? We will be looking at policy measures and EU added value of intervening. The opinion can tailor the science advice to specific recommendations.

Adaptation to climate change is a priority for the EC, and a new EU adaptation strategy is being prepared in DG CLIMA. There are joint meetings between DG SANTE and DG CLIMA in this context. Often the Commission is in a support role with respect to local authorities. There may be a case for EU policy and regulations.

Focus on direct climate change impacts on health and improving the public health system capacities to address them makes sense, but for DG CLIMA tackling the root causes and strengthening prevention is as important. The report could highlight the links between the two and the need to address both at the same time.

The EU is very aware of the importance of considering unintended consequences. Strategic environmental assessments are undertaken in a very comprehensive manner, taking into account sustainable finance and “do no significant harm”. In DG CLIMA climate proofing of infrastructure has been taken up as a focus area, and health should also be considered there.

There are several early warning systems at the JRC. There is a European and a global one on river flooding which will also include coastal flooding, and the European drought observatory, which will now also include indicators for heat waves. JRC does integrated studies on the assessment of the impact of climate change in a number of different sectors. These assessments should be extended to the health sector. The opinion could support the efforts of the JRC in this regard. A comment: warning systems are important, but only useful if there is there a resilient capacity to respond. One often observed weaknesses is the lack of community engagement, needed to make the warning systems sustainable.

Better federation of environmental agencies and ECDC could be very useful, rather than asking for a new body.

Impact of heat on medication should also be considered, directly on the storage life of medication, and indirectly on the effect within the patient, particularly to protect the most vulnerable.

Having in mind the subsidiarity principle, how should this be addressed in the opinion? There are cross-border components in inequalities and the data also need to be exposed, which can be done better at European level. Prevention and up-stream action is probably the best way to act on inequalities, but are not really health competences.

Migration should also be considered. Climate change may make life in the Middle East and Africa unbearable, leading to migration flows.

On vulnerable groups: resource-poor versus resource-rich countries have different ways of handling impacts like floods. Also age and pre-existing conditions like diabetes, play an important role. The scientific opinion will focus on actions that can be taken at the European level, but also in Europe there are differences in vulnerability in different regions.

## Wrap-up

Chief Scientific Advisor Nicole Grobert thanked all participants and announced that further input might be sought from them.

The key points brought forward in this meeting:

- The four reports discussed here provide similar messages. They will be combined with other reports and publications.

- There is a lack of clarity in the scoping question, particularly concerning the combined effects of climate change and air pollution, which shall be clarified together with the main concerned EC services.
- Water (drought or floods) and other extreme situations, as well as chronic warming are also relevant to consider in the opinion.
- Warning systems need to lead to effective actions and interventions should be assessed for effectivity.
- Measures to reduce the impact of vector-borne disease: eradication of vectors and vaccines where available should be considered.
- Biological toxins and marine toxins in food should be considered.
- Building regulations should take health components into account.
- Artificial intelligence may be used for predictions on how climate change affects health
- A 'health in all policies approach' is important.
- A global approach on collection of data, information about effectiveness of adaptation should be used at the European level, so that the information can be used to develop solutions on the local level. This could involve creating maps of adaptation.
- The medical community could support behavioural change by explaining the positive consequences of mitigation and adaptation.

## AGENDA

10:00 - 10:30	<b>Welcome coffee</b>
10:30 - 11:00	<b>Welcoming and introduction</b> Elvira Fortunato, Member of the EC Group of Chief Scientific Advisors <b>Scientific Advice Mechanism</b> <b>Purpose of the meeting</b>
11:00 - 11:45	<b>The EASAC report</b> <i>'The imperative of climate action to protect human health in Europe - Opportunities for adaptation to reduce the impacts and for mitigation to capitalise on the benefits of decarbonisation'</i> (Sir Andrew Haines, EASAC, by video conference) <b>Discussion</b> introduced by Pablo Fernández de Arroyabe (Universidad de Cantabria) and Dame Anne Mandall Johnson (Institute for Global Health, UCL) <b>Discussion - All</b>
11:45 - 12:30	<b>The WHO Reports</b> <i>'Protecting human health in Europe from climate change: 2017 update'</i> and <i>'COP24 special report: Health and climate change'</i> (Oliver Schroll, WHO) <b>Discussion</b> introduced by Jouni Jaakkola (University of Oulu) and George Christophides (Imperial College, London) <b>Discussion - All</b>
12:30 - 13:45	<b>Lunch</b>
13:45 - 14:30	<b>The Lancet Countdown report</b> <i>'The 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come'</i> (Nicholas Watts) <b>Discussion</b> introduced by Sotiris Vardoulakis (Institute of Occupational Medicine, Edinburgh) <b>Discussion - All</b>
14:30 - 15:00	<b>Comments and Q&amp;A</b> (moderator Sigrid Weiland, SAM)
15:00 - 15:45	<b>Discussion with a focus on implications for Europe</b> (moderator Johannes Klumpers, SAM)
15:45 - 16:00	<b>Coffee break</b>
16:00 - 16:15	<b>Wrap-up</b> – Nicole Grobert, Member of the EC Group of Chief Scientific Advisors
16:15	<b>End of meeting</b>



## LIST OF PARTICIPANTS AND OTHER ATTENDEES

<b>Scientific Experts</b>			
<b>Bertolini</b>	Roberto	SANTE SHEER Committee	Qatar
<b>Bojariu</b>	Roxana	National Meteorological Administration Bucharest	Romania
<b>Christophides</b>	George	Imperial College London	United Kingdom
<b>Duarte Santos</b>	Filipe	University of Lisbon	Portugal
<b>Fernández de Arróbye</b>	Pablo	University of Cantabria	Spain
<b>Füssel</b>	Hans Martin	European Environmental Agency (EEA)	Denmark
<b>Goodman</b>	Patrick	Dublin Institute of Technology	Ireland
<b>Jaakkola</b>	Jouni	University of Oulo	Finland
<b>Mandall Johnson</b>	Dame Anne	University College London	United Kingdom
<b>Nilsson</b>	Maria	University of Umeå	Sweden
<b>Robinson</b>	Tobin	European Food Safety Authority (EFSA)	Italy
<b>Schmoll</b>	Oliver	WHO Regional Office for Europe	Germany
<b>Vardoulakis</b>	Sotiris	University Edinburgh	United Kingdom
<b>Watts</b>	Nicholas	Executive Director of the Lancet Countdown, University College London	United Kingdom
<b>European Academies' Science Advisory Council (EASAC)</b>			
<b>Sir Haines</b>	Andy	London School of Hygiene and Tropical Medicine	
<b>Fears</b>	Robin	European Academies' Science Advisory Council (EASAC)	
<b>Federation of European Academies of Medicine (FEAM)</b>			
<b>Griffin</b>	George Edward	President FEAM	
<b>Corritore</b>	Elisa	FEAM	
<b>Castro</b>	Rosa	FEAM	
<b>Group of Chief Scientific Advisors</b>			
<b>Keskitalo</b>	Carina	Member	Remote
<b>Grobert</b>	Nicole	Member	
<b>Fortunato</b>	Elvira	Member	
<b>DG RTD – 03 Chief Scientific Advisors, SAM-EGE UNIT</b>			
<b>Klumpers</b>	Johannes	Head of Unit	
<b>Bray</b>	Jeremy	Deputy Head of Unit	
<b>Weiland</b>	Sigrid	Team Leader	
<b>Zegers</b>	Ingrid	Policy Officer	
<b>Boavida</b>	Dulce	Policy Officer	
<b>Stilianakis</b>	Nikolaos	Policy Officer	Remote

<b>EC Observers</b>			
<b>Loeffler</b>	Peter	DG CLIMA A.3 Adaptation	
<b>Fanos</b>	Margherita	DG SANTE C3, Crisis management and preparedness in health	
<b>Van Canghai</b>	Thomas	DG SANTE Assistant to Director-General	
<b>Franco</b>	Vicente	DG ENV C.3 Clean Air	
<b>Philip</b>	Wolfgang	DG SANTE C.3 Crisis Management and preparedness in health	Remote
<b>Santoro</b>	Anna	DG JRC A.2 Work Programme	
<b>Ibarreta</b>	Dolores	DG JRC C.6 Economics of Climate Change, Energy and Transport	Remote
<b>Feyen</b>	Luc	DG JRC E.1 disaster Risk Management	
<b>Toussaint</b>	Brigitte	DG JRC F.7 Knowledge for Health and Consumer Safety	
<b>Chassagne</b>	Olivier	DG Grow F.1 Industrial Strategy and Value Chains	
<b>Karjalainen</b>	Tuomo	DG RTD E.1 Healthy lives	