



Group of Chief Scientific Advisors

**Adaptation to climate change-related health effects in
Europe**

Expert Workshop Report

Scientific Advice Mechanism

24 September 2019, Brussels

Adaptation to climate change-related health effects in Europe Expert workshop hosted by the Group of Chief Scientific Advisors of the European Commission

24 September 2019, Orban building, Square Frère Orban, Brussels

WORKSHOP REPORT¹

Scope and purpose

The objective of this workshop was to review the scientific state-of-the art concerning adaptation measures that can best alleviate identified impacts of climate change on the European health sector.

The meeting was attended by the Chief Scientific Advisors Rolf Heuer (Chair), Elvira Fortunato, Nicole Grobert, Carina Keskitalo, and Janusz Bujnicki, as well as experts in the field, and EC officials as observers. The evidence gathered at this workshop will be part of the basis for the GCSA's opinion „Adaptation to climate change-related health effects in Europe”.

The opinion will provide recommendations regarding the question:

“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, 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?”

Background

Scientific evidence demonstrates that global climate is changing significantly since several decades and will continue to do so. Anthropogenic emissions have largely contributed to global warming and to an increase in the adverse effects to human health, morbidity, mortality and an amplification of health risks.

Evidence suggests that responding to climate change requires a two-pronged approach: i) **mitigation** through reduction of emissions of greenhouse gases (GHGs) and ii) **adaptation** by taking actions to help individuals, communities, and organisations to deal with those consequences of climate change that cannot be avoided.. Whilst, in strategic terms, the prime focus of the United Nations Framework Convention on Climate Change (UNFCCC) is on mitigation rather than adaptation, adaptation to climate change impacts is and will be needed. Even if the emission of green house gases was stopped now completely, global warming would continue due to the prolonged remainder of green house gases in the

¹ See meeting agenda and list of participants at the end this document

atmosphere and the delays in air-temperature increase, with all the related health impacts. Regarding the associated 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’. This definition will also be used by the GCSA scientific opinion.

A number of major European and international reports have been published in recent years on health impacts related to climate change and necessary adaptation measures. These reports will be considered for the scientific opinion of the GCSA which will focus on adaptation measures to increase the resilience of the European health sector. The October 2018 International Panel on Climate Change (IPCC) special report on the impacts of global warming of 1.5°C underlines that climate-related risks to health will be far greater than expected². Recently, the World Health Organisation Regional Office for Europe published a report entitled “Protecting health in Europe from climate change: 2017 update” (WHO 2017)³ where it describes the current knowledge on impacts in different regions and populations and how appropriate adaptation measures will make the health sector more resilient⁴. The latter has been reflected in a recent WHO special report (WHO 2018)⁵. The Lancet Countdown report on health and climate change (Watts et al, 2018) describes the progress made against 10 global recommendations using the indicators by the Lancet Countdown in 2018⁶. Recently, a report on the topic on “The imperative of climate action to protect human health in Europe” was published by EASAC⁷.

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.
- Both direct and indirect climate-related health effects maybe further amplified by socioeconomic and geopolitical dynamics such as climate change induced migration, displacement of populations, and resettlement, as well as poverty aggravation.

On this report

² <https://www.ipcc.ch/sr15/>

³ http://www.euro.who.int/__data/assets/pdf_file/0004/355792/ProtectingHealthEuropeFromClimateChange.pdf

⁴ <http://www.euro.who.int/en/publications/abstracts/protecting-health-in-europe-from-climate-change-2017-update>

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

⁶ [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)32594-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)32594-7/fulltext)

⁷

https://easac.eu/fileadmin/PDF_s/reports_statements/Climate_Change_and_Health/EASAC_Report_No_38_Climate_Change_and_Health.pdf

In view of the above mentioned relevant publications, the GCSA decided not to request a separate evidence review report in support of the Opinion, but that the Opinion should be informed by major existing reports, a literature review of the state of the art of evidence regarding the above-mentioned question and further expert consultation.

This report describes the contributions provided by experts and representatives of EC services during the discussions at the workshop under Chatham house rules without the intention of it being an exhaustive and complete review of the topics.

The structure of this report reflects the agenda of the workshop which is included in Annex 2.

1: Opening session

Rolf Heuer welcomed the participants, including Kristy Ebi participating by videoconference and representatives of Directorates-General Health and Food Safety, Climate Action,, Environment, Research and Innovation, and the Joint Research Centre .

Chief Scientific Advisors Elvira Fortunato, Nicole Grobert and Carina Keskitalo explained the background of the workshop.

As defined by the scoping question, the opinion will focus on the health sector, of which healthcare is one component. On the one hand, the delivery of health services is broader than that. On the other hand health is also influenced by trends and measures in other areas such as urbanisation and flood control where anticipatory adaptation is key. Experts agreed that health aspects should play a greater role in the policy making in these areas.

Several recent and current EU policy initiatives are relevant for adaptation to health impacts as a result of climate change. In particular, the 2013 EU strategy on adaptation to climate change⁸ aimed at making Europe more climate-resilient and enhancing preparedness at all governance levels through a coherent approach and increased cooperation. Its objectives are to

- promote actions by Member States and at a local level (e.g. through national adaptation strategies⁹ and the Covenant of Mayors¹⁰),
- promote adaptation in key sectors (climate-proofing of policy initiatives and actions), and
- promote better decision-making by addressing knowledge gaps and further developing the European Climate Adaptation Platform (Climate-ADAPT¹¹).

In 2018, the implementation of the 2013 EU strategy on adaptation to climate change was evaluated by the Commission. Although overall objectives had been reached, the evaluation report concluded that further synergies were needed between adaptation, sustainable development and disaster risk reduction. Moreover, links between public health and adaptation to climate change should be strengthened notably to improve cross-sectoral cooperation on risk assessment and surveillance and to increase the awareness and capacity of the health sector, including at local level. The conclusions of the evaluation will feed into an up-dated EU adaptation strategy (foreseen for end of

⁸<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0216&from=EN>

⁹https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/horizontal_assessment_en.pdf

¹⁰ <https://www.covenantofmayors.eu/en/>

¹¹ <https://climate-adapt.eea.europa.eu/>

2020). In the area of research, the Horizon Europe Mission 'Adaptation to Climate Change including Societal Transformation' is of particular interest as it deals with similar questions as the scientific opinion of the GCSA. Though the Horizon Europe missions – contrary to the GCSA scientific opinions – focus on research and innovation aspects, experts agreed that an exchange of evidence will be of mutual benefit. Board members Virginia Murray and Jaroslav Mysiak participated in this workshop.

2: Health adaptation measures to alleviate climate change impacts in Europe

The WHO considers the following components of public health adaptation to climate change as fundamental in the European Union: 1) intersectoral governance, 2) integration of climate risk into health systems, 3) development of the capacity of the work force to address health risks, 4) incorporation of risk assessment, surveillance and research into climate change policy planning, 5) prevention through management of environmental determinants of health, emergency preparedness, scaling up of the financing of health resilience and 6) embedding climate adaptation in the EU budget¹².

One of the international frameworks for responding to impacts from climate change on health is the Sendai Framework for disaster risk reduction¹³. According to this framework multi-hazard early warning systems as well as disaster risk information and assessments are crucial. Its four priorities for action are to: 1) understand disaster risk, 2) strengthen disaster risk governance, 3) invest in disaster risk reduction for resilience, and 4) enhance disaster preparedness. Under these priorities it is recommended to enhance the resilience of national health systems, to develop the capacity of health workers and to promote and enhance training capacities.

The climate change associated health impacts do not constitute novel categories of health concerns. Rather, climate change affects the frequency, severity and/ or distribution pattern of already known health concerns such as infectious, cardiovascular, or respiratory diseases etc. Therefore, already existing programmes to deal with them should be used and where necessary, be adapted to the altered situation.

In the design of policies and plans to manage risks particular attention should be paid to vulnerable people, for instance, people with life-threatening and chronic diseases, the elderly, pregnant women, outdoor workers, travellers, socially disadvantaged or isolated groups, migrants, refugees and internally displaced people (Adaptation GAP Report 2018, UNEP).

Participants mentioned that anticipatory adaptation is important in e.g. urban planning, building infrastructures, and power generation and that the risks for vulnerable populations can be reduced significantly by building resilient infrastructure. In order to act in a preventive way, a fine-grained understanding of vulnerability is needed.

For policy development the different options for adaptation need to be assessed, but the socio-economic dimension is often lacking in the assessments, particularly regarding the sustainability of the health sector.

The effectiveness of adaptation plans concerning climate change associated impacts is difficult to assess in the short term. More in depth evaluations are needed to take informed decisions on preventive and adaptive measures.. In addition, evidence is

¹² http://www.euro.who.int/__data/assets/pdf_file/0010/386965/Pagoda-REPORT-final-published-2.pdf?ua=1

¹³ https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf

needed on the costs of adaptation – as compared to the costs of no-action- , and effectiveness of prevention. In addition, data on climate variability and climate change needs to be combined with health information.

3: Health adaptation to impacts of vector-borne diseases

Many infectious diseases (vector, rodent, water, or food-borne) are sensitive to climatic conditions. This sensitivity can be demonstrated by the changing geographic distribution and seasonal variation, altering incidence and severity of many infectious diseases. All vector-, water-, rodent-and food-borne Infectious diseases such as dengue, West Nile fever, malaria, chikungunya, leishmaniasis, zika virus, tick-borne encephalitis, hantavirus infections, cholera and campylobacter have been associated with climatic drivers. Vector-borne infectious diseases are expected to be the most climate sensitive group of all infectious diseases(McMichael 2013)¹⁴. They are diseases in which the causative infectious pathogen is transmitted by vectors such as mosquitoes, ticks or fleas. Survival and reproduction rates of these cold-blooded insect and tick vectors of human pathogens are sensitive to variation in temperature and moisture. Furthermore, the development of the infectious agent within the vectors (extrinsic incubation) is also temperature dependent. Projections show that climate change will impact the alteration of the transmission period and the geographic range.

Besides temperature many other factors influence the impact of vector-borne diseases: the vector, trade, host resistance, the environment, urbanization, and the pathogens themselves. Climate change, with warming weather and shifting precipitation, will make it more difficult to control existing or newly emerging diseases.

There are different assessment tools for risk mapping and prediction that can provide information about the distribution of vector species and identify of areas at risk.

An analysis of the existing scientific literature on this subject, as summarized in the literature review, which was presented at the workshop and which will inform the GCSA's scientific opinion, identified adaptation measures to changes in the spread of vector-borne diseases including the following:

- Enhancement of epidemiological surveillance including climatic and environmental conditions,
- Health risk assessments to inform adaptation (modelling, remote sensing, vulnerability mapping),
- Forecasting readiness, early detection, rapid response, control operations,
- Facilitation of health care services including for the most vulnerable (higher exposure risk),
- Integration of vector and reservoir surveillance in epidemiological surveillance,
- Training of public health practitioners on assessment of climate-change attribution and impacts.

Experts mentioned the WHO “Manual on prevention of establishment and control of mosquitoes of public health importance in the WHO European region providing guidance on adaptation to vector-borne disease¹⁵” and the Sendai report as relevant documents.

¹⁴ <https://www.nejm.org/doi/full/10.1056/NEJMra1109341>

¹⁵ http://www.euro.who.int/_data/assets/pdf_file/0004/392998/mosquito-manual-eng.pdf?ua=1

The Emerging and Vector-borne Diseases (EVD) Programme of the ECDC contributes to the EU-wide preparedness and response capabilities. It provides Member States with access to expertise, topical assessments of disease risks and decision support tools with the latest scientific knowledge.

An open question is whether additional new structures are needed for prevention, early warning and response, or if current structures are sufficient to protect people's health effectively from vector-borne disease.

4: Health adaptation to impacts of heat and heat waves

Currently, many climate change adaptation plans assume a 1.5 – 2 °C warming. However, the predicted range of possible temperature change in Europe is very wide, and there may be a need for stress testing and evaluating the limits of adaptation in view of larger temperature changes locally, particularly for scenarios of a temperature rise above 2 °C. Experts put forward that even a temperature increase of 4 °C should be considered as a possible scenario.

In view of the projected increase in heat and extreme weather events in combination with socio-economic trends such as urbanisation, heat-related mortality will likely rise, which is, however, largely preventable with appropriate adaptation measures (Adaptation GAP Report 2018, UNEP)¹⁶. Most European countries (35 out of 53 Member States out of the WHO European region) have heat-health action plans in place, as recommended by the WHO and WHO/Europe supports national authorities in the development of those plans. The plans generally include the appointment of a lead coordinating body, alert systems, health information plans, reduction of indoor heat exposure, identification of vulnerable groups, preparedness of health and social systems, long-term urban planning and surveillance of heat-related outcomes. A decade after the publication of the WHO guidance they have been reviewed, and the evidence and experience can guide future action (Martinez et al (2019))¹⁷. According to first assessments of their impact they seem to be effective; mortality from heatwaves decreases while the number and severity of heatwaves increases. However, heat-health action plans vary between different European countries and few strategies have been evaluated. It is difficult to attribute beneficial effects directly to the action plans because of the lack of standardised and evidence-based best practices for the evaluation of programmes and action plans. The establishment of appropriate criteria such as simplicity, acceptability, sensitivity, timeliness, effectiveness of individual response measures and specificity are also necessary in this regard.

There is a need for better identification of location-specific levels of risk and risk groups. Synchronisation between health findings and weather information could provide baseline information that can be used to better target interventions and information.

Responding to heat in Europe requires the following elements: (1) governance, policy and leadership; (2) vulnerability assessments; (3) health information and early warning systems; (4) service delivery and response, (5) adaptation of the built environment, (6) financing, and (7) evaluation (Lancet Countdown: Tracking progress on health and climate change, 2017)¹⁸.

¹⁶ https://wedocs.unep.org/bitstream/handle/20.500.11822/27114/AGR_2018.pdf?sequence=3

¹⁷ <https://www.sciencedirect.com/science/article/pii/S0013935119303457>

¹⁸ <https://www.thelancet.com/doi/story/10.1016/vid.2017.10.27.6156>

The governance of heat-health action plans in Europe lies at the national and sub-national level. At the European level the monitoring system Copernicus, which could be extended to heat, and the meteorology sector, play an important role in providing the data for warning systems. The Copernicus Climate Change Service (C3S) and the European climate adaptation platform Climate-ADAPT (a partnership by the European Commission and the European Environmental Agency (EEA), maintained by the EEA with the support of the European Topic Centre on Climate Change Impacts, Vulnerability and Adaptation (ETC/CCA)) coordinate the provision of information. An example of a structure dealing with health information and early warning systems is the “Global heat health network”, an independent, voluntary and member-driven forum of scientists, practitioners and policy makers for improving capacity to protect populations from the avoidable health risks of extreme health in a changing climate.

The resilience of health services and their preparation for heavier workloads during heatwaves is important. Preparedness requires paying attention to building standards for hospitals including cooling and insulation, ensuring access to water and availability of energy¹⁹ etc. One participant stated that while air conditioning is an effective adaptation measure, it has major externalities, as it is responsible for 10% of CO₂ emissions.

Factors that could be considerably improved are information on heat wave related health risks and protective behavioural changes,, effective outreach to individuals at risk, which are sometimes difficult to reach, and risk perception.. A context-specific behavioural understanding about how to motivate change is important as demonstrated by the example of an outreach programme that did not provide the expected results: The Toronto Cold Weather Warning programme for cold spells since 1996. An evaluation of this programme which included public warnings and advice to modify outdoor activities, to wear appropriate clothing and to reach to vulnerable family members did not show any effect of the programme as compared to cities without warning systems (Benmarhnia et al. (2019))²⁰.

It should be noted that there is no clear definition of a heat wave, and there is a lack of monitoring and documentation at all levels. Both the definition of heat wave as well as monitoring and documentation are critical for evaluating cost and investment.

Under different temperature change scenarios the heat-wave associated mortality can increase considerably in Europe, particularly taking into account demographic changes such as the ageing population and urbanisation. Urban populations are particularly vulnerable because of the dense and generally older population, and high levels of air pollution (Sera et al. (2019))²¹. European regions that are particularly vulnerable are the Mediterranean and the Arctic.

5: The focus on vulnerable populations

The term ‘vulnerability’ is not well defined and experts agreed on the need for systematic reviews and meta analyses. Vulnerable sub-populations are at an increased health risk to climate change-related impacts because of higher exposure to hazards e.g. in risk-prone areas, and/or elevated sensitivity due to underlying health conditions and/ or lower adaptive capacity primarily because of a lack of economic resources. Social factors

¹⁹ https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113721/eur_29411_en_storms_ci.pdf

²⁰ <https://www.sciencedirect.com/science/article/pii/S0160412018327156>

²¹ <https://academic.oup.com/ije/article-abstract/48/4/1101/5366211?redirectedFrom=fulltext>

influence exposure and susceptibility and need to be considered in the identification of vulnerable sub-populations.

Multiple vulnerabilities have been met with public health responses to improve resilience of sub-populations at greatest risk for adverse health outcomes. Experts concluded that vulnerability assessment, adaptation plans, public health emergency response, and public health agency accreditation are necessary public health actions.

Adaptive capacity is defined in the IPCC report of 2014 as the ability of systems, institutions, humans and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences. It is a set of resources and assets that represent the base from which adaptation actions and investments can be made (Adger & Vincent, 2005)²².

A literature review by Siders (Siders (2019) *Wires Climate Change* 10: 1-36)²³ demonstrates that adaptive capacity research is highly interdisciplinary covering a wide range of sectors, geographic locations, and scales of analysis, and is highly fragmented.

Composite indices make it possible to monitor, report and evaluate the status of adaptive capacity. They have the advantage that they facilitate communication to the public, and support planning. Examples are European Climate Risk Typology from European Commission-funded project RESIN, a project supporting climate adaptation strategies in cities.

Experts pointed out that coping with the impact of climate change requires not only adaptive capacity, but also capacity to transform to make systems less vulnerable.

Early warning systems should be planned carefully and coordinated between governance levels so that people are not overwhelmed by multiple warnings. They should be constructed in a bottom-up manner, considering the 'human factor' and in communication with the population. For this purpose research results regarding psychosocial dynamics and climate communication should be considered

6 Discussion with focus on implications for Europe

The scientific opinion „Adaptation to climate change-related health effects in Europe” will provide recommendations focussing on European policy making. Given the global dimension of the problem and the relevance of available international reports on this subject, the international context will be taken into consideration throughout the opinion.

Experts agreed that the European Green Deal is an opportunity to move climate change adaptation high up on the policy agenda and emphasised the urgency of taking measures.

Preventive adaptation should be embedded or reinforced in European policies, for example, in synergistic policy initiatives spanning between climate mitigation and adaptation, between health and climate, as well as in civil protection policy and disaster risk management. In this context, the creation of a disaster risk knowledge centre was suggested that can interact with operational bodies of civil protection and provide timely information to them.

²²<https://www.sciencedirect.com/science/article/pii/S163107130400330X>

²³ <https://onlinelibrary.wiley.com/doi/abs/10.1002/wcc.573>

While the subsidiarity principle has to be respected, the European Commission has a clear mandate in the area of serious cross-border threats to health (Decision No 1082/2013/EU of the European Parliament and of the Council)²⁴. Coordination at the European, national and sub-national level is important to avoid duplication, to ensure complementarity and critical capacities and/ or coherence of measures, as well as to exchange data, knowledge and best practices. Where possible, European actions should use, adjust, and/or increase as appropriate, already existing initiatives, programmes and guidelines at different levels, such as available WHO guidelines, the Sendai Framework for disaster risk reduction, the European Climate Adaptation Platform (Climate-ADAPT²⁵), the Copernicus programme, national health adaptation plans and the Covenant of Mayors²⁶, just to name a few examples.

While experts agreed on the utility to focus the scientific opinion on the health sector, they emphasised the health impact of measures in other areas such agriculture, urban planning and transport which should be kept in mind.

7 Wrap-up

Elvira Fortunato wrapped up the findings of the workshop, which together with the major international reports and a literature review to be established by the secretariat of the GCSA will inform the Group's recommendations.

²⁴ https://ec.europa.eu/health/sites/health/files/preparedness_response/docs/decision_serious_crossborder_threats_22102013_en.pdf

²⁵ <https://climate-adapt.eea.europa.eu/>

²⁶ <https://www.covenantofmayors.eu/en/>

AGENDA

Date: 24 September 2019, 08:30-12:30

Place: Orban Building, Square Frère Orban 8, 1040 Brussels

Meeting Chair: Prof. Rolf Heuer,
Chair of the Group of Chief Scientific Advisors

<i>8:30 - 9:10</i>	<p>Welcoming and introduction Rolf Heuer, Chair of the EC Group of Chief Scientific Advisors</p> <p>Tour de table Purpose of the workshop - Elvira Fortunato, Member of the EC Group of Chief Scientific Advisors</p> <p>The policy context – Sigrid Weiland, European Commission RTD-SAM</p>
<i>9:10 – 9:50</i>	<p>Health adaptation measures to alleviate climate change impacts in Europe <i>Moderator Rolf Heuer</i></p> <p>Overview - Nikolaos Stilianakis (EC-JRC)</p> <p>Disaster risk reduction with a focus on climate change and health: the Sendai Framework: – Virginia Murray (Public Health England)</p> <p>Discussants Kristie Ebi (University of Washington) and Neil Adger (University of Exeter)</p> <p>Discussion – All</p>
<i>9:50 - 10:20</i>	<p>Health adaptation to impacts of vector-borne diseases <i>Moderator Nicole Grobert</i></p> <p>Introduction – Nikolaos Stilianakis (EC-JRC)</p> <p>Discussant Vladimir Kendrovski (WHO regional office for Europe)</p> <p>Discussion – All</p>
<i>10:20 - 11:00</i>	<p>Health adaptation to impacts of heat and heat waves <i>Moderator Carina Keskitalo</i></p> <p>Introduction - Ingrid Zegers (EC-RTD)</p> <p>Policy responses to heat impacts from climate change – Nicholas Watts (University College London)</p> <p>Resilience of the European population to heat waves – Jouni Jaakkola (University of Oulo)</p> <p>Discussant – Vladimir Kendrovski (WHO regional office for Europe)</p> <p>Discussion – All</p>
<i>11:10 - 11:40</i>	<p>The focus on vulnerable populations <i>Moderator Nicole Grobert</i></p> <p>Introduction - Nikolaos Stilianakis (EC-JRC)</p> <p>Assessing the adaptive capacity of populations – Jaroslav Mysiak (Centro Euro-Mediterraneo sui Cambiamenti Climatici)</p> <p>Discussant: Neil Adger (University of Exeter)</p> <p>Discussion – All</p>

11:40 – 12:10	Discussion with a focus on implications for Europe <i>Moderator Jeremy Bray (EC-RTD)</i>
12:10 – 12:30	Wrap-up – Elvira Fortunato, Member of the EC Group of Chief Scientific Advisors
12:30-13:30	Sandwich buffet

LIST OF PARTICIPANTS AND OTHER ATTENDEES

Scientific Experts			
Jaakkola	Jouni	Professor, Director Center for Environmental and Respiratory Health Research, Faculty of Medicine Oulu,	Finland
Adger	Neil	Professor Human Geography, University of Exeter	United Kingdom
Ebi	Kristie	Professor Global Health, Env. and Occ. Health Sciences, University of Washington	USA (remote)
Kendrovski	Vladimir	World Health Organization (WHO) European Centre for Environment and Health	Germany
Murray	Virginia	Public Health Service	United Kingdom
Mysiak	Jaroslav	Euro - Mediterranean Centre on Climate Change (CMCC)	Slovak Republic
O'Connell	Emer	Public Health Service	United Kingdom
Watts	Nicholas	Executive Director of the Lancet Countdown, University College London	United Kingdom
Group of Chief Scientific Advisors			
Rolf	Heuer	Chair	
Keskitalo	Carina	Member	
Grobert	Nicole	Member	
Fortunato	Elvira	Member	
Bujnicki	Janusz	Member	
DG RESEARCH and INNOVATION – 03 Chief Scientific Advisors, SAM-EGE UNIT			
Bray	Jeremy	Deputy Head of Unit	
Weiland	Sigrid	Team Leader	
Zegers	Ingrid	Policy Officer	
Boavida	Dulce	Policy Officer	
EC Observers			
Loeffler	Peter	DG CLIMA A.3 Adaptation	
Fanos	Margherita	DG SANTE C3, Crisis management and preparedness in health	
Van Canghai	Thomas	DG SANTE Assistant to Director-General	
Franco	Vicente	DG ENV C.3 Clean Air	
Stilianakis	Nikolaos	JRC F.7 Knowledge for health and consumer safety	
Imperiali	Olimpia	DG ECHO A.3 Security and Situational Awareness	
Andrade	Onelica	DG RTD C.3 Climate and planetary boundaries	

