In May 2014, the WHO Regional Office for Europe organized a technical meeting to discuss Fifth Assessment Report of the Intergovernmental Panel on Climate Change, and its implications for population health in the WHO European Region. Participants agreed that the time for action is now and that delayed action in reducing greenhouse gas emissions will increase costs and its impact, including on human health. Four single overarching communication outcomes (SOCO) were identified to be developed into a communication strategy to feed back to the European Environment and Health Process.
Health in the latest assessment report of the Intergovernmental Panel on Climate Change (IPCC): A discussion on findings for the European Environment and Health process

Meeting Report
27–28 May 2014
In May 2014, the WHO Regional Office for Europe organized a technical meeting to discuss Fifth Assessment Report of the Intergovernmental Panel on Climate Change, and its implications for population health in the WHO European Region. Participants agreed that the time for action is now and that delayed action in reducing greenhouse gas emissions will increase costs and its impact, including on human health. Four single overarching communication outcomes (SOCO) were identified to be developed into a communication strategy to feed back to the European Environment and Health Process.

Keywords

CLIMATE CHANGE
HEALTH
ENVIRONMENTAL HEALTH
ENVIRONMENTAL MONITORING
GREENHOUSE EFFECT
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of abbreviations</td>
<td>1</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>2</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>3</td>
</tr>
<tr>
<td>Scope of the meeting</td>
<td>4</td>
</tr>
<tr>
<td>Opening remarks</td>
<td>4</td>
</tr>
<tr>
<td>Summary of presentations</td>
<td>6</td>
</tr>
<tr>
<td>Mitigation of climate change</td>
<td>6</td>
</tr>
<tr>
<td>The physical science and impacts, adaptation and vulnerability</td>
<td>9</td>
</tr>
<tr>
<td>Possible implications for the UNFCCC process</td>
<td>20</td>
</tr>
<tr>
<td>Discussion</td>
<td>22</td>
</tr>
<tr>
<td>Key single overarching communication outcome (SOCO)</td>
<td>23</td>
</tr>
<tr>
<td>Next steps</td>
<td>23</td>
</tr>
<tr>
<td>Annex 1: Final programme</td>
<td>25</td>
</tr>
<tr>
<td>Annex 2: Final list of participants</td>
<td>28</td>
</tr>
</tbody>
</table>
## List of abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFOLU</td>
<td>Agriculture, forestry and other land use</td>
</tr>
<tr>
<td>AR4</td>
<td>Fourth Assessment Report of the Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>AR5</td>
<td>Fifth Assessment Report of the Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>BMUB</td>
<td>Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany</td>
</tr>
<tr>
<td>CGS</td>
<td>Climate change, green health services and sustainable development programme</td>
</tr>
<tr>
<td>CLA</td>
<td>Coordinating Lead Author</td>
</tr>
<tr>
<td>COP</td>
<td>Conference of the Parties to the UNFCCC</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EHP</td>
<td>European Environment and Health Process</td>
</tr>
<tr>
<td>EHTF</td>
<td>European Environment and Health Task Force</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FAR</td>
<td>First Assessment Report of the Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GEA</td>
<td>Global Energy Assessment</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
</tr>
<tr>
<td>GtCO₂eq</td>
<td>Gigatonnes of carbon dioxide equivalent</td>
</tr>
<tr>
<td>HIC</td>
<td>Working Group on Health in Climate Change of the EHP</td>
</tr>
<tr>
<td>ICLEI</td>
<td>International Council for Local Environmental Initiatives</td>
</tr>
<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>LWEC</td>
<td>Living with Environmental Change</td>
</tr>
<tr>
<td>NMT</td>
<td>Non-motorized-travel</td>
</tr>
<tr>
<td>POP</td>
<td>Persistent Organic Pollutant</td>
</tr>
<tr>
<td>RCP</td>
<td>Representative Concentration Pathway</td>
</tr>
<tr>
<td>SAR</td>
<td>Second Assessment Report of the Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>SBSTA</td>
<td>Subsidiary Body for Scientific and Technological Advice</td>
</tr>
<tr>
<td>SOCO</td>
<td>Single overarching communication outcomes</td>
</tr>
<tr>
<td>SPM</td>
<td>Summary for Policy-Makers</td>
</tr>
<tr>
<td>SREX</td>
<td>Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation</td>
</tr>
<tr>
<td>TAR</td>
<td>Third Assessment Report of the Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
<tr>
<td>WGI</td>
<td>IPCC Working Group I (e.g. in AR5: The Physical Science Basis)</td>
</tr>
<tr>
<td>WGI1</td>
<td>IPCC Working Group II (e.g. in AR5: Impacts, Adaptation, and Vulnerability)</td>
</tr>
<tr>
<td>WGI11</td>
<td>IPCC Working Group III (e.g. in AR5: Mitigation of Climate Change)</td>
</tr>
<tr>
<td>WHA</td>
<td>World Health Assembly</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WMO</td>
<td>World Meteorological Organization</td>
</tr>
</tbody>
</table>
Acknowledgements

This meeting summary was produced by Bettina Menne and James Creswick from the WHO Regional Office for Europe. Sincere thanks to all those who have contributed to the development of the background document *Summary of health in the IPCC 5th Assessment Report*, specifically Franziska Matthies and Nick Watts as well as all the meeting participants for their contributions and comments and for their active contributions during the meeting.

We would also like to thank the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) for co-sponsoring this meeting.
Executive Summary

A meeting held at the WHO European Centre for Environment and Health in Bonn on 27–28 May 2014 brought together around 45 experts and representatives from a number of European countries to examine the health implications of the latest assessment report of the Intergovernmental Panel on Climate Change (IPCC). The main discussion topics were to identify the key overarching communication objectives on climate change and health for environment and health officials, based on emerging evidence.

Result of the discussion

There is overwhelming evidence that:

- Our climate is changing;
- Health impacts of climate change and variability are happening now;
- Carbon dioxide (CO$_2$) remains the main driver of climate change;
- Our climate resilient future depends fundamentally on what we accomplish on mitigation; delays in mitigation or constraints on technological options increase the longer-term mitigation costs to hold climate change risks at a given level;
- Climate change will amplify existing risks and create new risks, with wide and profound effects on health and well-being;
- Limiting warming below 2°C is still possible, but requires major technological, institutional, political and behavioural changes;
- Reducing greenhouse gas emissions can have significant local and immediate benefits for human health, in particular through reducing noncommunicable diseases and improving universal health access;
- Sustainable development, population health and equity provide a basis for assessing climate policies;
- Our climate resilient future will depend on ability to manage and reduce the risks;
- Greater rates and magnitude of climate change increase the likelihood of exceeding adaptation limits.

Single overarching communication outcomes (SOCOs) were identified for four different target audiences:

1. For local governments: Make cities sustainable and climate resilient;
2. For European policy-makers: Mitigate greenhouse emissions to obtain immediate and local health gains;
3. For negotiators of the climate convention: Integrate health into negotiations of the United Nations Framework Convention on Climate Change;
4. For health policy-makers: Integrate climate change aspects into health strategies and policies.

Timing is crucial

Participants agreed that the time for action is now and the window of opportunity to mitigate these scenarios is narrowing by the day. Delayed action in reducing greenhouse gas emissions will increase costs and its impact.
Scope of the meeting

The Intergovernmental Panel on Climate change (IPCC) has launched its new assessment reports. They deal with health not only in a health chapter, but also refer to health, human security and well-being throughout the three thousand pages of the three working groups. The assessment provides important new insights into observed and projected developments, and thereby an important technical basis for the Mid-term Review of the Environment and Health process in Europe.

The objectives of the meeting are to:
- Discuss the implications of the findings for health in the WHO European Region;
- Discuss key messages for environment and health professionals in Europe; and
- Summarize the key messages.

Opening remarks

Dr Bettina Menne, Programme Manager, CGS, WHO Regional Office for Europe and Björn Ingendahl on behalf of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany (BMUB), opened the meeting and presented the scope and objectives. They outlined climate change as an unfinished concern for European Member States of the World Health Organization. The Parma “Commitment to act” is the bases of work in WHO European Member States to act in the face of climate change. The Working Group on Health in Climate Change (HIC) currently supports the implementation of the Parma Commitment. The participants were asked during the two days meeting, to consider the following questions:
- What is the size/magnitude of the health problem/impact/risk?
- Which solutions will improve people’s health and lives now?
- How do the solutions improve people’s health now and in the future?
- How can we tackle it with the available resources?
- How do we make this an issue that will attract collaboration?

Renate Christ, Secretary of the IPCC, gave an overview on the IPCC and the various assessment reports. The Intergovernmental Panel on Climate Change (IPCC) is the international body for assessing the science related to climate change. The IPCC was set up in 1988 by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) to provide policy-makers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation. Today the IPCC’s role is as defined in Principles Governing IPCC Work, “...to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socioeconomic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation. IPCC reports should be neutral with respect to policy, although they may need to deal objectively with scientific, technical and socioeconomic factors relevant to the application of particular policies.” The IPCC gained the Nobel peace prize “for their efforts to build up and disseminate greater knowledge about man--made climate change, and to lay the foundations for the measures that are needed to counteract such change”. IPCC produces assessment reports, special reports, and methodological reports, which are elaborated through a complex process of author selection, writing, expert review, government review and government approval.
Health impacts were mentioned for the first time in the IPCC First Assessment Report (FAR)\(^1\), emphasizing ozone depletion and UV damage. The Second Assessment Report (SAR)\(^2\), described potential health impacts arising from extreme weather events, changes in infectious disease distribution and the risks of health effects from disruption in major life on earth sustaining systems, such as agriculture. It concludes, that “the impacts of global climate change, particularly if sustained in the longer term, could include a multitude of serious—but thus far underrecognized—impacts on human health”. The SAR notes “Impacts are difficult to quantify, and existing studies are limited in scope; Detection [of climate-induced changes] will be difficult”. The Third Assessment Report (TAR)\(^3\) made the first strong conclusion on attributing impacts to climate change “recent regional climate changes, particularly temperature increases, have already affected many physical and biological systems”. The chapter on human health concluded, that “there is little published evidence that changes in population health status actually have occurred as yet in response to observed trends in climate over recent decades”. It identified extreme weather events, changes in infectious disease distribution, and reduced agricultural capacity and potential changes in air quality as risks to population health. In addition it mentions the need to consider the impacts on population health of social disruption, economic decline, and displacement of populations, as large scale risks.

The Fourth Assessment Report (AR4)\(^4\) included health throughout the whole of WGII, namely in a health chapter, as well as in all regional and sectoral chapters. AR4 for the first time concluded that “climate change currently contributes to the global burden of disease and premature deaths. At this early stage the effects are small but are projected to progressively increase in all countries and regions”. It also described emerging evidence that “climate change has altered the distribution of some infectious disease vectors, altered the seasonal distribution of some allergenic pollen species, and increased heatwave-related deaths” and concluded in the summary for policy-makers, that “projected climate change-related exposures are likely to affect the health status of millions of people, particularly those with low adaptive capacity, through: increases in malnutrition and consequent disorders, with implications for child growth and development; increased deaths, disease and injury due to heatwaves, floods, storms, fires and droughts; the increased burden of diarrhoeal disease; the increased frequency of cardio-respiratory diseases due to higher concentrations of ground-level ozone related to climate change; and, the altered spatial distribution of some infectious disease vectors”.\(^5\)

---


Two special reports include also references to human health, namely: The IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN)\(^6\), and the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)\(^7\).

Between September (2013) and November 2014, the Intergovernmental Panel on Climate Change (IPCC) released the 5th Assessment Report (AR5)\(^8\). For the first time health is mentioned not only throughout working group II (impacts, vulnerability and adaptation) chapters, but also throughout working group III (mitigation)\(^9\). More than 830 coordinating lead authors and review editors from over 80 countries produced the three working group contributions, supported by over 1000 contributing authors and drawing on the insights of over 2000 expert reviewers in a process of repeated review and revision. The authors assessed more than 30,000 papers.

**Summary of presentations from the AR5**

In this session, we summarize the various presentations given at the meeting. We started with presentations on mitigation and co-benefits for human health (WGIII), followed by a description of the main climate science (WGI) and impacts, adaptation, and vulnerability (WGII) relevant to human health.

For the purpose of this report, direct quotations from the IPCC report are italicised (with the corresponding section referenced). These have been mainly taken from the summaries for policy-makers and executive summaries of chapters. Literature has been included, where relevant, or where otherwise not cited in the IPCC reports, and is referenced directly.

**Mitigation of climate change**

Jan Minx, Head of Technical Support Unit of IPCC Working Group III, presented key findings on mitigation of climate change of the IPCC WGIII in the Fifth Assessment Report. He outlined that human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. This has led to

---


\(^9\) According to the glossary of the IPCC AR5, mitigation is “a human intervention to reduce the sources or enhance the sinks of greenhouse gases.”
atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Anthropogenic greenhouse gas emissions in 2010 have reached 49±4.5 GtCO$_2$eq/yr. (Fig. 1).

**Fig. 1: Total annual anthropogenic GHG emissions by groups of gases 1970–2000**

Note: Total annual anthropogenic GHG emissions (in GtCO$_2$eq/year) by groups of gases: CO$_2$ from fossil fuel combustion and industrial processes; CO$_2$ from Forestry and Other Land Use (FOLU); methane (CH$_4$); nitrous oxide (N$_2$O); fluorinated gases covered under the Kyoto Protocol (F-gases). At the right side of the figure GHG emissions in 2010 are shown again broken down into these components.10

European per person emissions are between 12–15 tonnes carbon dioxide equivalent per person per year – about seven times higher than median per person emissions in low income countries (1.34 tonnes carbon dioxide equivalent per person per year) (Fig. 2). However, GHG emissions are highly variable within (and between) income groups.

---

Without additional mitigation, global mean surface temperature is “more likely than not to exceed 4°C above pre-industrial levels by 2100. The risks associated with temperatures at or above 4°C include substantial species extinction, global and regional food insecurity, consequential constraints on common human activities, and limited potential for adaptation in some cases.” (Fig. 3 and Fig. 4).

**Fig. 2: Trends in GHG emissions by country income groups**

Note: Left panel: Total annual anthropogenic GHG emissions 1970–2010 (GtCO₂eq/yr). Middle panel: Trends in annual per capita mean and median GHG emissions from 1970–2010 (tCO₂eq/cap/yr). Right panel: Distribution of annual per capita GHG emissions in 2010 of countries within each country income group (tCO₂/cap/yr). ¹¹

**Fig. 3: A global perspective on climate-related risks.**

Note: Risks associated with reasons for concern are shown for increasing levels of climate change. The colour shading indicates the additional risk due to climate change when a temperature level is reached and then sustained or exceeded. Undetectable risk (white) indicates no associated impacts are detectable and attributable to climate change. Moderate risk (yellow) indicates that associated impacts are both detectable and attributable to climate change with at least medium confidence, also accounting for the other specific criteria for key risks. High risk (red) indicates severe and

widespread impacts, also accounting for the other specific criteria for key risks. Purple, introduced in this assessment, shows that very high risk is indicated by all specific criteria for key risks.\textsuperscript{12}

Fig. 4: The implications of different 2030 GHG emissions levels for the rate of CO\textsubscript{2} emissions reductions from 2030 to 2050 in mitigation scenarios reaching about 450 to about 500 (430 – 530) ppm CO\textsubscript{2}eq concentrations by 2100.

Note: The scenarios are grouped according to different emissions levels by 2030 (coloured in different shades of green). The left panel shows the pathways of GHG emissions (GtCO\textsubscript{2}eq/yr) leading to these 2030 levels. The black bar shows the estimated uncertainty range of GHG emissions implied by the Cancún Pledges. The middle panel denotes the average annual CO\textsubscript{2} emissions reduction rates for the period 2030–2050. Annual rates of historical emissions change (sustained over a period of 20 years) are shown in grey. The arrows in the right panel show the magnitude of zero and low-carbon energy supply up-scaling from 2030 to 2050 subject to different 2030 GHG emissions levels.\textsuperscript{13}

Limiting global temperature rise to 2°C over pre-industrial levels will require substantial emissions reductions over the next few decades and near zero emissions of carbon dioxide and other long-lived greenhouse gases by the end of the century. Mitigation cost estimates vary, but do not strongly affect global GDP growth (reaching 450ppm CO\textsubscript{2}eq entails consumption losses of 1.7% (1%-4%) by 2030, 3.4% (2% to 6%) by 2050 and 4.8% (3%-11%) by 2100; this is equivalent to a reduction in consumption growth over the 21st century by about 0.06 (0.04-0.14) percentage points a year (relative to annualized consumption growth that is between 1.6% and 3% per year)). Cost estimates exclude benefits of mitigation (reduced impacts from climate change) and other benefits (e.g. improvements for local air quality). Mitigation costs increase with mitigation ambition,


limited availability of technologies and delays in mitigation efforts. Delaying mitigation is estimated to increase the difficulty and narrow the options for limiting warming to 2°C.

Limiting global temperature rise poses substantial technological, economic, social, and institutional challenges. There will a need for (a) all countries cooperate and begin to mitigate immediately; (b) introducing a globally uniform price on all GHG emissions and (c) allowing the use of all key mitigation technologies. Mitigation can result in large near term and immediate co-benefits for human health and other societal goals.

Keywan Riahi, International Institute for Applied Systems Analysis, Graz University of Technology, summarized the co-benefits and adverse side-effects of mitigation, highlighting that the co-benefit effect is dependent on local circumstances and implementation practice. IPCC WGIII carried out a systematic mapping of possible co-benefits & adverse side-effects in the energy supply, transport, buildings, industry AFOLU and human settlements and infrastructure chapters. The key message was: ‘potential co-benefits for energy end-use measures outweigh the potential for adverse effects whereas the evidence suggests this may not be the case for all energy supply and AFOLU measures’ and “Stringent mitigation measures can lead to major cuts of air pollution emissions (aggregate effect). Mitigation scenarios reaching about 450 or 500 ppm CO₂ show reduced costs for achieving air quality [...] with significant co-benefits for human health [and] ecosystem impacts. The benefits [...] are particularly high where currently legislated and planned air pollution controls are weak”. (Fig. 5)
Fig. 5: Co-Benefits of Climate Change Mitigation for Energy Security and Air Quality

Note: Co-benefits of mitigation for energy security and air quality in scenarios with stringent climate policies reaching about 450 to about 500 (430–530) ppm CO$_2$eq concentrations in 2100. Upper panels show co-benefits for different security indicators and air pollutant emissions. Lower panel shows related global policy costs of achieving the energy security, air quality, and mitigation objectives, either alone (w, x, y) or simultaneously (z). Integrated approaches that achieve these objectives simultaneously show the highest cost-effectiveness due to synergies (w + x + y > z).

He also added, that the Global Energy Assessment (GEA) highlighted, that “currently planned climate change legislation is not sufficient in many regions” and that “Climate policies can contribute in major ways to reach WHO guidelines”.

Oliver Lah, Transport Chapter of IPCC Working Group III presented common cross-sector key messages, ‘strong, mutually supportive policies are required to decarbonize and achieve co-benefits’ and ‘properly designed policies can generate synergies between health and climate related objectives.’ Sector-specific key messages were presented (see

---


Examples of trade-off- and synergy-inducing measures from the transport sector were outlined, including fuel and vehicle tax, and environmental protection zones.

**Table 1. Draft table on health and other benefits and/or impacts of several GHG emission reduction measures**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Potential health co-benefits</th>
<th>Potential adverse impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable energy (wind, solar, geothermal) replacing coal</td>
<td>Reduced air pollution (except bioenergy); reduced coal mining accidents and potentially less cancer. (Coal was classified as carcinogenic by IARC18.) Social benefit: off-grid energy access at points of greatest need, and as substitutes for stand-alone diesel generators and kerosene lighting.</td>
<td>Occupational dust and toxic exposures associated with solar PV panel production; Occupational injuries; Increased threat of displacement (for large hydroelectric installations) and ecosystem disruption.</td>
</tr>
<tr>
<td>Nuclear replacing coal</td>
<td>Reduced air pollution and occupational hazards from coal mining. Increased energy security (resulting from reductions in fuel price volatility).</td>
<td>Public health risks from potential nuclear accidents; occupational health risks of radiation exposure, and long-term public health and occupational health risks from nuclear waste storage and treatment. Security risks associated with nuclear proliferation, and nuclear sabotage and terrorism.</td>
</tr>
<tr>
<td>Methane leakage prevention, capture and treatment</td>
<td>Reduced air pollution; occupational safety at coal mines.</td>
<td>Increased natural gas extraction through for example hydraulic fracturing: concerns about long-term contamination of surface and ground water sources with benzene and other health-damaging carcinogens, either through poor wastewater disposal or the fracking process itself. Increasing rates of methane, BETEX chemicals (benzene, toluene, ethyl benzene, and xylene), and radon, which are known to cause chronic respiratory disease and lung cancer in these settings.</td>
</tr>
<tr>
<td>Transport</td>
<td>Reduced urban air pollution – in particular, from use of electricity, hydrogen fuel; compressed natural gas and biofuels (unclear) In the case of electrified vehicles, there is significantly less urban noise exposure, which may lead to less noise-related stress, mental health and cardiovascular disease (among other things). There is no improvement in physical activity or risks of traffic injury and no improvement in access for groups without cars.</td>
<td>Adverse impacts: via increased urban air pollution from use of diesel fuel; Reduced road safety (silent electric cars at low speed) Increased active transport may see potentially higher exposures to urban air pollution and traffic by pedestrians and cyclists if not accompanied by lower levels of car use and</td>
</tr>
</tbody>
</table>

---


reduced urban noise (modal shift and travel reduction), reduces stress and sleep-related illness, and may improve mental health and well-being. Investments in safe non-motorized networks.

Other co-benefits include equitable mobility access to services, jobs, education and leisure opportunities, particularly in developing countries.

Increased road safety (via modal shift and/or infrastructure for pedestrians and cyclists) and less risk of injury.

Journey reduction and avoidance:
- Reduced levels of air pollution, increased physical activity, through non-motorized transport modes.

Buildings:
- Fuel switching, renewable energy source incorporation, green roofs, and other measures that reduce emission intensity:
  - Clean fuels: have lower emissions of health-damaging CO, PM pollution, including black carbon, resulting in fewer premature deaths. The use of biogas can lead to improved sanitation waste management due to anaerobic digestion of household and animal excrement. Improved solid fuel stoves that meet WHO guidelines emission rate standards, reduce air pollution.
  - Appropriate equipment and containers are needed to ensure safety (ethanol and liquefied petroleum gas (LPG) could lead to explosions, fires and burns).

- Retrofits of existing buildings:
  - Health co-benefits via reduced air pollution. reduced heat stress and risk of heat-related stroke; less cold-related disease risks; less exposure to damp.
  - Insufficient ventilation. (Better ventilation can reduce indoor air pollution exposure to a range of toxic chemicals, as well as radon and reduce risks of airborne disease transmission and asthma)

- Behavioural changes reducing energy demand:
  - Less outdoor air pollution; improved indoor environmental conditions

Industry:
- Carbon dioxide and/or non-carbon dioxide emission intensity reduction:
  - Health co-benefit via: reduced local air pollution and better work conditions

- Energy-efficiency improvements via new processes and/or technologies:
  - Health co-benefit via: reduced local pollution improved water availability and quality safety, better working conditions and job satisfaction
  - Other co-benefits: new business opportunities

- Material efficiency of goods, recycling:
  - Other co-benefits: new business opportunities and potential reduced local conflicts

- Product demand reductions:
  - Other co-benefits: reduced inequity in consumption; new diverse lifestyle concept

Agriculture, forestry and other land use (AFOLU):
- Supply side: forestry, land-based agriculture, livestock, integrated systems, and bioenergy:
  - Other co-benefits include: increased food-crops production through integrated systems and intensified sustainable agriculture. Incineration of fuels such as biogas produced through anaerobic digestion (e.g. of animal or human waste) further reduces both the pollution and GHG impacts.
  - Reduced food production (locally) due to large-scale monocultures of non-food crops; Questions arise regarding true long-term sustainability of biomass, because of deforestation impacts.

- Demand side: reduced losses in the food supply chain, changes in human diets, changes in demand for wood and forestry products:
  - Human health and animal welfare benefits: through reduced use of pesticides and reduced burning practices.
  - Shifting to diets richer in fresh, in-season vegetables, fruits and legumes: reduces risks of obesity, heart disease and cancers associated with excessive consumption of red meat and some processed foods. Important biodiversity of food systems, for healthy dietary diversity.

Nick Watts, Director of The Global Climate & Health Alliance, built on this and presented the health and mitigation considerations by sector, including energy, transport, buildings, industry, and agriculture forestry and other land use. He concluded that there is need for public health professionals feeling more confident with the proposed measures. This requires engagement of public health professionals in sectorial policy formulation and implementation. He further stressed the need for a transformational change.
Felix Creutzig presented the **co-benefits of mitigation in an urban environment**. In 2011, more than half of the world population (52%) live in urban areas and each week the global urban population increases by 1.3 million\(^{19}\). In 2006 these urban centres were response for some 71 – 76% of energy-related CO\(_2\) emissions. Aware of this, many cities in the World have started to take action. (Fig. 6)

Fig. 6: Common mitigation measures in Climate Action Plans.\(^{20}\)

Air pollution was highlighted as a driver of inequality, with the potential for non-motorized-travel (NMT) and urban design to provide public health benefit. Tools such as cool roofs and ‘greening’ were presented as opportunities for mitigation and adaptation (to offset climate change and reduce risk to public health from heat waves). He concluded by saying, that “Local health benefits of integrated urban mitigation policies vastly outperform climate benefits. Transport & urban planning emerge as crucial long-term public health/ climate mitigation domains; health-concerned cities could drive climate mitigation; but the global prisoner’s dilemma is mirrored in an urban prisoner’s dilemma (it is the individual advantage to use cars); an integrated urban strategy


Hilary Graham, University of York, delivered a presentation framing future generations as a springboard for public behaviour change. Lifestyle and behavioural change have been identified as a crucial measure to reduce GHG emissions. Her findings challenge the perception that the public is inclined to ‘discount the future’, as proposed by standard economic and policy appraisals. The potential for information-based interventions is fundamentally limited; as much human behaviour is influenced by environmental stimuli and cues. Therefore, there is a need for multilateral and comprehensive approaches to behaviour change. Graham presents the fate of future generations as a powerful motivator in initiating behaviour change, with levels of United Kingdom smoking cessation during pregnancy as an example of increased behaviour change with respect to background quitting rate (six-fold higher). Evidence suggests that the public are preferentially inclined to support policy decisions with an equal cost–benefit to future generations versus present population. Harnessing this commitment to future generations could provide a platform for changing behaviours to address climate change.

**The physical science and impacts, adaptation and vulnerability**

Gian-Kasper Plattner, Head of the IPCC WGI outlined current observations in the climate system; how understanding is changing and what the future impacts of climate change might be. He stressed that “warming of the climate system is unequivocal and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. Changes in many extreme weather and climate events have been observed since about 1950. It is likely that the frequency of heat waves has increased in large parts of Europe, Asia and Australia. The frequency or intensity of heavy precipitation events has likely increased in North America and Europe” and “that heat waves will likely occur with higher frequency and duration, with continuing occasional cold winter. He added that “Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century”. (Fig. 7)
Fig. 7: Comparison of observed and simulated climate change based on three large-scale indicators in the atmosphere, the cryosphere and the ocean

Note: Comparison of observed and simulated climate change based on three large-scale indicators in the atmosphere, the cryosphere and the ocean: change in continental land surface air temperatures (yellow panels), Arctic and Antarctic September sea ice extent (white panels), and upper ocean heat content in the major ocean basins (blue panels). Global average changes are also given. Anomalies are given relative to 1880–1919 for surface temperatures, 1960–1980 for ocean heat content and 1979–1999 for sea ice. All time-series are decadal averages, plotted at the centre of the decade. For temperature panels, observations are dashed lines if the spatial coverage of areas being examined is below 50%. For ocean heat content and sea ice panels the solid line is where the coverage of data is good and higher in quality, and the dashed line is where the data coverage is only adequate, and thus, uncertainty is larger. Model results shown are Coupled Model Intercomparison Project Phase 5 (CMIP5) multimodel ensemble ranges, with shaded bands indicating the 5 to 95% confidence intervals.  

He concluded that “limiting total human-induced warming to less than 2°C relative to the period 1861–1880 with a probability of >66% would require cumulative CO₂ emissions from all anthropogenic sources since 1870 to remain below about 2900 GtCO₂ (with a range of 2550–3150 GtCO₂ depending on non-CO₂ drivers). About 1900 GtCO₂ had already been emitted by 2011”.  


José Moreno, Vice Chair of WGII, University of Castilla-La Mancha Toledo, Spain, delivered a presentation on the **key findings of the WGII in relation to impacts, adaptation and vulnerability**. It was outlined that WGI is the starting point of work in this area, that human interference with the climate system is occurring and climate change poses risks for human and natural systems. He stressed that WGII used a risk

---

23 A “human system” is defined in the glossary to AR5 WGII as “Any system in which human organizations and institutions play a major role. Often, but not always, the term is synonymous with society or social...”
based approach. By focusing on risk, decision-making can be supported through people and society. (see Fig. 9)

**Fig. 9: Illustration of the core concepts of the WGII AR5**

Note: Risk of climate-related impacts results from the interaction of climate-related hazards with the vulnerability and exposure of human and natural systems. Illustrating overlapping entry points and approaches, as well as key considerations, in managing risks related to climate change.²⁴

The presentation outlined the impacts of climate change, including the physical, social, and geopolitical impacts as well as changes to biodiversity. Sectors highlighted were agriculture and food, species and ecosystems, coastal and low-lying areas, marine systems, urban areas, rural areas, economic sectors, and human security. The presentation noted that vulnerability to climate change has no single cause and that inequality is a fundamental principle in the progression of climate change. Fig. 10 describes the different key risks in specific regions.

He concluded by saying that “responding to climate-related risks involves decision-making in a changing world, with continuing uncertainty about the severity and timing of climate-change impacts and with limits to the effectiveness of adaptation.” Iterative risk management is a useful framework for decision-making in complex situations characterized by large potential consequences, persistent uncertainties, long timeframes, potential for learning, and multiple climatic and non-climatic influences changing over time. Fig. 11 illustrates this continuous process.

George Luber, Associate Director of Climate Change, Climate Change and Health Program, National Centre for Environmental Health, Centers for Disease Control and Prevention summarized **key emerging risks and key vulnerabilities.** Chapter 19’s objectives were to “assesses climate-related risks in the context of Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC)” and ‘recognizing and reassessing arising risks’ and vulnerabilities from complex socioecological and climatological systems.’ A risk that arises from the interaction of phenomena in a complex system was defined in the chapter as an emergent risk. An example provided was the Arctic where thawing and sea ice loss disrupt land transportation, buildings, other infrastructure, and are projected to disrupt indigenous culture. Differences in vulnerability and exposure arise from non-climatic factors and from multidimensional inequalities often produced by uneven development processes. “People who are socially, economically, culturally, politically, institutionally, or otherwise marginalized are especially vulnerable to climate change and also to some adaptation and mitigation responses.” Newly assessed health risks mentioned included “those high ambient CO$_2$ concentrations in the atmosphere will affect human health by increasing the production and allergenicity of pollen and allergenic compounds and by decreasing nutritional quality of important food crops”.

---


27 Article 2 of the UNFCCC establishes the objective of the convention as being “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”

28 Risks are considered “key” due to high hazard or high vulnerability of societies and systems exposed, or both vulnerabilities are considered “key” if they have the potential to combine with hazardous events or trends to result in key risks. Vulnerabilities that have little influence on climate-related risk, for instance, due to lack of exposure to hazards, would not be considered key.

29 Vulnerability – the propensity or predisposition to be adversely affected. It encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
Maarten van Aalst, Red Cross/Red Crescent Climate Centre, presented the main Lessons on extremes and disasters from IPCC WGII and SREX. Economic losses from climate-related disasters have increased, with large spatial and inter-annual variation. The increasing exposure of people and assets has been a major cause of changes in disaster losses. Climate models project more frequent hot days throughout the 21st century, and there is a likely increase in heat waves in the WHO European Region with an increase in warm days and nights in Europe. Fig. 12 shows the projected return periods for maximum daily temperature.

Fig. 12: Projected return periods for the maximum daily temperature that was exceeded on average once during a 20-year period in the late 20th century (1981–2000)

Note: Projected return period (in years) of late 20th-century 20-year return values of the annual maximum of the daily maximum temperature. The bar plots (see legend for more information) show results for regionally averaged projections for two time horizons, 2046 to 2065 and 2081 to 2100, as compared to the late 20th century (1981-2000), and for three different SRES emission scenarios (B1, A1B, A2). Results are based on 12 GCMs contributing to the CMIP3. The ‘Globe’ analysis (inset box) displays the projected return period (in years) of late 20th-century 20-year return values of the annual maximum of the daily maximum temperature computed using all land grid points.30

Hans Portner, CLA WGII author of Chapter 6 on Ocean Systems delivered background on the impact of climate change on the ocean. Physical evidence was outlined, including the oceans role as an insulator: absorbing 90% of the heat accumulated in the atmosphere. Displacement of marine species was highlighted as a key issue, with reference to the marginalization of certain ecosystems in the face of climate change. Deoxygenation, acidification and algal blooms were referenced in relations to other harmful impacts on climate change on the ocean environment. Further risks with consequences on social

economic development included: coastal security, reduced marine resources and impacts on the shipping industry. The impacts on human health have only recently started to be considered.

Alistair Woodward, Coordinating lead author of Chapter 11 of the IPCC WGII AR5, University of Auckland, presented the key findings on human health of chapter 11. He outlined the difficulty of detecting and attributing health impacts within the current scientific approaches. The Paracelsus notion of ‘the dose makes the poison’ was challenged by the view that in climate change it is ‘the speed of climate change and variability of exposures which present risk factors in their own right nowadays’. The presentation confirmed the AR4 finding, on that the “present burden on health is currently small compared to other stressors” and that “Rising temperatures have increased the risk of heat-related death and illness”. However in addition combined risks of population growth, aging and heat exposure were assessed (see Fig. 13)

Fig. 13: Projected changes (°C) in 20-year return values of the annual maximum of the daily maximum temperature

Note: Increasingly frequent heatwaves will combine with growing vulnerable populations. Bar graphs show how frequently a heat event that would have occurred only once in 20 years in the late 20th Century, is expected to occur in the mid-21st Century, under different climate change scenarios. Lower numbers indicate more frequent events. Countries are shaded according to the expected proportional increase in urban populations aged over 65.31

New findings on observed impacts include that “local changes in temperature and rainfall have altered distribution of some water-borne illnesses and reduced food production for some vulnerable populations” and that “Some parts of the world already exceed the international standard for safe work activity during the hottest months of the year” It further projects that “The capacity of the human body to thermoregulate may be exceeded on a regular basis, particularly during manual labour, in parts of the world during this century. In the highest Representative Concentration Pathway, RCP8.5, by 2100 some of

the world’s land area will be experiencing 4°C to 7°C higher temperatures due to anthropogenic climate change. If this occurs, the combination of high temperatures and high humidity will compromise normal human activities, including growing food or working outdoors in some areas for parts of the year.”

The projected changes confirm the AR4 findings, however identify new challenges over different timeframes and weight against adaptation (see Fig. 14).

Fig. 14: Conceptual presentation of the health impacts from climate change and the potential for impact reduction through adaptation

Note: Risks are identified in eight health-related categories based on assessment of the literature and expert judgments by authors of Chapter 11. The width of the slices indicates in a qualitative way relative importance in terms of burden of ill health globally at present. Risk levels are assessed for the present and for the near-term era of committed climate change (here, for 2030–2040). For some categories, for example, vector-borne diseases, heat/cold stress, and agricultural production and undernutrition, there may be benefits to health in some areas, but the net impact is expected to be negative. Risk levels are also presented for the longer-term era of climate options (here, for 2080–2100) for global mean temperature increase of 4°C above preindustrial levels. For each timeframe, risk levels are estimated for the current state of adaptation and for a hypothetical highly adapted state, indicated by different colours.32

Diarmid Campbell-Lendrum, Climate change and health team leader of the Public Health and Environment Department, World Health Organization adjourned some of the recent findings and described the relevance of IPCC findings for Adaptation Policy and Practice.

A recent WHO study showed, that between 2030 and 2050, climate change is expected to cause approximately 250 000 additional deaths per year, from malnutrition, malaria, diarrhoea and heat stress. The direct damage costs to health (i.e. excluding costs in health-determining sectors such as agriculture and water and sanitation), is estimated to be between US$ 2-4 billion/year by 2030. Areas with weak health infrastructure – mostly in developing countries – will be the least able to cope without assistance to prepare and respond. Health specific adaptation experience is accumulating across regions. Governments at various levels are starting to develop adaptation plans and policies and to integrate climate-change considerations into broader development plans. Most current health adaptation focuses on improvements in public health functions to reduce the current adaptation deficit, such as enhancing disease surveillance, monitoring environmental exposures, early warning and improved disaster risk management, risk mapping, provision of vaccination, medical supplies and facilitating coordination between health and other sectors to deal with shifts in the incidence and geographic range of diseases. Key messages of the IPCC report’s on adaptation include the necessity for further strengthen basic public health measures, enhance climate specific measures and the human physiological limit to adaptation. There is a strong evidence base for the potentiating of disparities in public health in the face of climate change. The most important impacts of climate change on health act via environmental and social determinants of health. Limits to global adaptation capacity were outlined and the need for a systematic and structured approach to adaptation was clearly emphasized.

**Regional Impacts.** The WHO European Region spans several of the regions covered in the IPCC report, including Europe, Polar Regions and Asia. In this meeting, only Europe and Polar regions were considered, however a careful analysis also of other chapters is required.

Oleg Anisimov, CLA IPCC WGII, author of Chapter 28 “Polar regions” of the State Hydrological Institute, St Petersburg, the Russian Federation. Physical features include a reduction in duration of the ice period on rivers, reduction in the extent of sea ice, warming and thawing of permafrost and changes in the distribution and ranges of plant and animal species. Changing availability of critical supplies and services was highlighted as a specific risk in communities. Effect on diet, zoonotic diseases, infrastructure damage (health-related built environment (sanitation structures, water supply, nuclear waste storages, historic cattle burial grounds), release/transport of contaminants (POPs, radioactivity, heavy metals) and biomagnification in traditional foods, intrusion of new insects serving as disease vectors, and compromised traditional food preservation (ice cellars, drying) were outlined as indirect potential effects. There

---

will be an observed difference in the impact faced by rural as opposed to urban communities which should be considered in attempts to achieve adequate adaptation. Table 2 describes the key risks and potential adaptation options.

Table 2: Key climate related risks in the Arctic and Antarctic, and potential adaptation practices

<table>
<thead>
<tr>
<th>Key risk</th>
<th>Adaptation issues &amp; prospects</th>
<th>Climate drivers</th>
<th>Level of risk &amp; potential for adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks for freshwater and terrestrial ecosystems (high confidence) and marine ecosystems (medium confidence), due to changes in ice, snow cover, permafrost, and freshwater/lowland conditions, affecting species’ habitat quality, ranges, physiology, and productivity, as well as dependent economies</td>
<td>• Improved understanding through scientific and indigenous knowledge, producing more effective solutions and technological innovations</td>
<td>Risk level with high-adaptation</td>
<td>Risk level with current adaptation</td>
</tr>
<tr>
<td>[28-2-4]</td>
<td>• Enhanced monitoring, regulation, and warning systems that achieve safe and sustainable use of ecosystem resources</td>
<td>Present: Very low, Medium: Low, Very high: High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hunting or fishing for different species, if possible, and diversifying income sources</td>
<td>Long-term: Very low, Medium: Low, Very high: High</td>
<td></td>
</tr>
<tr>
<td>Risks for the health and well-being of Arctic regions, resulting from system stress from the changing physical environment, food scarcity, lack of reliable and safe drinking water, and damage to infrastructure, including infrastructure in polar/humid regions (high confidence)</td>
<td>• Co-production of more robust solutions that combine science and technology with indigenous knowledge</td>
<td>Risk level with high-adaptation</td>
<td>Risk level with current adaptation</td>
</tr>
<tr>
<td></td>
<td>• Improved communications, education, and training</td>
<td>Long-term: Very low, Medium: Low, Very high: High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Shifting resource bases, land use, and/or settlement areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unprecedented challenges for northern communities due to complex inter-linkages between climate-related hazards and societal factors, particularly if rates of change is faster than local options can adapt (high confidence)</td>
<td>• Co-production of more robust solutions that combine science and technology with indigenous knowledge</td>
<td>Risk level with high-adaptation</td>
<td>Risk level with current adaptation</td>
</tr>
<tr>
<td></td>
<td>• Improved communications, education, and training</td>
<td>Long-term: Very low, Medium: Low, Very high: High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Adaptive co-management responses developed through the settlement of land claims</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2-3 illustrates the key identified risks and adaptation options.

---


She further described emerging health risks, for Europe. These include multiple systemic impacts of extreme weather events, cascade effects of systems and sectors affected on human health, such as through reduction of arable crop yields, change of distribution of terrestrial and freshwater species, changes to plant and animal health. She also mentioned a perceived positive emerging effect of awareness from European governments which may reduce vulnerability in western Europe.

### Possible implications for the UNFCCC process

Dr Florin Vlădu, Manager of the Adaptation Technology and Science Programme and Program Officer at UNFCCC Secretariat, provided updates to the IPCC AR5, including a near-term global and regional climate change projection supplement, a regional atlas, and mitigation scenarios. He delivered some key messages, based on the evidence presented, namely:

- The World is warming
  - The rise in global temperatures has not “paused” in recent years
  - Observed impacts of climate change are widespread and substantial
  - Adaptation to climate change is already occurring
  - CO₂ remains the main driver of climate change
  - The greenhouse gases reached levels that are unprecedented in at least 800,000 years

---

The emissions of GHGs increased at a growing pace despite reduction efforts, due to economic growth and, to a lesser extent, population growth.
Cumulative CO$_2$ emissions have more than doubled since 1970 and regional patterns of emissions are shifting along with changes in the world economy.

The World is changing:
- Global mean surface temperature might increase by 4°C over the 21st century.
- World’s coastlines will bear the brunt (just to give an example).
- More deadly weather to come.

Our climate resilient future depends fundamentally on what we accomplish on mitigation:
- Limiting warming below 2°C implies atmospheric concentrations in 2100 of about 450 ppm CO$_2$eq.
- Limiting warming below 2°C is still possible, but:
  - Requires major technological and institutional changes including the upscaling of low- and zero carbon energy. Delaying mitigation will increase the difficulty of limiting warming to 2°C.
  - Entails a reduction in consumption growth over the 21st century by about 0.06 percentage points per year and requires large changes in investment patterns.
  - Effective mitigation will not be achieved if individual agents advance their own interests independently (cooperation). Least-cost mitigation scenarios rely on strong institutions.

Our climate resilient future will also depend on how well we will be able to manage and reduce the risks:
- Otherwise: food production will be threatened; terrestrial and freshwater species will face increased extinction risks; urban areas will be at risk; impacts on water, food and agriculture incomes will affect rural areas; human health will be impacted; and the risks of violent conflicts will increase. Summarizing sectoral, regional and global risks helps us judge when they become dangerous and make decisions.
- Many risks are manageable through adaptation and clever development, should we get our act together!
- Effective and inclusive climate-change adaptation can help build a richer, more resilient world in the near-term and beyond.

He suggested that possible implications of the AR5 report on the international climate negotiations could be to:
- Make a case for ambition, equity and differentiation through nationally determined contributions and a mechanism to maintain ambition.
- Provide a long and near-term perspective on adaptation and mitigation.
- Inform on potential and limits of adaptation and mitigation.
- Inform on the social dimension of vulnerability, development processes and inequalities in societies.
- Provide arguments for mitigation action required to stay below 2°C and consequences of delayed mitigation.
Discussion

Participants agreed that the time for action is now as the window of opportunity to mitigate these scenarios is narrowing by the day. Delayed action in reducing greenhouse gas emissions will increase costs and its impact. Crucially, many of the causes of climate change such as fossil fuel combustion, poorly-designed cities, and overdependence on motorised transport, are also major drivers of the world’s fastest-growing public health problem – noncommunicable diseases. By designing smart climate mitigation policy, efforts to reduce carbon emissions offer profound co-benefits for health, which in turn result in cost-savings for the health care system and for governments in general. Measures discussed included, (1) sectoral measures; (2) measures in settings and (3) behavioural change.

It was added, that putting the health sector on a low-carbon trajectory can benefit health systems through greater energy efficiencies, greener forms of on-site power generation, through renewables and co-generation of heat and power, as well as shifting to greener procedures at every link in the health service procurement and delivery chain. Low-carbon energy solutions may also help improve access to energy for vital services. This can be essential to address the energy gap in rural areas, a key constraint to the achievement of universal health coverage. It was however concluded, that low-cost opportunities to avoid ill health are being not systematically addressed.

Discussion on climate change and its impacts, vulnerability and adaptation, mainly agreed that climate change differs from many traditional environment and health issues, in that it acts over long periods, is subject to multiple uncertainties, is strongly mediated by social, economic and environment determinants, and causes diverse and interacting health impacts.

The strongest evidence available is for the following health impacts anticipated by the middle of the coming century:

- greater risk of injury, disease, and death due to more intense heat waves and fires;
- increased risks of food- and water-borne diseases;
- increased risks of vector borne diseases;
- increased risk of undernutrition resulting from diminished food production in poor regions;
- consequences for health of lost work capacity and reduced labour productivity in vulnerable populations.

There is emerging concern about some of the cascade effects which climate change can have on major health determinants. These include:

- the potential for increasing severity and frequency of extreme weather events including storms and floods, threatening the viability of the health system by damaging critical services and infrastructure networks;
- mass displacement and disruption of livelihoods in low-lying coastal zones and small island states due to storm surges and sea-level rise;
- inland flooding in particularly vulnerable urban centres, causing severe ill health and adverse social outcomes;
• breakdown in food systems from drought, flooding, and extremes in precipitation, resulting in food shortages and volatile prices, disproportionately affecting those in low- and middle income countries;
• potentially increased risk of violent conflict associated with resource scarcity and population movements
• slow-down in economic growth and exacerbation of poverty, with the IPCC concluding that “poor people in urban areas in low- and lower middle-income countries in Africa, Asia and Latin America may slip from transient to chronic poverty”;
• associated reversal of global health progress, including achievement of the Millennium Development Goals.

Key single overarching communication outcome (SOCO)

The scientific findings of the three IPCC working groups formed the basis for a communications discussion. Cristiana Salvi, Communications Officer at the WHO Regional Office for Europe, presented a concept note on the development of single overarching communication outcomes (SOCOs). Operational guidelines included the identification of (i) an effective and appropriate SOCO, and (ii) reachable target audiences. Questions to deal with and potential responses, included:

Step 1: what is our issue?
• Health effects? Health adaptation? Health co-benefits of mitigation? Sustainable development?

Step 2: why do we want to focus on this issue and why do we want to focus on it now?
• New IPCC report with new and stronger evidence? Health co-benefits of mitigation for NCD reduction? Dramatic scenarios and irreversible changes?

Step 3: what do we want to see changed as a result of our communication (our SOCO)?
• Keeping warming under 2°C? Increased resilience to climate change? Health sector’s stewardship and leading by example? Health sector’s action and/or whole government’s action? Urgency of action?

Step 4: which groups of persons are best to target to achieve our SOCO?
• Ministry of Health, or other sectors (i.e. economics), or whole of government, cities or others?

Step 5: what is the compelling new piece of information that is relevant to our audience now?
• Evidence on health impacts of climate change have been known since at least IPCC AR4!

Experts looked into practical approaches to communicate the findings based on evidence, focussing on the expected magnitude of health risks, the solution for improving people’s health now and in the future, and taking into account available resources and stakeholder engagement.

Cristiana Salvi commented on the five key points to remember when targeting an audience for maximum effect and comprehension:
• Point – People are overloaded with information.
Relevance – People remember things that have meaning to them.
Number – People won’t remember more than 5 things, 3 is optimal.
Breaks – People retain information when there are regular breaks.
Action – When people have something to do they remember the message more.

The 7Cs of communication were recalled: in particular issues like communicate a benefit, cater to the heart and the head, as well as create trust and call to action, were considered most important.

Experts in different working groups crafted four SOCOs targeted to four audiences, as well as one key message (KM) per SOCO and several messages:

- For local governments: Make cities sustainable and climate resilient.
  a. KM: **A healthy city is climate resilient and low-carbon.**
  b. Climate change is affecting your city, but it is a manageable risk.
  c. Sustainable cities are healthier and more liveable.
  d. Low-carbon resilient cities provide multiple benefits for residents.
  e. Climate change threatens health in cities.
  f. Cities are at the frontline of climate policy.

- For European policy-makers:
  a. KM: **Mitigate greenhouse emissions to obtain immediate health gains**
  b. Mitigation can lead to substantial cost savings in health care.
  c. The health sector can lead by example.
  d. By cutting carbon we can fight noncommunicable diseases.

- For negotiators of the climate convention: Integrate health into negotiations of the United Nations Framework Convention on Climate Change.
  a. KM: **Human health and well-being is one of the most important outcome and driver of climate change policy.**
  b. There is a need for urgent action now.
  c. Human health is the most important outcome and driver of climate policy.
  d. Collaborate with other sectors for combined action.
  e. State Parties to explore the health co-benefits and health costs of intended national determined contributions (INDCs) for submission to the Conference of the Parties (COP).
  f. Integrate health into National Communications and request parties to evaluate national co-benefits of climate change mitigation.

- For health policy-makers: Integrate climate change aspects into health strategies and policies.
  a. KM: **Addressing climate change is an opportunity for public health development, health security, research, innovation and care.**
  b. Climate change poses risks to human health now.
  c. If we continue business as usual, the risks will become unmanageable.
  d. Main health determinants are affected.
  e. End-scenarios present only a narrow window of opportunity.
  f. The evidence is stronger and it is your choice to act!
  g. Addressing climate change is an opportunity for public health development.
  h. We need to protect future generations.
  i. Accountability for pollution.
  j. Mitigating climate change has positive benefits for health.
k. Win-win situation by reducing vulnerability and providing basic services.

A few common themes were identified throughout the discussions that were relevant across the four SOCO areas identified. Notably, emphasis was placed on the importance and need to foster partnerships across the sectors to promote coordinated and coherent multisectoral action, such as with the agriculture, energy and transport sectors, amongst others. Moreover, in some areas there are other potential partners already tackling the issues of climate change and its intersection with health, such as the work of ICLEI on sustainable cities. Strengthening such partnerships would greatly enhance the ability and efficacy of health sector action.

Furthermore, it was pointed out that the IPCC findings are not easy for the health community to understand, and that this meeting demonstrated the need for the results to be ‘translated’ into appropriate language and format for specific audiences. Further efforts are required to provide an understanding to the health community, by focusing on the main current public health challenges and their linkages to climate change.

The final take home message was the need for urgency; the risks that climate change is posing to public health are currently manageable, but eventually they will become too great to manage. We need to act now. Repetition of the issue is important and dialogues need to be maintained.

Next steps

WHO will further work with partners on crafting messages for communication to several audiences. The summary document on key scientific findings will be revised and the outputs will be fed into the key political European processes (e.g. Mid-Term Review of the Parma “Commitment to act” and the HIC Working Group of the EHTF) and technical work of the climate change programme, towards COP21 in Paris.
Annex 1: Final programme

Tuesday, 27 May

08:30 – 09:00 Registration

09:00 – 09:30 Welcoming, scope of the meeting and expected results (Bettina Menne and Jutta Litvinovitch)

09:30 – 09:45 Protecting future generations: a springboard for behaviour change (Hilary Graham)

09:45 – 10:00 Key single overarching communication outcome (SOCO) (Cristiana Salvi)

10:00 – 10:15 Coffee break

10:15 – 10:25 Introductory video: The physical science (IPCC WG1 video)

10:25 – 10:40 The Intergovernmental Panel of Climate change. A historical overview. (Renate Christ)

10:40 – 12:15 Key findings of the IPCC, WGIII: Mitigation of climate change (Jan Minx)

Additional presentations/comments:
- Co-benefits for health, economic and environment development of mitigation measures (Keywan Riahi)
- Urban areas as hotspots of co-benefits (Felix Creutzig)
- The example of transport and other sectors (Oliver Lah)

Q&A
Discussion introduced by Gerard Wynn

12:15 – 13:00 Key findings of IPCC, WGI: The physical science (Gian-Kasper Plattner)

Additional comments:
- Hotspots of climate change in the WHO European Region (Antonio Navarra)

Q&A
Discussion introduced by Franklin Apfel

13:00 – 14:00 Lunch break

14:00 – 16.00 Key findings of the IPCC, WGII: vulnerability, impact and adaptation (Jose Manuel Moreno Rodriguez)

Additional presentations/comments:
Emerging risks (George Luber)
Disasters and extreme events (Maarten van Aalst)
Oceans (Hans-Otto Pörtner)
The Arctic (Oleg Anisimov)
western Europe (Sari Kovats)

Q&A
Discussion introduced by Kieran Cooke

16:00 – 16:15 Coffee break

16:15 – 16:30 Importance of IPCC findings for the United Nations Framework Convention on Climate Change (UNFCCC) (Florin Vladu)

16:15 – 17:30 Three cross cutting working groups: single overarching communication outcome (SOCO)

19:00 Social dinner

Wednesday, 28 May

09:00 – 10:00 Key findings on human health in IPCC:

   Human health (Alistair Woodward)
   Emerging health findings (Sari Kovats)
   Adaptation (Diarmid Campbell-Lendrum)
   Health and mitigation (Nick Watts)

10:00 – 10:15 Feedback from “SOCO” working groups

10:15 – 11:00 Three cross cutting working groups: audience

11:00 – 11:15 Coffee break

11:15 – 11:30 Feedback from “audience” working groups

11:30 – 13:00 Three cross cutting working groups: key messages

13:00 – 14:00 Lunch break

14:00 – 16:00 Presentation of group results and discussion

16:00 – 16:15 Coffee break

16:15 – 17:00 Summarizing the findings of this meeting and next steps

17:00 – 17:15 Closure of the meeting
Annex 2: Final list of participants

Working Group on Health in Climate Change (HIC)

Albania
Zhaneta Miska
Sanitary Engineer
Hygiene and Epidemiology Sector
Public health Directory
Ministry of Health
Bulevardi “Bajram Curri”, Nr.1, Tirana
1001 Tirana
Albania

Austria
Fritz Wagner
Deputy Head of Department III/6
Prevention and Health Promotion
Ministry of Health
Radetzkystraße 2
AT-1030 Vienna

Germany
Karin Höppner
Bundesministerium für Gesundheit
Ministry of Health
Referat 422 – “Grundsatzfragen der Prävention,
Eigenverantwortung, Selbsthilfe, Umweltbezogener
Gesundheitsschutz”
Rochusstraße 1
53123 Bonn

Björn Ingendahl
Head of Division IG II 7
Health Impacts of Climate Change,
Environment-related Food Safety
Federal Ministry for the Environment,
Nature Conservation, Building and Nuclear Safety
Robert-Schuman-Platz 3
53175 Bonn

Hungary
Anna Paldy (WebEx)
Deputy Director
National Institute of Environmental Health
Albert Florian ut 2-6
1097 Budapest

Italy
Elisabetta Colaiacomo
Senior Advisor
Department for Sustainable Development,
Climate Change and Energy
Ministry for the Environment, Land and Sea
Via C. Colombo, 44
00147 Rome
**Lithuania**  
Romualdas Sabaliauskas (WebEx)  
Environmental Health Division  
Centre for Health Education and Disease Prevention  
Kalvarijų str. 153  
LT-08221 Vilnius

**Temporary Advisers**

Oleg Anisimov  
Head of Department of Climatology  
State Hydrological Institute  
23, second Line V.O.  
199053 St.Petersburg  
Russian Federation

Franklin Apfel  
World Health Communication Associates (WHCA)  
Little Harborne, Church Lane  
BS26 2HD Axbridge  
United Kingdom of Great Britain and Northern Ireland

Kieran Cooke  
Climate News Network  
10 Enstone Road, Charlbury  
OX73QR Chipping Norton  
United Kingdom of Great Britain and Northern Ireland

Felix Creutzig  
Mercator Research Institute on Global Commons and Climate Change  
Land use, transport and infrastructures  
Gorgauer Str. 12  
10829 Berlin  
Germany

Ulrich Cubasch (unable to attend)  
Freie Universität  
Meteorologisches Institut  
Carl-Heinrich-Becker-Weg 6-10  
12165 Berlin  
Germany

Hilary Graham  
Head of Department  
Area 2  
Seebohm Rowntree Building  
Department of Health Sciences  
University of York
The Netherlands

Nick Watts
UCL-Lancet Commission on Climate Change and Health
Global Climate and Health Alliance
Head of project/Covenor
119 Forrest Street, Peppermint Grove
6011 Perth
Australia

Alistair Woodward (WebEx)
42 Bassett Road
Remuera
1050 Auckland
New Zealand

Gerard Wynn
Gerard Wynn Limited
78 Belle Vue Road
Salisbury SP1 3YD
United Kingdom of Great Britain and Northern Ireland

Observers

Dovile Adamonyte (WebEx)
Centre for Health Education and Disease Prevention
Environmental Health Division
Kalvarijų str. 153
08221 Vilnius
Lithuania

Stefi Barna (WebEx)
Global Public Health
Norwich Medical School
Co-director
Sustainable Healthcare Education Network
University of East Anglia
Norwich Research Park
Norwich, NR4 7TJ
United Kingdom of Great Britain and Northern Ireland

Claude Chastel (WebEx)
Laboratoire de Virologie
Microbiologie
Faculté de Médecine et des Sciences de la Santé
22 avenue Camille Desmoulins CS 93837
29238 BREST Cedex 3
France
Representatives of UN organizations

**IPCC Secretariat**
Renate Christ
Secretary of the IPCC
c/o WMO, 7bis, Avenue de la paix
CH-1211 Genève 2
Switzerland

**United Nations Framework Convention on Climate Change (UNFCCC)**
Florin Vladu
Manager of the Adaptation Technology and Science Programme
Program Officer at UNFCCC Secretariat
Platz der Vereinten Nationen
53113 Bonn
Germany

Representatives of other organizations

**Health and Environment Alliance (HEAL)**
Lucy Mathieson
28 Boulevard Charlemagne
B-1000 Brussels
Belgium
World Health Organization

Headquarters
Diarmid Campbell-Lendrum (WebEx)
Scientist, Evidence and Policy on Environmental Health

Carlos Dora (WebEx)
Coordinator, Interventions for Healthy Environments

Regional Office for Europe
James Creswick
Technical officer, Climate Change, Green Health Services and Sustainable Development

Christian Gapp
Technical officer, Environment and Health, Intelligence and Forecasting

Vladimir Kendrovski
Technical officer, Climate Change, Green Health Services and Sustainable Development

Bettina Menne
Programme Manager, Climate Change, Green Health Services and Sustainable Development

Gerardo Sanchez Martinez
Technical officer, Climate Change, Green Health Services and Sustainable Development

Cristiana Salvi
Communications Officer
Division of Communicable Diseases, Health Security, & Environment

Alina Vandenbergh
Intern, Climate Change, Green Health Services and Sustainable Development
In May 2014, the WHO Regional Office for Europe organized a technical meeting to discuss Fifth Assessment Report of the Intergovernmental Panel on Climate Change, and its implications for population health in the WHO European Region. Participants agreed that the time for action is now and that delayed action in reducing greenhouse gas emissions will increase costs and its impact, including on human health. Four single overarching communication outcomes (SOCO) were identified to be developed into a communication strategy to feed back to the European Environment and Health Process.