



SUMMARY OF THE FORTIETH SESSION OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE: 27 OCTOBER – 1 NOVEMBER 2014

The 40th session of the Intergovernmental Panel on Climate Change (IPCC-40) met from 27 October - 1 November 2014 at the Tivoli Conference Center in Copenhagen, Denmark, to consider and finalize the Synthesis Report (SYR), which integrates the findings from the three IPCC Working Group (WG) reports. Together, these comprise the IPCC's Fifth Assessment Report (AR5). On 1 November, the Panel approved the SYR's Summary for Policymakers (SPM) line by line, and adopted the longer SYR section by section. More than 800 authors and review editors from 85 countries participated in the preparation of AR5 over the past six years. Approximately 450 participants attended IPCC-40, including government representatives, authors, representatives of UN organizations, members of civil society, and academics.

The SPM consists of an introduction and four sections. The section on Observed Changes and their Causes includes subsections on: observed changes in the climate system; causes of climate change; impacts of climate change; and extreme events. The section on Future Climate Changes, Risks and Impacts includes subsections on: key drivers of future climate; projected changes in climate systems; future risks and impacts caused by a changing climate; and climate change beyond 2100, irreversibility and abrupt changes. The section on Future Pathways for Adaptation, Mitigation and Sustainable Development includes subsections on: foundations of decision-making about climate change; climate change risks reduced by mitigation and adaptation; characteristics of adaptation pathways; and characteristics of mitigation pathways. The section on Adaptation and Mitigation includes subsections on: common enabling factors and constraints for adaptation and mitigation responses; response options for adaptation; response options for mitigation; policy approaches for adaptation and mitigation, technology and finance; and trade-offs, synergies and interactions with sustainable development. The longer report elaborates on these issues.

In addition to approving the SPM and adopting the SYR, IPCC-40 addressed, *inter alia*: the IPCC programme and budget through 2017; future work of the IPCC; communication and

outreach activities; a request for a technical report on climate change, food security and agriculture; implementation of the IPCC conflict of interest (COI) policy; and matters related to the UN Framework Convention on Climate Change (UNFCCC) and other international bodies. The Panel also heard a number of progress reports, including by the Task Force on Greenhouse Gas Inventories (TFI), on the IPCC's carbon footprint, and from the three WGs.

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The third meeting of the Task Group on the Future Work of the IPCC (TGF) met immediately prior to IPCC-40 on 26 October to consider, among other things, the refined Options Paper prepared by the Task Group Co-Chairs, which draws on submissions from governments, scientists, observer organizations, Technical Support Units (TSUs) and the Secretariat.

AR5 has been under preparation for six years and consists of the SYR and contributions by the three WGs. The Panel adopted Working Group I's (WGI) contribution on the physical science basis of climate change in Stockholm, Sweden, in September 2013, and Working Group II's (WGII) contribution on climate change impacts, adaptation and vulnerability in March 2014 in Yokohama, Japan. WGIII's contribution on mitigation of climate change was adopted in April 2014 in Berlin, Germany.

AR5 is dedicated to the memory of Professor Stephen Schneider, who was a major contributor to the IPCC and "one of its fiercest supporters."

A BRIEF HISTORY OF THE IPCC

The IPCC was established in 1988 by the World Meteorological Organization (WMO) and the UN Environment Programme (UNEP) to assess scientific, technical and socio-economic information relevant to understanding the risks associated with human-induced climate change, its potential impacts, and options for adaptation and mitigation. The IPCC does not undertake new research, nor does it monitor climate-related data. Instead, it conducts assessments of knowledge on the basis of published and peer-reviewed scientific and technical literature.

The IPCC has three WGs: WGI addresses the physical scientific aspects of the climate system and climate change; WGII addresses the vulnerability of socio-economic and natural systems to climate change, impacts of climate change and adaptation options; and WGIII addresses options for limiting greenhouse gas (GHG) emissions and mitigating climate change. Each WG has two co-chairs and six vice-chairs, except WGIII, which, for the Fifth Assessment cycle, has three co-chairs. The co-chairs guide the WGs in fulfilling the mandates given to them by the Panel and are assisted in this task by TSUs.

The IPCC also has a TFI to oversee the IPCC National GHG Inventories Programme, which aims to: develop and refine an internationally-agreed methodology and software for the calculation and reporting of national GHG emissions and removals; and encourage the use of this methodology by parties to the UNFCCC.

The Panel elects its Bureau for the duration of the preparation of an IPCC assessment report. The Bureau's role is to assist the IPCC Chair in planning, coordinating and monitoring the IPCC's work. The Bureau is composed of climate change experts representing all regions. Currently, the Bureau comprises 31 members: the IPCC Chair and Vice-Chairs, the WG Co-Chairs and Vice-Chairs, and the TFI Co-Chairs. In 2011, the IPCC established an Executive Committee to assist with intersessional work and coordination among the WGs. The Committee consists of the IPCC Chair, IPCC Vice-Chairs, WGs and TFI Co-Chairs, and advisory members, including the Head of the Secretariat and the four Heads of the TSUs. The IPCC Secretariat is located in Geneva, Switzerland, and is hosted by the WMO.

IPCC PRODUCTS: Since its inception, the IPCC has prepared a series of comprehensive assessments, special reports and technical papers that provide scientific information on climate change to the international community and are subject to extensive review by experts and governments.

The IPCC's First Assessment Report was completed in 1990; the Second Assessment Report in 1995; the Third Assessment Report in 2001; and the Fourth Assessment Report (AR4) in 2007. Currently, the Assessment Reports are structured into three volumes, one for each WG. Each volume is comprised of an SPM, a Technical Summary and an underlying assessment report. All sections of the reports undergo an intensive review process, which takes place in three stages: a first review by experts; a second review by experts and governments; and a third review by governments. Each SPM is approved line by line by the respective WG. The Assessment Reports also include a SYR, highlighting the most relevant aspects of the three WG reports, and an SPM of the SYR, which is approved line by line by the Panel.

In addition to the comprehensive assessments, the IPCC produces special reports, methodology reports and technical papers, focusing on specific issues related to climate change. Thus far, special reports include: Land Use, Land-Use Change and Forestry (LULUCF) (2000); Carbon Dioxide Capture and Storage (2005); Renewable Energy Sources and Climate Change Mitigation (SRREN) (2011); and Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) (2011). Technical papers have also been prepared on Climate Change and Biodiversity (2002), and on Climate Change and Water (2008), among others.

In addition, the IPCC also produces methodology reports or guidelines to assist countries in reporting on GHGs. Good Practice Guidance reports were approved by the Panel in 2000 and 2003. The Panel approved the latest version of the IPCC Guidelines on National GHG Inventories in 2006. The IPCC also adopted the 2013 Supplement to the 2006 Guidelines for National GHG Inventories: Wetlands, and the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol.

For its work and efforts "to build up and disseminate greater knowledge about manmade climate change, and to lay the foundations needed to counteract such change," the IPCC was awarded the Nobel Peace Prize, jointly with former US Vice-President Al Gore, in December 2007.

IPCC-28: During this session (9-10 April 2008, Budapest, Hungary), the IPCC agreed to prepare the AR5 and to retain the current structure of its WGs. In order to enable significant use of new scenarios in AR5, the Panel requested the IPCC Bureau to ensure delivery of the WGI report by early 2013 and completion of the other WG reports and the SYR as early as possible in 2014.

IPCC-29: This session (31 August - 4 September 2008, Geneva, Switzerland) commemorated the IPCC's 20th anniversary. The Panel elected the new IPCC Bureau, and reelected Rajendra Pachauri (India) as Chair. The Panel also continued discussions on the future of the IPCC and agreed to create a scholarship fund for young climate change scientists from developing countries with the funds from the Nobel Peace Prize.

IPCC-30: During this session (21-23 April 2009, Antalya, Turkey), the Panel focused mainly on the near-term future of the IPCC and provided guidance for an AR5 scoping meeting, which was held in Venice, Italy, from 13-17 July 2009.

IPCC-31: This session (26-29 October 2009, Bali, Indonesia) focused on approving the proposed AR5 chapter outlines developed by participants at the Venice scoping meeting. The Panel also considered progress on implementing decisions taken at IPCC-30 regarding the involvement of scientists from developing countries and countries with economies in transition, use of electronic technologies, and the longer-term future of the IPCC.

INTERACADEMY COUNCIL (IAC) REVIEW: In response to public criticism of the IPCC related to inaccuracies in AR4 and the Panel's response to the criticism, UN Secretary-General Ban Ki-moon and IPCC Chair Pachauri requested the IAC to conduct an independent review of IPCC processes and procedures and to present recommendations to strengthen the IPCC and ensure the quality of its reports. The IAC presented its results in a report in August 2010 and made recommendations regarding, *inter alia*: the IPCC's management structure; a communications strategy, including a plan to respond to crises; transparency, including criteria for selecting participants and the type of scientific and technical information to be assessed; and consistency in how the WGs characterize uncertainty.

IPCC-32: This session (11-14 October 2010, Busan, Republic of Korea) addressed the recommendations of the IAC Review. The Panel adopted a number of decisions in this regard, including on the treatment of gray literature and uncertainty, and on a process to address errors in previous reports. For recommendations requiring further examination, the Panel established task groups on processes and procedures, communications, COI policy, and governance and management. The Panel also accepted a revised outline for the AR5 SYR.

IPCC-33: This session (10-13 May 2011, Abu Dhabi, United Arab Emirates) focused primarily on follow-up actions to the IAC Review. The Panel established an Executive Committee, adopted a COI Policy and introduced several changes to the procedures for IPCC reports. The Panel also considered progress on AR5.

IPCC-34: This meeting (18-19 November 2011, Kampala, Uganda) adopted the revised Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports, as well as the Implementation Procedures and Disclosure Form for the COI Policy.

IPCC-35: This session (6-9 June 2012, Geneva, Switzerland) concluded the Panel's consideration of the recommendations from the IAC Review by approving the functions of the IPCC Secretariat and TSUs, and the Communications Strategy.

WGI-12 and IPCC-36: During these meetings (23-26 September 2013, Stockholm, Sweden), WGI finalized its AR5 contribution titled "Climate Change 2013: The Physical Science Basis." The Panel then met to approve the WGI SPM and also accepted the underlying report, including the Technical Summary and annexes.

IPCC-37: During this session (14-17 October 2013, Batumi, Georgia), the Panel considered and adopted two methodology reports: "2013 Supplement to the 2006 IPCC Guidelines for National GHG Inventories: Wetlands" and "2013 Revised

Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol." The IPCC also undertook initial discussions on mapping the IPCC's future.

WGII-10 and IPCC-38: These meetings (25-29 March 2014, Yokohama, Japan) finalized the WGII contribution to AR5 titled "Climate Change 2014: Impacts, Adaptation and Vulnerability." The Panel then met to approve the WGII SPM and accepted the underlying report, including the Technical Summary and annexes.

WGIII-12 and IPCC-39: These meetings (7-12 April 2014, Berlin, Germany) finalized the WGIII contribution to AR5: "Climate Change 2014: Mitigation of Climate Change." The Panel then approved the WGIII SPM and accepted the underlying report, including the Technical Summary and annexes. The Panel also discussed, *inter alia*, future work of the IPCC and COI. The first meeting of the TGF was held on 6 April.

IPCC-40 REPORT

On Monday, 27 October, Rasmus Helveg Petersen, Minister for Climate, Energy and Building, Denmark, opened IPCC-40. Welcoming participants, he said climate change is "too dangerous to ignore" and urged the world to take responsibility. He cited examples of Danish commitment, including a new Climate Bill, a US\$70 million contribution to the Green Climate Fund (GCF) and a 38% reduction of GHGs since 1990 combined with economic growth.

Kirsten Brosbøl, Minister of the Environment, Denmark, emphasized the "chilling" reality of climate change, evident in impacts occurring globally at an increasing rate. She noted extreme rainfall and flooding in Denmark, and said that while governments have the primary responsibility to act, everyone—business, NGOs and citizens—must come together and "do their part."

Frank Jensen, Lord Mayor of Copenhagen, pointed to a recently agreed Compact of Mayors to tackle climate change and cited Copenhagen's desire to help other cities adapt their innovations to local conditions. He called for sustainable solutions through links with private industry and research institutions, noting Copenhagen's 40% reduction in CO2 emissions and use of harbor water to cool buildings.

Jeremiah Lengoasa, Deputy Secretary-General, WMO, stated that the IPCC's participation in the UN Climate Summit had been a resounding success in communicating AR5 findings. Stressing communication as a key responsibility of the IPCC, he highlighted the WMO's efforts to implement the IPCC Communication Strategy Implementation Plan, including through the WMO Bulletin.

John Christensen, on behalf of UNEP Executive Director Achim Steiner, commended the IPCC's "tremendous efforts" towards a report that shows real, conclusive evidence of manmade climate change and provides timely scientific responses on how best to meet the climate challenge. He stressed that the cost of inaction to curb emissions is "insurmountable" in terms of lives and livelihoods, and will require more costly interventions later to keep within the 2°C goal.

IPCC Chair Rajendra Pachauri underscored the importance of AR5 and its SYR, which point to the serious implications of inaction while offering informed choices for action. He

emphasized that the SYR distills and integrates the findings of the three WG reports and incorporates the 2011 special reports, and provides a new benchmark for scientific robustness. While not discounting challenges, he called for overcoming hopelessness given that time still remains to avoid the most serious impacts.

UNFCCC Executive Secretary Christiana Figueres, via video, called AR5 the most influential climate change report ever released that validates the 98% consensus existing within the scientific community, and noted increasing global responses to climate change. She requested scientists to keep publishing impartial evidence of climate change and innovative solutions, and governments to serve humanity by making decisions that maximize positive outcomes for the world's population.

Delegates then approved the provisional agenda (IPCC-XL/Doc.1, Rev.1) as presented.

APPROVAL OF THE DRAFT REPORT OF THE 39TH SESSION

On Monday morning, IPCC Secretary Renate Christ introduced the draft report of the 39th session of the IPCC (IPCC-XL/Doc. 3). Saudi Arabia, Venezuela and Bolivia reiterated their reservations concerning the WGIII report. Christ explained that the Saudi Arabian and Bolivian reservations had already been attached to the IPCC-39 report, and that Venezuela's reservation would be added. Chair Pachauri added that those reservations could also be mentioned in the IPCC-40 report. Delegates accepted the draft report as amended.

IPCC PROGRAMME AND BUDGET

On Monday, IPCC Secretary Christ introduced the agenda item on the IPCC Trust Fund Programme and Budget (IPCC-XL/Doc. 2 and Add. 1), which was forwarded for consideration to the Financial Task Team, co-chaired by IPCC Vice-Chair Ismail Elgizouli (Sudan) and Nicolas Bériot (France).

On Saturday morning, IPCC Secretary Christ and IPCC Vice-Chair Elgizouli presented the revised budget, noting it provides for, *inter alia*, a small expert meeting on climate change, food and agriculture, a meeting on AR5 lessons learned, and TFI work. Christ also noted the provisional budget for 2016-2017, saying it is to be revised as needed by the Panel. The Panel then approved the IPCC programme and budget.

AR5 OF THE IPCC: CONSIDERATION OF THE ADOPTION OF THE DRAFT SYR AND APPROVAL OF ITS DRAFT SPM

On Monday morning, participants began to discuss the SYR's SPM line by line. Chair Pachauri praised delegates for their spirit of cooperation and urged them to respect and uphold the IPCC's work as a mutually productive coalition between science and policy makers.

Saudi Arabia and Bolivia cautioned against reopening discussion on issues already agreed upon, and stressed the need for balance between policy-relevant issues, involving sustainable development, adaptation and mitigation. Saudi Arabia called for balance also when addressing different sectors. Chair Pachauri urged delegates not to take rigid and inflexible stands so that agreement could be reached.

INTRODUCTION: Regarding a sentence stating that the SYR's SPM follows the structure of the longer report, Bolivia, supported by Slovenia, questioned reference to the section heading on "Transformations and changes in systems" and, with Venezuela, Nicaragua and Saudi Arabia, stressed the need to reflect the concept of sustainable development in relation to transformation. Saudi Arabia opposed referring to "measures" in reference to the topic heading on adaptation and mitigation and proposed use of the term "options" instead. Following discussions in the relevant section, delegates agreed to replace "Transformations and changes in systems" with "Future pathways for adaptation, mitigation and sustainable development," and "Adaptation and mitigation measures" with "Adaptation and mitigation."

Saudi Arabia expressed opposition to an introductory sentence stating that, "where appropriate, findings are formulated as statements of fact without using uncertainty qualifiers," and cautioned against providing unqualified statements. Chair Pachauri explained that the sentence comes from the Guidance Note for Lead Authors of the IPCC AR5 on Consistent Treatment of Uncertainties, and WGI Co-Chair Thomas Stocker reminded delegates that the text had already been approved by the three WGs and included in their respective SPMs. The UK urged acceptance of previously agreed text, and Saudi Arabia agreed to maintain the text as presented.

Regarding a proposed box on **information relevant to UNFCCC Article 2**, participants agreed that it merited further consideration. An informal group, co-chaired by Ronald Flipphi (the Netherlands) and Kenneth Kerr (Trinidad and Tobago), was established and met several times from Thursday through Saturday. In an initial meeting, participants exchanged views on whether to include in the SPM the version of the box from the longer report or a truncated version. The group also considered options for giving the box greater visibility in the longer report. Several delegations expressed concern over a lack of language on adaptation and sustainable development. The group then discussed the box from the longer SYR section by section and made a number of recommendations and textual proposals on, *inter alia*, references to the review of the long-term temperature goal under the UNFCCC. Participants debated whether or not to include references to 1.5°C and to 2015 in this regard. Some delegations favored borrowing verbatim text from relevant UNFCCC decisions, while others preferred making a general apolitical statement "without going into politics."

Protracted discussions in the informal group ensued and the contact group co-chairs and authors undertook numerous revisions of the longer report's box, taking into account suggestions and views of participants.

In plenary on Saturday afternoon, the Panel was presented with a revised authors' proposal for a "Background Box SPM.1 on Information Relevant to Article 2 of the UNFCCC." Addressing the box in the longer report, the UK, Australia, the US, Japan, Canada and the EU expressed reservations on using the authors' text as a basis for discussion. Norway, Sweden and Chile stressed the need to follow IPCC procedures and go through this text as had been done with the rest of the SPM, while Germany suggested taking the text back to the informal group. Noting the late hour and stressing respect for the authors' proposal, Saudi Arabia, Bolivia, Venezuela and China proposed

acceptance of the text as presented. IPCC Vice-Chair Jean-Pascal Van Ypersele (Belgium) explained the process leading to the text, emphasizing that while IPCC members had been consulted, only authors had had input into the written proposal. Citing the difference of views and the lack of time, Chair Pachauri proposed deletion of the box. Norway, Germany, Venezuela, China and Chile suggested another attempt at consensus, while Peru, the US, Australia, the UK and Saudi Arabia expressed regret at the loss of the information in the box, but supported its deletion. Chair Pachauri proposed, and the Panel agreed, to delete the box both in the longer report and in the SPM and to insert a sentence stating that “the report includes information relevant to Article 2 of the UNFCCC.”

Final SYR SPM Text: The introductory section states that, based on the reports of the three IPCC WGs, including relevant Special Reports, the SYR provides an integrated view of climate change as the final part of AR5. It further states that the SPM follows the structure of the longer report, and that certainty in key assessment findings is expressed as a qualitative level of confidence (from very low to very high) and, when possible, probabilistically with a quantified likelihood (from exceptionally unlikely to virtually certain). Where appropriate, findings are also formulated as statements of fact. The section also notes that the report includes information relevant to UNFCCC Article 2.

1. OBSERVED CHANGES AND THEIR CAUSES: No changes were made to the headline statement to this section.

Final SYR SPM Text: This section’s headline states that: human influence on the climate system is clear; recent anthropogenic GHG emissions are the highest in history; and recent climate changes have had widespread impacts on human and natural systems.

1.1: Observed Changes in the Climate System: Regarding a headline on **unequivocal warming and unprecedented observed changes** in the climate system, the US and the UK suggested adding reference to ocean acidification, noting it is a key finding of AR5. Authors preferred including this idea in the subsequent headline statement addressing anthropogenic emissions instead. The headline statement was agreed as presented.

On a paragraph noting that **ocean warming** dominates the increase in energy stored in the climate system, the Netherlands, supported by Norway and Germany, called for including Figure 1.2 from the longer report, which illustrates the heat content of oceans compared to that of the atmosphere, to demonstrate to policymakers how the climate system works. He also called for specifying that ocean warming accounts for “93%” of the increase in energy stored in the climate system, instead of “more than 90%,” and referring to the 1% of energy that is stored in the atmosphere. Participants agreed to add a sentence noting that only 1% of the energy accumulated between 1971 and 2010 is stored in the atmosphere, while keeping the rest of the paragraph as presented. They also agreed to reference the Figure from the longer report in the SPM, without actually including the Figure itself.

There was much debate regarding a paragraph referring to **increased oceanic uptake of CO₂ and resulting acidification**. Switzerland, the US, Ireland and others felt that a proposed additional clause specifying that “a decrease of 0.1 in the pH of ocean surface water since the beginning of the industrial era

corresponds to a 26% increase in hydrogen ion concentration” was too technical. Various proposals were made for improving the text. The US, supported by Norway, preferred referring specifically to acidity, while Norway proposed putting the technical text in a footnote, noting, with Germany, the Netherlands and the UK, the need to show that a 0.1 pH decrease is significant.

WGI Co-Chair Stocker proposed using approved WGI text in the footnote, stating that “pH is a measure of acidity using a logarithmic scale: a pH decrease of one unit corresponds to a 10-fold increase in hydrogen ion concentration, or acidity.” The US and Germany objected to this, noting it was still too technical. The UK, supported by the US, Belgium and Saint Lucia, but opposed by the Russian Federation, Switzerland, Saudi Arabia and Brazil, proposed adding a statement that “the current rate of ocean acidification is unprecedented in the last 65 million years.” An author noted inadequate evidence for including, in the SYR, a statement covering such a long time span.

Following small group discussions on the issue, participants approved text, which notes that “since the beginning of the industrial era, oceanic uptake of CO₂ has resulted in acidification of the ocean; the pH of ocean surface water has decreased by 0.1 (*high confidence*), corresponding to a 26% increase in acidity, measured as hydrogen ion concentration.” The text also refers to the longer report for more details.

On a sentence stating that over the last two decades the **Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent**, Norway proposed reflecting that the Greenland and Antarctic ice sheets have been losing mass “at an increasing rate.” Saint Lucia preferred “at an accelerated rate.” An author explained that the sentence as presented reflected a statement of robust evidence. Spain, with Mexico, requested including numbers on the changes in the cryosphere from Figure 1.1 of the longer report. An author said that adding greater detail would require substantial space and is inappropriate in the SPM.

The UK, with France, noted a lack of balance between this sentence and a subsequent one addressing the trend of increased sea ice extent around Antarctica, stressing that what is happening in the Arctic is graver than in Antarctica, and proposed drawing more on the WGI SPM and quantifying the issue of sea ice in the two regions.

After further consultation, the authors proposed separating the text into two paragraphs: one on loss of mass in the Greenland and Antarctic ice sheets, glacier shrink and decrease in spring snow cover in the Northern Hemisphere; and another one that includes differences in Arctic and Antarctic changes in sea ice extent. Noting recent studies published since the cutoff date of AR5 that call into question the increase in sea ice extent around Antarctica, the US questioned the usefulness of including very specific numbers in this regard. An author explained that these recent studies had not yet been properly assessed and remained controversial, and that the numbers proposed in the text were still considered valid as an annual mean rate per decade.

Participants agreed to the revised text as presented by the authors, including referring to the percentage changes in annual mean sea ice extent in ranges per decade for both the Arctic and Antarctic.

On a sentence stating that the **rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia**, the Netherlands sought to reflect the acceleration of global mean sea level rise since 1901. An author pointed to regional and decadal variability, and delegates accepted the text as presented.

There was much discussion, beginning in plenary on Tuesday, on **Figure SPM.1 consisting of four panels on: (a) land and ocean surface temperature; (b) sea-level change; (c) atmospheric GHG concentrations; and (d) global anthropogenic CO₂ emissions**. Following a number of proposals to include a diagram from the longer report on Arctic and Antarctic sea ice, WGI Co-Chair Stocker highlighted differences in the nature and quality of data from the Arctic and the Antarctic. He expressed concern over bringing this diagram to the SPM, noting lack of space to provide the necessary scientific evidence to put the diagram in the correct perspective. The diagram from the longer report was therefore not included.

There was some debate over whether to move panel (d) on global anthropogenic CO₂ emissions to the subsection on causes of climate change or maintain it in its present position in the section on observed changes in the climate system. The Republic of Korea, China, Venezuela, Nicaragua, Saudi Arabia and India proposed deleting this panel, noting it was not relevant in this section. The authors supported maintaining the panel as presented, noting that it acts as a bridge between the two subsections, and reflects the same time scale as the other panels in the figure.

Saudi Arabia opposed singling out emissions from land use, and burning of fossil fuels and cement production, and proposed, if the panel remained, referring to all sources of emissions. Italy suggested indicating that the panel refers to major sources of emissions. The US suggested citing emissions by GHGs rather than by sector. China suggested further consultations on the issue. A small group, co-chaired by Katrine Krogh Andersen (Denmark), and Arthur Rolle (Bahamas), convened to further discuss this issue. The group met multiple times throughout the week.

On Friday night, Co-Chair Rolle reported that the group had been unable to reach consensus on the caption and subtitle of panel (d) on global anthropogenic CO₂ emissions, and that every avenue to reach agreement had been exhausted. He felt that if the group had gone any further, it would have crossed the boundary of robust science.

The figure and its caption were forwarded back to plenary for further consideration, where an author explained that the figure represented a synthesis of the WGs' contributions and showed observations of key indicators in the climate system, and of CO₂ emissions in particular, which are important for understanding human influence. He said focusing on CO₂ as the main driver of climate change was appropriate as it has a long atmospheric lifetime.

Objecting to the figure, Saudi Arabia expressed concern that the panel did not include data for GHGs other than CO₂ and requested that a subtitle be added to note that other GHG

emissions data were not assessed for this timeframe due to lack of data availability prior to 1970. He cautioned that incorrect correlations between panels (a)-(c) and (d) may be inferred without explicit textual safeguards in the caption. WGI Co-Chair Stocker drew the Panel's attention to the subtitle of panel (d) stating that "quantitative information on CH₄ and N₂O emission time series from 1850 to 1970 is limited."

Stocker emphasized that it was not possible to bring all GHGs into one coherent figure, and pointed to new text in the caption stating that "the complex relationship between observations shown in panels (a)-(c) and the emissions in panel (d) is addressed in Section 1.2 and Topic 1." Austria, supported by Sweden, proposed giving this statement more prominence and it was moved to the beginning of the caption. China, Norway, Sweden, the EU, Denmark, Canada, the UK, Ireland, the Netherlands, New Zealand, Chile and others urged approval of the figure.

Saudi Arabia proposed language stating that "other GHGs were not assessed due to limited data," which the authors said would be scientifically incorrect. Following protracted discussions, Saudi Arabia said it could accept, in the spirit of compromise, the figure as amended by Austria. With additional minor changes, Figure SPM.1 was approved.

Final SYR SPM Text: The headline of this subsection states that: warming of the climate system is unequivocal; since the 1950s, many of the observed changes are unprecedented over decades to millennia; and the atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.

The subsection includes paragraphs on:

- each of the last three decades being successively warmer at the Earth's surface than any preceding decade since 1850;
- the sensitivity to beginning and end dates of trends based on short records given decadal and interannual variability; and
- ocean warming accounting for more than 90% of the energy accumulated between 1971 and 2010.

It also addresses, *inter alia*: increases in precipitation; oceanic uptake of CO₂ resulting in ocean acidification; the Greenland and Antarctic ice sheets mass loss, worldwide shrinking glaciers and spring snow cover decrease in the Northern Hemisphere; and global mean sea level rise from 1901-2010.

The subsection also includes a figure that contains panels on: globally averaged combined land and ocean surface temperature anomaly; globally averaged sea level change; globally averaged GHG concentrations; and global anthropogenic CO₂ emissions, as well as a smaller panel on cumulative CO₂ emissions.

2. FUTURE CLIMATE CHANGES, RISKS AND IMPACTS: Regarding a **headline statement** stating that "a combination of adaptation and substantial, sustained reductions in GHG emissions can limit climate change risks," Saudi Arabia, supported by El Salvador, proposed either moving the word "substantial" to qualify both adaptation and emission reductions, or reverting to WGII SPM language. Saint Lucia, opposed by Canada, proposed an additional sentence from the WGII SPM, stating that some risk from adverse impacts will remain for all levels of adaptation and mitigation. The Panel did not take onboard these suggestions, and the headline statement was agreed with slight modifications proposed by authors.

Final SYR SPM Text: The headline states that continued GHG emissions will cause further warming and long-lasting changes in the climate system, and that limiting climate change requires substantial and sustained GHG reductions.

2.1: Key Drivers of Future Climate: There was much discussion on a sentence stating that **Representative Concentration Pathways (RCPs) describe four different 21st century evolutions** of atmospheric GHG emissions and concentrations, air pollutant emissions and land-use change. New Zealand, opposed by Canada, proposed replacing reference to “evolutions” with “trajectories.” Norway preferred “pathways” or “realizations.” An author suggested “pathways,” which was accepted.

With regard to land-use change, Saudi Arabia stressed the need for a more comprehensive representation of sources of emissions and requested inclusion of reference to agriculture, forestry and other land use (AFOLU). An author proposed including reference to afforestation or deleting “change” when mentioning “land use” in order to address Saudi Arabia’s concern. Brazil, Argentina and Japan questioned this proposal but agreed to it following the author’s explanation that referring to pathways of land use would be the best option.

On a sentence stating that the RCPs include a mitigation scenario leading to a very low forcing level (RCP2.6), two stabilization scenarios (RCP4.5 and RCP6.0), and a scenario with very high GHG emissions (RCP8.5), Canada, supported by Finland, Saint Lucia and the UK, proposed simplifying language by referring to “a stringent mitigation scenario” and “two intermediate scenarios.” This was accepted.

Participants discussed a sentence stating that since **cumulative CO2 emissions determine peak warming**, higher emissions in the next few decades imply lower emissions in later decades to limit warming to the same level. Noting the statement contains no uncertainty, the UK suggested the term “require” instead of “imply.” In response to a question by Saudi Arabia on the use of CO2 emissions instead of GHG emissions, the authors explained that only long-lived gases, such as CO2, are of interest in determining peak warming. China, with Saudi Arabia, suggested using approved language from WGI SPM instead, which states that any given level of warming is associated with a range of cumulative CO2 emissions, and, for example, higher emissions in earlier decades imply lower emissions later. Participants agreed to the proposal by China and Saudi Arabia. Participants also agreed to insert a footnote from the WGI SPM explaining that quantification of this range of CO2 emissions requires taking into account non-CO2 drivers.

On Tuesday evening, the Panel began addressing a paragraph stating that “**limiting total human-induced warming to be likely less than 2°C relative to the period 1861-1880** will require cumulative CO2 emissions from all anthropogenic sources since 1870 to remain below about 2900 GtCO2,” and that “two-thirds of this amount had already been emitted by 2011.” WGI Co-Chair Stocker explained that the statement was a synthesis and that although it was based mostly on WGI language, it incorporated work undertaken by WGIII as well. He also noted that the most policy-relevant question the authors had been asked to address was what it meant to limit human-induced warming to 2°C in quantitative terms.

Brazil opposed the expression “will require” as too prescriptive, preferring a suggestion by Switzerland, Japan and others to refer to “is associated with” or “are characterized by.” The authors explained that “will require” did not refer to scenarios or to policy, but was a statement of fact about the climate system, and was agreed language from WGI.

Various suggestions were made to clarify the language, with the authors agreeing to note that the range depended on non-CO2 drivers. The authors also suggested referring to a “>66% probability “of limiting warming to less than 2°C instead of language reading “to be likely less than 2°C.” Citing the need for balance, Saudi Arabia objected to including only data for a >66% probability and, opposed by Norway, the UK, Germany, Sweden, the Netherlands, Chile, Japan, Austria and others, called for also including equivalent information for >50% and >33% probabilities. The US proposed including Table 2.2 from the longer SYR report, which shows cumulative CO2 emission budgets related to three different temperature goals at different probability levels.

Noting that synthesizing all probabilities from the WGs in this paragraph would be unmanageable, the authors proposed adding reference to additional probability levels in a footnote instead. Norway, Denmark, the UK, Germany, Canada and many others agreed to the authors’ proposal, but Saudi Arabia disagreed. Discussions on both Brazil’s and Saudi Arabia’s concerns continued in a small group. On Wednesday morning, the US reported that the small group had reached a compromise, which modifies the paragraph text and creates two new footnotes. The Panel agreed to the modified text, which specifies that “multi-model results show that” limiting total human-induced warming to less than 2°C relative to 1861-1880 with a probability of >66% “would require” cumulative CO2 emissions from all anthropogenic sources to remain below about 2900 GtCO2 and that “about 1900 GtCO2” had already been emitted by 2011. The text also refers to Table 2.2 in the longer report “for additional context.” The footnotes refer to the probabilities of limiting warming to 2°C under the alternative emissions scenarios of 3000 GtCO2 and 3300 GtCO2.

Final SYR SPM Text: The headline for this subsection states that cumulative CO2 emissions largely determine global mean surface warming by the late 21st century and that projections of GHG emissions vary greatly depending on socio-economic development and climate policy.

This subsection includes paragraphs on: the use of RCPs for making projections on anthropogenic GHG emissions; and the almost linear relationship between cumulative CO2 emissions and projected global temperature change. It also states that multi-model results show that limiting total human-induced warming to less than 2°C relative to 1861-1880 with a >66% probability requires cumulative anthropogenic CO2 emissions since 1970 to remain below about 2900 GtCO2.

The subsection includes Figure SPM.5 on annual anthropogenic CO2 emissions in the RCPs and the associated WGIII scenario categories, reflected as warming versus cumulative CO2 emissions.

2.2: Projected Changes in the Climate System: Regarding a headline stating that that **surface air temperature is projected to rise over the 21st century under all assessed emission scenarios**, and that the ocean will continue to warm and acidify

and global mean sea level will continue to rise, the Panel agreed to include references to heat waves and extreme precipitation events. The UK suggested adding language noting that the scale and magnitude of the rate of change depends on emission scenarios, but after comments from WGI Co-Chair Stocker and Saudi Arabia on the need for short and concise headline statements, the Panel agreed to the text as earlier amended without the addition proposed by the UK.

Participants discussed a paragraph stating that the **global mean surface air temperature change for the period 2016-2035 relative to 1986-2005** is similar for the four RCPs and will *likely* be in the range 0.3°C-0.7°C. On a sentence explaining that this assumes the absence of any major volcanic eruptions or secular changes in total solar irradiance, Saudi Arabia requested, and participants agreed, to add “changes in natural sources (e.g., CH₄ and N₂O)” to the assumption. Canada, Australia, the UK and South Africa called use of the term “secular” inappropriate in this context, and Ireland suggested replacing the term with “unexpected,” which was accepted.

On a paragraph projecting **global surface temperature changes for 2081-2100**, an author explained that the *high confidence* that had been given to the projection that warming is *more likely than not* to exceed 2°C for RCP4.5 in the WGI technical assessment and SPM was an error that was currently being corrected. Participants then approved the paragraph as presented, with a “*medium confidence*” level given to that projection, instead of “*high confidence*.”

On a sentence stating that the **increase in global mean surface temperatures** is *likely* to be 0.3-1.7°C under RCP2.6 and 2.6-4.8°C under RCP8.5, Japan requested specifying temperature ranges for the other RCP scenarios. WGI Co-Chair Stocker proposed adding the ranges of 1.1-2.6°C under RCP4.5 and 1.4-3.1°C under RCP6.0, which was accepted. Following Saudi Arabia’s proposal to specify the time period, Stocker suggested inserting “by the end of the 21st century (2081-2100) relative to 1986-2005,” which was agreed.

Regarding **Figure SPM.6** containing panels **on global average surface temperature change and on global mean sea level change**, India asked to reflect data from 1950 onwards. An author explained that while this was possible for surface temperature, no simulations were available for sea level for this time period, and stressed the need to maintain consistency between the two panels in the figure. He added that Figure 2.1 in the longer report contains multiple panels with a historical record of surface temperatures going back to 1900. On the figure’s caption and title, the Netherlands requested reference to sea level “rise” instead of “change,” to reflect increases illustrated in the figure, which was approved.

Regarding a footnote to the figure’s caption stating that based on current understanding only the collapse of marine-based sectors of the Antarctic ice sheet, if initiated, could cause global mean sea level to rise substantially above the likely range during the 21st century, Saudi Arabia questioned the meaning of “current understanding.” An author suggested adding “observations, physical understanding and modelling” for clarification, which was agreed.

Participants discussed **Figure SPM.7** with panels on **changes in average surface temperature and changes in average precipitation** from 1986-2005 to 2081-2100. Responding to

a request by Saudi Arabia to add a disclaimer in the Figure’s caption on models’ potential deficiencies or uncertainty, WGI Co-Chair Stocker, with the Netherlands, noted that this concern is addressed by the terminology used, such as “multi-model means” and “likely ranges,” as in other approved figures and the underlying assessment. Figure SPM.7 was approved with minor editorial amendments.

On a sentence stating that **ocean acidification** is “projected to increase for all RCP scenarios, with a decrease in surface ocean pH in the range of 0.06 to 0.07 for RCP2.6, and of 0.30 to 0.32 for RCP8.5,” Japan requested reflecting data for the other two RCP scenarios as well. Germany, with Saint Lucia, said that the statement on a decrease in surface ocean pH for all RCP scenarios was misleading, and noted that under RCP2.6 ocean acidification slowly begins to decline from the mid-21st century. Authors proposed revised text to reflect these concerns, which participants accepted.

On a sentence stating that a “**nearly ice-free Arctic Ocean** in the summer sea-ice minimum in September before mid-century is *likely* for RCP8.5,” Canada questioned the statement’s appropriateness for this scenario. An author proposed adding a footnote with text from the WGI SPM, stating that it is “based on an assessment of the subset of models that most closely reproduce the climatological mean state and 1979-2012 trend of the Arctic sea ice extent,” which was accepted. Sweden suggested capturing the amount of sea ice reduction, but an author explained that raising these details in the SPM would result in a lack of balance. The rest of the paragraph was approved as presented.

Regarding a paragraph on **global mean sea level rise projected to continue during the 21st century**, Saudi Arabia suggested adding a sentence to reflect the significant advancement of science on this issue since AR4. WGI Co-Chair Stocker responded that the new information was too complex to reflect in the SYR and that it is contained in the WGI assessment. He proposed, instead, inserting text stating that “there has been significant improvement in understanding and projection of sea level change since AR4,” and specifying that “for the period 2081-2100 relative to 1986-2005,” the rise will likely be in the ranges of 0.26 to 0.55 meters for RCP2.6, and of 0.45 to 0.82 meters for RCP8.5.

Final SYR SPM Text: The headline for this subsection states that: surface temperature is projected to rise over the 21st century under all assessed emission scenarios; heat waves will be longer and more frequent; and extreme precipitation will become more intense and frequent in many regions.

Paragraphs in this subsection highlight:

- the committed warming caused by past and future anthropogenic emissions and natural climate variability;
- the likelihood of global surface temperature exceeding 1.5°C or 2°C by 2100;
- the differences in global mean surface temperature by 2100 under different RCPs;
- the virtual certainty of more frequent hot and fewer cold temperature extremes over most land areas;
- the nonuniformity of changes in precipitation;
- the continued warming of the global ocean;
- increases in ocean acidification under all RCP scenarios;
- year-round reductions in Arctic sea ice;

- the reduction of near-surface permafrost as temperature increases; and
- the decrease in global glacier volume; and sea level rise projections.

2.3: Future Risks and Impacts Caused by a Changing Climate:

There was much debate on a headline sentence stating that climate change will amplify existing risks and create new risks for natural and human systems in countries at all levels of development. Bolivia, with Venezuela, Chile, Nicaragua, Ecuador, Brazil, Cuba, the Dominican Republic, China, Mexico, Argentina and Morocco, stressed the need to add reference to risks being “greater for people and communities with greater disadvantages,” with Venezuela calling for further emphasis on developing countries. Switzerland signaled that these concerns are already addressed in the longer report. Referring to **Figure SPM.8** (regional key risks and potential for risk reduction), Austria pointed to the limits of comparing risk levels across regions and, similarly, the difficulty of conducting a robust assessment of risks among countries. The US suggested, and participants agreed, to text stating that “risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.”

The US, supported by the UK and opposed by Saint Lucia, Switzerland, the Bahamas and Austria, suggested moving a sentence stating that “greater rates and magnitude of climate change increase the likelihood of exceeding adaptation limits” to the section dealing with adaptation. This was agreed and the sentence was included in the headline statement of subsection 3.3 on characteristics of adaptation pathways.

Participants discussed a sentence stating that the **risks of climate change impacts depend on** the magnitude and rate of climate change, and on the vulnerability and exposure of affected human and natural systems. The Netherlands and Turkey raised concerns over the definition of risk, with the Netherlands suggesting defining it as “a combination of exposure to hazards and vulnerability,” and Turkey proposing referring to the “probability of climate change.” To address these concerns, WGII Co-Chair Christopher Field proposed alternative language stating that risks of climate-related impacts result from the interaction of climate-related hazards with the vulnerability and exposure of human and natural systems, including their ability to adapt. Switzerland and Norway stressed the importance of referring to the magnitude and rate of climate change, and Field proposed to do so in a subsequent sentence on rising magnitudes of warming and other changes in the climate system, which was approved with the addition of reference to rates of warming.

Participants discussed a sentence stating that the **“overall risks of climate change impacts can be reduced** by limiting the rate and magnitude of CO₂ emissions and thus climate change, including ocean acidification.” Switzerland, Bolivia, Saudi Arabia, Venezuela and Australia favored replacing “CO₂” with “GHG” emissions. The US observed that the original SYR SPM formulation referring to the rate and magnitude of “climate change” was clearer, and the Panel agreed to this change.

The Netherlands, supported by the US, proposed inserting a new sentence on the **determination of risk**. With further suggestions by an author and WGII Co-Chair Field, the new

sentence states that evaluating the widest possible range of impacts, including low-probability outcomes with large consequences, is important for risk assessment.

Regarding a sentence stating that **plants cannot naturally move sufficiently fast to keep up with current and high projected rates of climate change in most landscapes**, Canada, with Japan, suggested referring to “plant species” that cannot “migrate” fast enough, while the Netherlands suggested “seed plants.” After some debate and other textual suggestions by India and the Bahamas, participants agreed to text saying “most plant species cannot naturally shift their geographical ranges.”

On a sentence stating that coastal systems are at risk from sea level rise, India suggested adding reference to low-lying areas, which was agreed.

Regarding **Figure SPM.8 on regional key risks and potential for risk reduction**, the US requested that language on limits to adaptation be included, to which Field responded that assigning probability levels to adaptation prospects in the future was difficult. The figure was approved as presented.

Regarding the caption, participants discussed at length a sentence stating that “for each timeframe, risk levels are indicated for a continuation of current adaptation and for a highly adapted state.” Saint Lucia preferred to refer to “hypothetical highly adapted state,” in line with the WGII SPM, and sought clarification on methodology and underlying assumptions. Field explained that in the WGII SPM “hypothetical” was only used in relation to the present, while “highly adapted state” was appropriate when referring to the future. Regarding methodology, an author clarified that “highly adapted state” corresponded to the best possible adaptation within reasonable limits. Saudi Arabia requested that “highly adapted state” be defined, in response to which Field proposed replacing it with “assuming high levels of current or future adaptation,” which was agreed.

On a sentence stating that “risk levels are not necessarily comparable across regions,” Austria proposed “especially across regions” in line with the WGII SPM, which was accepted after some discussion.

On a sentence stating that **global temperature increases of 4°C or more**, combined with increasing food demand, would pose large risks to food security globally and regionally, Saint Lucia emphasized the need to address local implications of a 4°C temperature increase in tropical areas. Following informal consultations, participants agreed to address Saint Lucia’s concern by: deleting the reference to regional risks to food security in the text; inserting a footnote stating that “projected warming averaged over land is larger than global average warming for all RCP scenarios for the period 2081-2100 relative to 1986-2005”; and referring to Figure SPM.7 (change in average surface temperature and average precipitation) for regional projections, as suggested by the Netherlands.

Saint Lucia expressed concern over a sentence stating that **species redistribution and biodiversity reduction in the oceans** will challenge sustained provision of fisheries productivity and other ecosystem services, especially in countries at low latitude. Participants agreed to add that this is “due to projected climate change by the mid-21st century and beyond,” and the sentence was approved with other minor amendments.

On the upper portion of **Figure SPM.9** titled “**Climate change poses risks for food production,**” which shows the projected global redistribution of maximum catch potential, Canada expressed concern over the underlying uncertainty due to the figure’s derivation from a single climate model, and requested that this be reflected in the caption.

On a sentence in the figure’s caption noting that projections use scenario A1B from the Special Report on Emissions Scenarios (SRES) to compare the 10-year averages for 2001-2010 and 2051-2060, and following requests for less technical language, an author proposed, and participants agreed, to replace the reference to SRES A1B with “ocean conditions based on a single climate model under a moderate to high warming scenario.”

On a sentence noting that **climate change is expected to lead to increases in ill-health in many regions,** “especially in developing countries with low income,” India, Saudi Arabia, the Bahamas and others noted that vulnerability was not necessarily linked to income in developing countries. Responding to a query from Saudi Arabia, an author said that the definition of low-income developing countries was derived from a World Bank categorization, to which Saudi Arabia replied that, for the record, they did not recognize the World Bank’s income categorization and only recognized developed and developing countries as categories. The Panel agreed to use approved language from WGII SPM, and add, at the end of the sentence, “compared to a baseline without climate change.”

Regarding a paragraph on **expected impacts of climate change in urban and rural areas,** participants agreed to proposals from Ecuador to add landslides and from the Bahamas to add drought and air pollution to a list of risks in urban areas. Participants also agreed to a US proposal to add assets to a list of items that may be affected by increased risks.

On a sentence stating that **aggregate economic damages accelerate with increasing temperature,** Japan, supported by Switzerland, proposed adding text noting that few quantitative estimates have been completed for additional warming of around 3°C and above. The US suggested, as an alternative, text stating that global economic impacts from climate change are difficult to estimate. Following queries from Switzerland, supported by Morocco, participants accepted a suggestion from South Africa to specify that global economic impacts are “currently” difficult to estimate. Participants agreed to a proposal from India to substitute “losses” for “damages.”

Responding to a query from Saudi Arabia, WGII Co-Chair Field proposed adding a sentence from the WGII SPM at the end of the paragraph, stating that “international dimensions such as trade and relations among states are also important for understanding the risks of climate change at regional scales.” This addition was agreed.

Regarding a sentence on **climate change indirectly increasing risks of violent conflicts** in the form of civil war and intergroup violence by amplifying well-documented drivers of these conflicts, such as poverty and economic shocks, Venezuela, with Nicaragua, Bolivia and Ecuador, opposed reference to civil war. Nicaragua said the sentence contained a political message and suggested deleting it. An author explained that the statement was “sharply focused on scientific findings” and emphasized the need to keep the wording as presented. IPCC Chair Pachauri

characterized the finding as one of the strongest in the WGII report and cautioned against deleting it. Canada proposed alternative wording without reference to civil war and intergroup violence. With additional revisions from the authors and removal of reference to civil war and intergroup violence, this paragraph was accepted.

Final SYR SPM Text: The headline for this subsection states that climate change will amplify existing risks and create new and unevenly distributed risks for natural and human systems.

This subsection includes paragraphs on:

- the risk of climate-related impacts resulting from the interaction of climate-related hazards;
- the increased risk of extinction for many species;
- the undermining of food security, redistribution of global marine species and reduction of marine biodiversity;
- impacts on human health; increased risks for people, assets, economies and ecosystems in urban areas;
- major impacts on water, food security, infrastructure and agricultural incomes in rural areas;
- the acceleration of aggregate economic losses with increasing temperature; and
- the increased displacement of populations and increasing risks of violent conflicts indirectly attributable to climate change through its amplification of conflict drivers, such as poverty and economic shocks.

It also includes figures on representative key risks for each region and on projected global redistribution of marine fish and invertebrate species.

2.4: Climate Change beyond 2100, Irreversibility and Abrupt Changes: There was much discussion on a paragraph stating that the **anthropogenic contribution to temperatures will remain at elevated levels** for many centuries after a complete cessation of emissions. Saudi Arabia said the text lacked balance and preferred to use language from the WGI SPM, which notes that this would depend on the scenarios used. Chile said this sentence had nothing to do with scenarios, but rather with different response times in the climate system. WGI Co-Chair Stocker expressed hesitance to mention scenarios and suggested noting that substantial continued warming is expected if emissions continue beyond 2100. The EU, Norway, Belgium and others proposed language reflecting that CO₂ remains in the atmosphere for a long time. Following a request by Germany, authors proposed adding a sentence that substantial continued warming is expected if emissions remain high beyond 2100. Belgium suggested, and participants agreed, to refer to “additional” instead of “continued” warming.

Discussions continued in a small group, after which the authors presented amended text. Debate ensued on a proposed sentence stating that “after 2100, substantial additional warming is expected if GHG emissions remain high,” with Saudi Arabia questioning use of the qualifier “substantial.”

Following consultations between Saudi Arabia and the authors, WGI Co-Chair Stocker presented a revised proposal for the paragraph, which included the removal of reference to “substantial” warming. Norway, with the UK, Slovenia and others, questioned this deletion. The authors, with Norway, the UK, Chile, Slovenia, Belgium, Germany, and others, and opposed by Saudi Arabia, proposed using a sentence from the

WGI SPM instead, stating that “warming will continue beyond 2100 in all RCP scenarios except RCP2.6.” Following protracted discussions, the Panel agreed to this wording.

Final SYR SPM Text: The headline for this subsection states that many aspects of climate change and associated impacts will continue for centuries even if anthropogenic GHG emissions are stopped, and that the risks of abrupt or irreversible changes increase as the magnitude of warming increases.

The subsection includes paragraphs on: the continuation of warming beyond 2100 under most RCP scenarios; the potential lack of stabilization of all aspects of the climate system even if temperature stabilizes; the increase of ocean acidification if CO2 emissions continue; continuing global mean sea level rise for centuries, depending on future emissions; and the increased risk of abrupt and irreversible regional changes associated with medium- to high-emission scenarios.

3. FUTURE PATHWAYS FOR ADAPTATION, MITIGATION AND SUSTAINABLE DEVELOPMENT:

Commenting on this section in general, Saudi Arabia, Qatar, Bolivia, and China expressed concern that sustainable development was not emphasized enough and requested use of approved language from WGIII. Saudi Arabia also expressed general concern over a lack of balance between adaptation and mitigation.

Regarding the title of this section, Bolivia proposed replacing “Transformations and changes in systems,” with “Climate-resilient pathways for sustainable development.” Authors suggested “Future pathways for adaptation, mitigation and sustainable development.” Switzerland objected, favoring the original formulation, noting “transformation” is one of the new concepts introduced in AR5 and had already been communicated in the WG reports. Following additional discussions, participants accepted the proposed reformulation as revised by the authors.

Final SYR SPM Text: The headline for this section states that **adaptation and mitigation are complementary strategies** for reducing and managing the risks of climate change, and that substantial emission reductions over the next few decades can: reduce climate risks in the 21st century and beyond; increase prospects for effective adaptation; reduce mitigation costs and challenges in the longer term; and contribute to climate-resilient pathways for sustainable development.

3.1: Foundations of Decision-making about Climate Change: In reference to a headline statement on **analytical approaches to inform decision making on limiting climate change and its effects**, Bolivia requested inserting reference to “issues of equity, justice and fairness,” while Saudi Arabia noted the need to also refer to cultural values, among others. Authors proposed, and participants agreed to, text recognizing the importance of “governance, ethical dimensions, equity, value judgments, economic assessments and diverse perceptions and responses to risk and uncertainty.”

Lengthy discussions ensued regarding a paragraph on the **relationship of adaptation and mitigation to sustainable development and poverty eradication**. Participants discussed a sentence stating that mitigation and adaptation raise issues of equity, justice and fairness, and are necessary to achieve sustainable development and poverty eradication. After a reworking of the text by authors in line with a proposal by Brazil, participants agreed to an alternative formulation stating

that: sustainable development and equity provide a basis for assessing climate policies; limiting the effects of climate change is necessary to achieve sustainable development and equity, including poverty eradication; and mitigation and adaptation raise issues of equity, justice and fairness.

On a sentence stating that **countries’ past and future contributions to the accumulation of GHGs in the atmosphere** are different, and countries also face varying challenges and circumstances and have different capacities to address mitigation and adaptation, Saudi Arabia requested adding reference to the concepts of equity and common but differentiated responsibilities. Brazil and Norway cautioned against changing “carefully crafted text,” and the sentence was approved as presented.

Participants then approved a sentence stating that “many of those most vulnerable to climate change have contributed and contribute little to GHG emissions.”

Regarding a sentence on the risks of delaying mitigation, Saudi Arabia, supported by Venezuela, but opposed by Finland, proposed adding language on how this could undermine action to promote sustainable development. Following small group discussions on this issue, an author reported on agreed text, which states that “delaying mitigation shifts burdens from the present to the future, and insufficient adaptation responses to emerging impacts are already eroding the basis for sustainable development” and that “comprehensive strategies in response to climate change that are consistent with sustainable development take into account the co-benefits, adverse side effects and risks that arise from both adaptation and mitigation options.” With the UK’s proposed qualifier that risks “may” arise, this text was approved.

Regarding a statement that **no single best balance exists between mitigation, adaptation and residual climate impacts**, the UK, supported by Finland, called for its deletion. Bolivia, supported by Saudi Arabia, preferred noting that this statement should be considered in the context of sustainable development. Finland, supported by South Africa, the EU and Italy, suggested using approved text that “these methods cannot identify” the single best balance. The approved statement specifies that these methods “cannot identify a single best balance between mitigation, adaptation and residual climate impacts.”

Participants then discussed a paragraph stating that: **climate change has the characteristics of a collective action problem at the global scale**; effective mitigation will not be achieved if individual agents advance their own interests independently; and effective mitigation “will only be achieved through collective responses.”

China, with Venezuela, Bolivia, Brazil and Saudi Arabia, requested reference to international cooperation, with Brazil, China and Saudi Arabia adding that such cooperation must be perceived as equitable. Venezuela proposed also referring to knowledge sharing and technology transfer.

Pakistan suggested stating that international cooperation is required “under the UN framework.” India, with El Salvador, Saudi Arabia, Pakistan and China, requested including reference to adaptation. Brazil, with the EU, stated that adaptation does not possess the characteristics of a collective action problem.

Following informal consultations, authors suggested, and participants agreed, to replace “collective” with “cooperative” responses, and to include new text stating that “evidence suggests that outcomes seen as equitable can lead to more effective cooperation.”

Final SYR SPM Text: The headline states that decision making to limit climate change can be informed by different analytical approaches, and also recognizes the importance of governance, ethical dimensions, equity, value judgments, economic assessments, and diverse perceptions of and responses to risk and uncertainty.

This subsection includes paragraphs on, *inter alia*: sustainable development and equity providing a basis for assessing climate policies; and the design of climate policy being influenced by how individuals and organizations perceive risks and uncertainties and take them into account. It also highlights the issue of climate change as having the characteristics of a collective action problem at the global scale, because most GHGs accumulate over time and mix globally, and emissions by any agent (e.g., individual, community, company, country) affect other agents.

3.2: Climate Change Risks Reduced by Mitigation and Adaptation: On a headline stating that “**mitigation involves co-benefits and risks**, but not the same possibility of severe, widespread and irreversible impacts as risks from climate change,” Saudi Arabia proposed “co-benefits and adverse effects.” Switzerland stressed the need to add some more nuanced language to avoid giving the impression that “all” mitigation actions can have negative impacts, and suggested stating that only “not well-designed” mitigation actions involve risks. Following additional suggestions and revisions, the Panel accepted wording that refers to “co-benefits and risks due to adverse side effects” and included language in the headline statement that these risks do not involve the same possibility of severe, widespread, and irreversible impacts.

Regarding a sentence on **mitigation and adaptation as complementary approaches for reducing risks** of climate change impacts over different time scales, Bolivia requested bringing in WGII language to reflect that adaptation and mitigation take place in the context of sustainable development. Sweden and Australia preferred maintaining the text as is, and the sentence was accepted as presented.

Regarding a statement that **investments in mitigation can reduce climate change** in the latter decades of the 21st century and beyond, Bolivia called for deletion of the reference to “investments,” noting it usually refers to financial transfers. The sentence was accepted with this deletion.

Regarding a sentence on **realizing adaptation benefits** over the next few decades, Saudi Arabia proposed including reference to a larger time scale, and participants agreed to “in the future” instead of “over the next few decades.”

On a sentence stating that **some risks of climate change are considerable at 1°C or 2°C above preindustrial levels**, Saint Lucia proposed including examples of risks, such as those associated with extreme events, and qualifying the risks as “moderate to high” instead of “considerable.” Saudi Arabia suggested noting risks to socio-economic systems as well. The sentence was agreed with the proposal from Saint Lucia.

Regarding a sentence stating that **limiting risks related to the Reasons for Concern (RFCs)** implies a limit for future cumulative CO₂ emissions, Saudi Arabia and Australia, opposed by Germany, France, the US, Spain, Saint Lucia and others, preferred referring to emissions from all GHGs. Austria, with Spain, the UK, Italy, Brazil and China, proposed deleting reference to “future” before cumulative CO₂ emissions, noting cumulative emissions represent the past and present as well. The Panel agreed to the text as presented with the deletion of “future” and another minor editorial amendment.

Saudi Arabia questioned the source of a sentence stating that, in an iterative risk management framework, inertia in the economic and climate system and the **possibility of irreversible impacts from climate change** increase the benefits from near-term mitigation efforts. An author explained that the text was a synthesis bringing together elements from different WGs. Chair Pachauri said a reference would be added to provide details on the source of the information. Participants agreed to a request by Saudi Arabia to simplify the language for policymakers’ understanding, and to a suggestion by Canada to delete the reference to the iterative risk management framework, and approved the remainder of the sentence as presented.

Noting that it constituted a major feat of synthesis of the work of the three WGs, Chair Pachauri introduced **Figure SPM.10**, showing how **future risks from climate change depend on cumulative CO₂ emissions, which in turn depend on annual emissions over the next decades**. An author presented the figure, explaining that it allowed for cross-checking the relationship between risks as in RFCs (panel A) and cumulative CO₂ emissions (panel B), and the corresponding constraints in annual emissions by 2050 (panel C). The figure and its caption were approved as presented, with the insertion of reference to GHG emissions in panel C instead of CO₂ equivalent, and other revisions for consistency and precision.

Final SYR SPM Text: The headline statement for this subsection warns that without additional mitigation efforts beyond those in place today, and even with adaptation, warming by the end of the 21st century will lead to high to very high risk of severe, widespread and irreversible impacts globally. It further states, *inter alia*, that risks due to adverse side effects of mitigation do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change.

The subsection contains paragraphs on, *inter alia*: how mitigation and adaptation are complementary approaches for reducing risks of climate change impacts over different time scales; how substantial cuts in GHG emissions over the next few decades can substantially reduce climate change risks by limiting warming in the second half of the 21st century and beyond; and five “Reasons For Concern, i.e., unique and threatened systems, extreme weather events, distribution of impacts, global aggregate impacts, and large-scale singular events.

This subsection also includes Figure SPM.10 illustrating the relationship between risks from climate change, temperature change, cumulative CO₂ emissions and changes in annual GHG emissions by 2050.

3.3: Characteristics of Adaptation Pathways: Regarding a headline sentence stating that “taking a longer-term perspective increases the likelihood that more immediate adaptation actions

will also enhance future options and preparedness,” Switzerland proposed to add “in the context of sustainable development,” which was agreed.

Following a request by Bolivia regarding a sentence on the **contribution of adaptation to the well-being of populations, the security of assets and the maintenance of ecosystem services**, participants agreed to insert a reference to ecosystem “goals and functions.”

Regarding a sentence on the **importance of building adaptive capacity** for effective selection and implementation of adaptation options, Germany, supported by China and Saudi Arabia, called for adding language on the need to integrate adaptation into all development planning. Referring to a suggestion by authors to add approved text from WGII SPM stating that integration of adaptation into planning and decision making can promote synergies with development and disaster risk reduction, Saudi Arabia, with El Salvador and opposed by Canada, requested referring to “policy design” instead of “decision making,” noting that the statement is mainly addressed to governments and that the private sector’s involvement in adaptation is insignificant in his country. Participants agreed to refer to integrating adaptation “into planning, including policy design, and decision making.”

Bolivia, supported by Saudi Arabia and Pakistan, said the SYR was “completely unbalanced,” with only three paragraphs on adaptation and four pages on mitigation. He stressed the need to include additional paragraphs in this section to reflect the richness of issues related to adaptation contained in the WGs’ reports, including on co-benefits and traditional knowledge of indigenous peoples. A small informal drafting group convened to further discuss this issue.

In response to a request to expand strategic coverage for adaptation, the authors presented and, with minor clarifications, participants approved, four additional paragraphs from the WGII SPM: SPM3.3-1B, SPM3.3-1C, SPM3.3-1D and SPM3.3-2B.

Regarding a paragraph on **limits to adaptation**, the US recalled long discussions on the matter in WGII and suggested using approved language. Participants agreed to replace the paragraph with approved language from the WGII SPM.

Regarding a paragraph on **transformations and how they can enhance adaptation and promote sustainable development**, Bolivia noted that transformations do not occur in a vacuum and called for adding language from WGII’s SPM referring to countries’ own national visions and approaches. He also proposed inserting language on transformational adaptation reflecting “strengthened or altered or aligned paradigms.” Participants agreed to both suggestions.

Final SYR SPM Text: The headline for this subsection states that: adaptation can reduce the risks of climate change impacts, but there are limits to its effectiveness; and taking a longer-term perspective increases the likelihood that more immediate adaptation actions will also enhance future options and preparedness.

This subsection comprises paragraphs on, *inter alia*: contributions of adaptation to the well-being of populations, the security of assets, and the maintenance of ecosystem goods, functions and services; ways to enhance adaptation planning and implementation, and common constraints that can impede them; limits to adaptation and how greater rates and magnitude

of climate change increase the likelihood of exceeding them; and co-benefits, synergies and trade-offs between mitigation and adaptation and among different adaptation responses. It also indicates that transformations in economic, social, technological and political decisions and actions can enhance adaptation and promote sustainable development.

3.4 Characteristics of Mitigation Pathways: On a sentence in the headline stating that “**these pathways require substantial emission reductions over the next few decades and near zero emissions of CO₂ and other long-lived GHGs over the long term,**” the US sought clarification of “over the long term,” asking for something more quantifiable. WG III Co-Chair Ottmar Edenhofer proposed “by the end of the century,” which was agreed. With this and another editorial amendment, the sentence was approved.

On a headline sentence stating that **limiting warming to lower or higher levels involves similar efforts, but on different timescales**, the EU, with the UK, suggested referring to “emission reductions” instead of “efforts.” An author responded that the correct term is “challenges.” With this amendment, the sentence was approved.

Regarding a sentence stating that “**emissions trajectories leading to CO₂eq concentrations in 2100 of about 450 parts per million (ppm) or lower are likely to maintain warming below 2°C over the century relative to preindustrial levels (Table SPM.1, Figure SPM.11),**” China, with Bolivia and Saudi Arabia, requested that information on achieving the 2°C goal through scenarios reaching different CO₂eq concentrations, with different confidence levels, be included as well. Norway, Germany, Denmark, New Zealand, Chile, Slovenia, the EU and Sweden supported the sentence as presented.

WGIII Co-Chair Edenhofer explained that the referenced Table SPM.1 refers to other concentrations and the WGIII SPM contains detailed information, so reproducing it was not necessary. Following a proposal by New Zealand to make the reference to the table and figure more prominent, Edenhofer suggested elaborating the reference in parentheses to read “for pathways leading to alternative levels of warming, see Table SPM.1 and Figure SPM.11.” An author proposed including information on other concentrations in a footnote to address concerns raised by participants.

Bolivia, with Nicaragua, restated their objection to accepting 2°C over the 1.5°C goal. Chair Pachauri responded that the Panel was mandated to look at what happens at 2°C warming.

The sentence, together with the rest of the paragraph, was considered in a small group. Following this, an author reported that a longer, more balanced text was agreed, providing more details on scenarios of reaching the 2°C goal with different CO₂eq concentrations in levels of likelihood. Brazil suggested that the same text be used in other conceptually similar parts of the SPM that had not yet been approved, but Chair Pachauri cautioned against duplication. Participants then approved the entire paragraph and two corresponding footnotes with minor editorial amendments.

The Panel agreed to a paragraph on, *inter alia*, **carbon dioxide removal (CDR) technologies being associated with challenges and risks to varying degrees**. Regarding a proposed footnote stating that CDR methods carry side effects and long-term consequences on a global scale, many

delegations, including the US, Australia, Canada, Norway and Slovenia, requested insertion of a qualifier to indicate that the statement may not apply to all CDR methods. Bolivia pointed to shortcomings associated with these technologies, noting that they do not contribute to sustainable development. The footnote was agreed with the addition of a qualifying statement.

Regarding a new sentence proposed by authors on **non-CO2 forcers in the context of mitigation**, the US, with Australia and Chile, supported a formulation stating that “mitigation of certain short-lived climate forcers can reduce the rate of warming in the short term, but will have a limited effect on long-term warming,” instead of an alternative formulation proposed by the authors stating that “long-term warming is driven mainly by CO2 emissions” and that “reducing emissions of SO2 would cause warming.” Following additional work on the text by authors, participants agreed to reflect that all GHG emissions affect the rate and magnitude of climate change over the next two decades, although long-term warming is mainly driven by CO2 emissions.

Regarding a sentence stating that while the effects of CH4 emissions are well understood, large uncertainties remain regarding the **effects of black carbon**. Norway, Chile, Canada, Austria and Australia requested deletion of the sentence, citing inaccuracies. Canada proposed a new formulation stating that while reduction in emissions of certain short-lived climate gases and aerosols (e.g., methane and black carbon) may reduce the rate of temperature increase in the short term, mitigating cooling forcers (e.g., SO2) would result in a temperature increase. China stressed that this proposal does not sufficiently convey the uncertainty regarding the impacts of black carbon and might imply that black carbon can be mitigated independently, which would be misleading. Noting the complexity involved in synthesizing this issue in one sentence, the authors proposed, and participants agreed to, deleting it.

Participants also debated whether or not to retain a sentence stating that the choice of a metric to calculate CO2eq emissions depends on application and policy context, and contains value judgments. Following calls for its deletion, the author team, supported by Brazil, stressed that the sentence reflects a fundamental policy-relevant finding, noting it is the only instance in the SYR that compares possible non-CO2 and CO2 mitigation options. Following informal consultations, participants agreed to retain the sentence as presented.

Regarding a paragraph on the **aggregate economic costs of mitigation**, a Saudi Arabian proposal to refer to a single global carbon “market” rather than “price” was not accepted, and the text was approved as presented.

The authors presented **Figure SPM.13** on global mitigation costs based on a figure from WGIII. In response to a suggestion by the US, who noted that mitigation costs are insignificant when compared to the projected consumption growth rate, the Panel agreed to add a bar on the side of the figure to represent baseline consumption growth. The figure was retitled “Global mitigation costs and consumption growth in baseline scenarios” and then approved.

Regarding a paragraph on **mitigation costs under limited availability of technologies**, Japan proposed adding nuclear and renewable energies from the WGIII SPM to a list of key technologies highlighted in a sentence on the limits of models in producing scenarios likely to maintain warming to below 2°C

over the 21st century if key technologies are delayed. Following further consultations between Japan, Germany and the authors, the Panel approved listing all the technologies from Table SPM.2 in parentheses in the first sentence, and the text was agreed.

The approved text reads that “in the absence or under limited availability of mitigation technologies (such as bioenergy, CCS [carbon capture and storage] and their combination, BECCS [bioenergy with CCS], nuclear, wind/solar), mitigation costs can increase substantially depending on the technology considered.”

Saudi Arabia, supported by the Russian Federation, Egypt, Jordan, Venezuela, India, Australia, the Maldives, the Republic of Korea and Pakistan, proposed text highlighting that **mitigation scenarios may reduce revenues for fossil fuel exporters and that the availability of CCS would reduce the adverse effects of mitigation on the value**, as stated in the WGIII SPM. Denmark and Switzerland and others objected. Sweden suggested that impacts on renewable energy producers should also be mentioned.

Participants considered Saudi Arabia’s proposed text sentence by sentence.

After further discussions, participants agreed to a sentence on increased national and subnational plans and strategies on both adaptation and mitigation since AR4, with an increased focus on policies designed to integrate multiple objectives, increase co-benefits and reduce adverse side effects. An author suggested and participants agreed to include this sentence in subsection 4.4 (policy approaches for adaptation and mitigation, and technology and finance).

A sentence on mitigation policy possibly devaluing fossil fuel assets and reducing revenues was approved, but the UK, Sweden and Slovenia called for the deletion of a subsequent sentence on mitigation scenarios being associated with reduced revenues from coal and oil trade, noting it was repetitive. The UK, EU, Germany, Sweden and Norway expressed concern regarding lack of balance in the report between environmental goals and the nature of other co-benefits and risks, particularly adverse side effects.

On Saturday morning, following small group consultations, an author reported that the group suggested keeping the already-approved text proposed by Saudi Arabia on the devaluation of fossil fuel assets, in a paragraph in this subsection (3.4). He said the group also suggested balancing that with a proposed sentence on co-benefits of mitigation originally proposed for a paragraph on effects of mitigation policies. This was agreed.

Language on co-benefits for human health, ecosystem impacts, sufficiency of resources, and resilience of the energy system for mitigation scenarios with CO2eq concentrations before reaching about 450 or 500 ppm was proposed for a new paragraph. It was agreed to include this language in subsection 4.4 (policy approaches for adaptation and mitigation, and technology and finance).

The author said the group proposed replacing a sentence on the potential for co-benefits for energy end-use measures outweighing the potential for adverse side effects, although not necessarily for all energy supplies and AFOLU measures into a paragraph in subsection 4.4.

These proposals were approved by the Panel.

Regarding a paragraph on **solar radiation management** (SRM), the US suggested stating that it “could” instead of “would” entail uncertainties and side effects, risks and shortcomings, as some methods might not have such side effects or risks and SRM is broadly defined in the glossary. The authors, with Bolivia, Norway, Austria, Mexico and others, preferred “would” since the text specifically refers to large-scale SRM. The text was agreed as presented by the authors.

Participants also addressed a statement noting that if SRM were deployed and then terminated, surface temperatures would rise very rapidly, impacting ecosystems susceptible to rapid rates of change. Brazil, Canada and the Russian Federation made suggestions to qualify the statement. The authors preferred maintaining the text as presented, which was agreed.

Final SYR SPM Text: The headline for this subsection states that: there are multiple mitigation pathways that are *likely* to limit warming to below 2°C relative to pre-industrial levels; these pathways would require substantial emission reductions over the next few decades and near zero emissions of CO₂ and other long-lived GHGs by the end of the century; implementing such reductions poses substantial technological, economic, social and institutional challenges; and limiting warming to lower or higher levels involves similar challenges, but on different timescales.

This subsection involves paragraphs indicating that, *inter alia*: without additional efforts, global emissions growth is expected to persist, driven by growth in global population and economic activities; scenarios leading to GHG concentrations in 2100 of about 450 ppm CO₂eq or lower are likely to maintain warming below 2°C over the 21st century relative to pre-industrial levels; and mitigation scenarios consistent with a likely chance to keep warming below 2°C relative to pre-industrial levels typically involve temporarily overshoot atmospheric concentrations.

It further states that: reducing emissions of non-CO₂ agents can be an important element of mitigation strategies; delaying additional mitigation to 2030 will substantially increase the challenges associated with limiting warming over the 21st century to below 2°C relative to preindustrial levels; estimates of the aggregate economic costs of mitigation vary widely, but increase with the stringency of mitigation; in the absence or under limited availability of mitigation technologies, mitigation costs can increase substantially; mitigation policy could devalue fossil fuel assets and reduce revenues for fossil fuel exporters; the availability of CCS would reduce the adverse effects of mitigation on the value of fossil fuel assets; and SRM involves large-scale methods that seek to reduce the amount of absorbed solar energy in the climate system, is untested, and is not included in any of the mitigation scenarios.

This subsection includes Figures: SPM.11 on GHG emission pathways 2000-2100 for all AR5 scenarios and associated upscaling of low-carbon energy supply; SPM.12 on the implications of different 2030 GHG emissions levels for the rate of CO₂ emission reductions and low-carbon energy upscaling in mitigation scenarios that are at least *about as likely as not* to keep warming throughout the 21st century below 2°C relative to pre-industrial levels; and SPM.13 on global mitigation costs and consumption growth in baseline scenarios.

This subsection also includes tables on: key characteristics of the scenarios collected and assessed for WGIII AR5; and the increase in global mitigation costs due to either limited availability of specific technologies or delays in additional mitigation relative to cost-effective scenarios.

4. ADAPTATION AND MITIGATION: On the section’s title, Saudi Arabia requested referring to adaptation and mitigation “options” instead of “measures,” while the UK preferred the more general title “Adaptation and Mitigation,” which was approved.

On a headline sentence stating that **effective implementation depends on supporting policies**, and can be enhanced through integrated responses that link adaptation and mitigation with other societal objectives, Brazil, with El Salvador, stressed the need to include a reference to the importance of international cooperation in addressing climate change. After some reworking of the text and a suggestion by WGIII Co-Chair Ramón Pichs Madruga, participants approved a proposal to refer to effective implementation depending on “supporting policies and cooperation at all scales.”

Final SYR SPM Text: The headline for this section states that: many adaptation and mitigation options can help address climate change, but no single option is sufficient by itself; and effective implementation depends on policies and cooperation at all scales, and can be enhanced through integrated responses that link adaptation and mitigation with other societal objectives.

4.1: Common Enabling Factors and Constraints for Adaptation and Mitigation Responses: On a sentence stating that **technological innovation and investments** in green infrastructure and environmentally sound technologies can reduce GHG emissions and enhance societal resilience to climate change, participants agreed to, *inter alia*, delete reference to “green” infrastructure and refer to “environmentally sound infrastructure and technologies” instead, as requested by Brazil.

On a sentence stating that the social acceptability and/or effectiveness of **climate policies** are influenced by the extent to which they incentivize or depend on changes in lifestyles or behaviors, Saudi Arabia requested, and participants agreed to, adding a reference to “regionally appropriate” changes in lifestyles.

Following comments by Brazil, Saudi Arabia and China, participants agreed to an alternative formulation of a sentence stating that improving institutions as well as coordination and cooperation in governance can help overcome regional constraints associated with mitigation, adaptation and disaster risk reduction.

Final SYR SPM Text: The headline for this subsection states that adaptation and mitigation responses are underpinned by common enabling factors, including: effective institutions and governance, innovation; investments in environmentally sound technologies and infrastructure; sustainable livelihoods; and behavioral and lifestyle choices.

This subsection includes paragraphs highlighting that, *inter alia*: inertia in many aspects of the socio-economic system constrains adaptation and mitigation options; vulnerability to climate change, GHG emissions and the capacity for adaptation and mitigation are influenced by livelihoods, lifestyles, behavior

and culture; and for many regions and sectors, enhanced capacities to mitigate and adapt are part of the foundation essential for managing climate change risks.

4.2: Response Options for Adaptation: Referring to a sentence on adaptation experience accumulating across regions in the public and private sectors and within communities, Bolivia, supported by Chile and opposed by the EU, stressed the importance of adding reference to “indigenous and local knowledge systems and practices.” Authors explained that Bolivia’s request was not in line with WGII conclusions on adaptation experience as assessed. The sentence was then approved as presented, but authors then proposed, and participants agreed, to insert an additional sentence from the WGII SPM on the increasing recognition of the value of social (including local and indigenous), institutional and ecosystem-based measures and of the extent of adaptation constraints.

On a sentence stating that adaptation options exist in all sectors and regions, participants agreed to a proposal by Germany to specify that options exist with diverse “potential” and approaches. The rest of the paragraph was approved without change.

Final SYR SPM Text: The headline for this subsection states that: adaptation options exist in all sectors, but their context for implementation and potential to reduce climate-related risks differ across sectors and regions; some adaptation responses involve significant co-benefits, synergies and trade-offs; and increasing climate change will increase challenges for many adaptation options.

This subsection contains paragraphs noting that adaptation experience is accumulating across regions in the public and private sectors and within communities, and that the need for adaptation along with associated challenges is expected to increase with climate change. This subsection also includes Table SPM.3 on approaches for managing the risks of climate change through adaptation.

4.3: Response Options for Mitigation: A new sentence was introduced by the authors, stating that “in scenarios reaching 450 ppm CO₂eq concentrations by 2100, global CO₂ emissions from the energy supply sector are projected to decline over the next decade and are characterized by reductions of 90% or more below 2010 levels between 2040 and 2070.” Saudi Arabia objected to the sentence’s emphasis on 450 ppm. An author specified that the sentence gives information based on Figure SPM.14 and is not selective about the 450 ppm scenario. Participants debated whether to keep this sentence, with Denmark, Chile, France and Costa Rica voicing support for it, and Saudi Arabia objecting to targeting the energy supply sector alone.

Participants then addressed Figure SPM.14 on **direct CO₂ emissions by major sectors and non-CO₂ emissions for baselines and mitigation scenarios**. In response to a request from Japan, the caption was modified to clarify that scenarios included the full portfolio of mitigation options, while retaining mention that the scenarios also include CCS, as suggested by Saudi Arabia. With other small amendments suggested by Germany and Saudi Arabia, the figure was agreed.

Final SYR SPM Text: The headline for this subsection states that: mitigation options are available in every major sector; and mitigation can be more cost-effective if using an integrated

approach that combines measures to reduce energy use and the GHG intensity of end-use sectors, decarbonize the energy supply, reduce net emissions, and enhance carbon sinks in land-based sectors.

The subsection includes paragraphs on: well-designed systemic and cross-sectoral mitigation strategies being more cost effective in cutting emissions than a focus on individual technologies and sectors; and key measures to achieve mitigation scenarios that limit GHG concentrations to low levels (about 450 ppm CO₂eq, *likely* to limit warming to 2°C above preindustrial levels.) It notes that in scenarios reaching 450 ppm CO₂eq concentrations by 2100, global CO₂ emissions from the energy supply sector are projected to decline over the next decade and are characterized by reductions of 90% or more below 2010 levels between 2040 and 2070. The subsection further states that: near-term reductions in energy demand are an important element of cost-effective mitigation strategies; and behavior, lifestyle and culture have a considerable influence on energy use and associated emissions, with high mitigation potential in some sectors.

The subsection also includes Figure SPM.14 on direct CO₂ emissions by major sectors, and non-CO₂ emissions, for baseline and mitigation scenarios.

4.4: Policy Approaches for Adaptation and Mitigation, Technology and Finance: This subsection was first addressed in an informal group, co-chaired by David Warrilow (UK) and Antonina Ivanova Boncheva (Mexico) on Wednesday afternoon and evening. Warrilow then presented the work of the group to plenary for approval.

Regarding a headline sentence reading that **policies supporting technology development and diffusion, and finance for climate responses**, can complement policies that directly promote adaptation and mitigation, delegates made different textual suggestions. Following a proposal by the Maldives, with Bolivia, for including a reference to technology “transfer,” authors proposed, and participants agreed, to refer to “technology development, diffusion and transfer.” Austria proposed adding text stating that substantial emission reductions would require large changes in investment patterns. Bolivia answered that, if Austria’s proposal were agreed, a reference to the need for “stronger international cooperation” would also be necessary. Other delegates, including Brazil and the US, preferred the formulation proposed by the authors, which was then approved.

In a paragraph on **international cooperation** being critical for effective mitigation, the informal group agreed to remove specification of “the mitigation of” climate change as the main focus of the UNFCCC. The Panel then approved the text as presented by the informal group, which states that the UNFCCC focuses on addressing climate change.

Regarding text proposed by the informal group stating that “**international cooperation for supporting adaptation planning** has received less attention historically than mitigation, but is increasing,” Nicaragua requested stating that international cooperation is still insufficient, to which WGII Co-Chair Field responded that this text had already been approved in the SYR longer report. The Maldives proposed adding “and implementation” after “adaptation planning.” With this change, the paragraph was approved.

The informal group also discussed a sentence on **institutional dimensions of adaptation governance**, with one participant calling for including examples of complementary adaptation approaches across levels, “such as large-scale, public-private risk reduction initiatives and economic diversification.” The authors proposed a separate sentence with examples, including payments for ecosystem services, public-private partnerships, land zoning laws, and economic diversification, which was accepted.

On language stating that “while local governments and the private sector have different functions, they are increasingly recognized as critical to progress in adaptation,” El Salvador, with Nicaragua, observed that the sentence does not correspond to reality as the private sector has played a secondary role in adaptation. Informal group Co-Chair Warrilow explained that the group had addressed this concern by replacing “subnational” with “local” governments, and adding reference to the “different functions” of local governments and the private sector. Pakistan, the EU and Chair Pachauri supported the sentence as presented. Responding to a proposal by Austria, WGII Co-Chair Field suggested reflecting that functions “vary regionally,” which was agreed.

On a sentence listing examples of **institutional approaches to adaptation** involving multiple actors, Bolivia, with Nicaragua, requested deleting “payments for ecosystem services,” noting that it is only one of the many possible functions that ecosystems serve. Field proposed, and delegates agreed, to include “ecosystem-based management” instead. Switzerland requested that reference to an economic instrument, such as insurance, be added, which was accepted.

Regarding a paragraph on **carbon pricing**, participants modified language to specify that “in principle, mechanisms that set a carbon price,” including cap and trade systems and carbon taxes, can achieve mitigation in a cost-effective way, but have been implemented with diverse effects due in part to national circumstances as well as policy design. A sentence on the effects of fuel taxes was modified to specify that such taxes are not necessarily designed for the purpose of mitigation. This entire paragraph was approved by the Panel as presented by the informal group.

Based on the Saudi Arabian proposal discussed under subsection 3.4, the informal group significantly modified a paragraph on **co-benefits and adverse side effects of mitigation** to: specify that “adverse effects and” co-benefits of mitigation could affect achievement of other objectives; delete a list of objectives in the draft text and substitute it with a new list of objectives “such as those related to human health, food security, biodiversity, local environmental quality, energy access, and livelihoods”; remove a sentence on subsidies, for placement elsewhere; clarify that whether and to what extent side effects that materialize will be case- and site-specific and will depend on local circumstances and scale, scope and pace of implementation; and add a statement that many co-benefits and adverse side effects have not been well-quantified. The paragraph, as presented by the informal group, was approved by the Panel.

The Panel addressed a sentence stating that “**technology policy** complements other mitigation policies, and many adaptation efforts also critically rely on diffusion of technologies and management practices.” Bolivia requested adding that “international cooperation can play a constructive role

in development, diffusion and transfer of knowledge and environmentally sound technologies” from the WGIII SPM. WGIII Co-Chair Edenhofer said international cooperation did not belong in this section. The Maldives proposed referring not only to diffusion of technologies, but also to technology development and transfer. Following informal consultations on the paragraph, WGII Co-Chair Field presented revised text, stating that “technology policy (development, diffusion and transfer)” complements other mitigation policies “across all scales from international to subnational,” which was then approved. The rest of the paragraph was approved, as presented by the informal group.

Participants agreed to modify a sentence on what is required for mitigation scenarios that **stabilize concentrations without overshoot** to specify the need for annual investments in energy efficiency in the key sectors of transport, industry and buildings.

Participants also agreed to modify a paragraph on financial resources to focus initially on the **gap in availability of financial resources** for adaptation and mitigation, and then to indicate that a gap exists between global adaptation needs and available funds.

Final SYR SPM Text: The headline for this subsection states that, *inter alia*, effective adaptation and mitigation responses will depend on policies and measures across multiple scales.

The subsection contains a paragraph focusing on international cooperation for effective mitigation and enhancement of adaptation through coordination across governance scales. The paragraph contains bullets stating that:

- the UNFCCC is the main multilateral forum focused on addressing climate change;
 - the Kyoto Protocol offers lessons on participation, implementation, flexibility mechanisms and environmental effectiveness;
 - policy linkages offer potential climate change mitigation benefits; and
 - international cooperation for supporting adaptation has received less attention than mitigation but is increasing.
- A paragraph on an increase in national and subnational plans and strategies since AR4 contains bullets stating that:
- national governments play a key role in adaptation planning and implementation;
 - institutional dimensions, including the integration of adaptation into planning and decision making, play a key role in the transition from planning to implementation of adaptation;
 - mechanisms that set a carbon price can in principle achieve cost-effective mitigation but have been implemented with diverse effects;
 - regulatory approaches and information measures are widely used and often environmentally effective;
 - sector-specific mitigation policies have been more widely used than economy-wide policies and may be better suited to address some barriers; and
 - economic instruments, such as subsidies for renewable energy technologies, have driven recent growth of renewable energy, while reducing subsidies for GHG-related activities can achieve emission reductions.

Other paragraphs focus on: co-benefits and adverse side effects of mitigation and their effects on other objectives; technology policy to complement other mitigation policies across scales; the necessity of large changes in investment patterns for substantial reductions in emissions; the gap between global adaptation needs and funds available; and the lack of financial resources for adaptation compared to mitigation.

4.5: Trade-offs, Synergies and Interactions with Sustainable Development: On a headline sentence stating that **climate change is a threat to sustainable development**, Denmark, with Germany, called for adding text to provide a broader context on how mitigation and adaptation improve human well-being. Bolivia, supported by Saudi Arabia, requested replacing the sentence with text stating that limiting the effects of climate change is necessary to achieve sustainable development and equity, including poverty eradication. Following suggestions to keep the headline statement concise, the sentence was approved as presented. The remaining sentences of the headline statement were also approved with minor editorial changes.

The authors proposed, and participants agreed, to add a paragraph on text from the WGII SPM to a paragraph on climate change threats as proposed by Norway during discussions in a small group on adaptation issues, stating that “delaying mitigation actions may reduce options for climate-resilient pathways and adaptation in the future,” and that “opportunities to take advantage of positive synergies between adaptation and mitigation may decrease with time, particularly if limits to adaptation are exceeded.”

There was some discussion on a sentence on **integrated responses** being “especially relevant” to: energy planning and implementation; interactions among water, food, energy generation and biological carbon sequestration; and urban planning. Responding to a suggestion by Saudi Arabia to also reflect CCS, the authors explained that the sentence referred to land-based activities and that the focus was on water, food and energy generation. Brazil questioned why biological carbon sequestration was singled out. Bolivia preferred using agreed terminology, including “food production,” and Saudi Arabia called for referring to water production as well. Following the authors’ proposal to keep the statement concise, participants agreed to refer to interactions among “water, food, energy and biological carbon sequestration, and urban planning.”

Final SYR SPM Text: The headline for this subsection states that: climate change is a threat to sustainable development; there are many opportunities to link mitigation, adaptation and the pursuit of other societal objectives through integrated responses; and successful implementation relies on relevant tools, suitable governance structures and enhanced capacity to respond.

The subsection includes paragraphs on: climate change exacerbating other threats to social and natural systems, placing additional burdens particularly on the poor; attention to both adaptation and mitigation being required for aligning climate policy with sustainable development; and delaying global mitigation actions as possibly reducing options for climate-resilient pathways and adaptation in the future. It further states that strategies and actions can be pursued now that will move towards climate-resilient pathways for sustainable development, while at the same time helping to improve livelihoods, social and economic well-being, and effective environmental management.

ADOPTION OF THE LONGER REPORT: Chair Pachauri emphasized that the process of adopting the longer SYR report was different from the SPM approval process, and invited delegates to review the longer report section by section. IPCC Secretary Christ reminded the Panel that the purpose of reviewing the longer report was to ensure consistency with the SPM and the underlying WG reports.

Introduction: Leo Meyer, Head of the SYR TSU, explained changes made to the section, which was then adopted.

Topic 1: Observed Changes and their Causes: The review editor for this topic led participants through the document, expressing satisfaction with the trickle back process and pointing to: small changes to support revisions to SPM language; changes to increase traceability and enhance transparency; and corrections of editorial errors. He explained that the SPM’s section on “causes” uses simpler language to reflect two longer report sections on “attribution” and “drivers,” both of which synthesize material from WGI and WGII, which necessitated a slightly different structure for the longer report.

Topic 2: Future Climate Changes, Risks and Impacts: An author explained changes that had been made to the section, and the section, including tables and figures, was adopted.

Topic 3: Future Pathways for Adaptation, Mitigation and Sustainable Development: The authors reported full consistency between the SPM and the underlying report, and participants adopted Topic 3 as presented, including its tables and figures.

Topic 4: Adaptation and Mitigation: Review editors explained changes that had been made to the section, including its figures and tables. There was some discussion on Table 4.1 and Figure 4.5.

In **Table 4.1**, following proposals by Saudi Arabia and Chile, the constraining factor of “weak governance and institutional arrangements” was changed to “challenges in governance and institutional arrangements,” to keep the table in line with the SPM.

Regarding **Figure 4.5**, Saudi Arabia questioned reference to corporate cash flows, general tax revenues and international levies under sources of capital, expressing concern over the international implications of using such terminology. Chair Pachauri responded that the figure was included in the 25 August version circulated to governments, and no comments had been received. WGIII Co-Chair Edenhofer explained that the table was descriptive with no normative implications, and proposed to refer to the Clean Development Mechanism (CDM) instead of international levies. The UK suggested “international levies, e.g., CDM levies,” to which Edenhofer replied that the only international levy was under the CDM. The Panel agreed to replace “international” with “CDM” levies.

Brazil proposed deleting reference to REDD from the project box, pointing out that REDD+ is not project-based. Edenhofer agreed to this proposal.

With these and other minor amendments, delegates adopted this section with its corresponding figures and tables.

ADMISSION OF OBSERVER ORGANIZATIONS

IPCC Secretary Christ introduced this agenda item (IPCC-XL/Doc.7) on Monday. The Panel agreed to admit as observers Green Cross International, Association Carré Geo & Environment (Cameroon) and CARE International (Denmark).

FUTURE WORK OF THE IPCC

TGF Co-Chair Helen Plume (New Zealand) introduced the second progress report by the TGF (IPCC-XL/Doc.13), also on behalf of TGF Co-Chair Taha Zatari (Saudi Arabia). She also presented an Options Paper (IPCC-XL/Doc.13 Add.1) resulting from discussions at the third TGF meeting held on 26 October 2014, which identifies further areas of convergence and defines options on: future IPCC products; the structure for the production of IPCC products; and enhancing the participation and contribution of developing countries. She noted that a Recommendations Paper will be available in January 2015, which will be submitted for consideration by IPCC-41 in February 2015, when the Panel will have to agree on, among other things, the size, structure and composition of the next Bureau to be elected at IPCC-42. Responding to a question by the UK, Chair Pachauri said governments may send their comments on the Recommendations Paper to the Secretariat.

COMMUNICATION AND OUTREACH ACTIVITIES

Jonathan Lynn, IPCC Head of Communications and Media Relations, provided an overview of communication and outreach activities undertaken since IPCC-39 and outreach plans for the coming year (IPCC-XL/Doc.9). He noted the planning of an extensive outreach programme, including subregional events, to present the AR5, the first of which will be held in South Africa. Lynn said the Report would be disseminated geographically and thematically, in all UN languages, through the IPCC website. Morocco congratulated the Secretariat on the compilation work and the new communications dynamic and stressed the need to publicize the AR5 in developing countries.

REQUEST FOR A POSSIBLE TECHNICAL PAPER OR OTHER APPROPRIATE ACTION ON CLIMATE CHANGE, FOOD AND AGRICULTURE

IPCC Secretary Christ opened this agenda item (IPCC-XL/Doc.14, Corr.1) and reported that another request for a technical report on this subject had been received from the UN Food and Agriculture Organization (FAO). She said that several options had been considered, and consultations on the request had been held with relevant UN organizations. She outlined options and procedures for addressing such an issue, including through a technical report, a special report, a workshop or an expert meeting.

Argentina, Bolivia, Venezuela, Brazil, Cuba, Ecuador and the Republic of Korea expressed hesitation over taking any immediate decision to carry out new work on this subject.

Austria, supported by Norway, expressed interest in preparing a technical paper that pulls AR5 material together on this topic. Tanzania, supported by Mali, Japan, the US, the Netherlands, Brazil and the UK, called for either a technical paper or a special report, as a priority for developing countries.

New Zealand, supported by Ireland, Japan, the US, Spain, China, Switzerland and Slovenia, suggested an expert meeting as a first step, with no time pressure to produce anything before the UNFCCC COP in Paris in 2015. Ireland offered to host such an expert meeting. Brazil, supported by Tanzania, Austria and Morocco, expressed interest in an expert scoping meeting without prejudice to the outcome, but asked for clarification on participation. Chair Pachauri said such a meeting would typically include participation of scientists and experts, with the possibility

of selecting government officials as well, according to IPCC procedures. Christ noted that IPCC criteria require nominations by government focal points or by observer organizations, relevant WG bureaus or the IPCC Chair, as appropriate.

Chair Pachauri then proposed asking the Executive Committee and the Secretariat to organize a small expert scoping meeting with a budgetary allocation. The Panel agreed to this proposal.

REPORT ON THE ACTIVITIES OF THE IPCC EXECUTIVE COMMITTEE

Chair Pachauri reported on the monthly activities of the IPCC Executive Committee, noting that it followed the recommendations of the IAC, which had seen value in the previous Executive Team and had recommended establishing an Executive Committee, which would submit reports on the details of its discussions to the Panel.

IMPLEMENTATION OF THE IPCC COI POLICY

IPCC Vice-Chair and COI Committee Chair Hoesung Lee (Republic of Korea) reported on the IPCC COI Committee (IPCC-XL/Doc.12). He said that the COI Committee review of COI forms found 100% compliance with the COI Policy and proposed amending the form to request details about any work carried out by candidates under consideration. The Panel approved the revised COI form. In response to a query by the UK, Lee noted that no member had ever been found to have a COI, but that if one were suspected, the Committee would exercise due diligence to determine whether a COI existed and arrive at a unanimous decision on what to do.

PROGRESS REPORTS

PROGRESS REPORT ON THE TFI: TFI Co-Chair Thelma Krug (Brazil) reported on the TFI's progress (IPCC-XL/Doc.6, Rev.1). She highlighted future TFI activities, including methodological refinement of the 2006 IPCC Guidelines for National GHG Inventories: Wetlands, through an online questionnaire survey, and two expert meetings in 2015 to identify specific areas to address in the TFI's future work. She said the Panel would need to consider the revised 2015 TFI budget that, she noted, did not differ numerically from the one approved at IPCC-39. Germany stressed that the 2016 work plan could not be approved at this point in time and that it would be revised based on progress of work in 2015. The TFI Co-Chairs agreed that the work plan should be considered at the upcoming IPCC plenary meeting in February 2015.

TASK GROUP ON DATA AND SCENARIO SUPPORT FOR IMPACT AND CLIMATE ANALYSIS (TGICA): IPCC Secretary Christ introduced the TGICA progress report (IPCC-XL/Doc.17), noting recent activities regarding development of the data distribution center (DDC), technical guidelines and activities, and capacity building. She noted that a number of new items have also been added to the TGICA agenda, including preparing a discussion document for mapping a long-term vision for the DDC. She said the next TGICA meeting would take place from 24-26 November 2014 in Yokohama, Japan.

IPCC SCHOLARSHIP PROGRAMME: Secretary Christ introduced the progress report for the IPCC Scholarship Programme (IPCC-XL/Doc.8). Chair Pachauri asked for the

Panel's assistance in identifying sources of support for increased endowments so that scholarships could be increased to 45-50 a year.

PREPARATIONS FOR THE EXPERT MEETING ON POTENTIAL STUDIES OF THE IPCC PROCESS: Noting this issue (IPCC-XL/Doc.10) had been more fully addressed by the Financial Task Team with regard to budgetary implications, Christ added that the expert meeting will now take place in February 2015 instead of in 2014. She said that the Executive Committee had established a steering committee to further develop the list of experts. Chair Pachauri said that regional and gender balance would be considered.

OTHER PROGRESS REPORTS: Christ then introduced other progress reports: on the IPCC Carbon Footprint (IPCC-XL/Doc.11); Progress of WGI towards IPCC AR5 (IPCC-XL/Doc.15); and progress of WGII towards IPCC AR5 (IPCC-XL/Doc.16). On the IPCC Carbon Footprint, she noted efforts to reduce the carbon footprint of IPCC activities and of traveling to meetings, including through teleconference activities, use of the Papersmart system, holding back-to-back meetings, and considering carbon footprint criteria when selecting meeting locations and venues.

On WGI progress, Co-Chair Stocker noted a growing burden on scientists to assess scientific findings and climate change literature, and called for recognizing that some kind of enhanced support should be considered to ensure their work is as effective and comprehensive as possible. WGI Co-Chair Dahe Qin noted communication and outreach activities in China to convey AR5 messages. The WGI Co-Chairs expressed hope that more scientists from developing countries and countries with economies in transition would be involved in the AR6 process.

The WGII Co-Chairs noted that the final versions of all chapters were now available, and that a key role of WGII was in producing regional chapters. They noted that more than 1000 presentations on the findings had been made by WGII report authors and that partner organizations had been engaged to ensure that practitioners have the scientific tools for adaptation.

WGIII Co-Chair Edenhofer noted that scientists were the mappers that explore different pathways for policymakers to navigate. He highlighted a chapter in the WGIII report on human settlements and cities, noting that all government levels were now covered. He said the full report was expected for publication in November 2014, and underscored significant outreach to convey the messages of the WGIII report. He said the Structured Expert Dialogue (SED) held during the UNFCCC meeting in Bonn in June 2014 provided the opportunity for the scientists to "provide maps" for delegates to use and to engage in discussions with policymakers. He highlighted excellent cooperation among all the WGs on the SYR. WGIII Co-Chair Pichs Madruga noted increasing interest in the IPCC on the part of governments and more diverse participation in IPCC sessions, which has not affected the scientific rigor of the results. Saudi Arabia expressed concern over a slide that was presented to the SED by the WGIII Co-Chair on emissions and country groupings based on income, noting significant disagreement on the issue during the WGIII SPM approval process. He said this should not have been presented as an IPCC finding and raised concerns over how information is disseminated. Chair Pachauri said his comments would be reflected in the report of the meeting.

MATTERS RELATED TO UNFCCC AND OTHER INTERNATIONAL BODIES

Secretary Christ and Florin Vladu, UNFCCC Secretariat, highlighted IPCC presentations at the UNFCCC SED, noting extensive interaction between negotiators and scientists. Christ also noted other meetings in the context of the UNFCCC, UNEP, the Convention on Biological Diversity, and the UN Secretary-General's Climate Summit. They also noted that an IPCC special event and various presentations will be held at UNFCCC COP 20 in Lima, Peru.

ALLEGED ERRORS IN THE SUMMARY FOR POLICYMAKERS OF THE WORKING GROUP III CONTRIBUTION TO THE FIFTH ASSESSMENT REPORT

WGIII Co-Chair Edenhofer introduced this item (IPCC-XL/Doc.18), noting that since the approval of the WGIII SPM, several potential errors had been identified. He explained the procedures undertaken according to the Error Protocol and then submitted the errata to the Panel for approval. Saudi Arabia proposed a procedure whereby significant errors would be brought to the Panel for consideration and, if found to be significant, should be deleted from the SPM. Austria opposed reconsidering the procedure for addressing errors, saying that it proved workable and was fit for purpose. The errata were then approved by participants.

OTHER BUSINESS

Secretary Christ introduced document IPCC-XL/Doc.5 on requests for workshops on lessons learned from AR5 to identify scientific gaps in knowledge that cut across the WGs. The Panel then approved requests received from the International Geosphere-Biosphere Programme and the UNEP-sponsored Programme of Research on Climate Change Vulnerability, Impacts and Adaptation.

TIME AND PLACE OF THE NEXT SESSION

IPCC-41 will convene from 24-27 February 2015 in Nairobi, Kenya.

CLOSURE OF THE SESSION

Chair Pachauri expressed his appreciation to all the individuals and groups who had helped bring the AR5 SYR to realization and to the Government of Denmark and the Tivoli Hotel for hosting the event, among many others. Christ, along with WGII Co-Chair Christopher Field on behalf of the WG Co-Chairs, also expressed their appreciation, including to Chair Pachauri, who responded in kind.

Francis Hayes, IPCC Conference Officer, then entertained the participants with an IPCC-relevant rendition of "Let's Face the Music and Dance," with a video of Fred Astaire and Ginger Rogers dancing projected on the screens, and with a jack o' lantern scarecrow as his dancing partner.

With the AR5 SYR adopted and its SPM approved, the meeting was gavelled to a close on Saturday, 1 November, at 4:40 pm.

A BRIEF ANALYSIS OF IPCC-40

With approval of the Synthesis Report (SYR) in Copenhagen, the Intergovernmental Panel on Climate Change completed its Fifth Assessment Report on the causes, consequences and possible responses to climate change. Initiated six years ago in Budapest, Hungary, preparation of the AR5 involved more than 830 scientists from over 80 countries, who drew on the work of over 1,000 contributing authors and over 2,000 expert reviewers, working in the three working groups. The process culminated with adoption of the SYR, which consists of the 175-page “longer report” and its SPM—the latter, a distillation of a distillation of thousands of pages (which themselves summarize over 30,000 scientific papers) approved line by line by the 195 government members of the Panel. Through this process, the AR5 is supposed to provide the scientific basis for global climate policy, including support for negotiations on a new international agreement under the UNFCCC, which is expected to be adopted in Paris in 2015. The immensity and complexity of this task is hard to overstate.

Yet after all this, the Panel’s findings are remarkably straightforward and conclusive: climate change is unequivocal and unprecedented; substantial and sustained emission reductions are needed if we are to avoid the most serious consequences; and the more we delay action the more costly it will be and the more we will have to rely on untested technologies in the future.

This brief analysis focuses on the adoption of the SYR in Copenhagen, while drawing attention to the significance of the AR5 as a whole. It summarizes the main findings contained in the SYR, reflects on the SPM approval process and places IPCC-40 in the larger context of evolving global climate policy.

AND WHILE WE STILL HAVE THE GHOST OF A CHANCE.... (IRVING BERLIN, AS ADAPTED BY FRANCIS HAYES)

While human-induced climate change is not news (the Panel itself had established it with a 90% certitude in its Fourth Assessment Report), the AR5 confirms that climate change is undeniable and unparalleled. Further, it finds that anthropogenic GHG emissions have continued to rise and have done so in the past few decades at a faster rate than in at least the last 800,000 years. Limiting warming to less than 2°C—the widely considered safe-ground and the official goal under the UNFCCC—can “likely” be achieved, with a probability level of 66%, if maximum cumulative CO₂ emissions are limited to 2900 GtCO₂. This means there is a total “carbon budget” of 2900 GtCO₂, out of which a total of 1900 GtCO₂ had already been emitted by 2011, leaving only 1000 GtCO₂ to go. In other words, we have used up two-thirds of this carbon budget. As many have noted, at current emission rates we could exhaust the carbon budget in less than 30 years.

The AR5 is the first IPCC assessment to look at a carbon budget with such numerical precision. If previous assessment reports stopped short of telling the world exactly how much more CO₂ can be released in the atmosphere before anthropogenic interference with the climate system can be considered dangerous, AR5 makes it crystal clear that, with two-thirds of the carbon budget expended and only one-third remaining, the internationally agreed global goal may slip out of reach, unless there is additional and effective mitigation.

Furthermore, the AR5 makes clear that time is of the essence: unless emissions peak soon and begin a quick decline to zero by the end of the century, limiting warming to less than 2°C is unlikely. The scenarios that would limit global temperature increase to 2°C and atmospheric concentrations at around 450 ppm CO₂eq at the end of this century imply emission reductions of 40-70% relative to 2010 by 2050, and emission levels near zero by 2100.

Given this reality, in the AR5 the IPCC adopts a risk management framework. It brings to light the inextricable links between climate change, risk and development, where climate change impacts exacerbate poverty, environmental degradation and political strife, thereby acting as a “threat multiplier.”

Compared to AR4, the AR5 made major improvements on harmonization of information across scenarios, and inclusion of a wider range of socio-economic, technological and institutional considerations. It also includes more robust projections on sea level rise and data on melting ice sheets, as well as broader attention to technology portfolios—including untested carbon dioxide removal technologies and geo-engineering. The AR5 is the first IPCC assessment to consider the oceans as a region and take up themes such as the indirect impacts of climate change in exacerbating violence. While sustainable development has been increasingly emphasized in each assessment report, the AR5 places climate change mitigation and adaptation squarely in the context of sustainable development.

The AR5 is also a more robust and careful product as a result of the IAC review of the IPCC and has seen better integration and coordination of the work of the three WGs, with the work of WGI staggered so its findings could feed into WGII and WGIII.

WRITE IT, CUT IT, PASTE IT, SAVE IT, SNAP IT, WORK IT, QUICK – ERASE IT (DAFT PUNK)

The SYR has the mandate to “synthesize and integrate materials contained within the Assessment Reports and Special Reports.” At each SYR SPM approval session, a discussion takes place on whether the SYR is just a “cut-and-paste” from the WG reports or whether it really synthesizes and provides value added. Be that as it may, insofar as the text of the SYR SPM comes from the WG reports already adopted by the Panel, the line-by-line approval process is in some ways smoother than the WG SPM approval process. The controversies and problems are somewhat predictable as they are not new, and in the absence of agreement the three WG SPMs themselves provide fallback positions with already approved language that cannot be easily dismissed.

Yet the SYR (at least its SPM) is also the most politically sensitive and directly policy-relevant since it is often the one that most policymakers are likely to read and/or quote. This was evident in some of the discussions in Copenhagen—in particular, discussion on a box with information on UNFCCC Article 2. This article outlines the objective of the Convention, which is to achieve “...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner.”

Following its mandate to provide policy-relevant but not policy-prescriptive information, the Panel had agreed to address this article when it first decided on the SYR's scope, as the SYR would be integrating the findings of the three WGs that speak directly to this goal. But views on what should be included in reference to this goal were not easily reconciled. Some countries called for being more operative, stating directly the need for sustainable development, including international cooperation and financial support. They were met with opposition from others who felt the matter transgressed the rule against policy prescriptiveness. This might simply be too much to attempt even for the IPCC, which straddles the "is/ought divide" that separates the worlds of science and policy. In any case, the complexity of the approval process and the protracted negotiations left little room or time to maneuver in Copenhagen, and the whole box was ultimately deleted. Some saw a silver lining to this outcome: the effort to produce a box on Article 2 ultimately resulted in one sentence in the introduction to the SYR, stating that the SYR includes information relevant to UNFCCC Article 2. In other words, the entire report is relevant.

"THE STONE AGE DIDN'T END BECAUSE THERE WERE NO MORE STONES" (IPCC CHAIR PACHAURI, QUOTING A FORMER SAUDI OIL MINISTER)

IPCC-40 took place just one month before UNFCCC parties meet in Lima as a key step towards a much-awaited agreement in Paris in 2015. Yet everyone remembers what happened at the last climate change meeting here in Copenhagen, right after the IPCC had issued its previous assessment with actually very similar—if less comprehensive—findings, which led to the questioning of what could lead to a more successful outcome this time. The lack of agreement on UNFCCC Article 2, together with the inability to agree on other language (i.e., on country groupings by income in WGIII) might be seen as a harbinger of things to come in Lima and Paris. However, optimists can argue that, in hindsight, countries were not ready for a comprehensive agreement in 2009 as they are now. They may also note, as WMO Secretary-General Michel Jarraud did during the press conference to release the SYR, that because this time there is no room for uncertainty to justify inaction, governments may also begin to recognize that their constituents might now hold them accountable if they fail to take action.

Without much ado after completing its fifth assessment cycle, the IPCC will embark on its journey into the future. IPCC-41 is expected to take a decision on whether to undertake a sixth assessment report, and the following IPCC session will elect the Chair and Bureau that, if so decided, will steer it along that cycle. The IPCC-41 agenda will also include decisions on the future of the IPCC, and address lessons learned from the AR5. The latter could be particularly useful and lead to more focused work in previously neglected aspects of mitigation and adaptation, which might include assessing current funding for research and development, and maladaptation. Although the IPCC does not conduct research, but rather assesses published literature, the Panel may also emerge from the AR5 process with a greater determination to engage more proactively in addressing the still glaring in knowledge gaps in many developing countries—in particular in Africa. Increasing engagement by

developing countries in the IPCC process will also hopefully spur greater awareness among many in the scientific community, including theorists and modelers, of the realities on the ground.

THERE IS NO PLAN B, BECAUSE THERE IS NO PLANET B (UN SECRETARY-GENERAL BAN KI-MOON)

The information contained in the AR5 SYR may in some ways appear to be "old news," confirming findings of the AR4 "only more so." But the IPCC's work has only just begun. The rate of climate change is very unlikely to slow down; thus, the impacts on all systems and places are likely to increase. Studies and observations will continue to multiply and hopefully the scientific coverage will expand to areas where important gaps exist, such as information on Africa and small islands. In the realm of mitigation and adaptation, new technologies and approaches will have to be invented and tested. We will need something like the IPCC to continue assessing and communicating in clear language, specifically to policymakers, the causes, consequences and possible responses to climate change in such a way that policymakers have ownership of the findings, thereby taking at least implicit responsibility for addressing them.

In an oft-repeated metaphor during the AR5 process, the scientists serve as the mapmakers that outline the contours and possible pathways that policymakers—the navigators—might take, with a sense of the consequences and associated uncertainty of the different pathways. But the age of exploration has only just begun and uncharted territory is already being navigated. Much remains to be charted in the years ahead. We have no option because, as UN Secretary-General Ban Ki-Moon has stated, "There is no Plan B, because there is no planet B."

UPCOMING MEETINGS

Pre-COP Ministerial Meeting for UNFCCC COP 20 and CMP 10: This event, organized by the Venezuelan Government, aims to revisit the engagement of civil society in the UNFCCC negotiations. **dates:** 4-7 November 2014 **location:** Caracas, Venezuela **contact:** Cesar Aponte Rivero, General Coordinator **email:** precop20@gmail.com **www:** <http://www.precopsocial.org/en>

Seventh International Symposium on Non-CO2 Greenhouse Gases (NCGG7): NCGG7 will look at innovations in the science, technology and policy aspects of controlling non-CO2 GHGs and precursor emissions, such as methane, nitrous oxide, fluorocarbons, black carbon, aerosols and tropospheric ozone. **dates:** 5-7 November 2014 **location:** Amsterdam, the Netherlands **contact:** NCGG Conference Secretariat **phone:** +31-30-232-29-89 **fax:** +31-30-232-80-41 **email:** office@ncgg.info **www:** <http://www.ncgg.info/>

International Conference on Mountain People Adapting to Change: This conference is expected to produce insights into global climate change for mountainous regions. **dates:** 9-12 November 2014 **location:** Kathmandu, Nepal **contact:** ICIMOD **phone:** +977-1-5003222 **fax:** +977-1-5003299 **email:** adapthkh@icimod.org **www:** <http://www.icimod.org/adapthkh>

REN21 Renewables Academy 2014: This event will take stock of renewable energy developments over the past decade and explore ways to further advance the global energy

transition with renewables. **dates:** 10-12 November 2014
location: Bonn, Germany **contact:** REN21 Secretariat c/o
 UNEP **phone:** +33-1-44-37-14-50-90 **email:** secretariat@
 ren21.net **www:** [http://www.ren21.net/REN21Activities/
 REN21RenewablesAcademy2014](http://www.ren21.net/REN21Activities/REN21RenewablesAcademy2014)

Second Preparatory Committee meeting for the Third UN World Conference on Disaster Risk Reduction: A second session of the Preparatory Committee for the Third International Conference on Disaster Risk Reduction (DRR) is expected to develop the draft post-2015 DRR framework. In addition to negotiations on this document, technical workshops will convene to address: indicators, monitoring and review process for the post-2015 framework; and integration of disaster risks in financial regulation. **dates:** 17-18 November 2014 **location:** Geneva, Switzerland **contact:** Elena Dokhlik, Secretariat **phone:** +41-22-91-78861 **fax:** +41-22-73-39531 **email:** wcdrr2015@un.org **www:** <http://www.wcdrr.org/>

UNECE Sustainable Energy Week: The week includes: the Group of Experts on Energy Efficiency; the Group of Experts on Renewable Energy; and the 23rd session of the Committee on Sustainable Energy. **dates:** 17-21 November 2014 **location:** Geneva, Switzerland **contact:** Stefanie Held, Secretary of the Committee on Sustainable Energy **phone:** +41-22-917-2462 **fax:** +41-22-917-0038 **email:** stefanie.held@unece.org **www:** <http://www.unece.org/index.php?id=35137>

World Conference on Disaster Risk Reduction 2015: The World Conference on Disaster Reduction will be hosted by the Government of Japan and organized by the UN International Strategy for Disaster Reduction, and is expected to agree a post-2015 DRR framework. **dates:** 14-18 March 2015 **location:** Sendai, Japan **contact:** Elena Dokhlik, Secretariat **phone:** +41-22-91-78861 **fax:** +41-22-73-39531 **email:** wcdrr2015@un.org **www:** <http://www.wcdrr.org/>

21st Meeting of the Task Group on Data and Scenario Support for Impact and Climate Analysis (TGICA): TGICA-21 will meet to continue its work in facilitating the distribution and application of climate change-related data and scenarios. **dates:** 24-26 November 2014 **location:** Yokohama, Japan **contact:** IPCC Secretariat **phone:** +41-22-730-8208 **fax:** +41-22-730-8025 **email:** IPCC-Sec@wmo.int **www:** <http://www.ipcc.ch/activities/activities.shtml#tabs-4>

Third Hemispheric Encounter of the Inter-American Network for Disaster Mitigation: The encounter will cover the theme 'Integrating Disaster Risk Management and Adaptation to Climate Change in the Development Agenda. **dates:** 25-26 November 2014 **location:** Washington D.C., US **contact:** Pablo Gonzalez, Department of Sustainable Development, OAS Secretariat **phone:** +1-202-370-4971 **fax:** +1-202-370-3560 **email:** pgonzalez@oas.org **www:** <http://www.rimd.org/actividad.php?id=615>

Second International Conference on Renewable Energies for Developing Countries (REDEC 2014): The conference will explore solutions for energy saving and production in developing countries. **dates:** 26-27 November 2014 **location:** Beirut, Lebanon **contact:** REDEC Secretariat **email:** redeconf@redeconf.org **www:** <http://www.redeconf.org>

Lima Climate Change Conference: The 20th session of the Conference of the Parties (COP 20) to the UNFCCC and 10th session of the Conference of the Parties serving as the Meeting

of the Parties (CMP) to the Kyoto Protocol will take place in Lima, Peru. Also meeting will be SBSTA 41, SBI 41 and ADP 2.7. **dates:** 1-12 December 2014 **location:** Lima, Peru **contact:** UNFCCC Secretariat **phone:** +49-228-815-1000 **fax:** +49-228-815-1999 **email:** secretariat@unfccc.int **www:** http://unfccc.int/meetings/lima_dec_2014/meeting/8141.php

12th Development and Climate Days: The 12th Development and Climate Days will be held on the sidelines of COP 20 under the theme 'Zero poverty. Zero emissions. Within a generation,' which emphasizes the need for climate change mitigation, adaptation and increased resilience in order to eradicate poverty. **dates:** 6-7 December 2014 **location:** Lima, Peru **contact:** Red Cross/Red Crescent Climate Centre **phone:** +31-70-44-55-886 **fax:** +31-70-44-55-712 **email:** climatecentre@climatecentre.org **www:** <http://www.climatecentre.org/site/development-and-climate-days>

UNFCCC ADP: The *Ad Hoc* Working Group on the Durban Platform for Enhanced Action under the UNFCCC will meet to continue to elaborate the 2015 agreement. **dates:** 8-13 February 2015 **location:** Geneva, Switzerland **contact:** UNFCCC Secretariat **phone:** +49-228-815-1000 **fax:** +49-228-815-1999 **email:** secretariat@unfccc.int **www:** <http://unfccc.int/>

41st Session of the Intergovernmental Panel on Climate Change: This session will meet in the first half of 2015 to address, *inter alia*, future work of the IPCC and lessons from AR5. **dates:** 24-27 February 2015 **location:** Nairobi, Kenya **contact:** IPCC Secretariat **phone:** +41-22-730-8208 **fax:** +41-22-730-8025 **email:** IPCC-Sec@wmo.int **www:** <http://www.ipcc.ch>

For additional meetings and updates, please visit <http://climate-1.iisd.org/>

GLOSSARY

AFOLU	Agriculture, forestry and other land uses
AR5	Fifth Assessment Report
AR4	Fourth Assessment Report
CCS	Carbon capture and storage
CDR	Carbon dioxide removal
COI	Conflict of interest
COP	Conference of the Parties
CO2	Carbon dioxide
CO2eq	Carbon dioxide equivalent
GHGs	Greenhouse gases
Gt	Gigatonne
IAC	InterAcademy Council
IPCC	Intergovernmental Panel on Climate Change
ppm	Parts per million
RCP	Representative concentration pathway
SPM	Summary for Policymakers
SYR	Synthesis Report
TFI	Task Force on National GHG Inventories
TGF	Task Group on the Future Work of the IPCC
TSU	Technical Support Unit
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
WG	Working Group
WMO	World Meteorological Organization