



SUMMARY OF THE TWELFTH SESSION OF WORKING GROUP III OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC) AND THE THIRTY-NINTH SESSION OF THE IPCC: 7-12 APRIL 2014

The 12th session of Working Group III (WGIII-12) of the Intergovernmental Panel on Climate Change (IPCC) and the 39th session of the IPCC (IPCC-39) were held from 7-12 April 2014 in Berlin, Germany. The meeting was attended by more than 605 participants, including government representatives from 107 countries as well as representatives from the UN and intergovernmental and observer organizations, and drew worldwide media attention.

During the six-day meeting, delegates met in plenary and informally to consider the WGIII contribution to the IPCC Fifth Assessment Report (AR5) on mitigation of climate change. Participants were assisted by short presentations by the Coordinating Lead Authors on various sections of and topics related to the Summary for Policymakers (SPM). At the end of the meeting, WGIII approved the SPM and accepted the underlying report, including the Technical Summary and annexes.

The SPM consists of an introduction and four main parts. SPM.1 is the introductory section. It sets out the role of the IPCC, the structure of the report and the degree of certainty behind the report's findings. Section SPM.2 examines various approaches to climate change mitigation. SPM.3 reviews trends in stocks and flows of greenhouse gases (GHGs) and their drivers. Section SPM.4 discusses mitigation pathways and measures in the context of sustainable development, including long-term mitigation pathways, and sectoral and cross-sectoral mitigation pathways and measures. This includes an examination of: energy supply; energy end-use sectors (transport, buildings, and industry); agriculture, forestry and other land use (AFOLU); and human settlements, infrastructure and spatial planning. The final section of the report is SPM.5, which addresses mitigation policies and institutions, with a focus on sectoral and national policies and international cooperation. The SPM also contains nine figures and two tables to help explain the trends and concepts that it addresses.

After the conclusion of WGIII's session on Saturday, 12 April, IPCC-39 re-convened to formally accept the actions of the working group with regard to the approval of its SPM, and to discuss other matters. The approved SPM and its underlying report can be found on the IPCC website <http://www.ipcc.ch>.

A BRIEF HISTORY OF THE IPCC

The IPCC was established in 1988 by the World Meteorological Organization (WMO) and the UN Environment Programme (UNEP). Its purpose is 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 working groups: WGI addresses the 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 GHG emissions and mitigating climate change. Each working group has two Co-Chairs and six Vice-Chairs, except WGIII,

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This issue of the *Earth Negotiations Bulletin* © <enb@iisd.org> is written and edited by María Gutiérrez, Ph.D., Elena Kosolapova, Ph.D., Mari Luomi, Ph.D., Leila Mead, Mihaela Secrieru, and Hugh Wilkins, LL.M. The Editor is Pamela Chasek, Ph.D. <pam@iisd.org>. The Director of IISD Reporting Services is Langston James "Kimo" Goree VI <kimo@iisd.org>. The Sustaining Donor of the *Bulletin* is the European Commission (DG-ENV). General Support for the *Bulletin* during 2014 is provided by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), the New Zealand Ministry of Foreign Affairs and Trade, SWAN International, the Swiss Federal Office for the Environment (FOEN), the Finnish Ministry for Foreign Affairs, the Japanese Ministry of Environment (through the Institute for Global Environmental Strategies - IGES), the United Nations Environment Programme (UNEP), and the International Development Research Centre (IDRC). Specific funding for the coverage of this meeting has been provided by the IPCC and the Government of Norway. Funding for translation of the *Bulletin* into French has been provided by the Government of France, the Wallonia, Québec, and the International Organization of La Francophonie/Institute for Sustainable Development of La Francophonie (IOF/IFDD). The opinions expressed in the *Bulletin* are those of the authors and do not necessarily reflect the views of IISD or other donors. Excerpts from the *Bulletin* may be used in non-commercial publications with appropriate academic citation. For information on the *Bulletin*, including requests to provide reporting services, contact the Director of IISD Reporting Services at <kimo@iisd.org>, +1-646-536-7556 or 300 East 56th St., 11D, New York, NY 10022 USA.



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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 Technical Support Units (TSUs).

The IPCC also has a Task Force on National Greenhouse Gas Inventories (TFI). The TFI oversees the IPCC National Greenhouse Gas 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 to encourage the use of this methodology by parties to the UN Framework Convention on Climate Change (UNFCCC).

The IPCC Bureau is elected by the Panel for the duration of the preparation of an IPCC assessment report (approximately six years). Its role is to assist the IPCC Chair in planning, coordinating and monitoring the work of the IPCC. The Bureau is composed of climate change experts representing all regions. Currently, the Bureau comprises 31 members: the Chair of the IPCC, the IPCC Vice-Chairs, the Co-Chairs of the three WGs and the Bureau of the TFI (TFB), and the Vice-Chairs of the three WGs. In addition to the Bureau, 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, WG and TFB Co-Chairs and advisory members, which include 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 that are subject to extensive review by experts and governments.

The IPCC has so far undertaken four comprehensive assessments of climate change, each credited with playing a key role in advancing negotiations under the UNFCCC: the 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. In 2008, IPCC-28 decided to undertake an AR5 to be completed in 2014.

The Assessment Reports are structured into three volumes, one for each WG. Each volume is comprised of a SPM, a Technical Summary and an underlying assessment report. All assessment 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 Report also includes a Synthesis Report (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. More than 800 authors and review editors from 85 countries are participating in the preparation of AR5.

In addition to the comprehensive assessments, the IPCC produces special reports, methodology reports, and technical papers, focusing on specific issues related to climate change. Special reports prepared by the IPCC 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 the Special Report on Managing the Risks of Extreme Events and Disasters

to Advance Climate Change Adaptation (SREX) (2011).

Technical papers have been prepared on Climate Change and Biodiversity (2002), and on Climate Change and Water (2008), among others.

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 latest version of the IPCC Guidelines on National Greenhouse Gas Inventories was approved by the Panel in 2006. In 2013, the IPCC adopted the 2013 Supplement to the 2006 Guidelines for 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: This session was held from 9-10 April 2008, in Budapest, Hungary, with discussions centering on the future of the IPCC, including key aspects of its work programme, such as WG structure, type and timing of future reports, and the future structure of the IPCC Bureau and the TFB. 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 at the earliest feasible date in 2014.

IPCC-29: This session, which commemorated the IPCC’s 20th anniversary, was held from 31 August to 4 September 2008 in Geneva, Switzerland. At this time, the Panel elected the new IPCC Bureau and the TFB, and re-elected Rajendra Pachauri (India) as IPCC 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. It also asked the Bureau to consider a scoping meeting on the SREX, which took place from 23-26 March 2009 in Oslo, Norway.

IPCC-30: This session was held from 21-23 April 2009 in Antalya, Turkey. At the meeting, 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 was held from 26-29 October 2009 in Bali, Indonesia. Discussions focused on approving the proposed AR5 chapter outlines developed by participants at the Venice scoping meeting. The Panel also considered progress on the implementation of 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 the IPCC processes and procedures and to present recommendations in order 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, held from 11-14 October 2010 in 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 that required further examination, the Panel established task groups on processes and procedures, communications, Conflict of Interest (COI) policy, and governance and management. The Panel also accepted a revised outline for the AR5 SYR.

SRREN: The eleventh session of WGIII met from 5-8 May 2011 in Abu Dhabi, United Arab Emirates, and endorsed the SRREN and its SPM. Discussions focused, *inter alia*, on chapters addressing sustainable development, biomass and policy. Key findings of the SRREN include that the technical potential for renewable energies is substantially higher than projected future energy demand, and that renewable energies play a crucial role in all mitigation scenarios.

IPCC-33: The session, held from 10-13 May 2011 in Abu Dhabi, United Arab Emirates, focused primarily on follow-up actions to the IAC Review of the IPCC processes and procedures. The Panel decided to establish an Executive Committee, adopted a COI Policy, and introduced several changes to the procedures for IPCC reports. The Panel also endorsed the actions of WGIII in relation to the SRREN and its SPM, and considered progress on AR5.

SREX: The first joint session of IPCC WGs I and II, which took place from 14-17 November 2011 in Kampala, Uganda, accepted the SREX and approved its SPM. The SREX addresses the interaction of climatic, environmental and human factors leading to adverse impacts of climate extremes and disasters, options for managing the risks posed by impacts and disasters, and the important role that non-climatic factors play in determining impacts.

IPCC-34: The meeting, held from 18-19 November 2011 in Kampala, Uganda, focused on follow-up actions to the IAC Review of the IPCC processes and procedures, namely in relation to procedures, COI policy and communications strategy. The Panel 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. The Panel also formally accepted the SPM of the SREX, which was approved by WGs I and II at their joint meeting held prior to IPCC-34.

IPCC-35: This session took place from 6-9 June 2012 in Geneva, Switzerland. The meeting 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. Delegates also agreed to revisions to the Procedures for the IPCC Reports, and the Procedures for the Election of the IPCC Bureau and Any Task Force Bureau.

IPCC-36: At its meeting, held from 23-26 September 2013 in 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 accepted the underlying report, including the Technical Summary and annexes.

IPCC-37: This session was held from 14-17 October 2013 in Batumi, Georgia. At the meeting, the Panel considered and adopted two methodology reports: "2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands" and "2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol." The IPCC also addressed a range of procedural matters and undertook initial discussions on mapping the future of the IPCC.

IPCC-38: The meeting, held from 25-29 March 2014 in Yokohama, Japan, focused on finalizing the WGII contribution to AR5 titled "Climate Change 2013: Impacts, Adaptation and Vulnerability." The Panel then met to approve the WGII SPM and accepted the underlying report, including the Technical Summary and annexes.

IPCC-39 REPORT

On Monday morning, 7 April, IPCC Chair Rajendra Pachauri opened IPCC-39, stressing that the meeting marked a crucial moment for the completion of AR5. Noting that setting mitigation pathways will be critical for attaining climate change targets, he emphasized that the WGIII contribution to AR5 must be a robust, policy relevant and informative document providing policymakers with the key knowledge and information they need.

Jochen Flasbarth, State Secretary, Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany, welcomed participants. He noted that while Germany is currently undergoing a transformation in its energy supply system as it phases-out nuclear power and increases its share of renewables, it remains committed to ambitious mitigation targets, including a national target of at least 40% reductions in GHG emissions compared to 1990 levels by 2020. He expressed hope that the WGIII report will generate national and international momentum for global mitigation action.

Georg Schütte, State Secretary, Federal Ministry for Education and Research, Germany, highlighted, *inter alia*, the need to: optimize modeling technologies to increase their predicting power, and strengthen mitigation technologies; build a broader knowledge base; strengthen international climate discourse; and "take a closer look" at the interaction between the science-policy interface and political realm.

Deon Terblanche, WMO, emphasized the importance of the WGIII report in offering options and elements for policymakers and of IPCC-39 in providing guidance for the future of the Panel. He described the WMO's work in monitoring and supporting efforts to reduce emissions, and stated that the world meteorological community plays a key role in providing information on the causes and impacts of climate change, as well as on adaptation and mitigation measures.

Jacqueline McGlade, UNEP, urged the international community to take "immediate and robust" action to mitigate climate change, stressing that trends can be reversed and 2020 targets can still be achieved. Emphasizing the need for "credible, transparent and relevant" assessments at the core of all activities, she promised UNEP's continued support to bring the IPCC findings to the world's attention.

UNFCCC Executive Secretary Christiana Figueres, via video message, emphasized that as the third contribution to AR5, the WGIII report will complete the “solution space” on how the world can meet the climate change challenge. Noting that AR5 will inform UNFCCC negotiations by providing objective evidence and options for pathways forward, she stressed the need to ensure increased access to the reports so that policy makers have guidance on how to move forward.

Using the analogy of scientists as mapmakers, and policymakers as navigators who decide which path to follow, WGIII Co-Chair Ottmar Edenhofer outlined the content of the draft WGIII report, stating that it consists of three sections: one presenting the different perspectives available to analyze mitigation paths; a second one examining the routes undertaken in the recent past and their results; and a third one presenting different pathways for the future, as well as their requirements and implications. He further highlighted the ethical issues that mitigation presents and the need for value judgments, and stressed the role of international and regional cooperation.

IPCC Deputy Secretary Gaetano Leone introduced the IPCC-39 agenda item on the IPCC programme and budget (IPCC-XXXIX/Doc.2, Corr.1). The item was forwarded for consideration to the Financial Task Team. Participants then approved the provisional agenda for IPCC-39 (IPCC-XXXIX/Doc.1).

IPCC Chair Pachauri suspended IPCC-39 until the conclusion of WGIII-12.

WGIII-12 REPORT

APPROVAL OF THE SUMMARY FOR POLICYMAKERS

On Monday morning, WGIII Co-Chair Ramón Pichs-Madruga (Cuba) opened WGIII-12. WGIII Co-Chair Youba Sokona (Mali) said more than 38,000 comments had been received from experts and governments. He said that the revised SPM consists of five sections: an introduction (SPM.1), SPM.2 summarizing chapters 1-4 of the underlying report, SPM.3 and SPM.4 summarizing chapters 5-12, and SPM.5 summarizing chapters 13-15. He introduced a graphic performance meter to compare the word and time budgets, to assess progress made throughout the meeting.

SPM.1. INTRODUCTION: Co-Chair Sokona explained that this section had been rewritten based on governments’ comments and that the language was similar to text already approved by WG-I. On a sentence describing the function of the report, Switzerland suggested, and participants agreed to, changing the words “focuses on literature” to “assesses literature.” Saudi Arabia, supported by India, called for reference to the IPCC’s special report on carbon capture and storage in a sentence describing the literature on which the report is based. Co-Chair Sokona clarified that the WGIII report builds on AR4 and, therefore, only includes literature published since AR4. Switzerland suggested, and participants agreed to, adding a reference to previous reports.

Venezuela, supported by China, Bolivia, Peru and Tanzania, lamented the removal from the text of a reference to UNFCCC Article 2 (Objective of the Convention). India called for reintroduction of deleted text on the definition of mitigation and climate policy.

Saudi Arabia, supported by China, called for retaining language from the December SPM draft version, emphasizing

that the report does not recommend particular goals for mitigation, but assesses available options. Switzerland, supported by Tanzania and Norway, said the reference to the report not recommending particular goals for mitigation is superfluous as IPCC reports are not intended to be prescriptive. Co-Chair Sokona suggested, and participants agreed to, adding text reflecting that the report assesses mitigation options and their societal implications, but does not recommend any particular option.

In the final introductory paragraph on the degree of certainty of findings, Switzerland suggested, and participants agreed, to state that the language on of the degree of certainty is consistent across the WG reports. Regarding a footnote, Norway suggested, and participants agreed to, text referring to the guidance note for Lead Authors on consistent treatment of uncertainties.

Final SPM.1 Text: The introduction addresses the role of the IPCC, outlines the SPM’s structure and explains degrees of certainty. In the SPM, the degree of certainty of the WG’s 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).

SPM.2. APPROACHES TO CLIMATE CHANGE

MITIGATION: Co-Chair Edenhofer explained that this section presents the main perspectives available to examine mitigation and their limitations, and that it is meant to enhance the transparency of the entire report. He clarified that the text had been revised by the Coordinating Lead Authors (CLAs) to take into account the many comments received on the previous draft.

A CLA provided an overview of the section, noting that it is based on Chapters 1-4 of the underlying report and is presented in the SPM as framing questions, such as how to treat decision making under uncertainty, what the best metric for aggregating gases is, whether moral philosophy can help determine how to share the mitigation burden, and how to determine what “dangerous anthropogenic interference” means. He also highlighted key findings in the section, including that: deep cuts in emissions will be difficult; extreme events are important in determining the benefits of mitigation; and sustainable development offers a framework for the design of climate policy.

The CLA further explained that in restructuring the section, certain issues were downplayed, for example, deleting specific reference to UNFCCC Article 2, while still retaining the concept of “dangerous” in a new paragraph on ethics appearing later in the report. He also noted the deletion of a paragraph on international cooperation involving ethical considerations, including equitable effort sharing.

Venezuela, supported by Bolivia, suggested reinserting an introductory paragraph referencing UNFCCC Article 2 to set the context for the section, noting its inclusion of many complex issues. She also expressed concern with terms that are not clearly defined, such as technological “transition.”

Participants commenced discussions on the text with a paragraph stating that **climate change mitigation involves a global commons problem**. The US noted that the concept of “global commons” may not be widely understood and could lead to different interpretations. The US, Tanzania, Canada, South Sudan and France suggested various formulations without using the term “global commons.” Saudi Arabia suggested referring

to collective action, differentiated responsibilities and global commons.

Supporting the insertion of a glossary entry proposed by Switzerland, a CLA pointed out that the global commons concept is defined in the social sciences and that the following sentences in the paragraph provide further explanation of the concept and its relevance.

Many participants, including Brazil, Saudi Arabia, Bolivia and Malaysia, noted difficulties in moving forward with text in SPM.2, given the complexity of concepts, such as “global commons,” and the difficulties of trying to summarize them. Saudi Arabia, supported by Brazil, Malaysia, Bolivia and South Sudan, stressed the importance of addressing responsibilities when referring to global commons, and called for using the December version of the paragraph, which refers to climate change as a global commons problem that implies the need for international cooperation. He stated that international cooperation “can contribute by defining and allocating rights and responsibilities with respect to the atmosphere.”

Bolivia, supported by the UK, the US and the Netherlands, proposed addressing the issue and the entire SPM.2 section in a contact group. The contact group, which was chaired by Austria and Mexico, met from Monday to Thursday.

Discussions in the contact group focused on a handful of controversial matters. Participants debated at length the issue of sustainable development and its role in relation to climate policy. Some developing countries stressed the need to emphasize the importance of the right to development and poverty eradication in addressing climate change, while some developed countries underlined that action is motivated by climate change risks. After three days of discussions, participants agreed to insert a paragraph on **sustainable development and equity as providing a basis for assessing climate policies and highlighting the need for addressing the risks of climate change**. Another sentence in the paragraph mentions that “some mitigation efforts could undermine action on the right to promote sustainable development, and on the achievement of poverty eradication and equity.”

Another point of contention was the reference to climate change as a “global commons” problem. Some countries expressed concern over including reference to this concept, saying it might be misunderstood by policymakers and carry unintended legal connotations related to international law. Another developing country stressed that any reference to global commons should be linked to the right to development. Many participants suggested adopting a descriptive approach, rather than trying to define the concept. The agreed text states that climate change has 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 affect other agents. Moreover, a footnote explains that in the social sciences this is referred to as a “global commons problem,” and notes that the expression “has no specific implications for legal arrangements or for particular criteria regarding effort sharing.”

Participants also discussed international cooperation on mitigation and technology transfer. On a reference in the December draft text to the need for cooperation on research and development in support of mitigation, opening up of markets, and the creation of incentives to encourage private firms to develop and deploy new technologies, some developing countries

requested deletion of references to opening up of markets as being prescriptive. Many developing countries called for including references to technology transfer and “environmentally sound” or “reliable and affordable low-carbon” technologies, with one developed country delegate cautioning against referring to technology transfer, noting it is a “contentious” issue under the UNFCCC, given some interpretations regarding its relation to intellectual property rights. The text agreed by the contact group states that **effective mitigation will not be achieved if individual agents advance their own interests independently**, and that “international cooperation can play a constructive role in the development, diffusion and transfer of knowledge and environmentally sound technologies.”

Participants also debated a proposed paragraph on climate policy raising issues of ethics, with some developing countries calling for reference to historical contributions of GHGs to be clear in relation to mitigation and adaptation, and others calling for inserting reference to the concept of equity. The agreed text points to **issues of equity, justice and fairness arising with respect to mitigation and adaptation**, and states that countries’ past and future contributions to the accumulation of GHGs in the atmosphere are different, as are the challenges and circumstances they face, and their capacities to address mitigation and adaptation.

Participants also approved, with minor amendments, paragraphs on, *inter alia*: climate policymaking involving value judgments and ethical considerations; economic evaluation as one method commonly used to inform climate policy design, while acknowledging “well-documented” limitations of tools for economic assessment; co-benefits and adverse side-effects created by intersections of climate policy with other societal goals, such as health, food security, and biodiversity; and climate policy being informed by consideration of different risks and uncertainties, some of which are difficult to measure, notably low probability events that would have a significant impact if they occurred.

The contact group presented the text to plenary late on Thursday night and it was approved without amendment.

SPM.2 Final Text: This section defines mitigation, clarifies the role of sustainable development and equity in assessing climate policies, and warns that effective mitigation will not be achieved if individual agents advance their own interests independently. The main findings address, *inter alia*: issues of equity, justice and fairness; value judgments, ethical considerations and economic evaluation in climate policymaking; the possibility of co-benefits or adverse side-effects as climate policy intersects with other societal goals; and risks and uncertainties informing climate policy, including through perceptions of risk by individuals and organizations.

SPM.3. TRENDS IN STOCKS AND FLOWS OF GHGS AND THEIR DRIVERS: On the proposed introductory sentence to section SPM.3 stating: “**Total anthropogenic GHG emissions rose more rapidly from 2000 to 2010 than in each of the previous three decades**,” China and Canada questioned the accuracy of the statement. Saudi Arabia and India called for citing a broader timeline, stating this would be more representative of trends. A CLA explained that the statement referred to growth in emissions, and the highest rate appeared for the 2000-2010 decade, enabling the authors to conclude that in that decade emissions grew faster than in previous decades.

Canada, supported by Saudi Arabia, proposed stating that “total anthropogenic GHG emissions rose in each of the previous four decades.” Norway, supported by Germany, Luxembourg and Ireland, favored keeping the statement as is. A CLA said the finding is not due to low emissions in 2000, as suggested by Canada. Following informal consultations, the CLAs proposed, and participants agreed to, the following formulation: “Total anthropogenic GHG emissions have continued to increase over 1970 to 2010 with larger absolute decadal increases toward the end of this period.”

Participants approved a sentence stating that despite a growing number of climate change mitigation policies, annual GHG emissions grew, on average per year, more during 2000-2010 (2.2%) than during 1970-2000 (1.3%).

On a footnote stating that GHG emissions in the SPM are weighted by global warming potential (GWP) with a 100-year time horizon from the IPCC’s Second Assessment Report, Brazil proposed a sentence from the WGI report, stating: “The choice of type of emission metric and time horizon involves explicit or implicit value judgments.” The US suggested instead: “The most appropriate metric and time horizon will depend on which aspects of climate change are considered most important to a particular application.” Brazil, supported by Peru, China, Bolivia and Saint Lucia and opposed by the US, the European Union (EU), Norway and Australia, recommended that a further sentence from the WGI report be added, stating: “No single metric can accurately compare all consequences of different emissions, and all have limitations and uncertainties.” The US, Norway, Luxembourg, the EU, France and others said Brazil’s latter proposal was out of context, with the US noting that it gave a misleading impression that the different metrics have equal levels of uncertainty. Switzerland proposed that the footnote simply refer readers to the WGI SPM and IPCC websites for more information. Canada, supported by South Sudan, suggested compromise text stating: “All metrics have limitations and uncertainties.”

A CLA explained that, in this case, metrics are used as a scaling device, which is different from their role in analyzing the contribution to climate change, and cautioned against generating undue confusion. He added that although the exact number might change if using a different metric, the trend would not, and proposed adding a reference to Chapter 3.9.6 and Annex 2 on metrics from the underlying report. New Zealand, Norway, Luxembourg, Sweden, the UK, the EU and others supported the CLA’s proposal, but agreed to include a reference to the WGI SPM as well. Luxembourg suggested also adding a sentence explaining that “this is the common metric used up to now under the UNFCCC.” Saudi Arabia, supported by Austria, Trinidad and Tobago, Republic of Korea and others, proposed stating that “all metrics have limitations and uncertainties in assessing the consequences of different emissions.” Participants agreed to this text and to additionally refer to WGIII Box TS.5, as suggested by Peru.

Participants approved a footnote regarding the treatment of uncertainty in the SPM and two sentences on the historically high total anthropogenic GHG emissions from 2000 to 2010, and the temporary impact of the global economic crisis on emissions.

Regarding a sentence in the paragraph on GHG emissions growth, stating: “**80% of the recent GHG emissions growth from 2000 to 2010 has been from the combustion of fossil**

fuels,” Saudi Arabia, supported by Venezuela, Egypt, Sierra Leone, Qatar, Iraq and others, suggested referring to 1970-2010 to be consistent with the previous paragraph and supported consideration of other sectors and gases. China proposed covering all GHG-related gases in the sentence. Saudi Arabia also proposed removing “fossil fuels” and noted that if the last four decades are reflected, the share of fossil fuels will not be so high.

The EU reminded, and a CLA confirmed, that AR5 focuses on the last decade, and, with Germany and Slovenia, that it is a highly relevant measure point for policymakers. Germany, with Slovenia, highlighted the period from 2000 to 2010 as the most relevant to policymakers. The CLA also referred to the need to remain connected to the literature, be transparent, provide precise information and not repeat AR4. Germany, supported by the UK, Sweden, Jamaica and Mexico, supported keeping the text as is.

IPCC Chair Pachauri said that suppressing information based on facts would be a “dereliction of the IPCC’s responsibility,” warning that otherwise “there will be a headline that this headline statement has been removed at the behest of a few countries.” The need to accept and maintain scientific findings was supported by Austria, the Russian Federation, the UK, Ireland, France, Belgium and others. Austria appealed to participants to accept scientific findings that are “politically relevant and not politically prescriptive” and cautioned against undermining the IPCC’s credibility. Belgium, with Ireland, reminded participants that “we are here to make a summary for, not by, policymakers.”

Co-Chair Pichs-Madruga proposed considering the first sentence of the paragraph in an informal group, noting that the authors’ opinion was fundamental. During the consultations, discussions focused on sources, sectors and gases for inclusion, and on referencing increased emissions for the periods 1970-2010 and 2000-2010. Participants reached agreement on the text, which was then considered and approved in plenary. The final text reads: “CO₂ emissions from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emission increase from 1970 to 2010; with a similar percentage contribution for the period 2000-2010.”

Slovenia queried whether the increases for 1970-2010 and 2000-2010 were the same. The CLAs explained that while there were fluctuations in the contribution to the emissions total for the two periods, the emissions share from fossil fuel combustion and industrial processes for the latter period was similar to that of the former. The remainder of the paragraph was approved.

On the footnote stating that, “in this report data on fluorinated gases is taken from the Emissions Database for Global Atmospheric Research (EDGAR) database, which covers substances included in the Kyoto Protocol,” New Zealand proposed, and participants agreed, to clarify that this applies to the first commitment period of the Kyoto Protocol.

Figure SPM.1 on **total annual anthropogenic GHG emissions (GtCO₂eq/yr) by groups of gases for 1970-2010** was adopted with minor amendments.

There were various requests for clarification on the first sentence of a paragraph stating that: “**more than half of cumulative CO₂ emissions between 1750 and 2010, about 1100 GtCO₂ out of 2000 GtCO₂, have occurred in the last 40 years (high confidence).**” China questioned the high confidence attached to this statement, given large uncertainties associated

with CO₂ emissions from Forestry and Other Land Use (FOLU) noted in the same paragraph. A CLA explained that the high confidence is related to the amount of cumulative emissions over the last 40 years, which holds despite the uncertainty associated with the specific numbers that underlie it. Opposed by China, he suggested alternative text linking the high confidence statement to the general statement, and decoupling it from the actual numbers “about 1100 GtCO₂ out of 2000 GtCO₂.”

After further consultations between China and the CLAs, participants agreed to remove the detailed numbers, noting that these can be calculated on the basis of the sentences that follow, and to state: “about half of cumulative CO₂ emissions between 1750 and 2010 have occurred in the last 40 years (*high confidence*).”

The US, supported by Switzerland, then proposed adding a sentence to this paragraph stating that non-CO₂ emissions account for about 25% of cumulative anthropogenic GHG emissions since 1970, saying that omitting this would be misleading to policymakers. Noting that this paragraph addresses CO₂ emissions, Brazil said the US proposal would be better placed in another paragraph where non-CO₂ emissions are discussed, and that including non-CO₂ emissions could be equally misleading, remarking that assigning a percentage would depend on the metric and timeframe chosen.

A CLA said that cumulative emissions over time have not been calculated for non-CO₂ emissions to the same degree, and that assigning a percentage to them, without identifying a time period and metric, would not be consistent with the literature. Expressing concern that the report focuses almost exclusively on CO₂, the US pointed to a “wide body of literature” regarding cumulative non-CO₂ emissions, adding that the US could accept addressing non-CO₂ emissions in a subsequent paragraph. Following informal consultations, participants agreed to add the following sentence to the paragraph addressing anthropogenic GHG emissions: “Annually, since 1970, about 25% of anthropogenic GHG emissions have been in the form of non-CO₂ gases.”

On the first sentence of a paragraph noting that “**about 75% of the 10 GtCO₂eq growth in annual anthropogenic GHG emissions between 2000 and 2010 comes from the energy supply and industry sectors,**” Saudi Arabia, supported by Qatar and Egypt, opposed focusing on the energy supply and industry sectors, and called for reverting to the December draft version of the SPM where AFOLU and other sectors were also mentioned, in order to be comprehensive and balanced. This was opposed by the UK, Denmark, Germany, the Netherlands and Switzerland, which called for retaining the statement as presented, saying that it constituted one of the clearer and more policy-relevant statements of the SPM. Saudi Arabia added that there were further problems besides not focusing on other sectors, such as the focus on the last decade instead of the last four decades.

Participants considered adding a sentence from the December draft reading: “Current GHG emission levels are dominated by contributions from the energy supply, AFOLU and industry sectors; industry and buildings gain considerably in importance if indirect emissions are accounted for.” Brazil opposed this addition, noting that AFOLU is not comparable to energy and industry, given much higher uncertainty levels and its dynamic carbon cycle. The US suggested adding reference to non-CO₂ gases.

Discussions continued in an informal group where participants addressed the need to distinguish between statements on the trend in the growth of emissions, the role of different sectors as drivers of this trend, and the role of indirect emissions. Reporting back to plenary, Norway presented the group’s proposal, stating: “Annual anthropogenic GHG emissions have increased by 10 GtCO₂eq between 2000 and 2010, with this increase directly coming from energy supply (47%), industry (30%), transport (11%) and buildings (3%) sectors. Accounting for indirect emissions raises the contributions of the buildings and industry sectors (*medium confidence*).” India requested a clarification on the fact that the percentages did not add up to 100 percent. Egypt, supported by Tanzania, enquired about the composition of the buildings sector. The US enquired why the percentages did not reflect the declining trend in AFOLU emissions since 2000. The CLAs explained that “buildings” included the direct combustion of fossil fuels but not construction or electricity use, and that the remaining share comes from AFOLU, which was omitted given the significant uncertainties associated with these emissions and inconsistencies in reviewed trends. Switzerland suggested adding the respective levels of confidence to each sentence. The Netherlands suggested, and participants agreed to, adding a glossary entry on “direct” and “indirect” emissions. Participants approved the text.

Participants agreed to text stating that GHG emissions have been growing in all sectors, except AFOLU. On a sentence setting out emissions sources, Brazil suggested, and participants agreed to, text stating that the AFOLU figures represent net emissions. China requested clarification on the assessment of uncertainty surrounding figures addressing the sectoral level. Given concerns expressed by many participants over the grouping of countries based on income levels for presenting data and trends in various paragraphs and figures, participants agreed to form a contact group to address the categorization of countries.

The contact group on the issue of categorizing countries based on income levels convened over three days. Discussions centered on whether or not to include in the SPM data on emissions and emissions growth based on a division of countries into four income-level groups originating from the World Bank, namely low income, lower-middle income, upper-middle income and high income. On the rationale for the choice of these variables, the CLAs explained that: income is widely used in the peer-reviewed literature; it is the single most important determinant of GHG emissions of all indicators assessed; it is not a new classification; and four is the optimal number of categories, minimizing variance within groups and maximizing it between them, and enabling the highlighting of similarities and differences. The CLAs stressed that the impact of income levels on countries’ emissions is one of the important trends for policymakers to understand. A WGIII Co-Chair cautioned that not presenting the results in this way would reduce the scientific credibility of the IPCC.

Most countries agreed on the importance of “staying true to the literature,” maintaining the IPCC’s scientific integrity, and ensuring that the SPM remains policy relevant, but were divided on what this meant for the categorization. While many countries supporting the proposed SPM text indicated their confidence in the authors’ ability to correctly reflect the underlying report, a number of developing countries questioned this, raising such

issues as: the existence of numerous other variables; using a categorization that originates from the World Bank, which is therefore not relevant in the context of climate change; that the allocation of countries to groups based on their income at one point in time creates biased results; and suggesting that “science has been manipulated for political purposes.”

The contact group also discussed at length the possibility of using other variables or categorizations. Countries opposing the use of the income criterion, *inter alia*: called for the use of other indicators, such as human development and national circumstances; noted that income alone cannot summarize all relevant information and does not “capture history”; called for consistency with WGII categories; and proposed categorizations, including developed and developing countries, Annex I and non-Annex I, and a division into five regions, which was used in the underlying report. CLAs stressed that presenting data through any of these categorizations would not be informative and would, *inter alia*, make invisible the low-income group, whose contribution to emissions remains low. Some countries also pointed out that WGII was different as it dealt with impacts, which are region-specific, unlike income. Referring to the WGIII glossary, countries supporting the text pointed out that no robust definitions exist for developed and developing country groups. Many agreed that it would be important in particular for the low-income countries or least developing countries (LDCs) to have their specific circumstances reflected. CLAs noted that while there is considerable overlap between the low-income countries and LDCs, for expository purposes it was also important to show how countries at many different income levels are contributing to emissions.

Countries opposed to using income categories stressed that the issue was highly political, since policymakers would draw from the SPM for the UNFCCC negotiations on a new climate agreement, and said that the IPCC should focus on science, not politics. CLAs and countries in favor of the original text assured that the proposed categories were used for expository purposes only and were not intended to have any meaning beyond the IPCC. Some countries proposed a footnote clarifying this, which was rejected by others as insufficient. On the final day of consultations, the CLAs presented a new categorization proposal, which would eliminate the word “income” from Section SPM.3, with the exception of a methodological footnote, and be based on four groups largely corresponding to the previous ones. With a number of countries opposing the CLA’s proposal, the contact group co-facilitators reported back to the WGIII Co-Chairs that the group had failed to reach agreement.

On Friday evening, Co-Chair Edenhofer informed the plenary of the lack of consensus, noting the WGIII Co-Chairs’ disappointment with the outcome. He proposed, and participants agreed, that the contact group reconvene to delete all draft figures in SPM.3 that use the income categorization as well as a figure using the regional groupings: Figure SPM.2 on total CO₂ emissions by region, Figure SPM.3b on total GHG emissions by country income group, Figure SPM.4 on trends in GHG emissions by country income group, and Figure SPM.5 on CO₂ emissions from fossil fuel combustion for country income groups attributed on the basis of territory and final consumption). In addition, the contact group was also asked to come up with text that was acceptable to all parties. Austria, the UK, the US, the EU, Saint Lucia, Madagascar, the Netherlands, Mexico, New

Zealand and others expressed concern over this decision and the IPCC’s inability to communicate all relevant information included by the WGIII authors in the SPM.

The contact group reconvened to delete the figures, but was unable to agree on alternative language for the associated SPM text. Many participants opposed the use of “developed countries” and “developing countries” in the text. Stating that expressions like “some other countries” did not provide any added value, the CLAs proposed, and the group agreed, to delete all related text, which included the second part of a paragraph on sectoral emissions growth between 2000 and 2010, and two paragraphs on regional and income group-based patterns in emissions growth and per capita emissions, including a reference to territorial and consumption-based emissions. One country proposed adding references to figures and chapters in the underlying report upon which the deleted parts were based. This was opposed by a number of developing countries.

In plenary, the proposal was opposed by China, India, Saudi Arabia, Qatar, Egypt and others, which said no references relating to the deleted text should remain in the SPM. Participants decided to focus on the references that were in the paragraph in the latest version of the SPM draft, two of which referred to chapters of the underlying report mentioning income-based categories (Chapters 1.3 and 5.3). The US, Slovenia, Norway, France, Canada and others, opposed by Saudi Arabia, supported keeping the references. Following further consultations, participants agreed to delete the two references to the underlying report, and remove the relevant paragraphs as proposed by the contact group.

Returning to the remainder of Section SPM.3, participants revised for consistency and clarity and approved **Figure SPM.2 on Total anthropogenic GHG emissions (GtCO₂eq/yr) by economic sectors**.

Regarding a paragraph on the **contributions of economic and population growth to CO₂ emissions**, Saint Lucia questioned why decarbonization patterns and energy intensity issues were not addressed in the first sentence of the paragraph. Supporting Saint Lucia, Germany urged a reference to decarbonization, stressing that economic growth can occur with low emissions. Ireland called for emphasis on energy intensity issues. Saudi Arabia called for a reference to economic “activities” instead of economic “growth” and suggested that the paragraph address trends over the past four decades rather than over the short term. Switzerland, supported by Slovenia, urged that the text refer to global trends. Saudi Arabia and Canada, supported by Venezuela, requested that the sentence not refer to fossil fuel “combustion” because this was not included in a previous draft and due to countries’ different circumstances.

On the request to reference “decarbonization,” the CLAs noted that the term is mentioned later in the paragraph. Supporting the retention of references to “growth” and “combustion,” the CLAs explained that there are other uses of fossil fuels besides combustion, and that economic growth is a component of the underlying global decomposition analysis. Co-Chair Pichs-Madruga proposed, and participants agreed, to the following sentences: “Globally, economic and population growth continue to be the most important drivers of increases in CO₂ emissions from fossil fuel combustion. The contribution of population growth between 2000 and 2010 remained roughly identical to the previous three decades, while the contribution of

economic growth has risen sharply.” Participants then considered and approved two sentences on the canceling out of energy intensity improvements, and the reversal of decarbonization due to increased coal use.

Figure SPM.3 on decomposition of the decadal change in total global CO₂ emissions from fossil fuel combustion by population, gross domestic product (GDP) per capita, energy intensity of GDP and carbon intensity of energy was revised for clarity and consistency and approved.

Regarding a paragraph on **emissions growth without additional mitigation efforts**, a CLA explained that text referring to “median temperature increase” had been replaced with “global mean surface temperature increase,” with corresponding numerical values. Saint Lucia and Norway favored retaining the median values noting that they were policy relevant, and participants agreed to reinsert them. In response to a query from Norway, a CLA proposed, and participants agreed, to clarify that emissions growth was without additional efforts to reduce GHG emissions “beyond those in place today.” In response to a query from China, a CLA explained that the reason for moving to a wider temperature range in the mean values was to maintain consistency with WGI and to indicate temperature uncertainties in future scenarios without additional mitigation. Canada requested including quantitative parameters of additional mitigation. China suggested, and participants agreed, to delete text stating that “higher temperatures cannot be excluded due to climate response uncertainties.”

On drivers of emissions growth, Slovenia and the EU supported referring to “economic growth,” whereas Saudi Arabia, China, Sierra Leone, Senegal and Qatar favored “economic activities.” Saudi Arabia called for a focus on industrialized countries’ economic activities, cautioning against “asking developing countries to slow down growth.” China emphasized that climate change impacts were due not only to growth in emissions but also to existing GHG stocks. The UK supported the reference to both population growth and economic activity, as in the underlying report. Saudi Arabia proposed referring to “economic activities and growth” as a compromise. Following various proposals and formulations, participants agreed to text stating: “without additional efforts to reduce GHG emissions beyond those in place today, emissions growth is expected to persist driven by growth in global population and economic activities,” and referring both to global mean surface temperature increases and median values. The CLAs proposed, and participants agreed, to include a footnote with text from the underlying report to address concerns expressed by the Russian Federation on the linkages between representative concentration pathways (RCPs) and scenarios collected for this report.

Germany proposed inclusion of text from the December draft SPM, stating that in 2010, 10 countries accounted for about 70% of CO₂ emissions from fossil fuel combustion and industrial processes. Co-Chair Edenhofer suggested, and participants agreed, that this be taken up in a contact group once the discussion on the groupings of countries was finalized. After the conclusion of the contact group’s work, the issue was raised on the last day of plenary, but no agreement was reached.

Final SPM.3 Text: This section highlights, *inter alia*, that: total anthropogenic GHG emissions have continued to increase over 1970-2010; CO₂ emissions from fossil fuel combustion and industrial processes contributed about 78% of the total GHG

emission increase from 1970-2010, with a similar percentage contribution for the period 2000-2010; and about half of cumulative anthropogenic CO₂ emissions between 1750 and 2010 have occurred in the last 40 years. Noting that annual anthropogenic GHG emissions have increased by 10 GtCO₂eq between 2000 and 2010, the section attributes 47% to energy supply, 30% to industry, 11% to transport and 3% to building sectors. It further concludes that: economic and population growth continue to be the most important drivers of increases in CO₂ emissions from fossil fuel combustion; and emissions growth is expected to persist without additional efforts to reduce GHG emissions.

The section contains the following figures: Figure SPM.1 on total annual anthropogenic GHG emissions by groups of gases in 1970-2010; Figure SPM.2 on total anthropogenic GHG emissions by economic sectors; and Figure SPM.3 on a decomposition of the decadal change in total global CO₂ emissions from fossil fuel combustion by key driving factors.

SPM.4. MITIGATION PATHWAYS AND MEASURES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT:

SPM.4.1. Long-term Mitigation Pathways: Co-Chair Edenhofer introduced this section, emphasizing major improvements and differences from AR4, including harmonization of climate information across all scenarios to ensure compatibility, and broader consideration of technology portfolios, including carbon dioxide removal (CDR) technologies, such as carbon capture and storage (CCS).

A CLA provided an overview of this section, highlighting that it did not only consider the near term, but the long-term strategic view as well. He noted: the increased number of models since AR4, including 300 baseline and 900 mitigation scenarios, constructed to link to WGI through the RCPs; an increased number of low-emissions scenarios; the wide range of socioeconomic, technological and institutional dynamics in the scenarios; and the intent to provide information for evaluating options and not make judgments on their feasibility.

On an introductory paragraph, noting that “**there are multiple scenarios with a range of technological and behavioral options that are consistent with different levels of mitigation,**” Saudi Arabia expressed concern regarding the omission of language in the SPM from the Technical Summary, stating that there is no single pathway to stabilize GHG concentrations at any level, and that the literature points to a range of pathways to meet stabilization levels. The authors preferred retaining the text as is, noting the differing contexts of the SPM and Technical Summary. Saudi Arabia underscored the need to describe how these scenarios and pathways will interact with sustainable development, and participants agreed to add language to the text referencing the different characteristics and implications of the options for sustainable development.

Bolivia expressed concern over the manner in which different technological options were referenced in this section, particularly geoengineering and related options, which, he said, violate the rights of Mother Earth, have not demonstrated their ability to address climate change, and are a “new kind of invasion from developed countries.” He emphasized uncertainty regarding the consequences, limitations and possible risks of these technologies, and suggested the IPCC establish an ethical protocol to address such issues. He proposed additional text for the introductory paragraph noting the limitations and possible

risks of CDR technologies, and insufficient knowledge to quantify emissions offsets from CDR. Noting this was not the appropriate place to reference specific technologies, Co-Chair Edenhofer and the CLAs said this paragraph was intended to provide a general statement about the range of scenarios and that CDR would be addressed in subsequent paragraphs.

On a footnote explaining the integrated models that were used to generate the long-term scenarios assessed in the WGIII report, Japan requested replacing “cost-effective” with “idealized.” The CLAs suggested language to clarify that the “cost-effective” solutions referred to in the text are idealized. Bolivia recalled a long discussion in WGII on the term and concept of “transformation,” and suggested including that same definition here. Co-Chair Edenhofer noted that the use of term transformation here is different than in WGII and proposed referring to “key characteristics of mitigation pathways.” Participants agreed to this change.

There was some discussion on the inclusion of scenarios below 430 parts per million (ppm) in relation to a sentence stating that “this range spans atmospheric concentration levels in 2100 between 430 ppm CO₂eq and 720 ppm CO₂eq, which is comparable to the 2100 forcing levels between RCP 2.6 and RCP 6.0.” In response to questions by Saint Lucia, Canada, the US and Saudi Arabia on the inclusion of scenarios below 430 ppm, the CLAs explained that only two studies had scenarios below 430 ppm and that these included two different models, which made them incompatible and did not allow for their inclusion in the database used in the report. Australia suggested, and participants agreed, to add text clarifying that scenarios outside the mentioned range were also assessed, including some scenarios below 430 ppm, and referring to a paragraph where that problem is adequately explained.

On a sentence stating that “the mitigation scenarios are based on a range of technological, socioeconomic and institutional trajectories,” Bolivia queried the extent to which only market-based approaches were considered in the scenarios, and called for explicit reference to this matter. The CLAs explained that it was not possible to characterize models as market versus non-market given the many methodologies and approaches used.

In regard to the same sentence, Saudi Arabia called for referring to uncertainty associated with technological, socioeconomic and institutional aspects. Canada, supported by the CLAs, suggested referring to the relevant chapter in the underlying report for a discussion of uncertainties and scenarios. This was opposed by Luxembourg and Switzerland, which noted that uncertainty was already mentioned elsewhere in the paragraph.

The discussion was forwarded to small group consultations between Bolivia, Saudi Arabia and the CLAs, which agreed that “the mitigation scenarios involve a wide range of technological, socioeconomic and institutional trajectories, but uncertainties and model limitations exist and developments outside this range are possible.” The revised text was then agreed as presented.

Figure SPM.4 on pathways of global GHG emissions in baseline and mitigation scenarios for different long-term concentration levels, and associated upscaling requirements of low-carbon energy for 2030, 2050 and 2100 was approved with minor amendments.

Participants then discussed a paragraph starting with: **“Mitigation scenarios in which it is likely that the temperature change caused by anthropogenic GHG emissions can be kept to less than 2°C relative to pre-industrial levels are characterized by atmospheric concentrations in 2100 of about 450 ppm CO₂eq.”** On a sentence stating that “mitigation scenarios reaching concentration levels of about 500 ppm CO₂eq by 2100 are *more likely than not* to limit temperature change to less than 2°C relative to preindustrial levels, unless they temporarily “overshoot” roughly 530 ppm CO₂eq before 2100,” the US expressed concern about the role and timeframe of an “overshoot” where a target is temporarily exceeded. Switzerland suggested including a reference to CDR technologies. Canada requested that the language be clarified to reflect overshooting “to” 530 ppm, not overshooting “by” 530 ppm. Slovenia cautioned that 530 ppm should not be made to be seen as a threshold. The sentence was approved with Canada’s proposed amendments.

Belgium said the paragraph was about scenarios of 2°C, not 3°C, and warned that references to scenarios beyond 2°C could be misunderstood as setting a new target. Norway said the issue of 3°C scenarios is addressed elsewhere and, thus, references in this paragraph were redundant. A CLA said the references were valuable as they provided balance regarding which concentrations would make a 3°C temperature increase likely. Norway and Belgium called for, and participants agreed to, the insertion of the word “about” before “650 ppm” to indicate that 650 ppm is not an exact threshold. Germany suggested adding a sentence referring to scenarios of 580 and 650 ppm and, after consultations, the CLAs proposed new text stating: “Scenarios that reach 550 to 650 ppm CO₂eq concentrations by 2100 are *more unlikely than likely* to keep temperature change below 2°C.” Slovenia pointed out that it should include “relative to preindustrial levels.” Belgium stated that the scenarios should range from 530 to 650 ppm. Participants agreed to these amendments and approved the sentence.

Canada, supported by Sweden and Denmark, suggested clarifying a sentence stating that “mitigation scenarios in which temperatures peak and are then likely to bring temperature change to less than 1.5°C by 2100 are characterized by 2100 atmospheric concentrations well below 430 ppm CO₂eq.” Following small group consultations, participants agreed to text stating: “Mitigation scenarios in which temperature increase is *more likely than not* to be less than 1.5 °C relative to pre-industrial levels by 2100 are characterized by concentrations in 2100 of below 430 ppm CO₂eq.”

On **Table SPM.1 on key characteristics of the scenarios collected and assessed for WGIII AR5**, participants agreed to refer to the percentage change in CO₂eq emissions in 2050 and 2100 compared to 2010 instead of the fraction of 2010 emissions. The table and related footnotes were also revised for clarity and consistency with the text. Participants then discussed a paragraph starting with a statement reading: **“reaching atmospheric concentrations levels of about 450 ppm CO₂eq by 2100 would require substantial cuts in anthropogenic GHG emissions by mid-century through fundamental changes in energy systems and potentially the land surface.”** Tanzania and India requested clarification on what “fundamental” changes meant, while Saudi Arabia and Bolivia objected to the term, noting it was too subjective. Saudi Arabia

also took issue with the reference to “potential” changes to land use alongside “fundamental changes in energy systems,” saying that a clearer and stronger reference to necessary changes to land use would be required under this scenario. The CLAs explained that the reference to “potential” land use changes originated from the fact that all scenarios show fundamental changes in energy, but not all show them in land use.

The CLAs agreed to change wording from “land surface” to “land use” and from “fundamental” to “large-scale” change.

Discussions on this paragraph and the subsequent one on temporary overshoot and reliance on CDR in the scenarios continued in an informal group, co-facilitated by the Netherlands and Brazil. On the first paragraph, several developing countries restated their objection to reference to 40 to 70% reductions by 2050, noting it was prescriptive, and called for deletion of the numbers. This was opposed by a number of developed countries, which said that the numbers were descriptive, derived from a range of scenarios, and policy relevant. CLAs presented revised text that: (1) referred to the target to keep to global temperature change to below 2°C relative to preindustrial levels; (2) included a footnote on changes being more effective when in accordance with local vision and approaches; and (3) added another footnote comparing the numbers with those in AR4.

Several developing countries, opposed by a number of developed countries, insisted on the need to remove the reference to 40-70% reductions by 2050, proposing to either show all scenarios with their various ranges or, preferably, only refer to that information in Table SPM.1. Supporting this proposal, one developing country expressed its preference for a 1.5°C target. In response, a developed country delegate proposed adding language on lower concentration scenarios requiring the same changes but on a faster time scale. He also called for stating that, in the long term, a phase-out of fossil fuels is implied by these scenarios. The CLAs presented additional quantitative numbers for other levels, but this was opposed by a developing country as confusing and cumbersome. A developed country called for and participants agreed to include reference to further increases in energy efficiency.

The final agreed paragraph incorporates the various suggestions, including more detail on different scenarios while keeping the reference to 40-70% reductions. In sum, it states that scenarios reaching atmospheric concentration levels of about 450 ppm CO₂eq by 2100 include emission reductions of 40-70% globally relative to 2010 by 2050, and emissions levels near zero or below in 2100. It also provides the percentage reductions in 2050 and 2100 for scenarios reaching 500 ppm CO₂eq and for 550 ppm CO₂eq. The paragraph further explains that scenarios reaching 450 ppm CO₂eq are characterized by more rapid improvements in energy efficiency, and a tripling to nearly a quadrupling of the share of zero- and low-carbon energy supply from renewables, nuclear energy and fossil energy with CCS, or bioenergy combined with CCS (BECCS) by the year 2050. It also states that the substantial changes implied in the scenarios vary across regions; and that scenarios reaching higher concentrations include similar changes, but on a slower timescale, while scenarios reaching lower concentrations require these changes on a faster timescale.

Participants discussed the following paragraph, including implications of temporarily exceeding or “overshooting” the concentration target in various scenarios, and the reliance

on CDR in those scenarios. One developing country made a proposal regarding the limited evidence on the potential of CDR technologies to combat climate change and noted that these techniques carry risks and uncertainties. Moreover, he suggested incorporating a footnote stating that “according to WGI, CDR methods have biogeochemical and technological limitations to their potential on the global scale.” Another developing country suggested a sentence stating that “most assessments agree that geoengineering technologies should not be treated as a replacement for conventional mitigation and adaptation due to high-cost risks or pervasive uncertainties.” The authors presented a reformulated proposal, which included recognition of CDR technologies’ associated risks.

On text stating that “in most scenarios, carbon dioxide is removed from the atmosphere through BECCS” and that “another CDR option, large-scale afforestation, is also included in some scenarios,” one developing country suggested not singling out afforestation and generally referring to CDR, but authors highlighted that the sentence is descriptive of real information used in the scenarios. Participants eventually agreed to text stating: “Depending on the level of the overshoot, overshoot scenarios typically rely on the availability and widespread deployment of BECCS and afforestation in the second half of the century.”

On a sentence stating that the availability and scale of BECCS and large-scale afforestation and other CDR technologies are uncertain and associated with a diverse set of risks, a developing country suggested a broader reference to CDR risks, rather than specifying large-scale afforestation “risks.” A developed country proposed, and participants agreed, to state that BECCS, large-scale afforestation and CDR “to varying degrees” are associated with challenges and risks. Some delegates proposed, but others opposed, to refer to “socioeconomic” risks associated with CDR, with some saying that other sections of the report adequately address those risks. Participants eventually agreed to include a reference to challenges and risks, as specified in Section SPM.4.2.

The final agreed text states: “**Mitigation scenarios reaching about 450 ppm CO₂ equivalent in 2100 typically involve temporary overshoot of atmospheric concentrations, as do many scenarios reaching about 500 ppm to 550 ppm CO₂eq in 2100. Depending on the level of the overshoot, overshoot scenarios typically rely on the availability and widespread deployment of BECCS and afforestation in the second half of the century. The availability and scale of these and other CDR technologies and methods are uncertain and CDR technologies and methods are, to varying degrees, associated with challenges and risks.**” The text also states that: “CDR is also prevalent in many scenarios without overshoot to compensate for residual emissions from sectors where mitigation is more expensive. There is only limited evidence of the potential for large-scale deployment of BECCS, large scale afforestation and other CDR technologies and methods.”

Among the other paragraphs in the section, participants discussed a paragraph reflecting that “**estimated global GHG emissions levels in 2020 based on the Cancún Pledges are not consistent with cost-effective long-term mitigation trajectories limiting temperature rise to 2°C.**” Responding to a question from China regarding the relation of the Cancún Pledges to the scenarios examined in Figure SPM.5 on emissions

pathways to 2030, a CLA clarified that the vast majority of cost-effective scenarios remain clearly below the Cancún Pledges. Norway suggested adding a reference to Figure SPM.5 in the text. Saudi Arabia, supported by India, proposed returning to the December SPM draft text. After informal consultations, participants agreed to text stating that the Cancún Pledges are not consistent with cost-effective long-term mitigation trajectories to limit warming to 2°C.

New Zealand, supported by Saudi Arabia, suggested including a definition of “Cancún Pledges” in the glossary and participants agreed to this inclusion. On a sentence noting that, while the Cancún Pledges refer to 2020, mitigation actions through 2030 have a substantially larger constraining effect on the pathways and options for meeting long-term temperature goals, Canada said the text does not accurately reflect that the earlier mitigation actions are taken, the less actions are constrained going forward, and suggested language to better reflect this. Australia questioned the need for the sentence. Belgium asked why 2030 was highlighted in comparison to 2020. The authors explained the relevance of emphasizing 2030, noting that constraints increase substantially within one decade, and suggested language stating that delaying mitigation through 2030 has a greater influence on mitigation challenges than delays through 2020. Canada said this formulation fails to take into account mitigation actions already taking place, and suggested language to reflect this. Noting similar language in the subsequent paragraph, participants agreed to delete this sentence.

Regarding the first sentence of a paragraph stating that **“delaying mitigation through 2030 will substantially increase the difficulty of the transition to low longer-term emissions levels, and narrow the range of options consistent with maintaining temperature change below 2°C relative to preindustrial levels,”** Canada and Australia proposed referring to “increased mitigation” to reflect that mitigation is already taking place, while the CLAs preferred “mitigation efforts beyond those in place today.” Belgium expressed its preference for “would” instead of “will.” Saudi Arabia, supported by Brazil, said the sentence should refer to projections, and the CLAs proposed text to reflect this.” Participants approved the sentence with the changes suggested by the CLAs.

No substantial changes were made to **Figure SPM.5 on the implications of different 2030 GHG emissions levels for the rate of CO₂ emissions reductions and low-carbon energy upscaling from 2030 to 2050 in mitigation scenarios reaching about 450 to 500 (430-530) ppm CO₂eq concentrations by 2100.**

Delegates approved the first sentence of a paragraph stating that **“estimates of the aggregate economic costs of mitigation vary widely and are highly sensitive to model design, assumptions and specification of scenarios.”** The US, supported by the UK, Chile, Switzerland, Ireland and Norway, expressed concern over the numbers conveyed in a subsequent sentence stating that “mitigation scenarios that reach atmospheric concentrations of about 450ppm CO₂eq by 2100 entail global consumption losses, measured as a change from baseline consumption, of 1% to 4% in 2030, 2% to 6% in 2050, and 3% to 11% in 2100 relative to what would happen without mitigation.” They requested reframing these numbers in terms of annualized numbers in consumption over time periods, instead of single points in time, saying that this would convey

cost information in a more “clear and balanced” manner. Chile stressed the importance of changing consumption models as “part of the solution.” Switzerland noted that assumptions may “radically” change over the course of the century and asked for reference to the certainty level associated with each timeframe. Norway requested adding text specifying that the numbers do not consider co-benefits of mitigation and other benefits of reduced climate change.

The sentence, together with the remainder of the paragraph, was deferred to an informal contact group. In the contact group, participants agreed to revised text that consolidates information on costs, adds information on complementary costs, and expands on various aspects of costs to show, for example, the compounded effect of annually accruing costs and the annualized reduction in growth rate that this implies. On the reference to BECCS, Saudi Arabia called for reference to CCS in addition to BECCS, and participants agreed to amend the text to read: “bioenergy, CCS and their combination (BECCS).”

Table SPM.2 on global mitigation costs in cost-effective scenarios and estimated cost increases due to assumed limited availability of specific technologies and delayed additional mitigation was revised for clarity and consistency with the text.

Delegates discussed text in a paragraph stating that: **“Only a limited number of studies have explored scenarios that are more likely than not to bring temperature change back to below +1.5 °C relative to pre-industrial levels by 2100;** these scenarios bring atmospheric concentrations to below 430 ppm CO₂eq by 2100.” Saint Lucia requested adding a footnote containing quantitative information on cumulative CO₂ emissions for different time frames. Saudi Arabia called for a characterization of the level of uncertainty. Switzerland observed that these scenarios require the use of CDR and that this should be mentioned. A CLA explained that CDR is not a specific characteristic of these scenarios alone. Participants approved the paragraph as presented with the inclusion of the footnote proposed by Saint Lucia.

Participants then discussed the first sentence of a paragraph on **costs, co-benefits and adverse side-effects associated with 450 or 500 ppm CO₂eq mitigation scenarios**, stating that these scenarios “show reduced policy costs for achieving air quality and energy security objectives, and they are associated with significant co-benefits for human health, ecosystem impacts, and sufficiency of resources and resilience of the energy system.”

Norway suggested, and the CLAs supported, referring to “costs” rather than “policy costs.” Switzerland queried the emphasis on energy security and air quality, Venezuela proposed substituting “energy security” with “energy supply,” and Saudi Arabia called for including adverse side-effects and suggested removing the reference to all other co-benefits apart from energy security and air quality.

With reference to energy security and air quality, a CLA clarified that the scenario literature to which the paragraph refers only includes robust and quantified evidence on these two co-benefits and none on adverse side-effects. Regarding the suggestion to refer to energy supply, he noted that it is a subset of energy security. Responding to Saudi Arabia’s request to insert reference to adverse effects, the CLAs proposed, and participants agreed, to add to the end of the sentence: “these scenarios did not quantify other co-benefits or adverse side-effects.”

On a sentence stating that the potential for co-benefits for energy end-use measures may outweigh the potential for adverse side-effects, and that evidence suggests this may not be the case for all energy supply and AFOLU measures, Japan questioned reference to AFOLU in this context, while Saudi Arabia opposed emphasizing adverse side effects of both AFOLU and energy supply measures. CLAs clarified that a detailed assessment of the potential for co-benefits and side-effects in each of the sectors had been carried out, and that AFOLU and energy supply measures were characterized by a greater potential for side-effects, but that this should not be taken to mean that AFOLU would have no co-benefits or would automatically lead to adverse side effects. Following proposals from the CLAs and Canada, participants agreed to qualifying language reflecting that “the potential for” co-benefits outweighs “the potential for” adverse side effects.

Participants approved **Figure SPM.6 on air pollutant emission levels for black carbon and sulfur dioxide in 2050 relative to 2005**, with minor changes.

On a paragraph on the **distribution of costs among different countries**, Switzerland expressed concern that the paragraph could be misinterpreted unless its language was clarified, and the US said scientific elements in the paragraph must be disentangled from policy-prescriptive normative elements. Norway, Canada and the EU, opposed by Brazil, Saudi Arabia and South Sudan, called for the establishment of an informal contact group to improve the paragraph. Co-Chair Sokona proposed, and participants agreed, to have the CLAs revise the paragraph and present amended text. The CLAs presented their proposal for the first sentence of the paragraph, stating: “Mitigation efforts and associated costs vary between countries in mitigation scenarios. The distribution of costs across countries can differ from the distribution of the actions themselves.” A CLA explained that the revised text addressed participants’ concerns over potential confusion between normative goals and scenario language; and finance-related language used by policymakers. Participants approved the sentence and the entire paragraph without further changes.

Participants also agreed to a new paragraph stating that **“there is a wide range of possible adverse side-effects as well as co-benefits and spillovers from climate policy that have not been well-quantified.”**

On a sentence stating: **“Mitigation policy may devalue fossil fuel assets, but differences between regions and fuels exist,”** Switzerland requested that the role of markets in providing value to commodities be acknowledged, and, with the Netherlands, suggested that the value of fossil fuel assets be put into context. The Netherlands called for a focus on “re-evaluation” of fossil fuel assets, not “devaluation.” A CLA explained that “devaluation” was more accurate because “re-evaluation” could “go in both directions.” Saudi Arabia said suggesting that fossil fuels will not devalue would “put science to the test.” The Netherlands said the idea that fossil fuel producers have the infrastructure to become future producers of sustainable energy had not been reflected. A CLA responded that sustainable energy opportunities do not change the devaluation of fossil fuels, and urged participants to accept the statement.

Regarding a sentence in the same paragraph on the largely negative effects of mitigation policies on coal exporters and their medium-term benefits for natural gas exporters, Norway

sought clarification of “medium-term.” Australia queried the meaning of “largely negative.” Argentina asked what time period the statement referred to. Saudi Arabia proposed that a sentence on the effects of mitigation policies on oil export revenues be separated according to the confidence levels attributed to the statements, and proposed that a paragraph be inserted on spillover effects on urban areas, food security, the poor and tourism in energy exporting countries.

Following consultations in an informal contact group, which led to a rearrangement of text to make it more coherent, participants approved the text. It states that “most mitigation scenarios are associated with reduced revenues from coal and oil trade for major exporters (*high confidence*),” the “effect of mitigation on natural gas export revenues is more uncertain (*medium confidence*),” and the “availability of CCS would reduce the adverse effects of mitigation on the value of fossil fuel assets (*medium confidence*).”

SPM.4.1 Final Text: On long-term mitigation pathways, the text states that there are multiple scenarios with a range of technological and behavioral options consistent with different levels of mitigation, and addresses various mitigation scenarios, including those that are *likely* to keep the temperature change to less than 2°C relative to preindustrial levels. It observes that estimated global GHG emissions levels in 2020 based on the Cancún Pledges are not consistent with cost-effective long-term mitigation trajectories, and cautions that delaying mitigation efforts beyond those in place today through 2030 is estimated to substantially increase the difficulty of the transition to low longer-term emissions levels. The section also notes, *inter alia*, that: mitigation efforts and associated costs vary between countries in mitigation scenarios; and mitigation policy could devalue fossil fuel assets and reduce revenues for fossil fuel exporters.

SPM.4.2. SECTORAL AND CROSS-SECTORAL MITIGATION PATHWAYS AND MEASURES: CLAs introduced this section, noting the first part addresses how energy supply affects energy demand and mitigation options in the transport, buildings, industry and AFOLU sectors, and provides, *inter alia*: information on mitigation technologies and their development since AR4; and mitigation costs, co-benefits, risks, adverse side-effects and potentials. Noting that the emphasis on human settlements and spatial planning represents a key innovation in AR5, the authors explained that the second part of the section addresses, in a holistic manner, interlinkages between human settlements, infrastructure and energy demand in the transport, buildings and industry sectors, and how these end-use sectors manifest themselves in human settlements. They said the section also addresses, *inter alia*: overcoming financial and institutional barriers to implementing best-practice technologies that reduce emissions across sectors and urban scales; and how infrastructure and urban planning lock-in energy demand in the end-use sectors.

SPM.4.2.1. Cross-Sectoral Mitigation Pathways and Measures: Regarding a paragraph beginning with a sentence stating **“in all sectors, GHG emissions are projected to grow in baseline scenarios, except for net CO2 emissions in the AFOLU sector,”** Saudi Arabia, noting the statement was unbalanced, asked about other gases in AFOLU, and preferred referring to GHG emissions, rather than CO2 emissions, in the AFOLU sector for consistency. CLAs clarified that overall

net CO₂ emissions in the AFOLU sector do decline. The US opposed a proposal to insert “emissions of all GHGs,” instead of “GHG emissions,” are projected to rise, stating that it conveyed a new meaning. Following informal consultations, participants approved text stating that, in baseline scenarios, GHGs are projected to grow in all sectors except for net CO₂ emissions in the AFOLU sector.

Regarding a related footnote, the CLAs explained they had sought to address all gases, provide clarity on the net AFOLU emissions, and ensure there is no conflict with WGI. Norway stated its concern over coherence with WGI and called for a reference to the issues related to the potential of terrestrial carbon removals. Australia said this reference would fit better in section SPM.4.2.4 on AFOLU. After further discussions, participants agreed to footnote text, stating: “Net AFOLU CO₂ emissions include emissions and removals of CO₂ from the AFOLU sector, including land under forestry and, in some assessments, CO₂ sinks in agricultural soils.”

Regarding a sentence stating that, in baseline scenarios, net CO₂ emissions from the AFOLU sector will decline over time, with some models projecting a net sink towards the end of the century, Saudi Arabia, with Ireland, suggested that non-CO₂ gases in AFOLU are expected to increase. Responding to a query from Brazil on whether this statement referred to forests only, the CLAs clarified that some of the models include carbon sequestration in agricultural soils. Brazil opposed the proposal to reference non-CO₂ emissions from the AFOLU sector, preferring to emphasize only agriculture. The CLAs suggested specifying that, while non-CO₂ GHG agricultural emissions are projected to increase, net CO₂ emissions from AFOLU decline over time, which was agreed. Participants also agreed to a footnote, stating: “A majority of the Earth System Models assessed in WGI AR5 project a continued land carbon uptake under all RCPs through to 2100, but some models simulate a land carbon loss due to the combined effect of climate change and land use change.”

Responding to a concern expressed by Luxembourg, CLAs clarified that WGIII is only addressing anthropogenic emissions in AFOLU, while WGI also includes carbon cycle feedback.

Participants then discussed a paragraph on the **risk of lock-in into energy-intensive pathways in infrastructure and products**. A sentence stating: “Infrastructure developments and long-lived products that lock societies into GHG-intensive emissions pathways may be difficult or very costly to change, reinforcing the importance of early action for ambitious mitigation” was approved without amendment. On a sentence stating that “products and infrastructure with long lifetimes and low lifecycle emissions can facilitate a transition to low-emission pathways while also reducing emissions through lower levels of material use,” the US suggested removing reference to “lower levels of material use.” Switzerland proposed adding “materials” to products and infrastructure. Saudi Arabia noted that this language may not be applicable to all countries and suggested adding a reference at the end to national circumstances and standards. A CLA said the text is not material-specific and these need to be assessed on a case-by-case basis. Bolivia expressed concern that the message suggests that the only solution is not to build infrastructure in developing countries. Participants approved the sentence with the addition of “materials,” as suggested by Switzerland.

Regarding a paragraph on **interdependencies in mitigation scenarios**, India expressed reservations over use of the term “decarbonization.” Following informal group consultations on this issue, participants agreed to text describing the relationships between different options, stating: “There are strong interdependencies in mitigation scenarios between the pace of introducing mitigation measures in energy supply and energy end-use and developments in the AFOLU sector. The distribution of the mitigation effort across sectors is strongly influenced by the availability and performance of BECCS and large-scale afforestation.” Regarding a proposal from Saint Lucia, participants also agreed to a new paragraph stating: “**Mitigation scenarios reaching around 450 ppm CO₂eq concentrations by 2100 show large-scale global changes in the energy supply sector (robust evidence, high agreement)**. In these selected scenarios, global CO₂ emissions from the energy supply sector are projected to decline over the next decades and are characterized by reductions of 90% or more below 2010 levels between 2040 and 2070. Emissions in many of these scenarios are projected to decline to below zero thereafter.”

Figure SPM.7 on direct emissions of CO₂ by sector and total non-CO₂ GHGs across sectors in baseline and mitigation scenarios that reach around 450 ppm CO₂eq with CCS and without CCS was approved with minor changes.

Participants moved to a paragraph on **energy demand reductions** and its first sentence referring to demand reductions in the energy end-use sectors. Noting the strong demand growth in energy use in developing countries, China, supported by India, Saudi Arabia and Iraq, expressed doubt over the term “demand reductions.” Noting that it is one of the world’s leading energy suppliers, Saudi Arabia stressed the need to respect the right to sustainable development. India suggested inserting “demand rationalization after meeting the energy demand.” Saudi Arabia expressed reservations over this formulation. A CLA suggested referring to “final energy demand” and pointed out, in response to Saudi Arabia, that the text does not say anything about regional contributions. Switzerland proposed omitting the word “reduction” and Canada suggested referring to energy efficiency improvements instead of demand reductions. Norway suggested adding “energy conservation.” Stressing the need to expand “energy grids” in many countries, Brazil suggested clarifying that the sentence is only valid under certain circumstances. Armenia proposed language reflecting “demand reduction that does not prevent sustainable development from happening.” The US highlighted that use of the word “reduction” could possibly be interpreted as implying a constraint on development and growth. A CLA proposed text stating: “Efficiency enhancements and behavioral changes, in order to reduce energy demand without compromising development, are a key mitigation strategy in scenarios reaching atmospheric concentrations of about 450 to 500 ppm by 2100.” Armenia and Chile, opposed by India, suggested the insertion of “sustainable” before “development” as an additional qualifier. India added that the words “may be” should qualify these as a key mitigation strategy. Switzerland suggested, and participants agreed, to use the CLA’s proposal with the addition of language stating that the changes to reducing energy demand compared to baseline scenarios.

On a sentence stating that “near-term reductions in energy demand are an important element of cost-effective mitigation

strategies,” India suggested deleting a reference to decarbonizing the energy supply sector. Participants agreed to replace it with “reducing carbon intensity.”

Participants agreed to a sentence stating that both integrated and sectoral studies provide similar estimates for energy demand reductions in the transport, buildings and industry sectors for 2030 and 2050.

Participants approved, with minor amendments, **Figure SPM.8 on final energy demand reduction relative to baseline and low-carbon energy carrier shares in final energy in the transport, buildings, and industry sectors by 2030 and 2050.**

Regarding the first sentence of a paragraph stating that **“behaviour, lifestyle and culture have a considerable influence on energy use and associated emissions**, with high mitigation potential in some sectors, in particular when complementing technological and structural change,” Bolivia said reference to “structural change” would cause concern among policymakers in Bolivia, given the term’s use in other contexts. A CLA stated that “structural change” is an agreed term included in the glossary. After informal consultations, participants accepted the original formulation with an added footnote setting out the definition of “structural change” from the glossary.

Participants then agreed to text stating that emissions can be substantially lowered through changes in consumption patterns, dietary change and reduction in food wastes. On a sentence stating that “a number of options such as monetary incentives and information measures to improve public awareness may facilitate behavioral changes,” Bolivia, supported by Switzerland and Canada, called for reference to “non-monetary” incentives. Switzerland said capacity building should be referenced. Tanzania suggested, and participants agreed, that the reference to public awareness should be deleted as incentives do not create such awareness. Participants approved the sentence with the inclusion of “non-monetary” incentives and the deletion of the reference to “public awareness.”

SPM 4.2.1 Final Text: On **cross-sectoral mitigation pathways and measures**, the text concludes, *inter alia*, that: in baseline scenarios, GHG emissions are projected to grow in all sectors, except AFOLU; infrastructure developments and long-lived products that lock societies into GHG-intensive emissions pathways may be difficult or very costly to change; and efficiency enhancements and behavioral changes are a key mitigation strategy.

Section 4.2.2. Energy Supply Sector: On the section’s opening sentence stating that **“direct CO2 emissions from the energy supply sector are projected to almost double or even triple by 2050,”** Saudi Arabia, opposed by Switzerland, requested that a caveat in the December version of the SPM should be reinserted, stating “unless energy intensity improvements can be improved beyond historical development.” Saudi Arabia emphasized that the stated projected emissions growth should not be portrayed as inevitable. Norway suggested that emission reduction potential in other sectors should also be referenced. Switzerland expressed concern regarding the new proposed text, stating that energy intensity is only one driver of emissions and that other drivers, such as population and income growth, are also factors. Peru urged clarifying that the focus is on energy intensity improvements.

Participants agreed to address the issue in two sentences, with the first stating that direct CO2 emissions from the energy supply

sector may double or even triple by 2050 from 2010 levels. The CLAs proposed that the second sentence read: “The lower end of the full range is dominated by scenarios with a focus on energy intensity improvements that go well beyond the observed improvements over the past 40 years.” Belgium urged specifying the lower end for the emissions levels. Following informal consultations, participants agreed to qualify the sentence to read that emissions would double or triple “unless energy intensity improvements can be significantly accelerated beyond the historical development.”

Tanzania and Senegal expressed concern over the term “scarcity” in a sentence stating that “the scarcity of fossil fuels alone will not be sufficient to limit CO2eq concentration to levels, such as 450 ppm, 550 ppm, or 650 ppm, by 2100.” Australia, supported by the Netherlands and the UK, and opposed by Saint Lucia, proposed only referring to 650 ppm. CLAs proposed, and participants agreed, to state that “the availability of fossil fuels alone will not be sufficient to limit CO2eq concentration to levels such as 450 ppm, 550 ppm, or 650 ppm.”

In the first sentence of the following paragraph stating that **“decarbonizing electricity generation is a key component of cost-effective mitigation strategies in achieving low-stabilization levels,”** India, supported by Saudi Arabia, proposed replacing “decarbonizing” with “reducing carbon intensity.” New Zealand, the UK, Canada, Ireland and others opposed this proposal, stressing that “decarbonization” is a widely agreed term that also appears in the WGIII glossary. The CLAs proposed, and participants agreed to, inserting a clarification in the text, stating that “decarbonizing” refers to “reducing carbon intensity.”

On the first sentence of a paragraph on **scaling up of renewable energy (RE)**, stating that “many RE technologies have advanced substantially in terms of performance and cost” and “many have achieved a level of technical and economic maturity, the US, supported by Tanzania, Germany and Peru, suggested changing “cost” to “cost-effectiveness” in order to avoid misinterpretations. Denmark, supported by Norway and Germany, called for mentioning co-benefits of RE, and for reinserting a sentence from the underlying report stating that “the aggregated global technical potential for RE as a whole is significantly higher than global energy demands.” The CLAs disagreed with this, referring to discussions on co-benefits in other sections and the need for brevity. Participants amended the sentence to read as follows: “Since AR4, many renewable energy (RE) technologies have demonstrated substantial performance improvements and cost reductions, and a growing number of RE technologies have achieved a level of maturity to enable deployment at significant scale,” which was agreed.

Participants then approved a sentence stating that RE accounted over half of new electricity-generating capacity added globally in 2012, with minor editorial changes. On a sentence stating that “many RE technologies still need some form of policy support (e.g., carbon pricing and/or direct technology support), if their market shares are to be significantly increased,” Japan, Germany and the EU, supported by the CLAs, favored keeping the proposed formulation or returning to the formulation of the December version of the SPM draft, which distinguished between direct and indirect policy support and mentioned more examples, including feed-in tariffs. Bolivia, Venezuela, Argentina

and others preferred not to include any examples. Bolivia, opposed by Switzerland, suggested deleting references to carbon pricing. Answering a question from Brazil, the CLAs confirmed that carbon pricing includes not only carbon markets but also carbon taxes, among other things. IPCC Chair Pachauri pointed out that AR4 mentions the importance of carbon pricing. Brazil disagreed, noting that the contexts were different.

Saudi Arabia questioned how RE technologies can be described in the first sentence of the paragraph as mature while simultaneously, in the same paragraph, as requiring policy support. A CLA clarified the text refers to technical maturity and that some RE technologies still need support. Spain called for adding reference to a secure level playing field," which was opposed to by CLAs who said this would be policy prescriptive. Switzerland suggested referring to "institutional, technological and economic barriers." After consultations, participants agreed to text stating that "many RE technologies still need direct and/or indirect support, if their market shares are to be significantly increased; RE technology policies have been successful in driving recent growth of RE." Participants also agreed to a sentence stating that "challenges for integrating RE into energy systems and the associated costs vary by RE technology, regional circumstances, and the characteristics of the existing background energy system."

On a sentence in the next paragraph, stating "**nuclear energy is a mature low GHG emission technology** and although its share of global electricity generation has been declining (since 1993), it could make an increasing contribution to low-carbon energy supply," Austria, supported by Germany and the CLAs, and opposed by Canada and the US, proposed deletion of "it could make an increasing contribution to low-carbon energy supply." Participants agreed to revert to the December draft SPM text that read: "Nuclear energy is a mature, low-GHG emission technology but its share of global electricity generation has been declining (since 1993)," and accepted the CLAs' proposal to add a second sentence to reflect that if major barriers can be addressed, nuclear energy could make an increasing contribution to low-carbon energy supply.

The US asked to reflect that nuclear energy is a baseload power source, which was agreed. Noting that "barriers" are exogenous to the development of a particular technology, Belgium proposed replacing "barriers" with "risks." The CLAs proposed "barriers and risks," which was supported by Austria, Luxembourg and Saudi Arabia.

Germany proposed deleting the sentence on the contribution of nuclear energy to a low-carbon energy supply, noting that it has been decreasing and will continue to do so in the future. A CLA explained that it could in fact increase. Germany then proposed language to reflect an increasing, but still low, contribution.

Following informal consultations, participants agreed to text reading: "Nuclear energy is a mature, low-GHG emission source of baseload power but its share of global electricity generation has been declining (since 1993). Nuclear energy could make an increasing contribution to low carbon energy supply but a variety of barriers and risks exist."

There was some discussion on whether the barriers and risks to nuclear energy include "concerns about operational safety and risks" or just "operational safety and risks." The US, opposed by Belgium and Austria, preferred "concerns about operational

safety." Participants agreed to include both "operational risks" and the "associated concerns."

On a sentence stating that "new fuel cycles and reactor technologies addressing some of these issues are being investigated and progress has been made concerning safety and waste disposal," participants agreed to a suggestion by Austria to refer to progress in research and development.

On a sentence stating that "**GHG emissions from energy supply can be reduced significantly by replacing coal-fired power plants** with modern, highly efficient natural gas combined cycle power plants or combined heat and power plants, provided that natural gas is available and the fugitive emissions associated with extraction and supply are low or mitigated," Japan proposed, and participants agreed to, adding "current world average" before coal-fired power plants as stated in the underlying report.

Participants agreed to a paragraph on **CCS technologies reducing the life cycle of GHG emissions from fossil fuel power plants**, with minor editorial changes.

On a sentence stating that "CCS power plants will only become competitive with their unabated counterparts if the additional investment and operational costs, caused in part by efficiency reductions, are compensated by sufficiently high carbon prices (or direct financial support)," the US suggested, and participants agreed, to refer also to regulatory measures and appropriate policies.

Saudi Arabia, supported by Qatar, called for deleting a sentence stating that "risks associated with CCS include concerns about the operational safety and long-term integrity of geological CO₂ storage as well as CO₂ transport," saying that the risk of gas transport was higher than that of CO₂ transport, and citing limited evidence to support the statement. CLAs said mentioning risk was justified. Norway and Germany noted that concern about operational safety is not a risk. CLAs suggested "barriers and risks include safety risks and concerns about the long-term integrity." The US, supported by Norway and the CLAs, suggested using language from the underlying report referring to a growing body of literature on: how to ensure the integrity of CO₂ wells; the potential consequences of pressure build-up within a geologic formation caused by CO₂ storage; and the potential human health and environmental impacts from CO₂ that migrates out of the primary injection zone. The section was approved as amended.

On a paragraph starting with a sentence stating that "**many low stabilization scenarios heavily rely on combining bioenergy and CCS (BECCS)** in an effort to achieve a net removal of CO₂ from the atmosphere," Japan, supported by Tanzania, suggested an alternative formulation that included reference to technological challenges and risks. Brazil, opposed by Germany and Norway, objected to the reference to challenges and risks, and offered an alternative formulation from the underlying report stating that "combining bioenergy with CCS (BECCS) offers the prospect of energy supply with negative emissions, which plays an important role in many low stabilization scenarios." Participants agreed to this suggestion with an added reference to challenges and risks, as proposed by Japan. Some discussion ensued between Brazil, Norway, Luxembourg and the CLAs about net negative emissions, with participants agreeing to language on "large-scale net negative emissions." Norway drew attention to challenges other than

technological ones, including to biodiversity, and called for a more general reference to challenges and risks. Participants amended the text to read: “Combining bioenergy with CCS (BECCS) offers the prospect of energy supply with large-scale net negative emissions which plays an important role in many low-stabilization scenarios, while it entails challenges and risks. These challenges and risks include those associated with the upstream large-scale provision of the biomass that is used in the CCS facility as well as those associated with the CCS technology itself.”

SPM.4.2.2 Final Text: On **energy supply**, the text indicates that: in baseline scenarios, direct CO₂ emissions from the energy supply sector are projected to almost double, or even triple, by 2050 compared to the level of 14.4 GtCO₂/year in 2010, unless energy intensity improvements can be significantly accelerated; decarbonizing electricity generation is a key component of cost-effective mitigation strategies in achieving low-stabilization levels; and, since AR4, many RE technologies have demonstrated substantial performance improvements and cost reductions. It further concludes that nuclear energy is a mature low-GHG emission source of baseload power whose share of global electricity generation has been declining, and that it could make an increasing contribution to low-carbon energy supply, but a variety of barriers and risks exist. The section also addresses, *inter alia*: reducing GHG emissions from energy supply by replacing current world average coal-fired power plants with modern, highly efficient natural gas combined-cycle power plants or combined heat and power plants; CCS technologies’ ability to reduce the lifecycle GHG emissions of fossil fuel power plants; and BECCS as a source of energy supply with large-scale net negative emissions.

SPM.4.2.3. Energy End-use Sectors: Transport: Participants approved paragraphs on: **transport sector emissions, growth projections and overall potential sectoral emissions reductions; and mitigation measures for transport modes and infrastructure**, and related mitigation potential without or with only minor editorial changes.

On a paragraph on **potential and constraints of strategies to reduce carbon intensity in transport**, relating to a sentence stating: “Mitigation potential of biofuels will depend on technology advances and on the level of emissions associated with the availability of sustainable feedstock supplies,” Norway, supported by Germany, suggested adding “in the production of” biofuels after “technology advances.” Brazil suggested removing the sentence given similar language elsewhere in the SPM. This was opposed by the CLAs who felt it was important for the “transport story.” After consultations between the CLAs, Brazil and Norway, participants agreed to the following sentence: “Commercially available liquid and gaseous biofuels already provide co-benefits together with mitigation options that can be increased by technology advances.”

On a sentence on reducing black carbon and nitrogen oxide (NO_x) emissions, the US, supported by Switzerland, suggested replacing black carbon and NO_x with particulate matter and ozone and aerosol precursors. Switzerland also proposed adding tropospheric ozone. Mexico called for keeping black carbon. Norway, supported by Luxembourg and the US and opposed by Saudi Arabia, stressed the importance of keeping NO_x, stating that it was better understood by policymakers. The CLAs proposed, and participants approved, the following

reformulation: “Reducing transport emissions of particulate matter (including black carbon), tropospheric ozone and aerosol precursors (including NO_x) can have human health and mitigation co-benefits in the short term.”

Participants agreed to a paragraph on **variations in the cost-effectiveness of different carbon reduction measures in the transport sector**. On the **influence of regional differences in the choice of transport mitigation options**, the Philippines and Saudi Arabia suggested, and participants agreed to, revisions reflecting how recommendations on transport measures apply to countries in different situations. Participants also approved a paragraph stating that **mitigation strategies can help decouple transport GHG emissions from economic growth**.

Buildings: On a sentence on **final energy use and GHG emissions in buildings**, Norway suggested adding text on mitigation potentials. A CLA said this information was already elsewhere in the text. Participants approved the sentence as is and agreed to the remainder of the sub-section.

Industry: The majority of this section was approved with minor editorial amendments. Only a sentence on the reduction of hydrofluorocarbon (HFC) emissions by process optimization and refrigerant recovery, recycling and substitution as key mitigation opportunities prompted discussion, with China noting that the section was not comprehensive enough and calling for including mention of barriers to these mitigation opportunities. Switzerland suggested adding reference to barriers at the end of the sentence, followed by a reference from the underlying report, as suggested by China. Participants agreed to this insertion.

SPM 4.2.3 Final Text: Regarding **energy end-use sectors**, the text addresses the transport, buildings and industrial sectors. On **transport**, the section states that the sector accounted for 27% of final energy use and 6.7 Gt CO₂ direct emissions in 2010, with baseline CO₂ emissions projected to approximately double by 2050. It notes, *inter alia*, that: technical and behavioral mitigation measures could reduce final energy demand in 2050 by around 40% below the baseline; the cost-effectiveness of different carbon reduction measures in the transport sector varies significantly with vehicle type and transport mode; regional differences influence the choice of transport mitigation options; and, when associated with non-climate policies, mitigation strategies can help decouple transport GHG emissions from economic growth in all regions.

On **buildings**, the section concludes that, in 2010, the sector accounted for around 32% of final energy use and 8.8 GtCO₂ emissions, with energy demand projected to approximately double by mid-century in baseline scenarios. It further observes, *inter alia*, that: recent advances in technologies, know-how and policies provide opportunities to stabilize or reduce global buildings sector energy use by mid-century; lifestyle, culture and behavior significantly influence energy consumption in buildings; and strong barriers, such as split incentives, fragmented markets and inadequate access to information and financing, hinder the market-based uptake of cost-effective opportunities.

On **industry**, the section states that, in 2010, the industry sector accounted for around 28% of final energy use, and 13 GtCO₂ emissions, with emissions projected to increase by 50-150% by 2050 in baseline scenarios. Among other things, it highlights that: the energy intensity of the industry sector could be directly reduced by about 25% compared to the current level

through the wide-scale upgrading, replacement and deployment of best available technologies; CO₂ emissions dominate GHG emissions from industry, but there are also substantial mitigation opportunities for non-CO₂ gases; and important options for mitigation in waste management are waste reduction, followed by re-use, recycling and energy recovery.

SPM.4.2.4. Agriculture, Forestry and Other Land Use (AFOLU): Participants considered a new paragraph proposed by the CLAs to replace two previous paragraphs in the draft SPM. On a sentence stating that the “**AFOLU sector accounts for about a quarter of net anthropogenic GHG emissions originating mainly from deforestation, agricultural emissions from soil and nutrient management and livestock,**” Switzerland, opposed by Brazil, called for disaggregated figures on deforestation and agriculture, given the REDD+ process under the UNFCCC. Participants agreed to leave the text as presented.

Regarding a paragraph beginning with a sentence stating that “**the most cost-effective forestry options are afforestation, forest management and reducing deforestation**” and that, “in agriculture, low carbon prices favor cropland and grazing land management, and high carbon prices favor restoration of organic soils,” Bolivia opposed linking forest management to carbon pricing. The Republic of Congo proposed mentioning forest deterioration as a source of GHG emissions. Germany suggested using the term “sustainable” forest management. Ireland supported reference to the sustainable enhancement of food production as a key mitigation option, but the CLAs cautioned against singling out one particular mitigation option.

Brazil lamented the heavy reliance on attaching a carbon price to a sector that has been explicitly excluded from the carbon market, noting that the most successful examples of carbon pricing in AFOLU do not involve trading or taxes, and cautioned against restricting carbon pricing to these two options. The authors explained that cost effectiveness of options varies with carbon price, and reference to price refers to the cost of policies.

Following informal consultations, the authors proposed stating that AFOLU plays a central role for food security and sustainable development, and revising the text to better highlight the most cost-effective mitigation options in both forestry (afforestation, sustainable forest management and reducing deforestation) and agriculture (cropland management, grazing land management and restoration of organic soils). China asked, and the authors and participants agreed, to include language on barriers to implementation of mitigation options.

CLAs also proposed including in the glossary a sentence stating that in many models that are used to assess the economic costs of mitigation, carbon pricing is often used as a proxy to represent the level of effort in mitigation policies.

Requesting deletion of the entire paragraph, Bolivia said the SPM was sending contradictory messages regarding, on the one hand, decarbonizing energy and, on the other, carbonizing sectors linked to natural resources. To take into account Bolivia’s concern, participants agreed to insert the glossary language into a footnote and to reiterate that reference to carbon price is not intended to implicate any carbon pricing policy.

Bolivia proposed, and the UK opposed, deleting a sentence on considering the economic potential of supply-side measures, noting limited studies exist, but the authors responded that it reflects the underlying text and all studies published on this issue since AR4.

On a paragraph on **policies governing agricultural practices, forest conservation and management**, participants agreed to a sentence stating that some mitigation options in the AFOLU sector may be vulnerable to climate change. On a sentence stating that, “if implemented sustainably, REDD+ can be a cost-effective mitigation policy option with potential economic, social and other environmental and adaptation co-benefits,” Brazil said REDD+ has safeguards to ensure that it is implemented sustainably and, with Peru, that stating this in the text is unnecessary. Noting various REDD processes, Bolivia called for the removal of the REDD+ acronym and for replacing it with its full meaning to avoid confusion. A CLA stressed that just because a project is designed to be sustainable does not mean it will be implemented sustainably. Brazil suggested text stating that “REDD+ is a cost-effective policy option for mitigating climate change” and referring to the glossary definition of REDD+ in a footnote. Canada proposed, and participants agreed to, revised text stating that, when implemented sustainably, activities to reduce forest emissions are cost-effective policy options for mitigating climate change. They also agreed to include a footnote referring to the glossary.

On a sentence stating that **bioenergy can play a critical role for mitigation, but issues such as the sustainability of practices and the efficiency of bioenergy systems should be considered**, the Comoros called for adding reference to available arable land. Brazil opposed, noting that large-scale sustainable options have already been used effectively and sustainably for years and that it was a matter of agricultural productivity, not land availability. Participants agreed to leave the sentence as is.

Brazil objected to a sentence stating that “barriers to large-scale deployment of bioenergy include risks and concerns about GHG emissions from land, food security, biodiversity conservation and livelihoods,” opposing, in particular, reference to food security risks. He noted that in large-scale bioenergy, food security is actually a co-benefit, as it allows for perennial crops and security for farmers from price fluctuations, which in the long run contributes to food security. Switzerland, opposed by Brazil and Canada, called for including human health as an additional concern related to bioenergy. Bolivia called for adding water as a concern. Brazil objected to the negative connotation given to bioenergy. He proposed, and participants agreed, to delete “risks” and leave only a reference to bioenergy concerns. Participants also agreed to a suggestion by Brazil to refer to “already available” options in a sentence referring to bioenergy options with low lifecycle emissions, such as sugarcane, which can reduce GHG emissions.

On a sentence stating that “overall bioenergy outcomes are site-specific and depend on efficient integrated biomass, bioenergy systems, sustainable land-use management and governance,” Brazil objected to presenting efficient integrated biomass, bioenergy systems, sustainable land-use management and governance as conditions for bioenergy. The CLAs proposed, and participants agreed, to state that overall bioenergy outcomes “rely on” those elements.

SPM.4.2.4 Final Text: The final text states that: **AFOLU accounts for about a quarter of net anthropogenic GHG emissions mainly from deforestation, agricultural emissions from soil and nutrient management, and livestock; AFOLU plays a central role for food security and sustainable development; the most cost-effective mitigation options in forestry are**

afforestation, sustainable forest management and reducing deforestation, and in agriculture they are cropland management, grazing land management and restoration of organic soils; and bioenergy can play a critical role for mitigation, but the sustainability of practices and efficiency of bioenergy systems are issues to consider.

SPM.4.2.5. Human Settlements, Infrastructure and Spatial Planning: Participants agreed to a paragraph with a sentence stating that “**urbanization is a global trend and is associated with increases in income**” and that higher urban incomes are correlated with higher energy consumption and GHG emissions. On a paragraph stating that “**the next two decades present a window of opportunity for mitigation in urban areas,**” China, supported by Saudi Arabia and opposed by the US, the UK and the Netherlands, emphasized that the text does not address infrastructure and suggested reinserting deleted text from the December draft SPM stating: “Currently, average per capita emissions embodied in infrastructure are more than five times higher in industrialized than in developing countries.” The paragraph was approved without the proposed amendment.

Participants approved, with some editorial changes, paragraphs on **bundling urban mitigation policy instruments, mitigation opportunities in rapidly urbanizing areas where urban form and infrastructure are not locked-in, the aggregate impact of urban action plans, and co-benefits of urban mitigation strategies.**

SPM.4.2.5 Final Text: Regarding **human settlements, infrastructure and spatial planning**, the text highlights urbanization as a global trend associated with increases in income and higher consumption of energy and GHG emissions. It notes that, *inter alia*: the next two decades present a window of opportunity for mitigation in urban areas, as a large portion of the world’s urban areas will be developed during this period; mitigation options in urban areas vary by urbanization trajectories and are expected to be most effective when policy instruments are bundled; the largest mitigation opportunities are in rapidly urbanizing areas; thousands of cities are undertaking climate action plans, but their aggregate impact on urban emissions is uncertain; and successful implementation of urban-scale climate change mitigation strategies can provide co-benefits.

SPM.5. MITIGATION POLICIES AND INSTITUTIONS:

SPM.5.1. Sectoral and National Policies: Introducing this section, a CLA explained that it is divided into two parts: sectoral and national policies; and international cooperation. He highlighted that attention had been given to theory and experience, and interaction effects, including: linkages to sustainable development; interaction across international, regional and national scales; and interactions across arenas and instruments.

On a paragraph on **substantial reductions in emissions requiring large changes in investment patterns**, China asked whether financial needs could be included alongside investment. A CLA explained that defining climate finance is a political decision. Sweden and Norway proposed including information on upside investments. A CLA preferred to confine the discussion to investments only. The paragraph was approved with few textual revisions.

On a paragraph stating that **estimates of the financial flows associated with climate mitigation are available**, but widely agreed definitions of what constitutes climate finance are lacking, Peru, supported by the Russian Federation, China, Venezuela and others, called for more emphasis in the text on the lack of widely agreed definitions on climate finance. Switzerland opposed, noting ongoing processes towards a climate finance definition. Responding to observations by China and the Russian Federation on the sentence being contradictory, a CLA explained that although widely agreed definitions of climate finance are lacking in the UNFCCC negotiations, this is not the case for the scientific community. The CLAs proposed, and delegates agreed to, stating: “There is no widely agreed definition of what constitutes climate finance, but estimates of the financial flows associated with climate change mitigation and adaptation are available.”

On a sentence stating that “applying the most comprehensive definition, i.e., ‘total climate finance,’ USD 343 to 385 billion per year are estimated to flow into mitigation and adaptation projects globally,” which also included a footnote defining “total climate finance” as including all financial flows whose expected effect is to reduce net GHG emissions and/or to enhance resilience to climate change, Venezuela, supported by China, the Maldives, the Philippines and others, called for deleting the sentence, noting lack of clarity regarding how these figures were calculated, given the absence of a widely agreed definition of climate finance. The Maldives and Saudi Arabia stressed that applying the definition of “total climate finance” to estimate financial flows was prescriptive, and called for using more general ranges instead of specific figures. On a proposal by Canada to refer to “published assessments” of total climate finance and a suggestion by Peru to include a definition of “total climate finance,” the CLAs proposed, and delegates agreed to, text stating: “Published assessments of all current annual financial flows whose expected effect is to reduce net GHGs and/or to enhance resilience to climate change and climate variability show USD 343 to 385 billion per year globally.”

On a sentence stating that “total public climate finance currently flowing to developing countries is estimated to be between USD 35 to 49 billion per year,” the Maldives, supported by Malaysia and China, expressed concern over accuracy of the figures, and suggested including reference to the needs of developing countries. Venezuela, opposed by Canada, called for deleting any reference to specific numbers. A CLA explained that the figures are based on reported commitments by governments, and multilateral and bilateral development banks and agencies, and comprise a range of information constituting a “very robust” dataset. Peru proposed, and the CLAs agreed, to specify that the figures refer to the years 2011 and 2012, as they appear in the underlying report. The agreed sentence states that, out of USD 343-386 billion per year, “total public climate finance that flowed to developing countries is estimated to be between USD 35 to 49 billion/yr in 2011 and 2012.”

On a sentence stating that “estimates of international private climate finance flowing to developing countries range from USD 10 to 72 billion/yr,” CLAs proposed inserting a reference to foreign direct investments in the range of USD 10 to 37 billion per year. Responding to an enquiry from Zambia on the timeframe, the CLAs proposed, and participants agreed, to add a reference to the period 2008-2011. The agreed sentence states:

“Estimates of international private climate finance flowing to developing countries range from USD 10 to 72 billion/yr with foreign direct investments as equity and loans in the range of USD 10 to 37 billion/yr over the period of 2008-2011.”

Participants approved **Figure SPM.9 on the changes in annual investment flows from the average baseline level over the next two decades (2010 to 2029) for mitigation scenarios that stabilize concentrations within the range of approximately 430-530 ppm CO₂eq by 2100.**

A paragraph on **sector-specific and economy-wide policies** was approved with a revision from Sweden specifying that economy-wide policies are “for the singular objective of mitigation.”

A paragraph on **cap and trade systems** being more cost-effective than sector-specific policies prompted some discussion. On a sentence on cap and trade systems for GHGs being established in a growing number of countries and regions, Brazil stated that the trend may be the opposite, given the plunging carbon prices. The CLAs proposed, and participants accepted, revisions to address this concern. The final text reads: “Since AR4, cap and trade systems for GHGs have been established in a number of countries and regions.”

Regarding a sentence on the limited short-run environmental effect of cap and trade systems as a result of loose caps or caps that have not proved to be binding, Saudi Arabia questioned use of the word “binding.” The CLAs proposed, and participants agreed, to replace it with “constraining.”

Saudi Arabia requested, and participants agreed to, inserting a reference to national circumstances in a sentence stating: “A well-designed cap and trade system can be cost effective.” After some discussion, CLAs proposed, and participants agreed to, an alternative formulation, stating that “in principle, a cap and trade system can achieve mitigation in a cost-effective way; its implementation depends on national circumstances.”

Participants then discussed a paragraph on **tax-based policies**. In response to a query from Saudi Arabia, the CLAs proposed referring to “GHG emissions” instead of “energy consumption or emissions.” Switzerland, with Slovenia, disagreed, stressing that taxes mainly target fossil fuel combustion. A CLA explained that taxes also cover other sectors and suggested that the sentence be accepted as is, which was agreed.

Regarding a paragraph beginning with a sentence on **“the reduction of fossil fuel subsidies achieving emission reductions at negative social cost, depending on the social and economic context,”** Germany, Monaco and Canada questioned use of the term “negative social costs.” CLAs responded that the term has a specific meaning and refers to increasing social welfare. Canada and Germany said the qualifier referring to the social and economic context weakens the text and requested its deletion, while the authors preferred its retention.

Saudi Arabia expressed concern that the text singles out fossil fuels, noting that other sectors, such as agriculture, could also benefit from the removal of subsidies and lead to reduced emissions. The authors responded that no corresponding literature exists on subsidy reform in other sectors, while many studies exist on fossil fuel subsidy reform. Austria suggested including a footnote explaining that subsidies in many sectors affect GHG emissions, but that most of the recent literature has focused on fossil fuel subsidies.

On Saturday morning, following extensive informal consultations, the authors presented revised text, explaining that it: was broadened to involve more than just the fossil fuel sector; includes a sentence noting that most of the recent literature is on fossil fuel subsidies; and footnotes reference to concrete numbers on projected emission reductions from phasing out subsidies, and to studies assessing the impacts of removing fossil fuel subsidies without assessing which subsidies are wasteful and inefficient. Saudi Arabia said the messages in the text are misleading, and that the G-20 is already addressing fossil fuel subsidies. Germany said the proposed revisions “watered down” the text and did not support the argument that fossil fuel subsidies should not be addressed here because the G-20 is addressing them.

On a revised sentence reflecting that reducing subsidies for GHG-related activities in various sectors can achieve significant emission reductions, Saudi Arabia asked to delete the qualifier “significant” and add back in reference to the social and economic context, which the authors said had been deleted in the revised text but could be reintroduced. With these amendments, this sentence was approved.

Saudi Arabia, Qatar, Egypt and Venezuela proposed deleting a sentence stating that since AR4, a small but growing body of literature based on economy-wide models has projected that complete removal of fossil fuel subsidies in all countries could result in significant reductions in global aggregate emissions by mid-century at negative social cost. Germany, the UK, Norway, the Netherlands, Belgium, Luxembourg and Canada opposed. The US said referencing the literature and findings on this issue in the report was useful. With the deletion of “significant” reductions and reference to “negative social cost,” the sentence was approved.

Following further informal consultations on outstanding issues in the paragraph on subsidies, CLAs proposed to include in the text, instead of in a footnote as initially proposed, a sentence stating that the studies assess the impacts of complete removal of all fossil fuel subsidies without seeking to assess which subsidies are wasteful and inefficient, keeping in mind national circumstances. Germany, supported by Norway, said they could accept including this text if the footnote specifying concrete numbers on projected emission reductions was retained. Saudi Arabia opposed inclusion of this footnote. The US, noting his country’s estimated emission reductions are higher than those projected in the proposed footnote, preferred deleting it, noting lack of agreement on the numbers. The authors said that since the projections are not very high, they could support deleting the footnote. Delegates agreed to include the text, but not the footnote.

Delegates then approved, with minor amendment, paragraphs on: **the potential of interactions between or among mitigation policies being synergistic or having no additive effect on reducing emissions; mitigation policies raising prices for some energy services** and possibly hampering the ability of societies to expand access to modern energy services to underserved populations; and **technology policy complementing other mitigation policies.**

On a paragraph stating that: **“within an appropriate enabling environment, the private sector can play an important role in mitigation,”** Malaysia, supported by Bolivia, requested inserting text emphasizing the private sector’s role in generating emissions. Bolivia underlined the private sector’s

“complementary” role to that of the public sector. Following informal consultations, the CLAs presented revised text incorporating reference to the role of the public sector, along with the private sector, in financing mitigation, stating: “In many countries, the private sector plays central roles in the processes that lead to emissions as well as to mitigation.”

Participants also approved a sentence referring to factors of a country’s enabling environment that have a “substantial” impact on private firms’ investment in new technologies and infrastructures in a country, including the effectiveness of its institutions, regulations and guidelines regarding the private sector, security of property rights and credibility of policies.

SPM.5.1 Final Text: On **sectoral and national policies**, the section concludes that: substantial emission reductions would require large changes in investment patterns; no widely agreed definition of what constitutes climate finance exists; national and subnational mitigation plans and strategies since AR4 have increased; and there has been, since AR4, an increased focus on policies designed to integrate multiple objectives, increase co-benefits and reduce adverse side-effects. It further notes, *inter alia*, that: sector-specific policies have been used more widely than economy-wide policies; regulatory approaches and information measures are widely used, and are often environmentally effective; the short-run environmental effect of cap and trade systems has been limited as a result of loose caps or caps that have not proven to be constraining; and the reduction of subsidies for GHG-related activities in various sectors can achieve emission reductions, depending on the social and economic context.

SPM.5.2. International Cooperation: Co-Chair Edenhofer opened discussions on new text proposed by the CLAs on international cooperation. Participants’ views diverged on a sentence stating that **the UNFCCC is the multilateral forum with virtually universal participation to address climate change**. The Maldives, supported by China, Venezuela, Brazil and Peru, called for retaining reference to the UNFCCC as the “primary” multilateral forum, while the US opposed singling out the Convention as the only multilateral climate change body. A contact group was established to discuss the entire section. Following these consultations, participants approved paragraphs on: **the role of the UNFCCC** as “the main multilateral forum on addressing climate change, with nearly universal participation”; **variations in international climate change cooperation arrangements** with different focus and degree of centralization and coordination; the **Kyoto Protocol offering lessons** towards achieving the ultimate objective of the UNFCCC; the **growth in international climate change cooperation arrangements** since 2007; **policy interlinkages**; and the **limited impact** to date of global mitigation initiatives.

SPM.5.2 Final Text: On **international cooperation**, the main findings include: the UNFCCC is the main multilateral forum on climate change, with nearly universal participation; existing and proposed international climate change cooperation arrangements vary in their focus and degree of centralization and coordination; the Kyoto Protocol offers lessons towards achieving the ultimate objective of the UNFCCC, particularly with respect to participation, implementation, flexibility mechanisms and environmental effectiveness; UNFCCC activities since 2007 have led to an increasing number of institutions and other arrangements for international climate change cooperation; and

policy linkages among regional, national and subnational climate policies offer potential climate change mitigation and adaptation benefits.

FIGURES AND TABLES: Figures and Tables were taken up in a contact group, co-facilitated by IPCC Vice-Chairs Jean-Pascal van Ypersele (Belgium) and Ismail El Gizouli (Sudan). Tables and Figures were revised for consistency and clarity. Participants approved two tables and nine figures as well as their captions and associated footnotes in plenary.

Participants also agreed to delete boxes throughout the SPM text containing headline statements highlighting key messages.

UNDERLYING SCIENTIFIC AND TECHNICAL ASSESSMENT

On Saturday afternoon, Co-Chair Edenhofer invited participants to approve the SPM and accept the underlying scientific and technical assessment. Bolivia expressed reservations on: the IPCC’s scientific results, noting they prioritize economic rationality over social, collective and human values; using mitigation scenarios and analysis promoting carbon markets without adequately considering non-market based approaches; technologies proposed by the IPCC to promote mitigation actions, noting they are framed through the use of geoengineering based on CDR technologies, and that they violate Mother Earth’s right to naturally adapt to climate change, and affect the livelihoods and rights of local and indigenous peoples; and country categorization based on income in the underlying chapters, explaining that although this is accepted in the scientific literature, it is not appropriate for policymaking.

Saudi Arabia, supported by Iraq, Venezuela, Malaysia, India, Egypt, Syria, Sudan and others, expressed concern about the acceptance of the WGIII report, expressing “substantial disagreement” on the use of income-based country groupings. Saudi Arabia, the Bahamas, the Maldives, Qatar, and others also opposed country categorization based on per capita emissions.

CLOSING OF WGIII-12

Closing the session, Co-Chair Edenhofer reflected on his last seven years as WGIII Co-Chair as an “extremely exciting and worthwhile” experience, thanked all the outstanding people he had worked with, particularly WGIII TSU members, and expressed his deepest respect for the authors. Co-Chair Edenhofer closed the session at 1:12 pm on Saturday, 12 April.

RESUMED IPCC-39 REPORT

On Saturday afternoon, following the conclusion of WGIII-12, IPCC-39 resumed. IPCC Chair Pachauri announced the departure of IPCC Deputy Secretary Gaetano Leone who, he said, had been invaluable as the IPCC’s “in-house troubleshooter” since 2011. He said Carlos Martin-Novella (UNEP) would replace him.

A number of countries spoke about the significance of the assessment reports and the SPM approval process. Switzerland expressed his satisfaction with the SPM and emphasized the importance of preserving the scientific character of the process. Austria called for keeping an open mind in light of the mitigation and adaptation challenges ahead. Noting mixed feelings about the meeting, Saint Lucia urged action at all levels.

IPCC Chair Pachauri expressed his deep appreciation for the WGIII report and said the manifestation of differences among countries was very much part of the scientific process and a clear expression of the IPCC’s democratic spirit.

APPROVAL OF THE DRAFT REPORT OF IPCC-38

The draft report of IPCC-38 (IPCC-XXXIX/Doc.14), held in Yokohama, Japan, in March 2014 was approved.

IPCC PROGRAMME AND BUDGET

The Financial Task Team, co-chaired by IPCC Vice-Chair Ismail El Gizouli (Sudan) and Nicolas Beriot (France), presented their revised 2014 budget proposal and budgetary issues for the next three years. The Panel adopted the revised budget as presented (IPCC-XXXIX/Doc.2, Corr.1).

ACCEPTANCE OF THE ACTIONS TAKEN AT WGIII-12

Saudi Arabia asked to have its statement made at the conclusion of WGIII-12 reflected in the report of IPCC-39. Acknowledging the difficulties overcome and respect shown throughout the meeting, France stressed the need to move to a higher level of cooperation, and said he looked forward to the UNFCCC climate change conference in Paris in 2015.

The Panel then accepted the actions of the WGIII-12 with regard to the approval of the AR5 WGIII SPM and acceptance of its underlying scientific-technical assessment.

ADMISSION OF OBSERVER ORGANIZATIONS

IPCC Deputy Secretary Leone introduced document IPCC-XXXIX/Doc.3 containing seven requests for observer status submitted since IPCC-37. The Panel approved the requests. Sweden, supported by China and Belgium, enquired about the IPCC's capacity to accommodate the attendance of "potentially hundreds" of observer organizations, given the increased interest by the public in climate change issues. IPCC Chair Pachauri invited the Panel to consider the possibility of limiting the total number of observers in the future. Germany opposed this suggestion and, with Belgium, stressed the need for maintaining transparency and trust in the IPCC's work. Switzerland, supported by China and Peru, suggested that this issue be considered by the Task Group on the Future of the IPCC, while Saudi Arabia and the Netherlands said this should remain the task of the IPCC Bureau. The Panel agreed to the latter proposal.

FUTURE WORK OF THE IPCC – FIRST PROGRESS REPORT BY THE TASK GROUP

IPCC Deputy Secretary Leone explained that the Task Group on the Future Work of the IPCC was established at IPCC-37, which decided the Group would hold its first meeting in conjunction with, and submit its first progress report to, IPCC-39 (IPCC-XXXIX/Doc.15).

Providing a status update from the Task Group, Co-Chair Helen Plume (New Zealand), explained that comments received from governments (IPCC-XXXIX/INF.1 and Add.1) and a synthesis of these submissions prepared by the IPCC Secretariat (IPCC-XXXIX/Doc.7) had served as the basis for the Group's meeting on 6 April. She described clear areas of convergence, including on: the products of the IPCC; enhancing developing country participation; and the Panel's structure and *modus operandi*, noting that there had been some suggestions for improvement on this latter issue. On next steps, she said the Group will request further inputs from a wide range of stakeholders and prepare an options paper for consideration by IPCC-40. To this end, she proposed a workshop prior to IPCC-40, which was supported by the UK, Australia, Tanzania, Chile, Finland, India and others, with IPCC Chair Pachauri noting that

the work of the Task Group will be extremely valuable for the Panel's future. The workshop proposal was approved by the plenary.

REPORT ON THE ACTIVITIES OF THE IPCC EXECUTIVE COMMITTEE

Chair Pachauri reported on the activities of the Executive Committee since IPCC-37, noting the smooth work of the committee through regular electronic meetings.

REPORT OF THE CONFLICT OF INTEREST COMMITTEE

Chair of the COI Committee Hoesung Lee (Republic of Korea) presented the Committee's report (IPCC-XXXIX/Doc.10). He stated that, during the meeting held on the margins of WGIII, the Committee discussed the advisory note by the COI Expert Advisory Group (EAG) on: to what extent IPCC Bureau members could be considered to have a conflict of interest if they are also members of a government delegation to other climate bodies, such as the UNFCCC; and how to improve the conflict of interest form to receive more detailed information from Bureau and Task Force Bureau (TFB) members. The EAG found, and the COI Committee agreed, that Bureau members had an inherent conflict of interest as a consequence of their nomination by governments and indicated it was preferable for them to disclose their association with other climate processes, such as the UNFCCC. The EAG also proposed a more elaborated COI disclosure form to be presented to the Panel before the election of a new Bureau.

On the EAG's finding of the Bureau members' inherent conflict of interest, Brazil disagreed, noting that the IPCC is only complete with the endorsement of its scientific findings by governments. He supported a closer relationship between lead authors and government officials, so that scientific knowledge "could be produced in a more policy-relevant way," stating that the need for greater transparency was not limited to Bureau members. Saudi Arabia and the Maldives expressed concern over the implications of the EAG's finding for developing countries' participation in the work of the Panel. Observing that the COI Committee was established to look out for the IPCC's best interests, Canada supported its actions and highlighted the importance of understanding the different roles people play at different times.

The US stated the need to examine: the meaning of "conflict of interest"; to whom it pertains; its implications; and ways of conveying scientific findings to government institutions. Germany requested more information on the kind of decisions to be taken on the basis of the EAG's advice.

Brazil observed that determination of a conflict of interest for those participating in the UNFCCC was up to the Panel, and supported a plenary discussion on the issue. Austria said there were limitations to how the COI policy could be changed. Stating that it was inappropriate for the COI Committee to take decisions on intergovernmental issues on behalf of the Panel, Saudi Arabia called for clarity on the COI Committee's terms of reference.

IPCC Chair Pachauri assured participants that their views would be recorded in the report of the session and communicated to the COI Committee.

PROGRESS REPORTS

SYR Progress Report: IPCC Chair Pachauri introduced a progress report on the preparation of the AR5 SYR (IPCC-XXXIX/Doc.5), saying that the SYR is “on track” and encouraged governments to provide their input.

TFI Progress Report: TFI Co-Chair Thelma Krug (Brazil) reported on the progress of TFI activities (IPCC-XXXIX/Doc.6), including selection of new members of the Editorial Board, continuous improvements to the IPCC’s GHG inventory software, and planned TFI meetings in 2014, including an expert meeting on systematic assessment of TFI products.

TGICA Progress Report: Timothy Carter (Finland), Task Group on Scenarios for Climate and Impact Assessment (TGICA) Co-Chair, provided a progress report on the activities of the Group (IPCC-XXXIX/Doc.11). Among other things, he pointed to the TGICA membership renewal process, urging governments to seek candidates.

Update on Options and Measures to Reduce the Carbon Footprint of IPCC Activities: IPCC Chair Pachauri introduced a progress report submitted by the IPCC Secretariat on options and measures to reduce the carbon footprint of IPCC activities (IPCC-XXXIX/Doc.8), noting the paper-smart system as one example.

Other Progress Reports: WGI Co-Chair Thomas Stocker reported on WGI progress towards AR5 (IPCC-XXXIX/Doc.9), noting that the printed version of the WGI contribution is now available, and that outreach activities are ongoing. WGII Co-Chair Christopher Field introduced a document on WGII progress towards AR5, noting roughly 150,000 downloads of the WGII SPM.

COMMUNICATIONS AND OUTREACH

Jonathan Lynn, IPCC Head of Communications and Media Relations, gave an overview of outreach and communications activities related to the WGI and WGII reports and the plan ahead for WGIII (IPCC-XXXIX/Doc.4), and noted an enormous amount of interest in, and worldwide coverage of, the IPCC.

MATTERS RELATED TO UNFCCC AND OTHER RELATED BODIES

Florin Vladu, UNFCCC, presented on various COP decisions where the IPCC’s work was recognized, including on research and systematic observation and annual GHG inventories, and noted numerous upcoming UNFCCC side-events where IPCC presentations were expected.

OTHER BUSINESS

IPCC Deputy Secretary Leone drew attention to a letter from the Consultative Group on International Agricultural Research (IPCC-XXXIX/Doc.12) requesting an IPCC technical report compiling agriculture-related information from the three WG reports to be completed by June 2015 to support the UNFCCC negotiations. Based on preliminary discussions with participants and given the limited time of IPCC authors, IPCC Chair Pachauri suggested an expert meeting as an alternative and said the development of a special report on agriculture could also be considered.

Noting that the SYR is still to be finalized and questioning the practical value of technical reports, the UK, supported by Ireland, Austria, Germany and others, said the proposal

was premature and felt it should be discussed at a later stage, including possibly in a technical meeting.

Belgium, Canada, Australia and the Netherlands suggested consulting with other relevant organizations, including the UNFCCC, FAO and UNEP, to further explore the issue, with Switzerland suggesting that a workshop be held. Brazil expressed concern over the signal such a report would send to UNFCCC negotiators, and said “dozens of subjects” are of particular concern to negotiators, pointing out that the SPM is the best place to elaborate on such issues.

IPCC Chair Pachauri proposed that the IPCC Secretariat consult with relevant organizations and return to IPCC-40 with a more comprehensive proposal. Calling for full consideration of the proposal, Saudi Arabia suggested establishing a process to address the issue between now and IPCC-40. IPCC Chair Pachauri assured participants that the IPCC would not undertake a “half-hearted exercise” on the matter, and the plenary agreed to his approach as proposed.

TIME AND PLACE OF THE NEXT SESSION

IPCC-40 will take place Copenhagen, Denmark, from 27-31 October, to review and adopt the AR5 SYR.

CLOSING OF IPCC-39

IPCC Deputy Secretary Leone thanked the Government of Germany for its hospitality, the IPCC Chair and the Secretariat. He said it had been a great privilege to contribute in a small way to the success of the IPCC.

Canada suggested discussing IPCC business matters before the review and approval of the SYR during IPCC-40 in October. On the SYR, she proposed that a plan of action for its review be shared with delegates in advance of the meeting so they could be better prepared.

The meeting closed with Francis Hayes, IPCC Conference Officer, giving an adapted IPCC rendition of Gershwin’s “I Got Rhythm.” IPCC Chair Pachauri thanked participants for a “productive and stimulating” week and expressed hope that all-night sessions could be avoided in Copenhagen. He gavelled IPCC-39 to a close at 5:34 pm.

A BRIEF ANALYSIS OF THE IPCC MEETINGS

“HOPE, MODEST HOPE”

Barely a week after approving the WGII report on impacts, adaptation and vulnerability in Yokohama, Japan, the IPCC reconvened again in Berlin to take up the WGIII contribution to the IPCC Fifth Assessment Report on climate change mitigation. The WGIII report examines trends and drivers of greenhouse gas emissions and mitigation measures for major sectors, presents scenarios for different emissions pathways, and lays out policy-relevant technological and socioeconomic considerations relating to mitigation. The report differs from AR4 in that it provides a more substantial body of evidence using more scenarios and pathways, a greater identification of co-benefits, and a better estimation of the costs and implications of taking various mitigation pathways. As at other recent IPCC WG meetings, a nearly 40-page overview of the WGIII report contained in a draft Summary for Policymakers (SPM) was subject to arduous line-by-line discussions by representatives of approximately 107 governments.

The WGIII report on mitigation is the final one in a series of three scientific assessments, which, together with a Synthesis Report, comprise the AR5. It follows the WGI contribution on the physical science basis of climate change approved in September 2013, and the WGII contribution on impacts, adaptation and vulnerability, approved in late March 2014, and precedes the approval of the Synthesis Report, which draws on the assessments of all three WGs, to be considered by the Panel in October 2014 in Copenhagen. By comprehensively assessing the scientific basis of climate change, its impacts and options for adaptation and mitigation, and then having governments approve the summary conclusions, the AR5 provides the scientific basis for global climate policy, including support for the negotiations on a new international agreement on climate change that UNFCCC parties are expected to adopt in Paris in 2015.

This brief analysis summarizes the main findings of the WGIII report, reflects on its approval process and places the Berlin meeting in the larger context of evolving global climate policy.

“IT DOESN’T COST THE WORLD TO SAVE THE PLANET” – CO-CHAIR OTTMAR EDENHOFER

Perhaps the most sobering message coming out of the WGIII report is that, in spite of several decades of awareness of the problem and national and international commitments to address it, greenhouse gas emissions have continued to rise, growing even more quickly between 2000 and 2010 than in each of the three previous decades. Despite all the talk and promises of decoupling economic growth from emissions, a renewed reliance on coal relative to other energy sources has made the global economy even more carbon intensive. The contribution of economic growth—the key driver of emissions alongside population growth—has increased each decade. Without a radical shift away from these trends in the near future, we could see an increase in global temperature of between 3.7-4.8°C above preindustrial levels, with serious impacts on all ecosystems, as was starkly shown in the WGII report. The scenarios that would keep global temperature increase to 2°C and atmospheric concentrations at around 450 ppm CO₂eq at the end of the century imply emission reductions of 40-70% relative to 2010 by 2050, and emission levels near zero by 2100. Many of these scenarios require the use of carbon dioxide removal technologies, such as carbon capture and storage that are not yet available at the required scale and are associated with significant challenges and risks.

In view of this challenge, the “hope, modest hope” that Co-Chair Edenhofer referred to during the official launch of the WGIII SPM revolves around the knowledge that we are still—barely—within reach of staying in the safe zone if we deploy a portfolio of well-known less carbon-intensive technologies and improve energy efficiency. The report notes that many renewable energy technologies have substantially advanced and achieved a respectable level of technical and economic maturity, although many of them still require incentives and some level of support, such as feed-in tariffs and quota obligations. It also describes ways that economic sectors, such as transport, industry and buildings, can go about reducing their emissions and increasing efficiency. But it won’t be easy. Such shifts in behavior and activities will require large changes in investment patterns. However, the report also makes it clear that even if changing

the emissions pathway means a relative slowdown of economic growth in the near term (the report projects that the economic cost of mitigation would be equivalent to a global reduction in consumption of about 0.06% per year), this would come with longer-term co-benefits beyond the not insignificant one of avoiding the adverse impacts of climate change, as elaborated by WGII.

A SUMMARY FOR POLICYMAKERS, NOT BY POLICYMAKERS

While one of the IPCC SPM’s great strengths derives from the fact that it is endorsed by all countries, casualties of the process are inevitable. Since the approval process requires consensus, whereby all must agree on the precise language in which the scientific findings are presented, in Berlin, the clearest casualty of this process was the key finding that, over the past four decades, income has been the key driver of emissions growth. All related material in the SPM was deleted when some developing countries classified in the high- and middle-income groups objected to use of income categories. These countries were concerned that a focus on income levels—the result of hard gained economic growth—turns the focus away from historical accumulated emissions and unfairly places the burden of action on them, possibly compromising their ability to maintain economic growth and, for many, to improve the basic well-being of their populations. Many were adamant that their right to development must not be hindered by the manner in which the science is presented.

Unfortunately, the inability to solve this resulted in the deletion of other policy-relevant information. For example, many delegates lamented the loss of reference to a consumption-based rather than production-based approach for emissions accounting.

This is not the first time something like this has happened during an SPM approval process. For the Second Assessment Report, some authors actually dissociated themselves from the SPM after changes were made to the text regarding assessed literature on the “value of statistical life,” that is, economists’ calculation that human life is valued differently in different countries. As Chair Pachauri and others noted, sorting through and showcasing differences is part of what science is about.

The WGIII report is the most directly policy relevant of the three WGs, since it centers on the effectiveness of policies and their impacts, and has implications for the UNFCCC negotiations on a new climate agreement. As a result, the discussions in Berlin were more political than those at WGI and WGII, with concerns of countries often expressed in the UNFCCC context leaking into the IPCC WGIII SPM approval process.

Fortunately, a more direct focus on action at the national level than ever before was clear throughout the meeting. As the WGIII report confirms, there has been a considerable increase in national and subnational mitigation plans and strategies since AR4. This is a welcome sign that the body of climate change policy has indeed increased and filtered down to various levels of government. The SPM is only a small part of AR5: in addition to the WG underlying reports (which, as noted by WGI Co-Chair Thomas Stocker, in the case of WGI weighs almost five kilograms), the AR5 includes glossaries as well as Technical Summaries and Frequently Asked Questions that can be read independently. All of this can be of indispensable value to decision makers at all levels.

The report also makes clear that the Cancún Pledges, resulting from political negotiations under the UNFCCC, are not consistent with cost-effective long-term mitigation trajectories that provide a good chance of limiting temperature change to 2°C relative to preindustrial levels. While the scientific evidence does not preclude the possibility of reaching that goal, the WGIII report stresses that much more robust emission reduction targets are needed. The report concludes that actions to meet the 2°C target should be guided by country-specific value judgments and ethical considerations, but success can best be achieved through international cooperation.

MAPMAKERS AND NAVIGATORS

Like the WGI and II outcomes, the WGIII report will provide an important basis for climate change negotiations. In an analogy echoed numerous times throughout the meeting, scientists are the mapmakers that help policymakers navigate which course to take. As mapmakers, scientists have to not only point out the possible routes, but also map the uncertain terrain, the blank spots and the dangers ahead. They must be transparent about challenges, risks and potential implications of the various pathways. The map that WGIII has drawn shows a rather narrow passage through which to travel to relative safety. But time is of the essence. The mapmakers made clear that delaying departure will have serious consequences for the voyage ahead; as conditions deteriorate and some routes become increasingly impassable, costly fixes to the vessel may be required—fixes that carry no certainty of success and use untested technologies that may demand greater investment and have greater associated risk. The science is clearer than ever, the impacts are undeniable, the various pathways have been charted, and the Synthesis Report, which will be adopted in October, will bring this all together to draw us a complete map of the choices available for steering away from troubled waters as well as the consequences of not doing so. As Co-Chair Edenhofer said, there is hope, modest hope.

UPCOMING MEETINGS

Africa Clean Energy Summit: The 2014 African Clean Energy Summit will bring together decision makers, policymakers, industry leaders, investors, experts and media under the theme of Sustainable Energy for All. Participants from around the world are invited to explore the challenges and opportunities for renewable energy through an international exhibition, technical sessions, business forums and other concurrent activities. **dates:** 22-24 April 2014 **location:** Abuja, Nigeria **contact:** Wale Akinwumi, Director **phone:** +234-803-316-4567 **email:** olawaleakinwumi@gmail.com **www:** <http://africacleanenergysummit.com/>

Sub-Saharan Africa Solar Conference 2014: This event will bring together key policymakers, investors, financiers, independent power producers and technology providers to explore sub-Saharan Africa's solar energy infrastructure development for rural electrification and energy intensive industrial applications. **dates:** 23-24 April 2014 **location:** Accra, Ghana **contact:** Reema Raj **email:** r.raj@magenta-global.com.sg **www:** <http://magenta-global.com.sg/subsaharanafricasolar2014/>

Abu Dhabi Ascent: The United Arab Emirates will host the Abu Dhabi Ascent, a high-level meeting to generate momentum for the September Climate Summit being convened by UN Secretary-General Ban Ki-moon. The two-day meeting will bring together ministers, as well as leaders from business, finance and civil society, to develop proposals for action and determine how their countries, businesses and organizations can increase their participation in initiatives that broaden and deepen partnerships, in order to deliver concrete action at the September Summit. **dates:** 4-5 May 2014 **location:** Abu Dhabi, United Arab Emirates **www:** <http://www.un.org/apps/news/story.asp?NewsID=47073&Cr=&Cr1=#.U0suKlxJ-Ji>

Clean Energy Ministerial 5 (CEM5): The Republic of Korea is hosting the fifth Clean Energy Ministerial, which will gather energy ministers and other high-level delegates from over 20 of the world's largest economies to identify avenues to accelerate the transition to a global clean energy economy. It will focus specifically on identifying smart policies, programmes and strategies to improve energy efficiency, clean energy deployment and energy access expansion. **dates:** 12-13 May 2014 **location:** Seoul, Republic of Korea **contact:** CEM Secretariat **email:** CEMSecretariat@hq.doe.gov **www:** <http://www.cleanenergyministerial.org/Events/CEM5>

46th Global Environment Facility (GEF) Council Meeting and GEF Assembly: The GEF Assembly will be held back-to-back with the 46th GEF Council meeting in Mexico. The Civil Society Organization (CSO) Consultation, GEF Council and other meetings will convene from 25-27 May, with the Council meeting beginning on 25 May and overlapping for half a day, on 27 May, with the CSO Consultation. The Assembly will convene from 28-30 May. **dates:** 25-30 May 2014 **location:** Cancun, Mexico **contact:** GEF Secretariat **phone:** +1-202-473-0508 **fax:** +1-202-522-3240 **email:** secretariat@thegef.org **www:** http://www.thegef.org/gef/5th_assembly

UNFCCC 40th Sessions of the Subsidiary Bodies: SBI 40 and SBSTA 40 will convene in June 2014. The fifth meeting of the second session of the ADP will also take place. **dates:** 4-15 June 2014 **location:** Bonn, Germany **contact:** UNFCCC Secretariat **phone:** +49-228-815-1000 **fax:** +49-228-815-1999 **email:** secretariat@unfccc.int **www:** http://unfccc.int/meetings/upcoming_sessions/items/6239.php

Second International Off-grid Renewable Energy Conference and Exhibition: The International Renewable Energy Agency (IRENA), the Asian Development Bank (ADB) and the Alliance for Rural Electrification are organizing this conference to convene off-grid renewable energy stakeholders to: gain insights into the current status of electricity access in Asia and gather stakeholder perspectives on improving access to modern energy services; discuss barriers faced in scaling up off-grid renewable energy deployment; identify solutions for overcoming barriers; and share best practices and lessons about design and implementation of policies and financing solutions. The meeting will take place as a component of the ADB's Asia Clean Energy Forum, taking place from 16-20 June 2014 at the same location. **dates:** 16-17 June 2014 **location:** Manila, Philippines **contact:** IRENA Secretariat **phone:** +971-2-4179000 **email:** offgridconference@irena.org **www:** <http://www.ioerec.org>

Asia Clean Energy Forum 2014: The Asia Clean Energy Forum is being organized by the Asian Development Bank (ADB), the US Agency for International Development (USAID) and the World Energy Council, and will gather stakeholders from academia, industry, civil society, government and multilateral institutions to discuss clean energy in Asia. **dates:** 16-20 June 2014 **location:** Manila, Philippines **contact:** Aiming Zhou, ADB **phone:** +632-632-5602 **fax:** +632-636-2444 **email:** azhou@adb.org **www:** <http://www.asiacleanenergyforum.org>

2014 CIF Partnership Forum: The Climate Investment Funds (CIF) and the Inter-American Development Bank are jointly convening the 2014 CIF Partnership Forum, hosting participants from civil society, the private sector, governments, indigenous peoples and academia. A special pre-conference event on 22 June, Stakeholder Day, will be dedicated to discussing progress and challenges in engaging key stakeholders in the CIF's activities. During the conference, panel discussions will address a variety of topics, including managing climate change programmes and unlocking private finance from mini-grids to REDD+. **dates:** 23-24 June 2014 **location:** Montego Bay, Jamaica **contact:** CIF Admin Unit **phone:** +1-202-458-1801 **email:** CIFAdminUnit@worldbank.org **www:** <https://www.climateinvestmentfunds.org>

Pre-Pre-COP Ministerial Meeting for UNFCCC COP 20 and CMP 10: This event is being organized by the Venezuelan Government and aims to examine: the role of local governments in climate change; how to engage local governments and citizens on the ground; and how local actions can be an integral part of the global agenda. **dates:** 15-18 July 2014 **location:** Caracas, Venezuela **contact:** Cesar Aponte Rivero, General Coordinator **email:** precop20@gmail.com

2014 Climate Summit: This event is being organized by UN Secretary-General Ban Ki-moon with the aim of creating political momentum for an ambitious international climate agreement through the UNFCCC process. **date:** 23 September 2014 **location:** UN Headquarters, New York **www:** <http://www.un.org/climatechange/summit2014/>

Climate Symposium 2014: This event will focus on the theme "Enhanced Understanding of Climate Processes through Earth Observation." It will help in developing an efficient and sustained international space-based Earth observation system; bring together international experts in climate observations, research, analysis and modeling; and emphasize the role of space-based Earth observations in improving knowledge of the climate at global and regional scales, and in assessing models used for climate projections. **dates:** 13-17 October 2014 **location:** Darmstadt, Germany **contact:** Organizing Committee **email:** climate.symposium@eumetsat.int **www:** <http://www.theclimatesymposium2014.com/>

Sustainability Science Congress: This meeting invites experts from a variety of disciplines to collaborate on sustainable solutions to global challenges, providing a platform for science-policy interface and solutions. **dates:** 22-24 October 2014 **location:** Copenhagen, Denmark **contact:** Sustainability Science Center, University of Copenhagen **email:** IARU2014@science.ku.dk **www:** <http://www.sustainability.ku.dk/iarucongress2014>

UNFCCC ADP 2-6: The ADP is expected to convene for the sixth part of the second session in October 2014. **dates:** 20-24 October 2014 (tentative) **location:** Bonn, Germany **contact:**

UNFCCC Secretariat **phone:** +49-228-815-1000 **fax:** +49-228-815-1999 **email:** secretariat@unfccc.int **www:** <http://unfccc.int>

IPCC-40: This IPCC meeting will be held to adopt the AR5 Synthesis Report and approve its Summary for Policymakers. **dates:** 27-31 October 2014 **location:** Copenhagen, Denmark **contact:** IPCC Secretariat **phone:** +41-22-730-8208 **fax:** +41-22-730-8025 **email:** IPCC-Sec@wmo.int **www:** <http://www.ipcc.ch/>

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

UNFCCC COP 20 and CMP 10: The 20th session of the Conference of the Parties to the UNFCCC (COP 20) and the 10th session of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP 10) will take place in Lima, Peru. **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>

For additional meetings and updates, go to <http://climate-l.iisd.org/>

GLOSSARY

AFOLU	Agriculture, forestry and other land uses
AR5	Fifth Assessment Report
AR4	Fourth Assessment Report
BECCS	Bioenergy with CCS
CCS	Carbon capture and storage
CDR	Carbon dioxide removal
CLA	Coordinating Lead Author
COI	Conflict of interest
CO2	Carbon dioxide
CO2eq	Carbon dioxide equivalent
EAG	COI Expert Advisory Group
FOLU	Forestry and other land use
GHGs	Greenhouse gases
GT	Gigatonne
GWP	Global warming potential
IPCC	Intergovernmental Panel on Climate Change
LDCs	Least developed countries
PPM	Parts per million
RCP	Representative concentration pathway
RE	Renewable Energy
SPM	Summary for Policymakers
SRREN	Special Report on Renewable Energy Sources and Climate Change Mitigation
SYR	Synthesis Report
TFI	Task Force on National GHG Inventories
TSU	Technical Support Unit
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
WG	Working Group
WMO	World Meteorological Organization