

Summary of the 56th Session of the Intergovernmental Panel on Climate Change and the 14th Session of Working Group III: 21 March – 4 April 2022

With greenhouse gas emissions at their highest ever and rising, Working Group III (WGIII) of the Intergovernmental Panel on Climate Change (IPCC) convened online to approve the Summary for Policymakers (SPM) of its technical report on climate change mitigation. WGIII is responsible for assessing methods for reducing greenhouse gas emissions (GHGs) and removing GHGs from the atmosphere, focusing on mitigation strategies across all sectors, including energy, transport, buildings, industry, waste management, agriculture, forestry, and other forms of land management. WGIII's outputs are used by decision-makers in government and the private sector to inform immediate and long-term actions to achieve climate policy goals.

Delegates and authors worked together to finalize the SPM, which presents the key findings of their report, "Climate Change 2022: Mitigation of Climate Change." Distilling the key findings of this 3,675-page report into a concise summary with clear messages for policymakers proved to be a significant challenge as many delegates sought to add extensive details to the authors' draft. Key findings include:

- net anthropogenic GHG emission have increased since 2010 across all major sectors globally, with an increasing share of emissions from urban areas;
- the unit costs of several low-emission technologies have fallen continuously since 2010;
- without a strengthening of policies, GHG emissions are projected to rise beyond 2025, leading to a median global warming of 3.2°C by 2100.
- accelerated and equitable climate action in mitigating and adapting to climate change impacts is critical to sustainable development;
- there is a strong link between sustainable development, vulnerability, and climate risks;
- in all countries, mitigation efforts embedded within the wider development context can increase the pace, depth and breadth of emissions reductions; and
- international cooperation is a critical enabler for achieving ambitious mitigation goals.

The 56th session of the IPCC (IPCC-56) and WGIII-14 exceeded their scheduled time by two-and-a-half-days. The meetings convened virtually from 21 March - 4 April 2022.

A Brief History of the IPCC

The IPCC was established in 1988 by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) to assess, in a comprehensive, objective, open, and transparent manner, the scientific, technical, and socio-economic information relevant to understanding human-induced climate change, its potential impacts, and adaptation and mitigation options. The IPCC is an intergovernmental and scientific body with 195 member states. It does not undertake new research or monitor climate-related data; rather, it conducts assessments of the state of climate change knowledge based on published, peer reviewed scientific and technical literature. IPCC reports are intended to be policy relevant but not policy prescriptive, and they provide key input into international climate change negotiations.

The IPCC has three Working Groups (WGs):

- WGI addresses the physical science basis of climate change;
- WGII addresses climate change impacts, adaptation, and vulnerability; and
- WGIII addresses options for reducing GHG emissions and mitigating climate change.

Each WG has two Co-Chairs and seven Vice-Chairs, with the exception of WGII, which has eight Vice-Chairs. The Co-Chairs guide the WGs in fulfilling their mandates with the assistance of

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Technical Support Units (TSUs). In addition, the IPCC also has a Task Force on National Greenhouse Gas Inventories (TFI), also supported by a TSU, to oversee the IPCC National GHG Inventories Programme. The Programme's aims are to develop and refine an internationally agreed methodology and software for calculating and reporting national GHG emissions and removals and to encourage its use by parties to the UN Framework Convention on Climate Change (UNFCCC).

The IPCC elects its Bureau for the duration of a full assessment cycle, which includes the preparation of an assessment report that takes five to seven years and any other special reports or technical papers that are published during that cycle. The Bureau is composed of climate change experts representing all regions and includes the IPCC Chair and Vice-Chairs, WG Co-Chairs and Vice-Chairs, and TFI Co-Chairs. The IPCC has a permanent Secretariat, which is based in Geneva, Switzerland, and is hosted by the WMO.

IPCC Products

Since its inception, the Panel has prepared a series of comprehensive assessment reports and special reports that provide scientific information on climate change to the international community.

The IPCC has produced five assessment reports, which were completed in 1990, 1995, 2001, 2007, and 2014. The Sixth Assessment Report (AR6) will be completed in 2022. The assessment reports are structured in three parts, matching the purviews of the WGs. Each WG's contribution comprises a comprehensive assessment report (the "underlying report"), a Technical Summary (TS), and a Summary for Policymakers (SPM). Each of these reports undergoes an exhaustive, three-stage review process by experts and governments, including: a first review by experts, a second review by experts and governments, and a third review by governments. Each SPM is then approved line-by-line by the respective WG and then adopted by the Panel.

A synthesis report is then produced for the assessment report as a whole, integrating the most relevant aspects of the three WG reports and special reports of that specific cycle. The Panel then undertakes a line-by-line approval of the SPM of the synthesis report.

The IPCC has produced a range of special reports on climate change-related issues. The AR6 cycle includes three special reports:

- Global Warming of 1.5°C (SR1.5), which was approved by IPCC-48 in October 2018;
- Climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems (SRCCL), which was approved by IPCC-50 in August 2019; and
- Ocean and Cryosphere in a Changing Climate (SROCC), which was approved by IPCC-51 in September 2019.

In addition, the IPCC produces methodology reports, which provide guidelines to help countries report on GHGs. Good Practice Guidance reports were approved in 2000 and 2003, while the IPCC Guidelines on National GHG Inventories were approved in 2006. A Refinement to the 2006 Guidelines on National GHG Inventories (2019 Refinement) was adopted at IPCC-49 in May 2019.

In 2007, the Nobel Peace Prize was jointly awarded to the IPCC and former US Vice-President Al Gore for their work and efforts "to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations needed to counteract such change."

Sixth Assessment Cycle

IPCC-41 to IPCC-43: IPCC-41 (24-27 February 2015, Nairobi, Kenya) adopted decisions relevant to the AR6 cycle. IPCC-42 (5-8 October 2015, Dubrovnik, Croatia) elected Bureau members for the AR6 cycle. IPCC-43 (11-13 April 2016, Nairobi, Kenya) agreed to undertake two special reports (SRCCL and SROCC) and the 2019 Refinement during the AR6 cycle and, in response to an invitation from the 21st session of the Conference of the Parties (COP) to the UNFCCC, to prepare SR1.5. The Panel also agreed that a special report on cities would be prepared as part of the Seventh Assessment Report (AR7) cycle.

IPCC-44: During this session (17-21 October 2016, Bangkok, Thailand), the Panel adopted outlines for SR1.5 and the 2019 Refinement, as well as decisions on, *inter alia*, a meeting on climate change and cities.

IPCC Cities and Climate Change Science Conference: This meeting (5-7 March 2018, Edmonton, Canada) produced a research agenda to better understand climate change impacts on cities and the critical role local authorities can play in addressing climate change.

IPCC-45 to IPCC-47: IPCC-45 (28-31 March 2017, Guadalajara, Mexico) approved the SRCCL and SROCC outlines, and discussed, *inter alia*: the strategic planning schedule for the AR6 cycle; a proposal to consider short-lived climate forcers (SLCFs); and resourcing options for the IPCC. IPCC-46 (6-10 September 2017, Montreal, Canada) approved the chapter outlines for the three WG contributions to AR6. During IPCC-47 (13-16 March 2018, Paris, France) the Panel agreed to, *inter alia*, establish a Task Group on Gender and draft terms of reference for a task group on the organization of future work of the IPCC in light of the Global Stocktake under the Paris Agreement.

IPCC-48: During this session (1-6 October 2018, Incheon, Republic of Korea), the IPCC accepted SR1.5 and its TS and approved its SPM, which concludes that limiting global average temperature rise to 1.5°C is still possible, but will require "unprecedented" transitions in all aspects of society.

IPCC-49: During this session (8-12 May 2019, Kyoto, Japan), the IPCC adopted the Overview Chapter of the 2019 Refinement and accepted the underlying report. IPCC-49 also adopted decisions on the terms of reference for the Task Group on Gender and on a methodological report on SLCFs to be completed during the AR7 cycle.

IPCC-50: During this session (2-7 August 2019, Geneva, Switzerland), the IPCC accepted the SRCCL and its TS and approved its SPM. A Joint Session of the three WGs, in cooperation with the TFI, considered the SPM line-by-line to reach agreement.

IPCC-51: This session (20-24 September 2019, Monaco) accepted the SROCC and its TS, and approved its SPM, following line-by-line approval by a Joint Session of WGs I and II.

IPCC-52: During this session (24-28 February 2020, Paris, France), the IPCC adopted the outline for the AR6 synthesis report, containing a stage-setting introduction and three sections: current status and trends; long-term climate and development futures; and near-term responses in a changing climate. The Panel also adopted the IPCC Gender Policy and Implementation Plan, which, among other things, establishes a Gender Action Team.

IPCC-53: This session (7-11 December 2020, online), which took place virtually due to the COVID-19 pandemic, addressed the IPCC Trust Fund Programme and Budget. The Panel approved the revised budget for 2020 and revised proposed budget for 2021.

IPCC-53 bis: In light of the COVID-19 pandemic, during this session (22-26 March 2021, online) the IPCC adjusted the strategic planning schedule for the AR6 cycle with regard to modalities for the approval plenary of the WGI report and preparations for the election of Bureau members for the AR7 cycle.

IPCC-54: This session (26 July - 6 August 2021) took place virtually due to the COVID-19 pandemic and included the 14th session of WGI. The IPCC approved the SPM and accepted the WGI contribution to AR6, entitled “Climate Change 2021: The Physical Science Basis.” The report was finalized and officially published on 6 August 2021.

IPCC-55: This session (14-27 February 2022) took place virtually due to the COVID-19 pandemic and included the 12th session of WGII. The IPCC approved the SPM and accepted the WGII contribution to AR6, entitled “Climate Change 2022: Impacts, Adaptation and Vulnerability.”

IPCC-56 and WGIII-14 Report

On Monday, 21 March, IPCC Chair Hoesung Lee welcomed delegates to IPCC-56 and underscored the importance of the WGIII report on mitigating climate change.

In the opening session, Ligia Noronha, UN Assistant Secretary-General and Head of the New York Office of UNEP, speaking on behalf of UNEP Executive Director Inger Andersen, reminded participants that a 1.5°C increase in global temperature could be reached within a decade and urged accelerated action on adaptation and deep cuts to emissions.

Patricia Espinosa, Executive Secretary, UNFCCC, highlighted the “manifestly insufficient ambition” of actions currently submitted under the Paris Agreement and called for countries to strengthen their nationally determined contributions (NDCs). She underscored the special role of G20 nations, which account for 80% of emissions, and the need to fulfill financial promises to support action on climate change.

Greg Hands, UK Minister for Energy, Clean Growth and Climate Change, deplored Russia’s attack on Ukraine, which he said conflicts with the UN Charter, and stressed the importance of international cooperation given the stark choices facing the global community. He welcomed the IPCC AR6 report, saying it will provide tangible information on the collective steps needed to act on climate change.

Adoption of the Agenda: Chair Lee introduced the provisional agenda (IPCC-LVI/Doc.1) and proposed consideration of its items, as outlined in the organization of work (IPCC-LVI/INF.1).

SAUDI ARABIA requested limiting the number of plenary sessions to three per day. INDIA cautioned against rushing matters and timelines, emphasizing that rigor and balance cannot be compromised. He asked delegates to adequately consider: equity and justice as foundational principles; historic responsibility, operationalized, *inter alia*, through access to the carbon budget, finance needs, risks of reliance on carbon removal in models, high-emission lifestyles in developed countries, and the unequal distribution of the burden of adaptation.

IPCC adopted the agenda. Chair Lee suspended IPCC-56 until the completion of WGIII’s work.

Consideration and Approval of the WGIII SPM

Opening statements: Immediately after the suspension of IPCC-56, WGIII Co-Chair Jim Skea opened the 14th session of IPCC WGIII. He announced that WGIII Co-Chair Priyadarshi R. Shukla was unable to attend the meeting for health reasons and

WGIII Vice-Chairs Nagmeldin Goutbi Elhassan Mahmoud and Ramón Pichs-Madruga would co-chair the session for the first week and the second week, respectively. Following a video message by Shukla, Skea acknowledged the enormous contribution of India to the IPCC’s sixth assessment cycle. Skea summarized changes to the floor draft of the SPM and organization of the approval process, including on rules for observer participation. He then opened the floor for general remarks.

Delegates welcomed the SPM draft as a good basis for discussions and expressed appreciation to the authors for their work.

Supporting the UK’s remarks during the opening, many countries condemned Russia’s invasion of Ukraine. Praising the commitment of the Ukrainian delegation to the IPCC process, delegates also highlighted the environmental destruction and suffering brought about by war.

SINGAPORE emphasized the impacts of climate change on livelihoods, resources, and global health, and said it poses an asymmetric challenge for small island city-states.

SAINT KITTS AND NEVIS said at least one of the pathways to mitigation outlined in the SPM must capture the goals of the Paris Agreement, underscoring that exceeding 1.5°C comes with extreme risks. ANTIGUA AND BARBUDA objected to scenario categorizations used in the SPM that are not in line with the Paris Agreement and suggested removing the 1.5°C label from high-overshoot pathways that substantially exceed 1.5°C for several decades. SAINT LUCIA lamented that not even the most ambitious scenario category captures Paris Agreement Article 4, specifying net-zero GHG emissions in the second half of the century. ZAMBIA stressed the SPM must be strengthened on this point to make it as policy-relevant as possible.

JAMAICA said the SPM must provide concrete quantitative statements on obstacles to mitigation, including financing for fossil fuels.

Underscoring the importance of energy security, JAPAN called for including a broader range of scenarios and clear guidance on approaches to mitigation.

SOUTH AFRICA noted that mitigation interventions can lead to maladaptation and emphasized the importance of transitional support for developing countries working to reduce GHG emissions.

Noting past leaks to the media, the US asked colleagues to respect the confidentiality of WGIII’s deliberations. CANADA also stressed the importance of confidentiality to the integrity of the process.

ARGENTINA asked to refer to country groupings in line with the UNFCCC’s approach, stressing that all developing countries are vulnerable to climate change, and highlighted the need for financial support for mitigation.

The EUROPEAN UNION (EU) expressed appreciation for the emphasis on practical sectoral solutions and called for increasing clarity concerning emissions estimates.

CHILE and ETHIOPIA emphasized that this report provides valuable input for their ambitious national plans. BRAZIL called for: enhanced coverage of finance and means of implementation; adding information on mitigation action by 2025 in addition to 2030; ensuring balance; and maintaining consistency with SR1.5 and other AR6 reports.

TANZANIA called for clearer regional focus.

IRAN welcomed the concurrence of the WGIII meeting with Nowruz, the Iranian New Year celebration, as a good sign and omen.

UKRAINE thanked delegates for their support and stressed the importance of urgent climate change action, given further impacts from the war in her country.

FRIENDS WORLD COMMITTEE FOR CONSULTATION (FWCC) and the OFFICE OF THE UN HIGH COMMISSIONER FOR HUMAN RIGHTS (OHCHR) highlighted the importance of human rights, including Indigenous Peoples' rights and rights to participation, and urged inclusion of rights-based approaches in the SPM. Joining FWCC and OHCHR in their call for an inclusive process, WORLD WILDLIFE FUND (WWF) and CLIMATE ACTION NETWORK INTERNATIONAL (CAN-I) asked to grant observer organizations the right to speak in contact groups. The EU ASSOCIATION OF ENVIRONMENTAL AND RESOURCE ECONOMICS called for the 1.5°C scenario to be the central element of analysis and for an integrated system approach. Observers also warned against conflating 1.5°C and 2°C pathways, calling for attention to: 1.5°C as a critical guardrail against irreversible change; the most ambitious scenarios and pathways; and fossil fuels and destruction of nature as dominant drivers of climate change.

On participation by observers, SAUDI ARABIA said that in accordance with IPCC rules and procedures, observers should only give general statements and not be involved in negotiations. Stressing the importance of inclusivity and transparency, CANADA, UKRAINE, FINLAND, GERMANY, NORWAY, and others supported following past practice and allowing observers to speak in contact groups and possibly in informal discussions referred to as "huddles."

IPCC Secretary Abdalah Mokssit proposed that observer organizations be allowed to take the floor in plenaries, remain silent in open contact groups, be able to submit written statements, but refrain from attending closed contact groups and huddles if a Member State objects to their presence. BELGIUM and NORWAY questioned Mokssit's reference to closed contact groups, saying they understood all contact groups to be open. After further consultations, Co-Chair Skea informed the group that, given lack of detailed guidance in the IPCC rules and procedures, and based on legal advice and on practice in other UN bodies, a decision had been made to allow observers, barring opposition by an IPCC Member State, to silently attend contact groups and to provide written comments.

Review of the SPM: In a departure from past practice, the Co-Chairs opened SPM issues in thematic clusters of subsections of text. These issues were first discussed in plenary and then referred to contact groups for further deliberation. All text was subsequently approved line-by-line in plenary, with further discussion in contact groups or huddles, as needed.

On Monday, 28 March, the "halfway point," WGIII Co-Chair Skea opened the floor for general remarks. Citing an online progress meter to help delegates compare time left in the meeting with progress achieved, NORWAY expressed concern that WGIII had approved only 3% of the text, compared to WGI's 22% and WGII's 10% at their halfway points.

INDIA, supported by CHINA, lamented: diminishing attention to equity and climate justice due to the focus on climate-modeling literature; lack of transparency of modeled global scenarios on implementation at regional levels; omission of information on emissions earlier than 1990; and persistent pressure not to differentiate between "developed" and "developing" countries. SAUDI ARABIA cautioned against reclassifying countries, urging adherence to IPCC rules and procedures, not UN terms and definitions.

The US noted WGIII's unique role in discussing areas for which governments are responsible. He noted the difficulty of using the traditional framing in WGIII reports while not prejudicing governments' positions on, for example, equity. He observed that "developed" and "developing" countries are UNFCCC terms, with no clear delineation of scope.

SWITZERLAND noted the SPM text ultimately comes from authors and must remain faithful to the underlying report.

On Wednesday, 30 March, IPCC Chair Hoesung Lee informed the plenary that WGII had used 71% of the time scheduled for its meeting and still had to complete 94% of its work. He exhorted delegates to focus on the big picture and key stories in the SPM.

On Thursday, 31 March, with less than 20% of their work completed and only one day left in the scheduled meeting time, WGIII convened a fourth plenary session to finalize elements of text that were close to completion. At its start, SAUDI ARABIA, BRAZIL, CHINA, ECUADOR, and SOUTH AFRICA objected to the additional session, with many citing exhaustion. INDIA expressed dismay at the time spent by delegates urging others to speed up and work flexibly.

MEXICO, TANZANIA, NORWAY, the UK, the NETHERLANDS, SWEDEN, NEW ZEALAND, AUSTRALIA, CANADA, TRINIDAD AND TOBAGO, and JAPAN supported the Co-Chairs' decision to add a fourth session. Several delegates urged participants to work more efficiently and flexibly. GERMANY reminded delegates their work is "about the lives of future generations."

IPCC Chair Lee encouraged delegates to trust the Co-Chairs and show a spirit of cooperation. IPCC Vice-Chair Thelma Krug rejected claims by two delegates that the process and a lack of responsiveness to comments by authors were to blame for the slow proceedings, underscoring that the authors had given five years of their lives to the IPCC and all participants bear responsibility for the meeting's slow progress.

On Friday, 1 April, WGIII Co-Chair Skea said that, during his three terms serving the IPCC, he had never seen developments like those witnessed in the previous days, which he said felt more like an academic seminar or a discursive process at the start of a scoping meeting than an IPCC report approval session. He reminded delegates their job was to approve the SPM and ensure it accurately reflects the underlying scientific assessment, which had been through expert and government review. He said unless they focused on completing this task, they would fail in their responsibility to address one of the most challenging issues humankind has faced.

Three additional plenaries were scheduled for Saturday, 2 April. At the conclusion of the third plenary, Co-Chair Skea again expressed dissatisfaction with WGIII's progress. He informed delegates that from midnight UTC, they would continue to work in four-hour cycles, with a three-hour plenary followed by a one-hour break, until they completed their work. IPCC Secretary Mokssit strongly supported the Co-Chairs' plan, expressed disappointment with the repetitive interventions from some countries, and reminded delegates that every minute matters. SAUDI ARABIA objected to the arrangement. Emphasizing that "the least pain is to get the job done as quickly as possible," Co-Chair Skea informed delegates that this was the decision of the Co-Chairs.

WGIII concluded its work on Sunday, 3 April, at approximately 7:30 pm UTC, in the sixth consecutive plenary session following this announcement.

The remainder of this report reflects discussions of the text in the order it is presented in the SPM.

A. Introduction and Framing

Co-Chair Skea explained this section is intended to present how the scientific literature has evolved and is not meant to convey substantial information.

SAUDI ARABIA called for including information on regional differences, scenarios, data gaps, and implications of mitigation. Supported by INDIA, she suggested including Box SPM.1 in Section A, since much of the information contained in the SPM was based on scenarios.

BRAZIL suggested giving more weight to the Kyoto Protocol and adding a reference to the illustrative mitigation pathways (IMPs).

INDIA proposed referencing the Cancún Agreement, as it set a basis for the pre-2020 commitments reflected in the report and strengthening language on considerations of equity and the role of economic efficiency.

JAPAN called for specifying that the report refers to the period from the present to 2030 as short-term, 2030-2050 as medium-term, and up to 2100 as long-term.

FWCC urged authors to include rights-based approaches—including just transition, human rights including Indigenous Peoples' rights, and issues of gender, biodiversity, and intergenerational justice—in the framing, saying that this would reflect multiple calls for equity and improve integration with WGII's report. In further deliberations on a sentence referring to the global spread of climate policies and cost declines of existing and emerging low emission technologies and of mitigation efforts and sustained reductions, authors considered a suggestion by SAUDI ARABIA, opposed by FRANCE and GERMANY, to include reference to abatement technologies alongside low emission technologies, and sustained reductions "and removals." Ultimately the text was changed to refer to "varied types and levels of mitigation efforts."

B. Recent Developments and Current Trends

B.1: This subsection addresses **rising anthropogenic GHG emissions from 2010-2019**, and cumulative net CO₂ emissions since 1850. Many countries emphasized the need for harmonized terminology and consistency with WGI, as well as clarification on agriculture, forestry and other land use (AFOLU) and land use, land-use change and forestry (LULUCF), including on net versus gross emissions, starting points for the estimates, and related methodologies. Noting confusion regarding the term "AFOLU," NEW ZEALAND proposed splitting it into agriculture, forestry and other sectors. FRANCE suggested specifying the contribution of deforestation.

Regarding LULUCF methodologies, the authors explained that the report uses global bookkeeping models for carbon land fluxes instead of inventory data to be consistent with WGI and the SRCCL and because inventory data, starting in 1990, do not allow a long-term perspective. The authors also explained the use of net emissions given lack of consistent gross emission numbers.

On a paragraph on total net GHG emissions in 2019, there was lengthy discussion on the statement that the increase from 2010 is "the highest absolute decadal increase recorded in human history." CHINA noted that records only began in 1970. In the approval plenary, this sentence, now reading "the highest increase in average decadal emissions on record," was approved. The first sentence was changed to refer to increases in "global" net "anthropogenic"

GHG emissions. The entire paragraph and its three footnotes were approved without prejudice to the order of paragraphs in the subsection.

Figure SPM.1: This figure shows the rise of total net anthropogenic GHG emissions 1990-2019. INDIA queried the lack of reference to non-CO₂ emissions from the industrial sector. Following discussion in a contact group and huddle, the authors outlined key changes. WGIII approved the figure and title. On a new footnote, INDIA stated its intent to submit a formal declaration of reservation regarding the representation of aggregate global net anthropogenic GHG emissions from 1990 to 2019, saying it was unrepresentative of "the basic scientific position." Co-Chair Skea acknowledged India's statement, noting that this rule applies when consensus cannot be achieved. Figure SPM.1 was approved.

On emission growth from sources and uncertainty of LULUCF emissions, GERMANY, supported by CAN-I, called for including sectors most responsible for methane emissions. Delegates agreed to specify "anthropogenic" GHGs throughout the SPM. INDIA and SAUDI ARABIA queried the base year of 1990. INDIA urged using national GHG inventory data rather than global bookkeeping models for estimating GHG emissions growth, as its estimate is ~5.5 GtCO₂ lower, and objected to singling out LULUCF in an associated footnote.

In plenary, discussion focused on an associated footnote on differences between the methodologies for reporting on land fluxes. INDIA, with SOUTH AFRICA, said that using the global bookkeeping model to measure natural resources within national boundaries was "free-riding of industrial processes." Authors agreed to include a caveat that the inventory process is equally valid. BELGIUM called for inserting all numbers associated with each methodology for comparison, especially on the carbon budget. Delegates agreed to include a footnote stating that "some reasons for the difference in estimates can arise from the limited representation of land management in global models and varying levels of accuracy and completeness of estimated LULUCF fluxes in national GHG inventories."

On cumulative CO₂ emissions, SWITZERLAND welcomed reference to limiting warming to 1.5°C but called for detail on what meeting that goal requires. SAUDI ARABIA and INDIA called for specifying "historical" CO₂ emissions. INDIA, opposed by many countries, proposed separating 1850-2019 into 1850-1989 and 1990-present. A number of countries asked for clarification on the "total" versus "remaining" carbon budget in an associated footnote.

Delegates approved reference to "historical" cumulative net CO₂ emissions and text from the contact group that "more than half (58%) occurred between 1850 and 1989" and "about 42% between 1990 and 2019," and specifying that about 17% of cumulative "net" CO₂ emissions "since 1850" occurred between 2010 and 2019.

On an associated footnote on the total carbon budget, CHINA urged using exact percentage numbers regarding likelihoods of limiting global warming to 1.5°C and 2°C, respectively. INDIA, with the US, noted uncertainties due to differences in the two land sector methodologies. Authors explained that: national GHG inventory data for LULUCF emissions do not close the carbon gap; the bookkeeping methodology is consistent with WGI scenarios; and AR7 will further reconcile the two approaches. The US called for including exact figures on uncertainties and elevating a footnote defining the total and remaining carbon budgets into the main

text. Authors said there has been no assessment of the combined uncertainty of the historical and remaining carbon budget, but uncertainties are noted qualitatively.

On Wednesday, 30 March, IPCC Vice-Chair Sokona reported agreement had been reached in the huddle. The huddle's text was approved.

On the impact of the COVID-19 pandemic, SAUDI ARABIA, supported by INDIA, questioned the relevance of text on the impacts of the COVID-19 pandemic on CO₂ emissions from fossil fuels and industry, given the pandemic's anomalous nature and lack of literature. Many countries, however, asserted current policy relevance and sufficient literature. SAUDI ARABIA called for referencing the COVID-19 pandemic's social impacts and costs. The authors said there is no assessment of those in Chapter 2.

B.2: This subsection addresses **net GHG emissions increasing across all major sectors since 2010**. Debate focused on energy intensity versus carbon intensity, attributions to different sectors, and uncertainties on attribution to AFOLU and to urban areas. GERMANWATCH questioned the lack of reference to aviation.

On sectoral shares of total net anthropogenic GHG emissions in 2019, INDIA queried how AFOLU's share was calculated. BRAZIL questioned the large uncertainties of the AFOLU sector and high confidence level. Responding to INDIA, authors confirmed there was no double counting. SAUDI ARABIA asked what percentage of the energy sector's share is attributed to electricity and heat production and requested reference to "global" net GHG emissions. This resulted in a new sentence specifying the remaining energy supply sector's share as "12% of global net anthropogenic GHG emissions." With this, the paragraph was approved.

On average annual GHG emissions growth between 2010 and 2019, ARGENTINA asked whether the uncertainty of emissions growth in AFOLU pertained specifically to agriculture, forestry, or other land use. NEW ZEALAND noted that forestry encompasses both emissions and removals, so the three sectors are dissimilar.

FRANCE suggested identifying emissions from deforestation. NORWAY proposed quantifying both emissions and uptake from AFOLU. Wording was added to a reference that emissions growth in AFOLU is more uncertain than in other sectors mainly due to the high share and uncertainty of CO₂-LULUCF emissions, explaining that AFOLU comprises emissions from agriculture (mainly methane and nitrous oxide) and forestry and other land use (mainly CO₂). INDIA, supported by the US, suggested noting, together, anthropogenic and natural fluxes constitute a net sink.

Following discussion in a contact group, the authors outlined proposed changes, highlighting this subsection's focus on changes in emissions across sectors over the last decade.

FRANCE queried the deletion of quantification of deforestation, pointing to its important role for AFOLU emissions, and requested language reflecting how this has evolved since AR5.

Stressing the intention of the section to convey trends across sectors, the authors suggested noting that half of total AFOLU emissions are from CO₂-LULUCF and moving the explanation on land as a net sink to a footnote. INDIA preferred retaining that information in the text for balance. SWEDEN suggested adding regional variations in sources and sinks and, supported by ITALY, replacing the footnote with a shorter formulation used in the SRCCL, specifying the net sink as the sum of the net removals and AFOLU net emissions. FRANCE suggested specifying CO₂-LULUCF as "predominantly from deforestation." BRAZIL and ARGENTINA said either all or no sectors should be mentioned.

The authors explained: regional aspects were taken up in subsection B.3; trends in agricultural emissions were omitted for brevity; and reference to "half the emissions" was based on Fig.7.3 in the underlying chapter. They also agreed to add "predominantly by deforestation" and expressed strong preference for the current formulation regarding the net sink and its place in a footnote.

Following lengthy discussion, delegates agreed on the authors' proposed footnote and approved text specifying about half of total "net" AFOLU emissions are from CO₂ LULUCF, "predominantly from deforestation."

On the increasing global share of emissions from urban areas, in response to requests for clarification, authors added a new sentence explaining that the drivers of urban GHG emissions are "complex and include population size, income, state of urbanization and urban form."

On an associated footnote, authors agreed to NORWAY's suggestions to delete peat burning as a subcategory of land use and to note that urban emissions are consumption-based. NORWAY and INDIA sought clarification on consumption-based emissions and direct versus indirect emissions from within and outside urban areas. Authors agreed to specify that the estimate includes "both direct emissions from within urban areas and indirect emissions from outside urban areas related to the production of electricity, goods, and services consumed in cities."

On global energy intensity and carbon intensity, SAINT KITTS AND NEVIS requested clarity on drivers leading to decreased carbon intensity. In a sentence on global energy intensity improving between 2010-2019, INDIA, supported by CAN-I, cautioned that regional variations in stages of development mean many countries are starting from much higher levels of emissions. GERMANY, supported by the NETHERLANDS, NORWAY, UKRAINE, the US, and SAUDI ARABIA, favored keeping the sentence but suggested specifying intensity has "decreased" rather than "improved," which was accepted. In response to INDIA and CAN-I, authors revised the sentence to refer to "large regional variations."

SAINT KITTS AND NEVIS requested putting a list of factors influencing decreased carbon intensity in order of importance. SAUDI ARABIA requested reference to increased use of abatement technologies and increased energy efficiency. INDIA objected to specifying "switching from coal to gas" and "reduced expansion of coal" in that list, cautioning against justifying continued investment in oil and gas. The authors said the listed factors are the dominant ones but cannot be ordered. They agreed to a proposal by MEXICO that the listed factors are the "main" ones.

On a sentence comparing observed decreases with those likely to limit global warming to 2°C or 1.5°C, CAN-I stressed the need for continual improvement to comply with the Paris Agreement.

B.3: This subsection addresses **uneven contributions of emissions**. Under a section specifying regional distribution of emissions, concerns about the categorization of country groupings took up considerable time in two plenaries, contacts groups, and a huddle facilitated by IPCC Vice-Chair Sokona that stretched through the second week. During these deliberations, subsection B.3 was extensively rewritten to accommodate concerns about classification of countries, and historical and recent regional contributions to emissions. B.3.1 was split into two paragraphs: B.3.1 on general emission trends, with specification on developments of per capita emissions and total 2019 emissions of small island developing states (SIDS) and least developed countries (LDCs) in a footnote, and B.3.2 specifying regional variations in contributions to historical

emissions, again with a footnote for SIDS and LDCs. The section continues with B.3.3 on inequality across populations in different countries and the implications of providing modern energy service to the poorest segment of the population, B.3.4 on consumption-based household emissions, and then B.3.5 on trends in emission reductions and decoupling.

On a paragraph comparing developed and least developed and other countries' emissions, INDIA called for specifying the scale of reductions, noting, with SAUDI ARABIA, that developing countries are increasing cumulative and per capita emissions from a low base while developed countries are reducing from high levels. SAUDI ARABIA requested including both percentages and absolute numbers.

CHINA suggested using the UN classification of regions and adding historical cumulative emissions figures for developing countries. JAPAN requested specific numbers from Chapter 2 of the underlying report on emissions reductions weights to balance descriptions of emissions reductions growth. TANZANIA and JAMAICA called for quantitative information on cumulative CO₂ emissions. BRAZIL queried a reference to developed countries having reduced emissions since 2010 by 1.1 Gt CO₂eq.

Delegates were unable to approve proposed revised text replacing the two categories of “developing” and “developed” countries with regional groups as per UN M49 regions used in the assessment, with a footnote providing details for SIDS, despite prior agreement in a contact group. BOLIVIA, who had not been in the contact group, objected to the revised text and, supported by INDIA, SOUTH AFRICA, ECUADOR, EGYPT, and CHINA, requested reversion to the original formulation, which specified emissions for developing and developed countries. SAUDI ARABIA supported reversion, saying that the issue went beyond this sentence and: classification of countries was not within the mandate of WGIII; UN and UNFCCC classifications were the ones to be used; in the table in WGIII Annex II Part 1, it should be clarified that categories were used for statistical purposes only; and that lack of reference to LDCs and SIDS in Annex II was a grave concern. BRAZIL also preferred to see “developing” and “developed” countries and, with ARGENTINA, expressed concern about inconsistencies in classification of countries in the Americas. MEXICO asked about her country's regional placement, since it is geographically part of North America but is considered with Latin America in other parts of the report.

The US reiterated concern about grouping major emitters with those who are not major emitters. He noted that the UN M49 standard no longer groups countries as developed or developing, saying this is an outdated classification that does not reflect the dynamic development some countries have undergone.

SAINT KITTS AND NEVIS stressed that a footnote on SIDS agreed in the contact group should be maintained.

FRANCE recalled long discussions and general agreement reached in the contact group to accept the way scientists had classified countries, highlighting the WGIII assessment was based on the literature and did not constitute a proposal for new classifications for international negotiations. With GERMANY, LUXEMBOURG, NORWAY, CHILE, and the UK, he stressed that country groupings were clear and transparent. FINLAND urged flexibility and said both formulations had merit.

Co-Chair Skea clarified that the IPCC Bureau had provided guidance on the matter to authors, and stated that the regional group classification is: essentially the same as that used in AR5;

attached to the UN statistical division UN M49 classification, which uses economic linkages rather than the WMO regions based on geography used in WGI; and contained in Annex II. He said that since WGIII assesses a body of literature that follows the scheme used in AR5, changing these classifications would be difficult. Skea explained that at the time of the literature cut-off date on 11 October 2021, the UN M49 listed “developed” and “developing” countries, even though that classification was dropped soon thereafter. He added that in the literature assessed, the general terms “developed” and “developing” countries are ubiquitous and may be used in qualitative text, although they are difficult for statistical analysis. Discussions continued in a huddle facilitated by IPCC Vice-Chair Sokona.

Following the huddle, INDIA, supported by ECUADOR, reiterated his earlier proposal for a statement on cumulative emissions in this paragraph. The authors, supported by the US, proposed to add to the first sentence that emissions vary widely across regions and over time “and over different stages of development.” IRELAND, NEW ZEALAND, SWITZERLAND, the UK, FRANCE, SAUDI ARABIA, TRINIDAD AND TOBAGO, and CHINA supported this sentence and a following sentence on average global per capita net anthropogenic emissions as presented from the contact group, with information by region having been deleted. INDIA called for including information about variation in emissions between developed and developing countries. Noting this proposal had been discussed previously and not accepted by some delegates, the US said this was part of an ongoing discussion about what constitutes developed and developing countries.

The authors agreed to add a reference to Figure SPM.2 to allow readers to clearly see regional differences. INDIA reiterated a call for referencing the differences in emissions in the text and emphasized this is a fundamental issue affecting the credibility of the IPCC. LUXEMBOURG proposed including a footnote stating that regional information is specified in Figure SPM.2.

The US noted that in the contact group many delegates had suggested pointing readers to Figure SPM.2. INDIA, supported by ECUADOR, expressed profound disappointment with the discussions and called for including “as in Figure SPM.2” in the text. This was accepted.

On a sentence stating that major shares of cumulative CO₂ from fossil and land sources were concentrated in different regions, INDIA called for more detail and balance in representation of LULUCF emissions and suggested re-introducing a reference to developing and developed countries. Referring to a consensus to stay general across subsection B.3, as agreed in the contact group, the US cautioned against cherry-picking data from Figure SPM.2 and called for maintaining balance, suggesting the sentence might also be deleted.

SWITZERLAND urged following the consensus-based text from the contact group that had been provided as guidance to authors. INDIA stressed that no consensus had been reached on this statement in the contact group and asked for more differentiated treatment of land use emissions. The authors highlighted there were no inventory data available for historical emissions from land use. The US reiterated that regional information was presented in Figure SPM.2 and should not be qualified in the text, with the alternative to spell out issues regarding the rapidly closing gap between some regions and others in terms of emissions since 2019. Noting that both full and partial deletion had been proposed, the

Co-Chair parked the sentence for further consideration. After further discussions, the sentence was deleted. A sentence on historical cumulative emissions of SIDS and LDCs was approved.

On inequality of emissions and energy access, FRANCE requested specifying types of emissions. SAINT LUCIA said a reference to “universal access to modern energy” misleadingly implies it is detrimental to the climate.

Following discussion in a contact group, most of the text was approved, including a footnote defining modern energy use. On a sentence and footnote defining decent living standards, INDIA called for specifying large parts of the world still need “carbon space” to develop beyond the minimal standard of “decent living conditions,” while others are overconsuming. FINLAND requested referencing rights-based approaches instead of decent living conditions. The authors clarified that the statement was not about an emissions ceiling or development rights or aspirations, but about basic needs.

INDIA preferred no reference to rights in this context and asked instead to include the Sustainable Development Goals (SDGs) and the timeframe to realize them or, alternatively, referring to “near-term,” which was supported by SAUDI ARABIA. The authors agreed to specify “minimal material requirements” in the footnote and revise the sentence to read “Decent living conditions to all in these regions, in the context of sustainable development objectives, in the near term, can be achieved...” to accommodate INDIA’s concerns. The paragraph was approved.

On consumption-based household emissions, NORWAY queried how consumption-based emissions are estimated, given no internationally-agreed methodology exists. The paragraph was agreed in a contact group and approved.

On trends in emission reductions and decoupling, INDIA, supported by IRELAND, noted a reference to production-based GHG and consumption-based CO₂ emission reductions only had one source and all the countries are developed, with already high emission levels. CHINA suggested adding that few countries sustain reduction rates longer than three or four years or achieve rates consistent with limiting warming to 1.5°C.

SPAIN, supported by LUXEMBOURG, SWITZERLAND, JAPAN, and IRELAND, called for quantification of: countries that have sustained production-based GHG and consumption-based CO₂ emission reductions; countries having reduced production-based GHG emissions by one-third or more since peaking; and “partial” offset of global emissions growth. LUXEMBOURG suggested adding the number of regions having sustained GHG reductions and reflecting this in the Headline Statement. NORWAY requested reference to associated risk of carbon leakage. IRELAND suggested clearer separation of consumption and production numbers and clarity on why and where policies are working.

SAINT KITTS AND NEVIS called for specificity and percentages of emissions represented. She also asked for clarification on whether any countries have made reductions consistent with limiting warming to 1.5°C. The paragraph and its related footnote defining consumption-based emissions were agreed in a contact group and approved in plenary.

Figure SPM.2: This figure, on **uneven distribution of emissions growth**, shows regional GHG emissions and regional proportions of total cumulative production-based CO₂ emissions from 1850-2019, including panel (a) on net emissions per capita and by region in 2019, and panel (d), on regional indicators including consumption- and production-based emissions estimates.

BRAZIL and INDIA called for beginning the timeline at 1850 rather than 1990. INDIA also called for adding absolute population numbers from 2019 and cumulative regional GHG emissions to panel (d), and absolute numbers on regional consumption—including overconsumption—and production patterns rather than simple ratios. LUXEMBOURG, with NORWAY, the US, and IRELAND, requested reference to absolute increases and decreases between 1990 and 2019. The REPUBLIC OF KOREA noted negative emissions shown only refer to GHGs. SWITZERLAND recommended referring to per capita emissions in the title and clarifying percentage fractions in panel (d). NORWAY called for including a line with production and consumption emissions in absolute numbers.

GERMANY and the US questioned references to developed and developing countries, requesting a clear statement that the terms are not consistent with the UNFCCC definition. The US also noted inconsistencies in referring to countries by development level and by region. She objected to the limited number of categories given the large development spectrum and suggested a more standard classification scheme based, for example, on income levels.

PERU proposed referring to the need for increased energy efficiency. BRAZIL asked for clarity on uncertainties associated with AFOLU in Latin America and the Caribbean.

Discussions continued in a contact group, co-facilitated by Tanzania and Switzerland and informed by the discussions on regional classifications pertaining to subsections B1 and B3. When this text returned to plenary, it was approved.

B.4: This subsection addresses **low-emission technologies**. Noting with appreciation the presentation of “concrete solutions,” the US cautioned against implying that the alternative to technology is no development or resource use. The EU, supported by SWEDEN, said the subsection tends to rebut the use of technologies without stating their benefits.

Following a suggestion from BRAZIL to reflect a sentence from B.4.2 on weak enabling conditions, the authors agreed to insert “Innovation has lagged in developing countries due to weaker enabling conditions.”

In a paragraph on costs of these technologies, the US called for clarifying that the limited scale of carbon capture and storage (CCS) taking place today is due in part to lack of commercializable projects. Emphasizing nuclear energy is not part of sustainable development, LUXEMBOURG, supported by SWITZERLAND, SPAIN, SWEDEN, and AUSTRIA, called for spelling out its risks.

INDIA said even if risks of nuclear energy have not been fully addressed, the risks of climate change have increased so significantly that trade-offs have to be examined. FRANCE said renewable energies cannot yet substitute for fossil fuels and, supported by CHINA, called for referencing hydropower.

On a sentence on large increases in deployment for electric vehicles, INDIA’s proposal to add “varying widely across regions” was accepted.

On policy mixes tailored to national contexts, INDIA called for “up front recognition” of the need for some fossil fuels. The US called for clarifying that one remedy to use of resources is to address rebound effects. INDIA’s proposal to add that innovation has provided opportunities to lower “expected” emissions was modified by the US to read “lower emissions and reduce emission growth,” which was accepted.

On using digital technologies to improve energy management, the US emphasized that digitalization should be accelerated for groups that have been slower to adopt digital technologies. INDIA cautioned against exaggerating digitalization's importance. The BAHAMAS said the language on digitalization was too negative. SAUDI ARABIA called for referencing abatement technologies in addition to renewable energy.

Figure SPM.3: This figure depicts the unit cost reductions in and increasing use of some forms of renewable energy and batteries. SWITZERLAND called for the key message that the costs of renewables are now competitive with fossil fuels to be reflected in the Headline Statement. SAUDI ARABIA said the unit costs do not represent the true costs of these technologies. Figure SPM.3 was approved with minor changes. In the caption, in response to a request from SAUDI ARABIA, authors proposed specifying "in 2020 the levelized costs of energy could" compete with fossil fuels. This was accepted.

B.5: This subsection addresses an **expansion of policies and laws since AR5**. On the Headline Statement, FRANCE requested information from the Final Government Draft version of the SPM on policy coverage of emissions from non-energy sectors. SAUDI ARABIA, supported by the US, called for reference to investment in low-GHG rather than low-carbon technologies.

On a paragraph covering the Kyoto Protocol and the Paris Agreement, INDIA, with FRANCE, noted the underlying chapter finds no evidence that the Kyoto Protocol has led to reduced emissions in any country. SAINT KITTS AND NEVIS, conversely, suggested including quantitative information from Chapter 14 on emissions reductions achieved by countries with obligations under Kyoto. SAUDI ARABIA suggested reference to "emissions," rather than "carbon," markets. In response to a request from INDIA, a sentence was expanded to note "at least 18 countries that had Kyoto targets" have had sustainable absolute emission reductions "for at least a decade from 2005, of which two were economies in transition."

INDIA's call for deleting "near-universal" participation in the Paris Agreement was not accepted.

On proportion of emissions covered by policy instruments, INDIA suggested specifying that carbon taxes or emissions trading systems are found mostly in Europe and China, querying the consistency with the underlying assessment of a statement that these cover over 20% of global GHG emissions. SAINT KITTS AND NEVIS requested information on LDCs. FRANCE suggested reintegrating wording from a previous draft of the SPM on demand management and materials efficiency being insufficiently addressed by public policy. SAUDI ARABIA sought deletion of "carbon" taxes as sourced from one non-peer-reviewed World Bank report. In response to INDIA, "diverse policy instruments for mitigation" was expanded to include "at the national and subnational levels."

On policies leading to reduced or avoided emissions, INDIA and SAUDI ARABIA queried estimates of emissions policies' global impact. SWEDEN requested quantifying how many countries have policies enhancing energy efficiency. SAUDI ARABIA's proposal to add "or removed" emissions was accepted, as was their request to replace "emissions pricing" with "economic instruments." Authors did not accept INDIA's request to replace "executive orders" with "administrative measures," saying the database on which the statement is based uses the former term.

On tracked financial flows for adaptation and mitigation, JAPAN called for clarifying that the data were aggregated in 2019. GERMANY requested clarification of "financial flows." SAINT KITTS AND NEVIS called for inclusion of robust, quantitative information from the underlying assessment. SAUDI ARABIA said the basis for comparison of financial flows for fossil fuels and climate adaptation and mitigation is unclear. INDIA called for specifying that growth in financial flows "still remains much below the needs of developing countries." Co-Chair Mahmoud said this would be addressed elsewhere.

Following discussion of this text in contact groups and huddles in conjunction with subsection E.5, INDIA questioned a statement saying that in 2018 public and publicly mobilized private climate finance flows from developed to developing countries was reported at USD 79 billion, calling into doubt the source of the estimate and requesting a footnote noting that it comes from a single report that assembles data from multiple sources. INDIA requested to refer to the debate on whether only public flows can count toward the goal. The authors offered to add "although interpretational differences remain." The US objected.

On the final day of plenary, the paragraph was adopted with: a footnote explaining the source of financial flows; the reference to USD 79 billion dropped; a change in the base year and estimated trend in the first line; and reference to challenges regarding green bond markets.

B.6: This subsection on **global GHG emissions in 2030 associated with NDCs** indicates that current policies imply even higher GHG emissions than NDCs. On the Headline Statement, SAINT LUCIA, with the UK and GERMANY, requested quantifying the absolute values of gaps between the NDCs and the temperature targets. The UK stressed reference to the importance of returning to 1.5°C by 2100 without high overshoot. SAUDI ARABIA asked if the likelihood of exceeding 1.5°C is from text in the underlying report or deduced from the modeled scenarios. CANADA, with the UK, called for focusing on the need for accelerated action before 2030, noting the Paris Agreement goal is not "2°C" but "well below 2°C." BRAZIL suggested including that some countries have NDC targets for 2025. INDIA, with NEW ZEALAND, queried the relevance of current NDCs for a 5-7-year-term assessment report and called for specifying cumulative emissions targets for 2050. He recommended leaving the synthesis of NDCs to the UNFCCC.

NORWAY suggested opening with a statement underscoring immediate action and a sense of urgency.

The US and GERMANY called for: distinguishing between NDCs and enacted policies; clarifying whether NDCs are consistent with scenarios in category C1 or imply exceeding 1.5°C and then returning to that level; and consistent usage of "overshoot."

On an associated footnote on NDCs submitted after the cut-off date for assessment, the US, the UK, LUXEMBOURG, GERMANY, NORWAY, AUSTRALIA, and NEW ZEALAND urged specifying whether NDCs submitted between the 11 October 2021 deadline and UNFCCC COP 26 are included in the analysis. NEW ZEALAND noted breakthrough NDC pledges at COP 26. AUSTRALIA suggested a footnoted qualitative statement on possible impacts of post-deadline NDCs on warming and emissions gaps.

Authors responded that many recent studies address all NDCs, including those submitted during COP 26, and show an "order of magnitude" change in estimates. The EU asked if another

footnote, on NDC-based mitigation after 2030 no longer being able to “establish a pathway with less than 67% probability to exceed 1.5□” before 2100, refers to “returning to” or “staying below” 1.5□. Authors replied that, under current NDCs, it will likely not be possible to limit warming to 1.5□ without at least limited overshoot.

Following further deliberations in contact groups, the B6 Headline statement was approved, along with footnotes clarifying treatment of NDCs announced prior to COP 26, those commitments could no longer establish a pathway to limit warming to 1.5°C with no or limited overshoot, and the cut-off date underlying the assessment of policies implemented by 2020.

On implemented policies projected to result in higher global GHG emissions than those implied by NDCs, the US suggested defining “immediate action” as starting, for example “before 2025.” INDIA, supported by SAUDI ARABIA but opposed by many countries, asked to replace reference to an emissions “gap” in 2030 between emissions from NDC implementation and those in modeled mitigation pathways with a statement that they “do not line up.” Authors said the term “emissions gap” is well established. After lengthy discussion, INDIA suggested introducing the paragraph with reference to an “implementation” gap. SAUDI ARABIA noted the gap size depends on the assumptions of the model used. The EU said it depends on emissions levels, not on changing the target. The UK requested specifying the size of gaps.

Following deliberations in a contact group, authors introduced a new Table SPM.X, extracted from Figure SPM.4, showing projected global emissions in 2030 associated with policies implemented by the end of 2020 and NDCs announced prior to COP 26, and associated emission gaps. INDIA requested qualification of the term “emission gaps” at its first occurrence in B.6.1. The relevant information was moved from the caption of the new Table SPM.X to a footnote in B.6.1. Authors suggested inserting a sentence specifying the “implementation gap” in B.6.1 and agreed to a proposal by INDIA to start the paragraph with this new statement, for consistency with Table SPM.X. The footnote specifying types of gaps was approved with minor modifications in response to comments by INDIA.

This paragraph was approved with small editorial changes in response to interventions by the US, and the authors confirming high confidence for the qualitative statement in the text, while adding medium confidence to the table, indicating higher uncertainty of the quantitative analysis. The footnote defining immediate action was revised to read “adoption between 2020 and at latest before 2025,” for consistency with Section C. On an associated footnote defining conditional and unconditional elements of NDCs, IRELAND, opposed by SAUDI ARABIA, queried mention of Paris Agreement Article 6. Authors said it was only an example of a mechanism of international cooperation. INDIA, with BRAZIL, suggested replacing this with bilateral and multilateral agreements. This was accepted.

Table SPM.X: This new table shows projected global emissions in 2030 associated with policies implemented by the end of 2020 and NDCs announced prior to COP 26, and associated emission gaps, and was extracted from Figure SPM.4 following discussions in a contact group. The table was approved with a note clarifying 2019 emissions.

On global emissions in 2030 implied by recent NDCs being lower than those implied by the original NDCs, AUSTRALIA requested including the absolute emissions values of both from Figure SPM.4.

FRANCE called for acknowledgement that achieving the NDCs will be very challenging. INDIA strongly objected to post-cut-off date assessments and proposed neutral language, replacing “lower” with “change.” The US and NORWAY supported more precise language on direction of effects of COP 26 submissions, whereas authors cautioned against potentially contradicting language pending revised numerical estimates. GERMANY asked to postpone approval until a decision was made on such an update and INDIA suggested dropping the sentence on changes due to NDC updates.

INDIA repeated his strong wish to include information on cumulative emissions implied by NDCs, pointing to the UNFCCC NDC Synthesis Report as a source for such data. Authors explained that cumulative emissions implied by NDCs were not assessed in that report as the focus was on robust numbers from multiple sources.

Co-Chair Skea highlighted that the UNFCCC NDC Synthesis Report had been published after the cut-off date, and the function of the SPM was to synthesize the underlying assessment. The EU stressed the SPM should not include information that had not been assessed.

INDIA reiterated his position, highlighting: he had raised this point repeatedly; it is relevant and scientifically valid information; the decision to not assess it was surprising, given the consequences for the development space for developing countries; the IPCC had used information from multilateral institutions on other occasions; the UNFCCC and the NDC report have the weight of a multilaterally agreed process; and it would have been possible to use the draft version of that report prior to the cut-off date. He proposed including a reference stating cumulative emissions implied by NDCs had not been assessed in the report as an alternative.

Co-Chair Skea stated it would be outside IPCC procedure to include reference in the SPM to an external source not included in the underlying assessment and that no government had asked for such an assessment during the formal review of the report. LUXEMBOURG, DENMARK, JAPAN, the US, CHILE, the NETHERLANDS, SWEDEN, BELGIUM, and the UK objected to INDIA’s request. The IPCC legal officer confirmed that material that has not been assessed cannot be included in the SPM unless mandated by a consensus decision from the Panel. Since many members had objected, the Co-Chair offered to record India’s concern in the report of the meeting if he could not approve the statement.

Emphasizing his disagreement was not with a single sentence or the assessment, but that he had not found a space over the two weeks to accommodate this very relevant point, INDIA requested his concern be put on the record.

On an associated footnote on implications of unconditional and conditional elements of NDCs, CHINA expressed concern at the amount of information and figures. LUXEMBOURG urged stronger language on a statement that NDC updates “could” further lower the implied emissions. B.6.2 and the footnote were approved, with the footnote revised to state that NDCs updates could further change the implied emissions.”

On implied annual average global GHG emissions reductions for pathways consistent with NDCs that limit warming to 2°C between 2020-2030 and between 2030-2050, SAUDI ARABIA urged inserting reference to investments in “unabated” emissions-intensive infrastructure as a barrier to accelerating reductions. The EU stressed the NDC emissions gap trajectory was calculated by scientists to force the NDCs to become consistent with Paris Agreement

goals. The UK requested including language from Chapter 3 of the underlying report on the average emissions reduction rates required being “unprecedented at the global scale” and emphasizing action before 2030. These changes were accepted.

On modeled emission pathways consistent with NDCs implying overshoot and net-negative emissions to return warming to 1.5°C, INDIA questioned how to infer from NDCs the scale of net negative emissions needed. The US cautioned that limiting warming requires availability of, and ability to deploy, new technologies, not just investment. SAUDI ARABIA called for specifying the risks of large-scale deployment of carbon dioxide removal (CDR) and remedies for these, given that the scenarios establish its necessity even in pathways not limiting warming to 2°. The EU requested outlining solutions to feasibility challenges in modeled overshoot pathways returning warming to 1.5° by 2100. Authors responded there are some pathways that show feasibility of returning to 1.5° warming even after only following NDC commitments to 2030.

The UK, with AUSTRALIA, called for clearer acknowledgement that some modeled pathways are unable to return to 1.5°, with details on the overshoot and how much could feasibly be reversed. CHINA urged use of percentage numbers to express likelihood, to make it easier for non-native English speakers. ARGENTINA proposed including a “general economic risks” list along with climate-related, social, and environmental risks entailed in large-scale deployment of CDR.

Figure SPM.4: Figure SPM.4 addresses projected global GHG emissions from NDCs announced prior to COP 26, making it likely that warming will exceed 1.5° and making it harder after 2030 to limit warming to below 2°. CHINA requested inclusion of trends to 2100 from a figure in Chapter 4, to show the complete future evolution. SAINT KITTS AND NEVIS suggested adding IMPs up to 2030. FRANCE, with BELGIUM, noticed discrepancies between this figure, Figure SPM.5, and paragraph B.1.1 on total net GHG emissions in 2019, and recommended a new curve showing actual emissions from 2000-2015 from Chapter 2 and the differences between modeled and actual emissions. Authors said multiple datasets mean there is no “one” history of emissions, meaning there is uncertainty on gaps as well as on reality, but models are calibrated to historical emissions using various data sources that reflect evolving uncertainty. They noted that NDC emissions implications until 2030 use similar data sources so the estimate of the emissions gap is robust. They also confirmed reliance on the pathways literature to assess long-term implications of the NDCs for achieving the Paris goals, with panel (b) showing the large change in reduction rate this would require.

Back in plenary, delegates considered authors’ proposed revisions to Figure SPM.4, based on comments received.

INDIA asked for information on cumulative GHGs. BRAZIL requested information relating to countries with targets for 2025. GERMANY, with the US, requested information on how IMPs relate to panels with “snapshots” of emissions at 2030 and 2050. INDIA called for showing historical emissions in the graph and queried treatment of the NDCs received post-deadline. SAUDI ARABIA, opposed by FRANCE, asked to extend the figure to 2100.

Authors agreed to make Figure SPM.4 consistent with wording on Figure SPM.5. In response to INDIA, authors confirmed that LULUCF emissions are a main driver of the uncertainties indicated. In response to NORWAY, authors detailed methodologies used for assessing gaps between planned and implemented policies.

On the implications for emissions of NDCs announced post-cut-off date, the authors said the median value of emissions reductions would change by up to 200 MtCO₂eq and that some numbers would come down by 1 Gt, meaning larger bounds of uncertainty but no change to median figures.

Co-Chair Skea informed participants that, legally, the plenary can include information received after cut-off dates in a footnote, identifying that it was not assessed and underwent no formal IPCC peer review; such information would “sit outside” the report itself and would not be footnoted at all if any country objects. This received no opposition.

INDIA, with SAUDI ARABIA, requested a footnote stating the time series starts at 2010 because information on prior emissions is available elsewhere in the report.

Information contained in a table within Figure SPM.4 was moved to Table SPM.X.

In plenary on Saturday, 2 April, authors presented final changes to Figure SPM.4, highlighting a new panel (d) adding a timeframe to 2100, and noting removal of the word “snapshot.” With these changes Figure SPM.4 was approved.

B.7: This subsection addresses **fossil fuel infrastructure’s future CO₂ emissions**. On the B.7 Headline Statement, NORWAY, with AUSTRALIA, asked whether such “planned” infrastructure covers extraction and decommissioning. INDIA noted fossil fuel installations’ relevance for deployment of renewables, bemoaned lack of language on oil and gas phaseouts, and sought specification that most existing and planned infrastructure is in developed countries. SAUDI ARABIA and JAPAN requested specifying “unabated” CO₂ emissions in this section. SWEDEN observed these emissions “alone” exceed the total cumulative net CO₂ emissions in pathways limiting global warming to 1.5°. The UK and US sought clarification on the implication that existing and currently planned infrastructure could put limiting warming to 1.5°C or even 2° out of reach. The US recommended adding reference to current investments in such infrastructure. This text was agreed during extensive discussions in a contact group.

On historical operating patterns in fossil fuel infrastructure, SAUDI ARABIA stressed fossil fuels are needed for manufacturing parts for renewables and because renewable energies are intermittent.

On modeled pathways likely limiting warming to 2°, SWEDEN asked if reference to most fossil fuel CO₂ emissions being outside the power sector applies to the whole pathway. FRANCE said options for reducing emissions here should be reflected in the Headline Statement. SAINT KITTS AND NEVIS again urged language on 1.5°.

C. System Transformations to Limit Global Warming

SAUDI ARABIA proposed replacing “transformation” with “transition” in the title of Section C. NORWAY, LUXEMBOURG and ESTONIA said urgency should be emphasized throughout Section C, possibly by highlighting the risks and uncertainty connected to negative emissions from large-scale LULUCF and CDR. SAINT KITTS AND NEVIS, supported by SAINT LUCIA, again stressed the IPCC’s role is not to provide interpretations of the Paris Agreement. She cautioned that scenarios that “likely limit warming to 2°C” do not satisfy the Paris Agreement’s temperature goal of staying “well below 2°C” and asked authors for a subcategory C1(a) for scenarios that limit warming to 1.5°C with no or limited overshoot and reach net-zero GHG emissions before 2100. SAINT LUCIA added that scenarios limiting warming

to 1.5°C with high overshoot were removed from the SR1.5 SPM to avoid confusion and suggested that such pathways (category C2) should instead be relabeled and included as subcategories under scenarios that likely limit warming to below 2°C (category C3), with a specific label such as “return to 1.5 in 2100.” SAUDI ARABIA asked to include all scenario categories in the text. INDIA expressed deep concern about the use of scenarios, modeling, and pathways in the entire report, and called for including references to the carbon budget. Supported by CHINA and SAUDI ARABIA, he requested including a summary specifying assumptions and criteria and their use in models in the Introduction (Section A), based on Chapter 1.

C.1: This section, which discusses **pathways to different warming levels**, was subject to extensive deliberations in contact groups and huddles, in conjunction with Table SPM.1 and categories C2 and C3 in Box SPM.1. When the pre-agreed text was brought to plenary, Section C.1 and associated footnotes were approved without further discussion.

On a paragraph on modeled pathways that limit warming to 2°C or 1.5°C, the US and NORWAY asked to clarify “maximum technical potential” for methane emissions reductions given the potential of agricultural methane reductions and new technologies. NORWAY suggested possible examples of non-technical reductions of methane through changes such as switching to less meat-intensive diets or reducing livestock.

Table SPM.1: This table, specifying key characteristics of the global emissions pathways, was rated as very complex but useful by many delegations, with suggestions to improve readability, including through visualization of certain elements, comprehensiveness, transparency, and policy-relevance.

CHINA, supported by INDIA and SAUDI ARABIA, suggested including socio-economic information in addition to the emissions data, including clarification on associated costs, trade-offs, technology requirements, and possibly regional differentiation.

FRANCE suggested deletion of a column due to inconsistency between modeled and historical GHG emissions data in 2019. The US suggested specifying the role of climate sensitivity. GERMANY highlighted that policymakers would link the categories to the Paris Agreement’s temperature goals and suggested adding “very likely below 2°C” to the C1 category. He supported SAINT LUCIA’s intervention on high overshoot pathways in category C2 being inconsistent with the 1.5°C limit and questioned whether categories C3 and C4 should be associated with 2°C pathways.

After extensive deliberations in contact groups and huddles, the table was revised, with a distinction within category C1, which shows pathways that limit warming to 1.5°C with no or limited overshoot, to distinguish between pathways that reach net zero GHG emissions by 2100 (C1a) and those that do not (C1b). With this and other modifications, the revised table was presented to plenary. After final edits clarifying a column specifying which shared socio-economic pathways (SSPs) and IMPs were aligned to the scenario categories shown, Table SPM.1 was approved.

Following a further short discussion, with INDIA asking to include “cumulative and net-negative emissions” in the title, which the authors rejected, the caption, including 15 table notes, was approved with minor edits for consistency.

Box SPM.1: Delegates lauded the inclusion of this box, which summarizes **characteristics of modeled long-term emission scenarios and their temperature outcomes** and provides details on underlying assumptions and developments since SR1.5. With

GERMANY, NORWAY requested more detail on the IMPs and suggested including information from C.3.1 on pathways with no or limited overshoot.

CANADA highlighted the importance of SSPs as a means of integrating across WGs and requested including basic descriptions for SSP storylines, as well as, with the US, better explanation of their relation to IMPs. She suggested providing: a visual representation of temperature outcomes; information on magnitude of overshoot for categories C1 and C2 and resulting CDR requirements; and transparency around the choice of boundaries. The US sought clarification on the larger set of emissions scenarios compared to WGI. CHINA inquired about considering regional differences within the box. SAINT LUCIA requested clarification on a statement that AR6 scenarios rely proportionally less on large-scale negative emissions than SR1.5. GERMANY queried the limitation of temperature overshoot, the timing of net-zero GHG emissions, and why some of the pathways do not reach this target. INDIA warned against downscaling global scenario results for regional and country level estimates, saying this would be policy prescriptive. In response to concerns expressed by INDIA, the authors introduced a footnote setting out key assumptions underpinning the assessment, including on socio-economic development and developments in agriculture and energy systems. The US, LUXEMBOURG, the NETHERLANDS, IRELAND, SPAIN, FRANCE, and NEW ZEALAND supported the proposed footnote, for consistency across IPCC reports. SWEDEN said there is an empirical basis for these models. The authors did not accept INDIA’s proposal for a new table outlining socio-economic outcomes. INDIA queried whether equity was a criterion in selecting scenarios. INDIA also called for additional details on, *inter alia*, assumptions and regional differences in gross domestic product (GDP), land and energy use, and negative emissions. The authors suggested adding a reference to Table 3.4 from the underlying report.

INDIA, supported by ECUADOR, requested wording in the footnote indicating that alternative scenarios could be developed or considered. GERMANY, the NETHERLANDS, LUXEMBOURG, and SWEDEN, objected. INDIA reiterated his concern that equity was not a criterion in IPCC’s evaluation. They eventually agreed to include a statement in the footnote that IPCC is neutral with regard to assumptions of scenarios in the literature assessed in this report, which do not cover all possible futures.

Noting that the IPCC’s assessment is comprehensive, GERMANY with the US, proposed deleting a reference to consideration of alternative scenarios. NORWAY said it could live with the sentence as amended. Ultimately the group agreed to specify that many underlying assumptions in the models “are regionally differentiated,” and the footnote was approved.

There was discussion on reference to least-cost emission abatement options, with GERMANY, FINLAND, LUXEMBOURG, FRANCE, and IRELAND, opposed by SAUDI ARABIA and INDIA, preferring reference to “mitigation options.” There were also various attempts at wording to reflect that few global emissions scenarios do not make assumptions about equity.

On a paragraph that explains IMPs, NORWAY, INDIA, CHINA, TRINIDAD AND TOBAGO and others requested clarification on their differences, particularly regarding IMP-Neg, which is characterized by “high reliance on CDR to achieve net negative global GHG emissions.” SAUDI ARABIA proposed changing the name of IMP-LD, which focuses on more efficient use of resources and low energy demand, to “IMP-ER,” to denote efficient resources.

BRAZIL asked for a footnote stating that not all CDR is necessarily deployed to achieve net negative emissions. Discussion continued in a contact group co-facilitated by Ukraine and Canada.

Text remaining open after extensive contact group deliberations was revisited during a plenary on Sunday, 3 April. INDIA voiced concern about the use of global model outcomes for regional policy making and requested specifying that such assessments needed to be made with great care. The authors highlighted that INDIA's concerns had already been incorporated in edits referring to cost-effective approaches and recognition of assumptions. Text was revised to read "with the careful recognition of these assumptions." Further revisions relating to changes to the emission characteristics between SR1.5 and AR6, and to IMPs, were approved. A request from INDIA to insert additional language from Chapter 1, specifying that IMPs do not attempt to portray the whole range of alternative socio-economic pathways in the context of implementing the Paris agreement, was declined by authors as being duplicative. After further deliberation, INDIA agreed to the text as presented.

Responding to calls from multiple governments to visually display warming outcomes for different pathways, the authors crafted a figure for Box SPM.1, showing both temperature over time (panel a) and peak and year 2100 warming (panel b) for the range of assessed scenario results, based on underlying report Figure 3.11. With this, Box SPM.1 was approved.

C.2: Stressing the urgency of action, the NETHERLANDS, the UK, and NORWAY described the Headline Statement on **global net zero CO2 emissions in modeled pathways** limiting warming to 1.5°C or 2°C as very weak. SAINT LUCIA called for reflecting the Paris Agreement throughout Section C, including by adjusting pathway categories to ensure policy relevance. The UK called for further details on high-overshoot 1.5°C pathways given their policy relevance. Supported by LUXEMBOURG and NORWAY, he also questioned using "NDCs" to refer to current Paris Agreement ambitions. SAUDI ARABIA asked to: clarify whether GHG emissions cited are abated or non-abated; add "modeled pathways" whenever appropriate; and quantify "deeper" GHG emissions reductions and "mostly" associated with fossil fuels. She also objected to "strengthening of policies" as being policy prescriptive. LUXEMBOURG suggested better distinguishing between scenarios that reach net-zero GHG emissions and those that do not.

INDIA called for revising the Headline Statement to emphasize that these are modeled pathways and that substantial amounts of negative emissions are involved. The authors proposed to add "global" to the start of the sentence and to revise the scenario language, but said this addition would not be factually correct. GERMANY, SAINT LUCIA, and the US supported the authors. INDIA reiterated calls for rewording the paragraph. The authors proposed to add a new sentence indicating that "many of these pathways continue to net negative CO2 emissions after the point of net zero." CANADA called for adding "global" before CO2 emissions. SWEDEN and the US said "these pathways" was unclear. INDIA called for referencing "continuing to net negative emissions after the point of net zero." The authors preferred to keep the statement concise and factual. They requested time to consider how to clarify which pathways are being referenced in the new sentence.

This text was taken up in contact groups and huddles, and agreed text was brought to plenary and approved.

On projected cumulative net CO2 emissions consistent with pathways that limit warming to 1.5°C or 2°C, language on consistency with the remaining carbon budget assessed by WGI was moved to a footnote. The paragraph was approved with minor changes.

On differences between characteristics of pathways that limit warming to 1.5°C with no overshoot and those that return after high overshoot, INDIA called for addressing feasibility by reflecting the volume of net negative emissions required and the lack of currently available technologies. ESTONIA suggested visualizing temperature outcomes of scenarios.

On non-CO2 contributions to 1.5°C and 2°C pathways, CANADA, SAINT KITTS AND NEVIS, and FRANCE questioned "without air pollution controls" in a sentence stating that reduction of aerosols and their precursor emissions have a net warming effect due to the reduced combustion of fossil fuels without air pollution controls. SAUDI ARABIA noted that the formulation had come to replace "unabated fossil fuel use" from the authors' original text, in order to accommodate some countries' sensitivities with "unabated." She clarified her preference for the original reference to "unabated." Authors proposed revised text to clarify that projected reduction of cooling aerosols are mostly due to reduced fossil fuel combustion not equipped with effective air pollution controls. This was accepted.

GERMANY, opposed by INDIA, called for specifying a timeline, such as "in the short term." The authors preferred to maintain WGI language but agreed to add "in the near- to mid-term" as suggested by Co-Chair Skea, to adjust for the slightly different definitions of "near term" in WGI and WGIII. WGI Co-Chair Valérie Masson-Delmotte confirmed consistency with the WGI assessment. With this, the sentence was approved.

There was also discussion on the "cooling" effect of methane emission reductions, with JAMAICA, INDIA, IRELAND, and GERMANY suggesting referring instead to a reduction of the warming effect. After further wording attempts and clarifications, the paragraph was approved.

On the timing of net-zero GHG, discussion centered on a sentence explaining the implications of using a 100-year global warming potential metric (GWP100), with INDIA, GERMANY and others preferring to drop the sentence for being too technical while the US, BELIZE, and others emphasized its importance. A footnote explaining GHG emission metrics was added, and WGI Co-Chair Masson-Delmotte confirmed the wording as consistent with WGI. With this, the paragraph was agreed.

C.3: In a section on **global modeled pathways that limit warming to 1.5°C (>50%)** with no or limited overshoot, and those that limit warming to 2°C (>67%) involving rapid and deep GHG emission reductions, the BAHAMAS called for caveats on CDR in the Headline Statement. SAUDI ARABIA asked to specify "unabated" fossil fuels and refer to reductions through innovation and technologies. CHINA requested information on the high-overshoot pathway C2, to be comprehensive.

In a paragraph on variation in the contributions of different sectors as illustrated by IMPs, SAUDI ARABIA warned against labeling IMP-LD, on "low demand," as an "energy demand reduction" strategy, since restricting energy access conflicts with SDG 7 (affordable and clean energy). Ultimately, some information was moved to Box SPM.1 and the paragraph was revised to refer to shared characteristics between different pathways.

In a paragraph on use of fossil fuels in modeled pathways limiting warming to 1.5°C and 2°C with no or limited overshoot, the BAHAMAS suggested deleting estimates for 2100 due to high uncertainty. Debate ensued on the use of interquartile ranges versus the 5-95th percentile in a sentence giving projected declines by 2050. SAUDI ARABIA and INDIA opposed a proposal by the authors to use interquartile ranges in the text and a footnote with the 5-95th percentile, calling for having the 5-95th percentile in the text. This was opposed by TRINIDAD AND TOBAGO, SAINT KITTS AND NEVIS, SAINT LUCIA, the UK, DENMARK, BELGIUM, and the NETHERLANDS, who urged supporting the authors for consistency in the text.

On net-zero timing and CDR requirements, FRANCE asked to include the role of soil carbon sequestration for the AFOLU sector.

On reductions at net-zero GHG, JAPAN suggested listing all sectors that emit non-CO2 GHGs in order of their near-term mitigation potential.

On CDR portfolio and requirements to 2100, FRANCE called for prominently reflecting the SR1.5 findings on CDR deployment being subject to multiple sustainability constraints and on rapid and near-term emissions reductions decreasing CDR demand. JAPAN asked to specify “net-negative CO2 emissions.”

On lower resource demand and shifts towards sustainable development reducing mitigation challenges, FRANCE called for specifying CDR’s impacts on biodiversity and feasibility constraints, citing WGII’s finding that nature-based solutions (NbS) become less effective beyond 1.5°C warming. SAUDI ARABIA called for emphasis on equitable transitions and differing needs and circumstances. JAPAN requested details on how to reduce demand, highlighting the role of social and technological innovation.

Figure SPM.5: Delegates welcomed improvements on Figure SPM.5 showing illustrative IMPs and different portfolios underpinning net-zero CO2 and GHG emissions strategies.

JAMAICA asked for the top-level statement to clearly differentiate between 1.5°C and 2°C pathways and for clarification on the relationship between IMPs and scenario categories. CANADA suggested specifying that all IMPs align with scenario categories C1-C3 on pathways to 2°C and lower. She expressed appreciation for the addition of a panel on GHG emissions. FRANCE recommended normalizing the y-axes in panels (a)-(d), given inconsistencies between modeled and actual GHG emissions in 2019, and specifying that historical and modeled emissions are shown. CHINA highlighted that both 1.5°C and 2°C pathways require deep and rapid reductions, called for all categories to be included in panels (a) and (b), and suggested adding the net-zero ranges for category C2. The UK suggested showing different temperature outcomes for pathway categories.

During an approval plenary, GERMANY raised an issue with the legend of panel (e) stating “Energy supply (negative),” saying it was not comprehensible, that it referred to bioenergy with carbon capture and storage (BECCS) and should be labeled as such, and explanations by the authors that direct air carbon capture and storage (DACCS) was included in that category were wrong, since DACCS does not supply energy but, instead, consumes large amounts of it.

The authors responded that DACCS was included because it interacted with the energy system, not as energy supply, and offered to include explanatory text in the caption to panel (e), which was accepted. SPM.5 was approved.

C.4: In a subsection on **transitions to reduce GHG across the energy sector**, SAINT KITTS AND NEVIS, supported by NORWAY and LUXEMBOURG, called for clearly defining terms and concepts such as “low-carbon energy” throughout the SPM. NORWAY preferred “low emissions” or “low GHG-emissions.”

IRELAND suggested stating that the energy sector is responsible for major emissions of CO2 and methane. GERMANY underscored the “paramount importance” of renewables, and especially solar and wind energy. CAN-I emphasized that the “real objective” is zero carbon, not low carbon, and called for using terms such as “clean renewables” rather than “alternative energy.”

On a paragraph on the characteristics of net-zero energy systems, a sentence was added that most appropriate strategies depend on national and regional circumstances, and a footnote was added specifying the term “unabated fossil fuel.”

On economic attractiveness of low-emission energy systems, INDIA called for acknowledgement of factors such as land availability, technology access, and costs of large-scale storage systems. Energy security was added to a list of co-benefits.

IRELAND asked for clarification on the barriers to making renewables more viable for entire energy systems. The US, supported by AUSTRALIA and GERMANY, said the text could better acknowledge the predominance of renewable energy in many systems. Language was changed to specify that electricity systems predominantly powered by renewables are becoming increasingly viable. A sentence was added specifying that in some countries this is already the case.

On unburned fossil fuel resources, SAUDI ARABIA insisted that the estimated value of stranded assets only reflects the unabated part of fossil fuels, saying new technologies will make fossil fuels low carbon. The BAHAMAS said findings on limiting warming must reflect the 1.5°C level here and throughout the SPM. Delegates agreed to indicate that “Depending on its availability, CCS could allow fossil fuels to be used longer, reducing stranded assets.” The term “stranded assets” was further explained, and the difference between pursuing a pathway to 1.5°C, or to 2°C, for fossil fuel use was specified.

On fugitive emissions from fossil fuel production, LUXEMBOURG called for including figures for total GHG emissions and, supported by IRELAND, for global methane emissions.

The origin of global methane emissions from energy supply was further specified, and shares of fugitive emission in global methane and GHG-emissions were added. A new subsection was added, specifying the characteristic of CCS, such as: being the storage component for CDR methods, when captured from air or biomass; technological maturity in enhanced oil recovery, but not for other sectors; global storage potential; implementation barriers and enabling conditions; and current global rates being far below those required in 1.5°C or 2°C pathways.

C.5: In a section on **reducing industry emissions**, SWITZERLAND called for references to the whole life cycle of plastics, not just recycling. NORWAY, with GERMANY, emphasized the importance of the circular economy.

The NETHERLANDS called for additional information on substitutions for carbon feedstocks and standards and regulation for industry. CHINA suggested adding a footnote defining and providing examples of carbon feedstocks.

SAUDI ARABIA called for positive framing of CCS as an important element in achieving net-zero emissions. Noting that CCS is the most expensive option for reducing emissions, SAINT KITTS AND NEVIS called for a statement on the feasibility of CCS at the scale required. FRANCE said the text conveys that CCS is more important than other options, thus not reflecting the underlying chapter's balance. BRAZIL called for additional references to sustainability and sustainable development throughout Subsection C.5. FWCC noted there were 33 SPM references to CCS and only six to renewable energy. CAN-I suggested referencing reusing and recycling materials and low-impact mining.

On increasing use of materials such as steel, cement and plastics and circular material flows, INDIA, supported by the RUSSIAN FEDERATION, emphasized that the text does not clarify that some materials cannot be circular. FRANCE called for clarification that "materials efficiency" means "more circular flows." MEXICO emphasized referencing renewable energies or technologies for low-carbon-generating industrial processes and the EU suggested adding "energy efficiency."

After discussions in a contact group, the authors offered to replace "more circular material flows" with "circular economy solutions" as one option to reduce emissions from production of materials. SAUDI ARABIA suggested replacing "circular economy" with "horizontal and vertical circularity based on countries' needs and development choices." The authors clarified that science does not support such a concept.

GERMANY, NORWAY, MEXICO, FRANCE, the EU, and CHILE strongly supported "circular economy" as an established concept familiar to policymakers. FRANCE suggested referring to the glossary definition.

INDIA, BRAZIL, ECUADOR, SOUTH AFRICA, and INDIA supported SAUDI ARABIA's point that "circular economy" is too specific and not at the same conceptual level as other options mentioned. The NETHERLANDS and the RUSSIAN FEDERATION urged delegates to accept either "circular material flows" or "circular economy." Numerous delegates offered possible compromise language. FWCC suggested text highlighting that AR5 defined economic growth as the main driver of emissions. SAUDI ARABIA called a point of order, saying IPCC rules and procedures do not permit observers to negotiate with governments. After further deliberation, agreement was reached on the authors' suggestion, initially proposed by the RUSSIAN FEDERATION, to refer to "sustainable" technically viable options, of which "circular material flows" are one example.

Views diverged on new text from the authors specifying that new options are not yet well represented in top-down models, leading to comparatively higher mitigation estimates in bottom-up assessments. INDIA proposed to delete both sentences or move them to a footnote, arguing that discussion of real-world developments should not be mixed with discussions on model results. CHINA said that issues of models' assumptions relate to all sectors and should be discussed elsewhere. Authors clarified the intention of the text is to show policymakers that many solutions presented to them may not yet include these new options.

The US supported the statement as relevant for long-term decision making, suggested a footnote explaining "top-down" models, and adding "due to relative new-ness." GERMANY and the NETHERLANDS said that the text helps policymakers interpret findings and data. The RUSSIAN FEDERATION agreed, suggesting

moving parts of the text to a footnote. Authors accepted the US proposal, specifying model types and a focus on scenarios.

INDIA remained opposed, saying reference should be to pathway scenarios. Authors underscored it is a matter of discrepancies in model approaches, with a need to clarify that the mitigation potential in some top-down scenarios is underestimated compared to bottom-up industry-specific models.

After further discussion, the group agreed to the deletion of reference to models as suggested by INDIA, while keeping the point made by the authors that these new options and new production technologies are generally not considered in recent scenarios due to relative newness.

On potentials across industry sectors, SAUDI ARABIA called for including references to abatement technologies and electrification. GERMANY called for adding information on carbon capture and utilization (CCU). JAPAN said this paragraph does not reflect industrial reality, as only a small proportion of production processes are at the pilot or near-commercial stage and cost increases for final consumers are not always small. CHINA said these technologies are commercialized only in developed countries, not globally. INDIA said the emphasis on CCS is problematic.

On climate-friendly processes for basic materials, SAUDI ARABIA asked to specify that some processes are at commercial stage in some regions. The EU suggested replacing "not yet standardized" with "not yet commercially adopted." BELGIUM suggested a footnote defining "primary" metals. The authors explained that climate-friendly processes are global, and proposed to include commercialization and a footnote specifying that primary metals referred to virgin materials, not recycled metals. In response to a query from INDIA, the authors said low-GHG options are available for "almost all basic materials."

On cost increases for final consumers, SAUDI ARABIA said "less than a few percent for final products" is difficult for policymakers to understand. The US suggested expanding it to explain that, given the small fraction of consumer cost based on materials, sustainable basic materials production processes would translate into minimal cost increases for final consumers, which drew general support from authors and many delegations. An alternative proposal by INDIA, referring to "substantial cost decreases for final products" and supported by SAUDI ARABIA, was opposed by the US and others as changing the intended logic. Authors stated that INDIA's suggestion did not follow their assessment.

After further discussion, text based on the US proposal was finally agreed, modified to read that such sustainable production processes "are expected" to translate into minimal cost increases for final consumers. A request from INDIA for a footnote with clarifying caveats regarding the claim of small costs to consumers, was not agreed.

On reducing cement process emissions relying on already commercialized cementitious material substitution and CCS until new chemistries are mastered, FRANCE, opposed by the NETHERLANDS, cautioned against implying that CCS is already commercialized. SAINT KITTS AND NEVIS, supported by MEXICO, questioned the feasibility of CCS options, citing Chapter 11 language. GERMANY suggested referring to "availability" of CCS. The authors offered to add that CCS is only at the pilot stage. INDIA recalled language from the chapter's Executive Summary that CCS will be essential for eliminating the limestone calcination process emissions for making clinker, which represent

60% of GHG emissions in cement production. FWCC asked about reducing the use of cement or using more sustainable materials. The authors said that comes under material efficiency and demand management. The approved sentence now states that deep reduction of cement process emissions will rely on “the availability of” CCS. There was lengthy discussion on a sentence that, in the SPM floor draft, said reducing chemicals’ emissions would need to rely on increased plastics recycling, fuel and feedstock switching, and CCS. BELGIUM asked if chemical emissions refer to the chemicals themselves or their manufacturing process and, with GERMANY, suggested “reducing emissions from the production and usage of chemicals.” SWITZERLAND, with MEXICO and BELGIUM, preferred reference to the life cycle approach (LCA), which includes packaging and use as well as recycling. MEXICO noted other industries also need the LCA for reducing chemicals.

Authors suggested deleting specific reference to plastics and instead referring to the LCA as it is for all GHG-intense products, but SWITZERLAND said it must apply clearly to plastics. He suggested referring to a life cycle approach including “for” plastics. SAUDI ARABIA, with INDIA, objected to singling out plastics. The US suggested simply referring to “considering life cycle emissions” at the end of the sentence.

FRANCE sought clarification on a change suggested, but not agreed, in the contact group, to add “carbon management (e.g., CCU, biogenic and direct air capture carbon, and permanent CCS)” to the list of actions needing to be relied upon. SAUDI ARABIA recommended adding “enhanced” fuel and feedstock switching and replacing “carbon” with “GHG” management. GERMANY sought clarification on “CCU” and, with INDIA, on “carbon management,” requesting a list of examples. INDIA noted, with FRANCE, that availability is an issue for most elements in the list. The authors said CCS and CCU are related and suggested referring to “carbon sourced through CCU, biogenic sources, direct air CO₂ capture, and permanent CCS.” GERMANY queried “permanent” CCS.

The final sentence refers to relying on “a life cycle approach, including increased plastics recycling, fuel and feedstock switching, and carbon sourced through biogenic sources, and, depending on availability, CCU, direct air CO₂ capture, as well as CCS.”

On decarbonizing light industry, mining, and manufacturing through electrification and low- or zero-GHG emitting fuels, SAUDI ARABIA requested adding through “abatement technologies.” The US, supported by GERMANY, said hydrogen not produced in a zero-GHG way is not decarbonized. INDIA said Chapter 11 refers explicitly to “low-carbon hydrogen” for decarbonizing. Delegates did not agree to INDIA’s request that text on major cost barriers be added, but, after further discussion, agreed to say light industry, mining, and manufacturing “have the potential” to be decarbonized through available abatement technologies, electrification and low- or zero- GHG-emitting fuels.

On potential impacts of emissions on location of GHG-intensive industries, CHINA noted that regions where fossil fuel energy sources are co-located with CCS sites have potential to become hydrogen production sites. On a sentence stating that action to reduce industry sector emissions may change the location of GHG-intensive industries and the organization of value chains, INDIA highlighted implications for economies, employment, and just transitions. The group agreed to add a sentence stating that such reallocation will have global distribution effects on employment and economic structure.

In a paragraph on effective policies in the context of international competition, SAUDI ARABIA, supported by INDIA, requested reference to national context and capabilities and deleting a reference to carbon pricing in a list of possible policies. INDIA, supported by ARGENTINA, called for referencing market-based and regulatory and voluntary instruments. FRANCE, supported by GERMANY and MEXICO, called for deleting a reference to CCS infrastructure, saying it is not widely available or feasible. JAPAN said the sentence is focused on strategies, not policies, and called for replacing “CCS” with “CCUs.” The NETHERLANDS said CCS may not be applicable everywhere but is essential for decarbonization in some places.

CHINA called for replacing “phase-outs” with “low carbon technologies.” GERMANY called for retaining the references to carbon pricing and, with MEXICO, phase-outs. SAUDI ARABIA requested reference to “nationally” or “sub-nationally.” In further discussion, INDIA suggested reflecting regional contexts “and national circumstances.” The US preferred SAUDI ARABIA’s suggestion of reference to “broad and sequential national and subnational policy strategies,” which was accepted.

On a revised list of policy packages from the contact group, INDIA, with NORWAY, suggested replacing “market-based” with “economic” instruments, which the authors accepted. With SAUDI ARABIA, ARGENTINA, CHINA, and BRAZIL, but opposed by NORWAY, JAPAN, and GERMANY, INDIA recommended dropping a parenthetical reference to the example of carbon pricing. Authors agreed to delete it. NORWAY’s proposal to insert low-emission materials, “processes,” and products was accepted. BRAZIL suggested linking climate action to SDG 9 on sustainable industrialization. UKRAINE with BRAZIL, requested adding “sustainable production and consumption” to the list. FRANCE, supported by the NETHERLANDS and BELGIUM, noted “abatement infrastructure” in the list and called for definition of “abatement,” “abated,” and “unabated” in the glossary. He asked whether it refers to all or only partial emissions. The NETHERLANDS, BELGIUM, and NORWAY preferred “CCS infrastructure.” A previously suggested change from phase-out to phase-down was not accepted. JAMAICA noted Chapter 11 only refers to “phase-out.” The authors suggested “socially inclusive phase-out plans.”

SAUDI ARABIA, opposed by NORWAY, suggested socially inclusive phaseout plans of “unabated” emissions, noting “abatement” is used many times in Chapter 11. FRANCE, with GERMANY, noted that “abatement infrastructure” is not mentioned in the chapter. GERMANY, supported by FWCC, suggested referring instead to “CCS where feasible.”

SAINT LUCIA, opposed by SAUDI ARABIA, suggesting placing CCS at the end of the list of elements, given questions of overestimation and feasibility at scale. GERMANY, supported by LUXEMBOURG, stressed the importance of properly addressing the limitations, risks, and slow deployment rates of CCS in the SPM.

NORWAY, the NETHERLANDS, the US, JAPAN, and CHINA expressed concern over forestalling to address CCS, underscoring the need for CCS for certain production emissions to achieve net-zero, with the US noting stronger language on this in the Technical Summary. Authors recalled the section was specific to industry and that feasibility was addressed elsewhere in the SPM.

Eventually the paragraph was agreed, with CCS as an example, in parenthesis, of low emissions energy and other abatement infrastructure among the list of possible policy package options.

C.6: This section addresses **mitigation in urban areas**. SAINT KITTS AND NEVIS called for more regional context throughout the section. INDIA, CHINA, BRAZIL, and MEXICO underscored differences between developed and developing countries. INDIA also stressed respective capabilities and enabling conditions, including finance and technology.

JAPAN, supported by MEXICO, cautioned against demoting rural areas when addressing resource efficiency opportunities of urban areas.

SAUDI ARABIA, supported by the RUSSIAN FEDERATION, objected to singling out the energy sector. She also requested: clarifying these are projections; adding ranges; including all scenarios; and referring to all GHGs.

NORWAY suggested defining “resource efficiency.” SWITZERLAND called for reference to standard consumption and production patterns and, with the US, including supply chain issues and local government units.

On the Headline Statement, which says effective mitigation efforts will encompass reducing energy and material consumption, electrification, and enhancing carbon uptake and storage in the urban environment, INDIA insisted on the need for differentiation and addressing cities at various stages of development. The authors explained these findings apply to all cities, but agreed to insert “for established, rapidly growing and emerging cities.” They agreed to a proposal by SAUDI ARABIA to refer to “reducing or changing” energy and material consumption but did not agree to another proposal by INDIA to add “at various levels.”

On the rising share of emissions from urban areas, INDIA, NORWAY, NEW ZEALAND, and IRELAND called for clarifying consumption-based accounting. FRANCE highlighted the urban heat island effect. NEW ZEALAND and IRELAND questioned reference to peat burning in a footnote.

On efficient design, electrification, and green infrastructure, INDIA highlighted technology transfer and trade-offs, given requirements of carbon-intensive materials. GERMANY, NORWAY, FRANCE, and MEXICO called for reference to NbS, while NEW ZEALAND warned of the potential for reversal of NbS, and BRAZIL preferred “ecosystem-based approaches.” MEXICO called for references to non-motorized transportation and, with BRAZIL, waste management.

On cascading effects and enablers of urban action, INDIA noted negative as well positive cascading effects, especially in the transport sector. NORWAY and FRANCE pointed to multi-level governance and policy coordination. SPAIN questioned reference to level of financial control.

This paragraph also addresses net-zero targets and city boundaries. On a sentence stating that cities can play a positive role in reducing emissions across supply chains, INDIA called for changing “reducing” to “addressing,” noting that emerging cities will not be able to achieve absolute reductions in the near term.

INDIA stressed the importance of immediate peri-urban and rural areas for cities in developing countries and called for softening the language. After further consideration in a huddle and in plenary, the group agreed to INDIA’s proposal, modified by NORWAY and the authors, to say that the full potential for reducing consumption-based urban emissions to net-zero “can be met only when” emissions beyond cities’ administrative boundaries are also addressed.

C.7: This subsection addresses **emissions related to the global stock of buildings**. On the Headline Statement, INDIA called for references to multiple barriers and lack of institutional capacity in

developing countries. BELIZE called for specifying whether trends are global or specific to certain regions. NORWAY, FRANCE, and MEXICO highlighted circular economy approaches, repurposing, and retrofit.

On a paragraph on the share of building sector emissions, INDIA questioned accounting of direct and indirect emissions. SAUDI ARABIA questioned the source. NORWAY proposed including direct emissions from construction. After a back and forth between the authors and INDIA and pleas to respect authors’ authority and focus on key issues, the paragraph was approved with the insertion of “according to the decomposition analysis,” to accommodate INDIA. The US noted very few people understand what decomposition analysis is but agreed in the spirit of compromise and respect for the authors.

On drivers of emissions growth, INDIA requested clarity on emissions in residential buildings related to population growth.

On integrated design approaches in construction and retrofitting of buildings, INDIA suggested indicating that low renovation rates and low ambition of retrofitted buildings lead to increasing emissions. The authors agreed. INDIA and SAUDI ARABIA called for referencing regional differences. The authors agreed to replace “almost all regions” with “several regions.”

On a sentence on mitigation interventions at the design stage, SAUDI ARABIA called for replacing a reference to renewable energy generation with low emission energy generation. The authors proposed to reference renewable energy sources. SAUDI ARABIA said her previous suggestion would be more inclusive. The authors said the assessed literature refers specifically to integration of renewable energy generation or sources.

CANADA, supported by LUXEMBOURG, expressed concern about language calling for avoidance of virgin materials, noting some materials, such as wood, are valuable from a climate perspective. The authors suggested replacing “virgin” with “GHG intensive” materials. This was accepted.

NORWAY called for adding a reference to low emission machinery, noting these emissions are very important for cities trying to achieve net zero. The authors said that the literature assessed did not address machinery.

SAUDI ARABIA raised questions on the meaning of integration of renewable energy solutions at the construction phase. These were solved by adding a footnote explaining this refers to the integration of solutions such as solar photovoltaics, small wind turbines, solar thermal collectors, and biomass boilers.

On the mitigation potential of buildings, SWITZERLAND suggested adding recycling and reuse and green versus gray infrastructure. INDIA questioned assumptions on the growth of the building stock and regional differentiation and, with SAUDI ARABIA, called for clearly identifying projections.

Noting the world-wide focus of the report, the US, FRANCE, the NETHERLANDS, NORWAY, IRELAND, and SWEDEN objected to highlighting caveats in regional differentiation and exposing scenario assumptions in every line of the text. SAUDI ARABIA also questioned a sentence stating that up to 61% of global building emissions could be mitigated by 2050, and requested including the percentages contributing to that number, namely 10% from sufficiency approaches, 42% from energy efficiency, and 9% from renewables. FRANCE, the NETHERLANDS, NEW ZEALAND and others objected given lack of clarity and last-minute changes. Following discussions in a huddle, this subsection was approved, along with a footnote defining “sufficiency policies.”

C.8: Numerous countries expressed support for this subsection on **transport** and lauded the focus on demand side options. FRANCE requested more emphasis on feasibility, constraints, and resource needs. The US called for specifying low-carbon production requirements for biofuels and hydrogen. SWITZERLAND, supported by the RUSSIAN FEDERATION, said uncertainty should be expressed through confidence levels. BRAZIL, supported by SAUDI ARABIA, CHINA, and INDIA, called for a regionally differentiated assessment, balanced representation of all technologies, scenarios, and energy sources, and consideration of barriers, costs and high investment needs in developing countries. He also lamented inherent biases and asked to highlight the role of biofuels for the transition. INDIA asked to elevate findings on preconditions for successful implementation of demand-side options from Chapter 5. SAUDI ARABIA asked to replace the term “low-carbon” with “low-GHG” emissions.

On the Headline Statement, BRAZIL, called for acknowledging the short-term mitigation benefits of biofuels for land-based transport and, with INDIA and SAUDI ARABIA, eliminating the word “greatest” in relation to the decarbonization potential of electrifying transport. The UK said “greatest” was consistent with the underlying assessment of both costs and life-cycle emissions. JAPAN asked to specify life-cycle emissions for electric vehicles and motors.

On a sentence indicating that electric vehicles and motors powered by low-emissions electricity offer the largest decarbonization potential for land-based transport, JAPAN requested adding “on the life cycle basis.” The US suggested deleting “and motors.” The authors accepted these changes. In response to SAUDI ARABIA, the authors said the literature supports saying they offer the “largest” decarbonization potential for land-based transport. ARGENTINA proposed compromising on “a great variety of” land-based transport.

During plenary on Saturday, 2 April, on the Headline Statement that the mitigation potential in land transport is largest for electric vehicles, SAUDI ARABIA queried the reference of life-cycle basis for electric vehicles, supported by INDIA, who also requested to specify “technical” potential. JAPAN, supported by NORWAY, noted the life cycle was assessed for electric vehicles since their emissions stem from the production phase, and referred to approved language in Chapter 8.3. The authors confirmed.

The authors presented revised language on the mitigation potential of sustainable biofuels for land transport in response to comments from BRAZIL. BRAZIL objected since the result was not in line with their intention, asking to revert to an earlier version from a contact group. SAINT KITTS AND NEVIS, GERMANY, and FRANCE supported the authors’ proposal and asked to move forward. BRAZIL requested to highlight the potential of biofuel for both land-based and other forms of transport. After further iterations on confidence level, sustainability, and magnitude of the mitigation potential, “additional” and “in the short to medium term” was inserted and the sentence approved.

On mitigation potential of alternative fuels for aviation and shipping, biofuel was added in response to BRAZIL, a reference to heavy-duty land transport added in line with C.8.3 on JAPAN’s request, and “sustainable” biofuels were specified after calls from GERMANY and FRANCE.

On multiple co-benefits from mitigation strategies, INDIA queried whether “equitable access to transport” applied to all

options. The authors confirmed strong support in the literature and underscored that not all co-benefits applied universally by changing “multiple” to “various.” With this change, the section was approved.

On transport emission trajectories in 1.5°C pathways, CHINA, INDIA and SAUDI ARABIA suggested including information on other scenarios. The NETHERLANDS asked how transport emission levels in 2050 relate to net-zero requirements in 1.5°C pathways.

Revised text was later presented in plenary, with further questions raised on scenarios and methodology regarding the need for negative emissions to counterbalance residual CO₂ emissions from the sector in order to reach zero CO₂ emissions by 2050. CHINA questioned the 2050 timeframe for zero emissions under the 2°C scenario. Authors proposed, and the group agreed, to state that in both categories of scenarios, 1.5°C and 2°C, the transport sector “likely” does not reach zero CO₂ emissions by 2100 so negative emissions are “likely” needed to counterbalance residual CO₂ emissions from the sector.

On infrastructure planning and demand-side options, INDIA asked for clarification concerning “changes in urban form,” queried the potential for smart and shared mobility, and requested a statement acknowledging higher relative shares of transport emissions in developed countries. SPAIN sought clarification on “rebound effects,” with SWEDEN and the US noting these should be specific to transport. JAPAN suggested dropping “automation” due to inconsistent evidence.

On a sentence indicating that combinations of systemic changes (e.g., teleworking, dematerialization, and supply chain management) can reduce demand for transport services, JAPAN, supported by BRAZIL, questioned the inclusion of vehicle automation, noting this can increase carbon demand. The authors reformulated the sentence to delete automation and replace transport services with “demand for passenger and freight across land, air and sea.”

On land-based transport options, BRAZIL, INDIA, and SAUDI ARABIA asked for regional differentiation, including on constraints related to raw materials and feedstocks, trade-offs, and costs of the transition. MEXICO noted that life-cycle assessment, rather than market deployment, determines whether fuels help mitigation. The US asked for reference to production requirements for low-GHG biofuels and hydrogen, and NORWAY, to challenges for mining. SWITZERLAND and the UK requested quantifying the accelerated deployment of electric vehicles.

INDIA, SAUDI ARABIA, and BRAZIL objected to a sentence indicating that costs of electric vehicles are decreasing and deployment is accelerating, saying this is not applicable to every region. The authors clarified that this statement refers not only to personal cars, but also to buses and two- and three-wheel vehicles. The text was amended accordingly and accepted.

On a sentence indicating that advances in battery technologies can facilitate electrification of heavy-duty trucks, BRAZIL and SAUDI ARABIA questioned the feasibility of these technologies, especially for heavy-duty trucks. NORWAY supported retaining the sentence, emphasizing that electrification is working and developing quickly. The authors said the literature and evidence demonstrate that advances in battery technologies can facilitate heavy duty transport, noting heavy-duty trucks in the mining sector, for example, are already electrified. BRAZIL called for qualifying the statement by adding “according to some assessments.” The authors proposed changing “can” to “could.” This was accepted.

Following a contact group discussion of a sentence on energy and material efficiency improvements, the authors proposed text reflecting “growing concerns about critical minerals needed for batteries.” INDIA, SAUDI ARABIA, and BRAZIL preferred “challenges” to “concerns.” This was accepted.

SAUDI ARABIA called for replacing “circular economy” with “circularity.” NORWAY, supported by the EU, proposed to instead use the term “circular material flows,” as in other sections of the SPM, and add a reference to recycling. These changes were accepted.

On options for shipping and aviation, SPAIN asked to specify changes to governance structures. CHINA called for including options beyond alternative fuels, such as improved regulations, operational measures, and ship design. FRANCE queried feasibility conditions for hydrogen and alternative fuels, such as feedstock and electricity needs. GERMANWATCH suggested elevating a chapter statement that alternative fuels only partially mitigate the warming effects of aviation.

Discussing the authors’ changes, INDIA’s call for replacing new reference to “improvements to national and international governance structures” with “improvements to national mitigation structures and the international regime” was not accepted. The sentence was accepted as presented.

On improvements encouraging the inclusion of shipping and aviation emissions in NDCs, authors accepted SAUDI ARABIA’s request replacing “improvements” with “changes.”

BRAZIL noted there is ample confidence on the availability of biofuels for aviation, but much less certainty about the future of hydrogen-fueled planes and called for different confidence statements. The authors agreed to assign high confidence to the former and medium confidence to the latter.

NORWAY called for replacing low-carbon with low-emission. The authors agreed.

Citing the importance of demand-side measures, SAINT LUCIA called for adding a statement on socio-cultural factors such as avoiding long-haul flights and using trains. GERMANY said the paragraph requires additional quantification to make it more policy relevant.

INDIA, supported by TANZANIA, said that referring to national government structures and NDCs is policy prescriptive, and called for focusing on national-level mitigation of aviation emissions.

Delegates accepted this paragraph.

BRAZIL, CHINA, INDIA, and SAUDI ARABIA expressed concern about a statement on “leapfrogging” for developing countries, citing multiple barriers such as high costs, investment needs for power and charging infrastructure, and technological lock-in. NORWAY supported the statement and, with SWEDEN, the US, and SWITZERLAND, asked about co-benefits other than for developing countries and air quality.

On GHG reductions in the transport sector, authors agreed to BRAZIL’s adding “power sector decarbonization” to a list of factors on which reductions depend and to BELGIUM’s addition of “also” indicating that some factors are not listed. INDIA, with BRAZIL, requested reference to “direct and indirect” emissions in the transport sector. NORWAY proposed referring to “the full potential” of GHG reductions, with BELGIUM and US proposing to compromise on “substantial” potential. Participants accepted the authors’ suggestion to say “substantial potential” for GHG

reductions, “both direct and indirect,” emissions reductions “largely” depend on power sector decarbonization and low emissions feedstocks and production chains. The sentence was approved.

On a statement that technology transfer and financing would support developing countries to leapfrog GHG-intensive transport systems, the authors accepted CANADA’s proposal to say they “can” support and INDIA’s adding leapfrog “and transition.” In response to CHINA, they raised the associated confidence level to “high” and the paragraph was approved.

C.9: On a subsection on AFOLU, INDIA queried a claim in the Headline Statement that AFOLU can deliver large-scale GHG emission reductions. Cautioning against violating equity for developing countries, he noted that land “availability” is not synonymous with “most efficient use.” SOUTH AFRICA said the potential of the AFOLU sector has been overstated. NORWAY, supported by FINLAND, requested quantifying the potential for forest and agricultural products substituting for fossil fuels and referencing peatland as a “carbon sink and ecosystem to protect and restore.” NEW ZEALAND, supported by the US, suggested including messages from the underlying report on co-benefits for nutrition security, health and Indigenous Peoples’ rights. The REPUBLIC OF KOREA suggested referencing integrated land use. GERMANY asked why sustainable management and NbS are not mentioned in this section and objected to the SPM’s frequent references to biochar given potential negative effects on biodiversity.

On a footnote explaining that the models and sectoral estimates cited in this section do not include the substitution effects of displacing fossil fuels and GHG-intensive materials, INDIA called for focusing on scenarios, not models. The authors proposed replacing the term “integrated assessment models” with “global top-down” and “sectoral bottom-up” estimates. The US noted that the term “integrated assessment model” is defined in the glossary and appears frequently in the literature, adding that these models are helpful for understanding different scenarios. SAUDI ARABIA called for retaining language on avoiding unabated fossil fuel emissions rather than “displacing” fossil fuels. FRANCE opposed inclusion of “unabated” and, supported by the US, NORWAY, and GERMANY, called for reverting to text that had been previously debated at length. On AFOLU mitigation options, DENMARK, the NETHERLANDS, SWEDEN, LUXEMBOURG, and FRANCE opposed SAUDI ARABIA’s proposal that agricultural and forest products can be used to “complement,” not “substitute,” some fossil fuels” and, opposed by ITALY, “depending on natural resources’ availability.” The US offered “in conjunction with” some fossil fuels. INDIA called for changing “can” to “are projected to” and qualifying the sentence with “but cannot compensate for delayed emissions reductions in other sectors.”

On a list of barriers to implementation and trade-offs, participants accepted JAPAN’s suggestion to add “conflicts with food security and livelihoods” to the list and BRAZIL’s suggestion to mention “impacts of climate change” first.

On a paragraph on cost-effective mitigation options in the AFOLU sector, ARGENTINA requested reference to conservation, sustainable land use, and restoration of ecosystems.

FRANCE, with GERMANY, asked to clarify a sentence on contributions from “improved and sustainable crop and livestock management, carbon sequestration in soils, agroforestry, and biochar,” saying biochar depends on the soil and biomass used.

The authors, supported by NORWAY, added biochar “application” to emphasize its difference to normal soil carbon management, reflecting lengthy treatment in Chapter 7.

FRANCE and NORWAY questioned “soil carbon sequestration.” FRANCE and GERMANY requested referring to “certain” biochar, as does the SRCCL.

When discussions continued, the authors suggested specifying carbon sequestration “in agriculture,” including “soil carbon management in croplands and grasslands.” This was accepted.

On demand-side and material substitution measures, the authors changed a range of CO₂-eq emissions reductions that measures can contribute per year to a median figure. The US objected. TANZANIA, NORWAY, and CHINA raised questions on the sources and quantification of the figure. LUXEMBOURG, with CHINA, suggested combining figures here with those in another subsection on other demand-side measures. The EU and NORWAY questioned “use of bio-materials” as a material substitution measure.

On demand-side measures together with sustainable intensification of agriculture reducing ecosystem conversion and “non-CO₂” emissions, the authors agreed to GERMANY’s request to specify methane and nitrous oxide emissions. Authors assured INDIA that smallholders are addressed further in the text and confirmed to the FWCC that “sustainable intensification” of agriculture is well accepted in the literature, noting a box with details and caveats on it in the chapter.

References were added to improved and “expanded” use of wood products “sourced from sustainably managed forests,” as proposed by JAPAN.

SPAIN suggested replacing references to “sustainable and healthy diets” with reference to plant-based or low-emission animal products. The US preferred consistent use of “balanced” rather than “sustainable healthy” diets. ARGENTINA, supported by BRAZIL and TANZANIA, preferred referring to sustainable “food production” as in the SRCCL. GERMANY, with NEW ZEALAND, NORWAY, the NETHERLANDS, CHILE, SWEDEN, LUXEMBOURG, and FWCC objected. CHILE distinguished diet from production-side measures. NEW ZEALAND noted the Food and Agriculture Organization – World Health Organization (FAO-WHO) Guidelines say sustainable food production incorporates all dimensions of healthy diets. INDIA preferred reference to sustainable production or to “balanced” diets.

The US compromised by calling for a footnote definition, and consistent use, of “sustainable healthy diets,” questioning, with BRAZIL, its consistency with the SRCCL and WGII report. The authors confirmed “sustainable healthy diet” is in the SRCCL and in the WGII SPM. ARGENTINA, supported by TANZANIA, insisting on “balanced diets” or “healthy food production” in the text, opposed by NEW ZEALAND, GERMANY, and LUXEMBOURG, who supported “sustainable healthy diets.”

BRAZIL, supported by ECUADOR, suggested having both terms: balanced diets and sustainable healthy diets. GERMANY stressed the notion of shifting towards plant-based foods.

WGIII Co-Chair Skea suggested having BRAZIL’s proposal of both terms with an added footnote with WGII SPM text and a definition for “balanced diet.”

After further huddle discussions facilitated by IPCC Vice-Chair Thelma Krug, the group agreed to refer to “balanced, sustainable healthy diets” and to link that to a footnote that separately explains the terms, with sustainable healthy diets as described by FAO and WHO, and balanced diets as described in the SRCCL.

On co-benefits and risks, INDIA called for listing the risks posed by competition for land. This was accepted.

On AFOLU’s impact on stakeholders, CANADA asked to replace “multiple stakeholders” with “all relevant voices” since stakeholders is not appropriate for Indigenous Peoples, while MEXICO suggested “Indigenous Peoples and small landowners.”

On overcoming constraints and trade-offs, COLOMBIA suggested noting “cultural” constraints hindering realization of AFOLU’s potential. INDIA noted smallholder agriculture cannot be a major source for mitigating methane and nitrous oxide due to costs and constraints. The US objected to a pessimistic statement about methane reduction. GERMANY suggested adding that mitigation of nitrous oxide emissions in agriculture is constrained by increasing demand for livestock and livestock products. BRAZIL called for referencing food security.

Reference to “low incomes and the lack of access to alternative sources of income” was added to a sentence addressing barriers to the implementation of AFOLU, as proposed by INDIA.

On costs and enabling conditions, SAINT LUCIA requested: reference to pathways limiting warming to below 1.5°C; including the costs of present land-related subsidies and AFOLU mitigation measures, respectively; and specificity on the proportion of global mitigation AFOLU or forests can contribute, as per Chapter 7.

In response to a request by SWEDEN who asked to put into perspective the up to USD 400 billion annual costs up to 2050 to deliver the forest-related carbon sequestration and GHG emission reductions consistent with a 2°C warming, authors recalled an earlier formulation that compared it to agricultural subsidies. The group agreed to add that this corresponds to a mitigation potential of 5-6 Gt CO₂ per year.

NEW ZEALAND and NORWAY proposed, and the group agreed, to add “enhanced monitoring, reporting and verification capacity and the rule of law” in what is crucial for land-based mitigation.

The group also agreed to add reference to Indigenous Peoples and local communities as requested by CANADA and NEW ZEALAND.

In a paragraph on country-specific policies and measures for AFOLU mitigation options, the US suggested including a range of strategies beyond regulatory approaches, as per Chapter 7. On policies, lessons, and Indigenous Peoples’ and local communities’ knowledge, NORWAY urged considering Indigenous Peoples’ rights and their large role in protecting tropical forests.

Authors accepted JAPAN’s request to change a sentence on “nationally-specific” to “context-specific” policies and measures and INDIA’s proposal to say they “have been effective in demonstrating the delivery of AFOLU carbon sequestration and GHG emission reductions but the above-mentioned constraints hinder large-scale implementation.”

Participants accepted CANADA and NEW ZEALAND’s proposal to specify lessons from Indigenous knowledge and local knowledge, with INDIA’s addition of “and scientific” knowledge. The paragraph was approved.

C.10: This subsection addresses **demand side measures**. BRAZIL, INDIA, and others underscored the need to distinguish between demand side mitigation measures in developed and developing countries.

INDIA emphasized feasibility and regional differences, lack of capacities, developmental priorities, equity, and distributional impact of the measures. With SAUDI ARABIA, he also called for defining “basic wellbeing” and asked for clarity on the methodology.

SAUDI ARABIA objected to a lack of reference to tradeoffs, national circumstances and implications of demand-side measures. She also opposed reliance on a single agency and/or commissioned report source, asking that information from all such sources be deleted.

Noting the potential of demand-side mitigation measures, particularly in the context of the Ukraine war and the need to reduce fossil fuel demand and address price shocks, SAINT LUCIA and TRINIDAD AND TOBAGO suggested adding timescales at which these have effect, particularly the near- and mid-term time horizon. MEXICO highlighted pricing and economic instruments affecting demand side mitigation. LUXEMBOURG, with NORWAY and others, suggested adding concrete examples. FRANCE proposed including the notion of “digital sobriety.”

On reducing energy demand, the REPUBLIC OF KOREA suggested reference to social or lifestyle movements. NORWAY called for addressing electricity distribution.

On socio-cultural and behavioral change, SWITZERLAND and LUXEMBOURG asked for more detail on individual choices, and PERU and GERMANY on the socio-cultural factors taken into account. In a paragraph indicating that socio-cultural options and behavioral change can reduce GHG emissions, INDIA called for reinstating “mostly in developing countries.” The authors agreed. The US, NORWAY, and others asked what this means. The authors explained there is more potential for reduction of GHG emissions by end-of-use sectors. The US said this could be misunderstood to imply that developed countries have more emissions that can be abated. The authors revised the text to ensure clarity.

On emissions reductions from the built environment, NORWAY and FRANCE supported adding more concrete examples.

On how choice architecture can help consumers adopt low GHG intensive options, BRAZIL, the US, and KENYA suggested referring simply to “balanced diets,” possibly with an added footnote, and deleting “plant-based,” as was done in the AR6 WGII SPM. GERMANY, supported by FWCC, objected, given the mitigation potential of reducing animal source foods. The EU proposed elaborating on “status consumption.” FRANCE called for reference to better building insulation. An author suggested deletion of “balanced” sustainable healthy diets was not accepted, but a GERMAN proposal for a footnote definition of this term was. INDIA, with KENYA and NEW ZEALAND, but opposed by GERMANY, proposed deleting “plant-based foods.” This was accepted.

Figure SPM.6: On Figure SPM.6 on the indicative potential of demand-side mitigation options by 2050, questions were raised regarding an added baseline scenario, methodological aspects and graphical representation. The figure was taken up in the contact group set up for this section, co-facilitated by the UK and WGIII Vice-Chair Abdulla. Dissent centered on reference to diets, with KENYA, ARGENTINA, SOUTH AFRICA, and BRAZIL opposing reference to plant-based diets and preferring “balanced diets,” while the NETHERLANDS, GERMANY, NORWAY, LUXEMBOURG, and NEW ZEALAND suggested “sustainable healthy diets.” The US also preferred the latter term but called for a footnote defining it. SWEDEN strongly supported keeping plant-based foods. Authors explained the literature is very clear that the mitigation potential is in the shift from animal to plant protein. Following discussion in a huddle, revisions for clarity, and agreement on language on diets, the figure was approved.

C.11: On a subsection on **CDR being unavoidable**, SAINT LUCIA requested: reference to risks beyond geophysical issues, such as overburdening future generations, in the Headline Statement; an additional bullet on this topic; and more detail on deployment effects on applicable regions.

INDIA called for examples of CDR mitigation costs and potential. He cautioned against the SPM’s emphasis on AFOLU for CDR as the only way to “balance the books” with the remaining limited carbon budget. NORWAY called for dividing CDR methods by sector, geography, and feasibility rather than type of process. The US and REPUBLIC OF KOREA suggested reinserting the term afforestation from the Final Government Draft. The NETHERLANDS noted that CDR is needed in case of overshoot. SPAIN suggested referencing the ocean as a storage medium.

On hard-to-abate residual emissions, SPAIN suggested referencing maritime transport. The UK called for including quantitative estimates of sustainable levels of CDR.

On impacts on ecosystems and biodiversity, NORWAY requested reference to scale of CDR deployment. SPAIN suggested adding a reference to water security.

There were lengthy discussions, including in a huddle facilitated by WGII Vice-Chair Mark Howden, on a sentence stating that rapid emission reductions in all sectors can reduce future needs for CDR deployment and associated risks, while reliance on the future deployment of CDR has implications for near term mitigation efforts. SAINT KITTS AND NEVIS with the UK, supported the sentence as presented, opposed by SAUDI ARABIA. TRINIDAD AND TOBAGO suggested replacing implications with “could obstruct” near term mitigation efforts.

C.12: This subsection addresses **costs of mitigation options and potentials**. INDIA and SAUDI ARABIA called for deleting the paragraph on costs and potentials and its associated figure, but many countries objected. CANADA, with SWEDEN, requested quantification of co-benefits of mitigation, avoided costs and damages, and net costs or benefits. He questioned the conditions under which “avoiding damages” from climate change would exceed the costs of inaction

Figure SPM.7: This figure presents mitigation options and their estimated ranges of costs and potentials in 2030. INDIA expressed confusion on “<0” carbon cost. BRAZIL, supported by INDIA, SAUDI ARABIA, and JAPAN, said the figure misrepresented costs, such as by excluding costs of charging stations for electric vehicles while exaggerating biofuels’ costs, and noted non-transparency on sources for assumed costs. He requested longer-term information than just up to 2030, urging the figure’s deletion if these problems were insoluble. SWEDEN, supported by many countries, highlighted the figure’s usefulness, given that mitigation is needed before 2030. MEXICO requested specifying that the list of mitigation options is not exhaustive. LUXEMBOURG, supported by BELGIUM and GERMANY, called for making the range of options clearer and quantifying “substantially” reducing net emissions. He said the cost of nuclear energy should be greatly magnified. BELGIUM urged including additional measures that might be taken now, such as employing nuclear power plants for the short-term, and queried the low estimate for recycling’s potential. CANADA queried whether discount rates differ for different options. Supported by JAPAN, the US, and AUSTRALIA, he questioned: the baseline assumption on emissions; whether assumptions on continued use of fossil fuels apply to all pathways; and how different options’ mitigation potentials are assessed. The US asked whether “negative

cost” means an action is lower cost than its baseline alternative and urged clarifying in the title that not all mitigation options could be implemented simultaneously or at the same cost. SAINT LUCIA requested another bar showing total mitigation potential, from Chapter 12. FRANCE requested information on feasibility and constraints for different options from FGD Figure 10.

After the authors explained modifications to the figure, NORWAY and BRAZIL called for consistency with Figure 8. SAUDI ARABIA, with INDIA, the US, BRAZIL, and CHINA, called for extending the time period from 2030 to 2050. SOUTH AFRICA noted more than eight years is needed for forests to achieve high mitigation.

FRANCE, the NETHERLANDS, SAINT KITTS AND NEVIS, GERMANY, LUXEMBOURG, CHILE, SWITZERLAND, DENMARK, ESTONIA, SWEDEN, BELGIUM, JAMAICA, BHUTAN, and CAN-I supported the 2030 timeframe, citing urgency.

ARGENTINA and COLOMBIA recommended referring to sustainable food “production” rather than “diet,” or, from COLOMBIA, “low-carbon diets.”

ESTONIA, with POLAND, suggested referring to “sustainable” forest management as the correct term.

INDIA, supported by JAPAN and BELGIUM, recalled querying “negative costs,” given non-inclusion of costs such as for nuclear waste disposal.

BRAZIL and SOUTH AFRICA questioned why repeated comments were still not reflected. GERMANY said some changes requested would unbalance the figure.

CHINA queried the “global” conclusions behind the figure given acknowledged uncertainties and use of non-comparable studies.

CAN-I said “carbon emissions” cost is not “energy” cost.

Following a huddle, the authors presented changes to the figure, including modifying the legend for clarity. The figure and its title were approved. On the caption, INDIA called for clarification regarding the costs. The authors suggested adding a sentence indicating that the costs shown are net lifetime costs of avoided GHGs. CHINA suggested indicating that costs are calculated relative to a reference technology. BRAZIL proposed text “uncertainty for the cost estimates,” which was accepted with minor amendments.

GERMANY asked how the authors had calculated the costs of long-term storage for nuclear waste, noting that such storage options do not yet exist. The authors explained the methodology and agreed to include text clarifying that the costs of the reference technologies were taken from underlying studies and recent datasets. Delegates approved a footnote specifying that for nuclear energy, modeled costs for long-term storage of radioactive waste are included.

INDIA requested clarification on the global estimates. The authors agreed to specify “global aggregate estimates.” BRAZIL, supported by CHINA, expressed concerns that the estimates may not reflect different regional realities. After lengthy discussions, participants agreed to BRAZIL’s suggestion to include “costs and mitigation potential estimates were extrapolated from available sectoral studies.”

On the Headline Statement for the subsection addressing costs of potential mitigation pathways, INDIA bemoaned lack of language on the economic cost of climate change and the co-benefits and trade-offs associated with mitigation. SAUDI ARABIA queried the lack of consideration of, *inter alia*, life cycles, feed-in tariffs, or competition for land and food. She noted extreme impacts for developing countries, and, with CHINA, said GDP should be

discussed per country in the context of equity and distribution costs. She observed significant variation in estimates of global costs and benefits and current global warming, suggesting leaving assessment of costs and benefits until AR7. The NETHERLANDS requested quantitative information on how much benefits exceed costs of mitigation. CHINA called for assessing the economic costs of more pathways. JAPAN requested an analysis of the 1.5°C scenario. The US called for indicating the volume of mitigation being addressed and more specificity on options available.

On low-cost options, JAPAN requested clarifying which actions have greater potential. AUSTRALIA called for including transport in the list.

On a footnote stating that assessments per sector were carried out by a common methodology, INDIA requested a definition of “common methodology.” BRAZIL suggested referencing the caption for Figure SPM.7, which clarifies this issue. This was agreed.

SAUDI ARABIA called for the confidence level applied to the paragraph to be changed from high to medium, due to the caveats noted in the caption. After lengthy discussion, this was accepted.

On effects on global GDP, MEXICO sought information on the impact of warming pathways above 2°C on GDP. GERMANY, with the US, lamented that the limited calculation of GDP lacked discussion of the benefits of avoided impacts, especially avoidance of tipping points. He objected to postulating a hypothetical, impossible no-climate change future. JAPAN called for including the marginal abatement costs of working towards carbon neutrality by 2050.

On estimated costs and benefits of mitigation pathways, MEXICO, the US, CHINA, JAPAN, and others queried, *inter alia*, “subjective” projections, limitations on GDP calculations, statements on economic benefits of reducing emissions that are too general to guide decision-makers, and the distributional implications of mitigation costs and economic benefits.

Authors responded that “costs” only includes out-of-pocket costs and cost savings, excluding subsidies and hidden and external costs.

D. Linkages between Mitigation, Adaptation, and Sustainable Development

Co-Chair Skea opened general discussion on Section D, noting it addresses equity and justice. INDIA opined that this section puts the mitigation burden on developing countries although the problem has been caused elsewhere. FRANCE called for stressing the urgency of climate change in the short term, building on WGII’s SPM. SWITZERLAND said this section implies compatibility between climate action and sustainable development, but Figure SPM.8 makes no such claim.

KENYA, BRAZIL, CANADA, and SWITZERLAND, among others, called for more attention to links between adaptation, sustainable development, and mitigation, including agreed WGII language in various places. Numerous calls were also heard for reference to urgency on climate action. CANADA said climate goals cannot be met without equity, urging meaningful language on justice, rights, and the knowledge of women, marginalized groups, and Indigenous Peoples. GERMANY requested a footnote defining “developed” and “developing” countries and regions.

D.1: On the Headline Statement on **sustainable development and accelerating climate change mitigation**, UKRAINE, with KENYA, said sustainable development is also unachievable without adaptation. INDIA sought qualification of the Statement’s certainty of positive links between sustainable development and climate action, given trade-offs, negative impacts, or lack of information

in many areas, and urged including that mitigation varies across regions depending on countries' contribution to emissions, state of development, and equity. He called for addressing trade-offs also through "financial and capacity-building support" and said the SDGs only go to 2030 but this report requires framing for 2050 and 2100. SAUDI ARABIA said climate action depends on countries' development priorities.

Ultimately, the Headline Statement was changed, in response to SAUDI ARABIA and CHINA, from "Sustainable development cannot be achieved without accelerating climate change mitigation" to "Accelerated and equitable climate action in mitigating climate change, and adapting to climate change impacts, is critical to sustainable development," in line with previously agreed language in paragraph D.1.1.

On synergies and trade-offs between climate action and sustainable development, SAINT LUCIA, with IRELAND, called for text from WGII SPM D.1.5, on just development being increasingly limited if global warming exceeds 1.5°C and unachievable in some regions if it exceeds 2°C. INDIA and BRAZIL said "decades" of unsustainable activities is actually 150 years. SAUDI ARABIA said climate change attribution is not the mandate of WGIII. The RUSSIAN FEDERATION urged reference to links between climate action and biodiversity. IRELAND suggested adding "ecosystems" or "biodiversity" to a list of things threatened by adverse impacts of climate change. SWITZERLAND requested including "coherent, coordinated, efficient, and effective governance" for addressing trade-offs. Discussion continued in a contact group. The opening sentence on human-induced climate change as the consequence of unsustainable activities was approved after: changing "decades" to "more than a century," inserting "net-GHG emissions," and referencing WGI. Upon request from SAUDI ARABIA, "lifestyles" was added to the list of areas under threat.

On the increasing threat posed by climate change, SAUDI ARABIA requested clarifying the link to mitigation. A suggestion by authors to begin with "without effective and equitable mitigation" was accepted. GERMANY, NORWAY, and TRINIDAD AND TOBAGO stressed urgency and time-boundness, proposing "sufficient," "accelerated," or "enhanced" action. INDIA cautioned that equity is equally important and, with SAUDI ARABIA and CHINA, suggested omitting qualifiers.

SAINT KITTS AND NEVIS, CHINA, and the US noted that referring simply to "equitable" mitigation could save words. INDIA objected, highlighting that urgency arises from both growing global inequity and a very limited remaining carbon budget. GERMANY asked to retain reference to sustainable development being conditional on mitigation, and TRINIDAD AND TOBAGO stressed the importance of immediate action.

On a statement that sustainable development cannot be achieved without accelerated climate change mitigation and adaptation actions, CHINA, INDIA, SOUTH AFRICA, and SAUDI ARABIA proposed inverting the terms and saying the latter "can help" the former. This was opposed by FRANCE, FINLAND, SWEDEN, SAINT KITTS AND NEVIS, the NETHERLANDS, NORWAY, DENMARK, BELGIUM, SPAIN, CHILE, SWITZERLAND, SAINT LUCIA, and TRINIDAD AND TOBAGO. They agreed to a proposal by the authors stating that "accelerated and equitable climate action in mitigating and adapting to climate change impacts is critical for sustainable development," with the addition of "equitable" as called for by INDIA.

Wording on possible trade-offs was shortened in response to concerns raised by TANZANIA, INDIA, SWITZERLAND, and FINLAND, to "climate action can also result in some trade-offs." A reference to the SDGs as a framework for climate action was approved after interventions by INDIA asking to add "near-term," GERMANY and SWITZERLAND to specify the 2030 Agenda, and BOLIVIA to refer to both mitigation and adaptation.

A sentence on dependence of synergies and trade-offs was re-ordered and split into two, following interventions by INDIA and SWITZERLAND. The first now specifies that the development context includes inequalities, as modified to address US concerns framing climate justice. The second provides a list of other important factors.

On potential synergies between sustainable development and energy options, SAINT KITTS AND NEVIS suggested adding that listed elements can also contribute to "enhanced energy security." NORWAY suggested referring to "low-emission" rather than "low-carbon" energy. IRELAND stressed enhanced human and ecosystem health, and "air quality" rather than "reduced air pollution." GERMANY requested examples of demand-side measures, such as sustainable diets and green spaces in urban areas.

On land-based options, BRAZIL requested changing "avoided" to "reduced" deforestation. JAPAN requested adding "water management," from Chapter 7. NORWAY requested including "agroforestry" in the glossary. The US queried "providing additional biomass" as a synergy with the SDGs. GERMANY suggested adding "enhancing land productivity," as in the SRCCL, noting land degradation neutrality also brings adaptation and mitigation benefits.

Several insertions and word changes were made to the paragraph, including: "avoided" instead of "reduced" deforestation, as suggested by the RUSSIAN FEDERATION and GERMANY; "capacity building" proposed by BRAZIL; "improved and sustainable forest management" by ESTONIA and ITALY; "forest conservation" as suggested by COLOMBIA and ARGENTINA; "sustainable agricultural productivity" instead of "land productivity," as proposed by SPAIN, ITALY, and FWCC; and reference to UN Convention to Combat Desertification (UNCCD) as the framework for land degradation neutrality, as suggested by IRELAND.

On well-managed land-based mitigation options, the US requested clarifying this term and referring to "maximizing synergies while limiting trade-offs" rather than "avoiding trade-offs." FRANCE stressed large-scale food security and biodiversity, requesting a footnote on how options interrelate.

CANADA called for including a reference to Indigenous land rights. COLOMBIA objected, saying this depends on how nations have organized their territories. The authors said Indigenous land rights fall under an existing reference to sustainable land uses. CANADA, supported by NORWAY and COLOMBIA, suggested including "land rights in general." INDIA suggested referring to "a need to develop more frameworks for integrated policy implementation." The authors accepted these amendments.

On the sustainability of bioenergy and other biobased products, SPAIN, supported by INDIA, suggested referencing the speed of deployment. INDIA added timing and scale. This was agreed.

On land-based CDR methods, FRANCE noted trade-offs, such as between SDG 2 (zero hunger) and large-scale biochar made with biomass, and between biodiversity and monoculture afforestation/reforestation. He highlighted Chapter 12's findings on NbS and their description in TS.5.6. as "measures which provide additional

benefits to biodiversity and human wellbeing.” SAINT KITTS AND NEVIS requested details on CDR risks, such as permanence of CDR and risks to food production. JAPAN called linking reforestation to “displacing food production” inaccurate because reforestation is on land previously forested. IRELAND urged reference to “soil management that enhances carbon sequestration.” GERMANY called for reference to “CDR by Nbs” rather than “CDR methods” and to the unsustainable effects of monoculture reforestation. He suggested reordering the sentences, grouping proven approaches together and then ones as yet undeployed. He noted the SRCCL says restoring ecosystems alleviates the risk of displacing food production.

During an approval plenary, GERMANY, supported by IRELAND and the RUSSIAN FEDERATION, opposed referencing biochar. The authors noted that approximately 20,000 papers on biochar have been published in the past 20 years, there is strong evidence that it improves soil quality, and the evidence was reviewed in Chapter 7. INDIA questioned the need to single out biochar in a general statement about carbon sequestration and suggested deleting biochar and a related footnote on its potential risks and co-benefits. THE NETHERLANDS and DENMARK supported the authors’ formulation, emphasizing the footnote indicates there are knowledge gaps and potential risks. GERMANY, supported by ARGENTINA, proposed referencing in the footnote biochar’s relative immaturity unknown impacts. The authors said the risks of biochar are associated with biomass production, which is addressed elsewhere. After lengthy deliberations, the authors agreed to Germany’s suggested amendment and the paragraph and footnote were approved.

D.2: In general comments on this subsection on **strong links between sustainable development, vulnerability, and climate risks**, NORWAY suggested linking findings on ecosystems, ecosystem management, conservation, carbon uptake, and biodiversity challenges.

On the Headline Sentence, SAINT LUCIA requested information on feasibility of mitigation and adaptation options for different countries and regions. SAUDI ARABIA called for specifying “quality” of implementation, such as “poorly planned” afforestation. GERMANY noted aquatic mitigation’s very low potential, suggesting deletion. After discussions in a contact group, the modified Headline Statement was approved without further changes.

On synergies and trade-offs depending on many factors, NORWAY suggested categorizing many options as NbS. The US cautioned that “increasing urban density” is not a mitigation policy. GERMANY said listing trade-offs from urban mitigation efforts overemphasizes potential negative effects. The paragraph was ultimately approved with the insertion of the word “sustainable” to qualify “urban planning and infrastructure design,” on request from ARGENTINA.

On land-related mitigation options with potential co-benefits for adaptation, JAPAN suggested adding “soil carbon management and improved water management.” GERMANY called for reference to shifting to healthy diets and reducing food loss and waste rather than overemphasizing the mitigation potential of restoring mangroves and coastal wetlands.

On mitigation in land and aquatic ecosystems, BRAZIL called for mentioning adverse impacts from afforestation of grasslands, from the WGII SPM. NORWAY queried the term “rivalry for land” if it involves human rights violations. This was approved without further discussion. On integration of adaptation and mitigation, the US

urged enhancing “the success of” rather than “the acceptability of” climate action. GERMANY called for specifics from the Executive Summary of Chapter 13 on identifying and prioritizing options prior to policymaking and strengthening relevant institutions and knowledge overlap through partnerships. After the authors agreed to refer to “equitable” partnerships, in response to INDIA, the paragraph was approved.

Figure SPM.8: On Figure SPM.8, on synergies and trade-offs between sectoral and system mitigation options and the SDGs, SAUDI ARABIA called for replacing a reference to “circular economy” with “approaches of circularity” under options for mitigation in industry. JAPAN stressed noting the severity of trade-offs and the scale of synergies to trade-offs. CANADA asked if WGII’s term “disbenefits” is synonymous with WGIII’s “trade-offs,” noting trade-offs can be addressed before implementation of mitigation options. GERMANY queried the effects of CCS on health and well-being; noted benefits of climate action on SDG 12 (responsible consumption and production); and questioned the posited impacts of nuclear power.

In an approval plenary, authors provided a list of changes made to Figure SPM.8 in response to comments and to align with changes made to the text. Specifically, both synergies and trade-offs were specified for SDG 12 for wind, solar, and nuclear power; the word “balanced” was added to “sustainable healthy diets,” the word “sustainable” added to “improved forest management,” and SDG 13 (climate action) added to the legend. Both the figure and its caption were approved with no further comments.

D.3: On the Headline Statement on **shifting development pathways towards sustainability**, distributional issues and just transition, SAUDI ARABIA, supported by BRAZIL and SOUTH AFRICA, highlighted: climate action, including both mitigation and adaptation, as SDG 13; distributional consequences being the largest for developing country regions; equity and common but differentiated responsibilities and respective capabilities; and just and equitable transition for transformative change. KENYA requested information on adaptation, highlighting just transition, and elevating regional context and developing countries’ needs from the Technical Summary.

During contact group discussions, “changes in employment and economic structure” as examples of distributional consequences was replaced by “within and between countries.” For the finding that broad stakeholder participation in decision-making can help build social trust, CANADA, supported by COLOMBIA, the NETHERLANDS and the US, sought reference to all relevant voices, including those of Indigenous Peoples. CHINA and INDIA opposed the additions. FWCC suggested “inclusive and meaningful participation” and further reference to marginalized groups. The Headline Statement was adopted with the authors’ proposal of “broad and meaningful participation of all actors.”

On a paragraph on improving the wellbeing of people, JAPAN requested including “energy” in the list of development priorities. NORWAY cautioned against focusing on people’s “wellbeing,” as policymakers also need to consider future generations. Following discussions in a contact group, this was approved.

On a paragraph noting that ambitious mitigation can lead to disruptive changes, SAINT KITTS AND NEVIS asked for wording on a specific number of jobs generated in the fossil fuel and renewable energy sector from Chapter 6. INDIA stressed distributional consequences beyond shifts in employment. SAUDI ARABIA stressed reference to distributional consequences on

energy-producing countries, referencing Figure 3.35 from the underlying chapter. KENYA, supported by NORWAY, emphasized a just transition, given developing countries' need to grow. SOUTH AFRICA asked for elaboration on "integrated policy packages."

After contact group discussions, a modified sentence, "Equity remains of central importance in the UN climate regime, including under the Global Stocktake," was received with lengthy discussion. BRAZIL called for specifying the UNFCCC. INDIA asked for "international" equity and offered "the UN multilateral system, including the UNFCCC," but deleted reference to the Global Stocktake. The authors said "the UN climate regime" is used in Chapter 14. GERMANY proposed that equity remains "a central element." After ESTONIA and LUXEMBOURG suggested deleting the sentence if no agreement was reached, delegates agreed that "equity remains a central element in the UN climate regime."

On distributional consequences within countries including income and shifting employment, INDIA, supported by SAUDI ARABIA suggested adding "and between" countries. Authors agreed and the sentence and paragraph were approved.

On a just transition, SAINT KITTS AND NEVIS sought specifications of the difference between "many" and "several" countries. INDIA asked to specify just transition for developing country contexts, highlighting distributional issues between countries. SAUDI ARABIA queried a reference to just transition "already taking place." KENYA differentiated "transition management" in developing country contexts, calling for regional information.

Following contact group deliberations, INDIA requested reference to obstacles to high ambition, such as lack of resources. SAUDI ARABIA suggested referring to equity and just transition "among other enablers" of ambition. The US objected. The authors offered "depending on national circumstances" to address context specificity and the paragraph was approved.

On equitable access to finance, technology, and capacity being catalytic for shifting development pathways, SOUTH AFRICA requested emphasis on just transition and transitional support for developing countries, and, with KENYA, clarification of "informal economies." After substantial discussions during contact groups, relevant text from AR6 WGII Chapter 18 and the SR1.5 was added by the authors to address the role of ethics, equity, and climate justice.

E. Strengthening the response

This section was opened by WGIII Vice-Chair Ramón Pichs-Madruga. INDIA, with BRAZIL and SOUTH AFRICA, noted some regions in South Asia and Sub-Saharan Africa should not be described as "carbonized," let alone subject to "decarbonization." He highlighted poverty eradication and accelerated development actions as priorities, stressing that in such countries fossil fuel capacities needed to be improved. LUXEMBOURG expressed strong support for both sections but consistently underscored addressing risks and barriers from nuclear power, referring to language from AR5. BRAZIL requested enhanced references to finance, technology, and capacity building. After discussions in contact groups, Section E was brought forward for approval.

On feasible near-term mitigation options and enhanced implementation, INDIA stressed differentiated feasibility definitions for developing and developed countries, saying "low carbon development" includes raising emissions for developing countries. SAUDI ARABIA queried timescales of options and questioned the feasibility of strengthened near-term options. FRANCE asked

to reinstate former Figure SPM.10 on the different dimensions of feasibility. NORWAY called for reference to lessons learned on some of the barriers described. SOUTH AFRICA called for strengthening reference to national circumstances and means of implementation.

On feasible mitigation options, JAPAN lamented lack of balance across the examples. SAINT LUCIA called for clarification on "rapid deployment," given cost effectiveness conditions already exist. SAUDI ARABIA called the section policy prescriptive and asked to remove examples. LUXEMBOURG suggested a huddle to solve issues pertaining to risks and barriers of nuclear power. FRANCE asked to include "constraints to," as well as impacts of implementation. The US requested including wind energy and energy efficiency in a list of feasible options. A sentence on negative impacts of some mitigation options was broadly contested. ICELAND, NORWAY, and SAINT LUCIA questioned the inclusion of geothermal energy among examples with particularly negative environmental impacts, with ICELAND emphasizing the significant benefits and minimal environmental impacts of geothermal energy for district heating and the inconsistency of this paragraph with the underlying report. Authors agreed to ICELAND's suggestion to refer instead to "geothermal energy for electricity production." SPAIN, GERMANY, and UKRAINE called for including impacts, such as from large-scale biofuels, on food and water security, although BRAZIL recalled the SRCCL had found little evidence of a link between these. LUXEMBOURG, SPAIN, AUSTRIA, BELGIUM, GERMANY, SWITZERLAND, and SWEDEN, called for more attention to the risks of nuclear energy. The US, supported by POLAND, asked authors for balance, noting nuclear energy includes well-established technology and can deliver low-carbon energy at scale. SAUDI ARABIA, INDIA, and CHINA objected to a reference to phasing out fossil fuels.

The authors proposed to delete examples of mitigation options with adverse environmental impacts, including geothermal energy. GERMANY, supported by LUXEMBOURG, FRANCE and NORWAY, objected, saying the sentence had lost its meaning. ICELAND, KENYA, and the EU supported the deletion of geothermal energy but called for retaining other examples, including biofuels.

BRAZIL suggested referencing large-scale production of bioenergy and battery storage. INDIA called for referencing "very large-scale" bioenergy. With these and minor amendments, the text was accepted.

On enabling conditions and barriers for feasibility of mitigation options, SAUDI ARABIA lamented over-simplification and a lack of discussion of trade-offs and called for balance by also including feasibility and effectiveness of renewables. The authors explained that a key finding was that almost all mitigation options face institutional barriers that need to be addressed.

On feasibility depending on scale and speed of implementation, SAUDI ARABIA asked to clarify that the feasibility assessment is based on scenarios and projections. BRAZIL asked for a reference to support developing countries through finance, technology and capacity building for implementation. FRANCE asked to include language from WGII specifying reasons for feasibility constraints on ecosystem-based adaptation processes beyond 1.5°C and 2°C warming.

The authors presented new text for the footnote indicating that "future feasibility challenges described by the model pathways may differ from the real-world feasibility experiences of the past." INDIA

accepted this, but noted it was “somewhat unsatisfactory” because the future is never guaranteed to be like the past.

E.2: This section addresses **enabling conditions and shifting pathways**. In general comments, TANZANIA sought clarification regarding “unintended behavior” and “changes in human behavior and lifestyles.” INDIA pointed to Cross-Chapter Box 5, stating that without further substance this subsection is superfluous. SAUDI ARABIA queried whether information had been assessed for all countries and the level of confidence. NORWAY called for better explanation of AFOLU options. The US called for streamlining the subsection.

On current development pathways creating unintentional barriers to accelerated mitigation, INDIA challenged the statement as too sweeping. He asked for a qualification of “current,” pointing out there are already mitigation efforts and decoupling underway, and for simply referring to barriers and choices.

The authors clarified their intention to indicate that overall direction of development pathways opens opportunities, and the connection between development pathways was representative of the assessed literature. With the revision to “may” create... barriers,” deletion of “unintentional,” and addition of a footnote on interpretation of sustainability, the paragraph was approved.

On combining mitigation with broader structural policies, INDIA opposed the insertion of “policies to shift development pathways” and SAUDI ARABIA asked to specify “within national context and capabilities.” In response to INDIA, authors highlighted the term is central in the literature and is in an underlying chapter. They pointed to a contact group-agreed list of examples and said “policies that induce lifestyle or behavior change” was requested by some governments. He pointed to a footnote specifying different contexts and objectives regarding sustainability. The US and EU supported authors, and FRANCE highlighted that shifting pathways is critical for systems transformation across multiple dimensions. INDIA requested language capturing that the shift is a global responsibility, lamenting that “development pathways” could be interpreted as only pertaining to developing countries.

Co-Chair Skea advised that development pathways were originally scoped into the report by governments, and that INDIA’s concerns had been accommodated throughout Section E. INDIA requested either removing or replacing some examples with more substantive ones on the reality and burden of developing countries, such as sustainable food production. Authors highlighted more material in Cross-Chapter Box 5. After several iterations, the paragraph was approved.

On the role of institutional capacity, innovation, governance and finance, SAINT LUCIA asked to clarify findings on improved access to finance. NORWAY requested strengthening a sentence on near-term action. This paragraph was further discussed in a contact group, and subsequently split in two.

On the timing of enhanced action, INDIA requested including “high consumption lifestyles” to signal problematic behavior. The EU and GERMANY sought clarification on an example of “innovation in novel technologies.” Authors explained their intent to emphasize urgency, explained the innovation example and, opposed by INDIA, GERMANY and LUXEMBOURG, suggested dropping a reference to socio-cultural changes, for brevity. In response to a comment by INDIA that the example of finance was not representative, authors presented revised text, proposing that “the provision of energy related information, advice and feedback to promote energy saving behavior.”

E.3: Describing a subsection on **how laws, policies, and institutions support mitigation** as “overly policy prescriptive,” INDIA called for deletion of references to laws and institutions due to limited evidence on the aggregate effects of climate laws on climate outcomes. SAUDI ARABIA called for deleting the entire Headline Statement.

On this and the next subsection, the US stressed the importance of policies and frameworks that contribute to mitigation, noting good governance, regulatory frameworks, and enabling environments can attract international finance. She noted the private sector’s role in facilitating innovation.

On how climate laws can support mitigation, GERMANY, supported by SAINT LUCIA, called for replacing the word “can” and using more specific language.

Following discussion in a contact group, INDIA said climate laws were overwhelmingly concentrated in developed countries and other strategies were more relevant in a developing country context. GERMANY and SWITZERLAND opposed broadening language beyond what had been agreed in the contact group and asked to move forward. Authors explained that the focus on climate laws was due to empirical evidence, including from developing countries, and functions they served, which are not always pertinent to other approaches.

BOLIVIA, supported by INDIA, suggested replacing “climate strategies” with “climate public policies.” INDIA, with SAUDI ARABIA and BOLIVIA, requested to use the broader term “relevant laws.”

GERMANY, BELGIUM, NORWAY, SWEDEN, the NETHERLANDS, and the REPUBLIC OF KOREA supported the authors’ focus on climate laws. BELGIUM proposed “relevant laws, including climate laws, which are growing in number.”

NORWAY, GERMANY, the EU, and FRANCE opposed weakening language to “may” or “could,” pointing to medium confidence as a qualifier. After extensive deliberations, the authors’ suggestion “climate laws, which are growing in number, and climate strategies among others” was approved.

On national and sub-national climate institutions, SAUDI ARABIA suggested tailoring the text to acknowledge differences in local contexts. The paragraph was approved with addition of a reference to limits posed by inequities, and resource and capacity constraints.

SAUDI ARABIA said a sentence about factors that could affect the pace and extent of political change was not specific to climate change. SWITZERLAND called for reference to coherent and coordinated governance in this paragraph and in the Headline Statement. Supported by CANADA, he asked whether “influence” on political support is positive or negative and requested assessing mitigation options that are unpopular or inconsistent with values and beliefs. CANADA called for consistent and appropriately referenced usage of “Indigenous Peoples.”

On structural factors affecting the breadth and depth of climate governance, GERMANY, supported by CANADA, SPAIN, SWEDEN, MEXICO, and ARGENTINA, called for adding gender. FWCC called for reference to human and Indigenous Peoples’ rights, gender, and meaningful participation. SAUDI ARABIA, opposed by the NETHERLANDS, the US, and CHILE, asked for reference to national circumstances and capabilities and said gender participation should be placed elsewhere. ARGENTINA, MEXICO, and CHILE proposed inclusion of ancestral knowledge. The REPUBLIC OF KOREA suggested adding “intellectual endowment.” INDIA

cautioned that what was not assessed in the underlying chapter could not be included even if it constituted a gap. The authors explained the scope of their assessment and its structure, and proposed references to national circumstances and “gender considerations.” This was accepted.

On a statement that climate-related litigation is growing, INDIA suggested specifying this is “primarily in some developed countries.” The authors explained that while most of the 1841 cases recorded until May 2021 are in developed countries, particularly the US, the report included 58 cases in 18 developing countries.

The issue was taken up again in plenary after consultations in a contact group. INDIA opposed removing a reference to developed and developing countries.

The authors pointed to the rate of change, underscoring that just one or two cases in developing countries have the potential to be very influential, including transnationally. NORWAY noted large variation among developed countries and, with FINLAND, the US, GERMANY, SAINT KITTS AND NEVIS, NORWAY, and IRELAND, emphasized the finding was highly policy relevant.

Various wording options were attempted, until the group finally agreed to state that climate change litigation “is growing with a large number of cases in developed countries, and in a much smaller proportion in developing countries.”

E.4: In this subsection on **regulatory and economic instruments**, NORWAY called for making information more concrete throughout. INDIA suggested replacing “market” instruments with “economic” instruments. INDIA and SAUDI ARABIA suggested deleting references to carbon pricing throughout this subsection, to avoid singling out one instrument.

On the E.4 Headline Statement, COLOMBIA suggested only mentioning economic instruments used worldwide, due to lack of numbers to support arguments made based on actions undertaken in only a few regions.

On regulatory instruments at the sectoral level, SAUDI ARABIA, supported by INDIA but opposed by the authors, called for adding “based on national circumstances and the SDGs” to a sentence indicating that, *inter alia*, regulatory instruments on industrial energy efficiency could be scaled up. ARGENTINA suggested “taking into account different national capabilities.” Following a suggestion from the US, delegates agreed to add “national and sub-national circumstances” to an earlier sentence indicating that sectoral regulatory instruments have proved effective in reducing emissions.

In a paragraph on market instruments, the US supported including other instruments, such as feed-in tariffs. The EU said the role of market instruments and carbon pricing is to promote cost-effectiveness. He also preferred referring to improving public revenue through measures other than removing fossil fuel subsidies. TRINIDAD AND TOBAGO lauded textual additions related to removing fossil fuel subsidies and called for further clarification regarding current subsidy levels. GERMANY noted the underlying report states that eliminating fossil fuel subsidies is equivalent to negative carbon pricing, providing a clear link between the two approaches. SAUDI ARABIA said “removing fossil fuel subsidies could reduce emissions” is policy prescriptive and should be deleted.

In plenary on Wednesday, 30 March, the authors presented revised text for the entire paragraph. SAUDI ARABIA called for revising the assignment of “high confidence” to a statement indicating that market economic instruments have been effective in reducing emissions alongside regulatory instruments. The authors

noted the assessment is based on ex-post analyses, not modeling. INDIA and SAUDI ARABIA suggested adding “in some regions,” with Japan adding in “assessed” regions. The authors confirmed that assessments only address instruments that have been implemented. In response to CHILE, the authors emphasized complementarity between economic and regulatory instruments. SAUDI ARABIA requested specifying “national” regulatory instruments. The authors declined, explaining the assessment refers to sub-national instruments and can also apply to multilateral agreements. After lengthy discussion, delegates agreed to add “complemented by national and subnational regulatory instruments.” BRAZIL and INDIA suggested referring to economic instruments and not only carbon pricing. INDIA called for referring to low-cost emissions.

The US called for deleting wording on carbon pricing instruments being relatively ineffective in promoting higher-cost measures necessary for deeper reductions. The authors explained that the existing formulation conveys complementarity and refers to carbon pricing instruments specifically. With minor amendments, the sentence was approved.

On revenue from carbon taxes or emissions trading being used to address equity and distributional impacts of carbon pricing, INDIA said this approach should not be singled out. The authors agreed to add “among other approaches.” SAUDI ARABIA, opposed by the NETHERLANDS, the US, JAPAN, the authors, FRANCE, and NORWAY, called for adding “where implemented” and “at the national level.” After lengthy discussion, delegates agreed to minor editorial amendments.

On fossil fuel subsidy removal reducing emissions, SAUDI ARABIA suggested referring only to subsidies leading to wasteful consumption. She also called for deleting reference to fossil fuel subsidy removal being projected to reduce emissions by 1-10% by 2030. The US, NORWAY, SAINT KITTS AND NEVIS, and DENMARK said the text reflects important findings that fossil fuel subsidies distort markets.

POLAND, supported by SAUDI ARABIA, called for adding that removing fossil fuel subsidies can have “adverse distributional and equity impacts.” SAUDI ARABIA called for focusing on emissions, not energy, citing existing technologies for removing emissions and preferring a focus on the inefficiency of subsidies causing wasteful consumption. GERMANY and FRANCE said subsidy removal “would,” not “could,” lower emissions, noting the literature shows that the benefits of subsidies in lower income countries frequently accrue to higher income people anyway. INDIA said equalizing benefit accrual requires direct benefit transfer, which does not happen automatically, and noted fossil fuel will be necessary up to 2030, even for expanding renewable energy.

On technology-push policies and investments, SWITZERLAND requested reference to governance for enhancing developing countries’ abilities to deploy low-emission technology. INDIA suggested referencing international support in the form of technical transfer and capacity building. Authors accepted INDIA’s request to add “and managing trade-offs.” In response to SAUDI ARABIA, with TANZANIA, requesting “and technology transfer,” the authors added “alongside technology transfer,” saying this paragraph focuses on capacity for innovation.

On effective policy packages, Spain called for clarifying the concept of “information provision” and specifying that “pricing reform” refers to carbon. FRANCE suggested mentioning carbon pricing as part of a policy package.

On characteristics of effective policy packages, “tailored to national circumstances” was added in response to a request by SAUDI ARABIA and INDIA. In response to queries by the US, FRANCE and the NETHERLANDS, the authors explained the statement was based both on empirical evidence and conceptual work and agreed to change the beginning of the sentence, “effective policy packages are” to “would be” to clarify the intention of the phrase.

After discussions in a contact group, the authors added wording specifying policy packages are able to realize synergies and address trade-offs across multiple objectives. SAUDI ARABIA, supported by BRAZIL, requested replacing a reference to carbon pricing and market creation with “economic instruments,” in line with the rest of the SPM. The NETHERLANDS, with GERMANY, supported inclusion of carbon pricing, and the UK inquired about costs. The authors explained that the examples illustrate that combined instruments lead to better outcomes, while implications for costs are sometimes indeterminate. With this, the paragraph was approved.

On economy-wide packages that support mitigation and avoid net negative environmental outcomes, SAINT LUCIA asked that a deleted reference to “phase-out of fossil fuels” be reinstated. The BAHAMAS requested information on the scale of COVID recovery packages compared to the spending needed to achieve temperature targets, noting that Chapter 15 says “total stimulus pledged to date are ten times higher than low-Paris-consistent carbon investment needs from 2020-2024.” BRAZIL requested quantification of “deep” emissions reductions. SAUDI ARABIA asked to remove a reference to “net negative environmental outcomes.” The authors suggested deleting “net” to avoid confusion.

In a sentence on meeting short-term economic goals while reducing emissions and shifting development pathways, INDIA requested to change “reducing” emissions to “addressing” them to make it universally applicable. SAUDI ARABIA asked to replace “sustainability” with “SDGs.” The authors pointed to a footnote explaining sustainability, and, supported by GERMANY, preferred to keep “reducing” emissions, but agreed to changing confidence from high to medium.

On cross-border effects of innovation policies and international emission trading, the BAHAMAS questioned whether reduced demand for fossil fuels is adversely affecting exporting countries. CHINA advised aligning with the underlying report on this. He also said “national development support” policies, not “broad innovation” policies, can bring positive spillover. JAPAN asked whether the stated lack of evidence of emission trading systems leading to emission leakage is because many are designed to minimize competitiveness effects.

The FWCC requested assessment of rights-based literature on, *inter alia*, biodiversity conservation, intergenerational equity, and Indigenous Peoples’ rights and participation in decision-making, to ensure effective and fair mitigation policies.

After deliberations in a contact group, national “innovation policies” was replaced with “policies to support technology development and diffusion.” On reduced demand for fossil fuels “adversely affecting” exporting countries, language was changed to “could result in costs to.” SAUDI ARABIA requested to strengthen this language and assign “high confidence” in line with AR5. The confidence level was elevated. The NETHERLANDS asked to explain positive spillover-effects as “reduced mitigation costs for other countries.” In response to the US, the authors explained the paragraph was to provide an assessment of national policies

with implications beyond borders. “Credits” was dropped from “international markets for emission reductions,” as suggested by BRAZIL. On lack of evidence for leakage effects from current emissions trading systems, various wording options were attempted to capture the role of design features addressing competitiveness effects. The authors, noting strong empirical evidence in the chapter, suggested “which can be attributed to design features aimed at minimizing competitiveness effects among other reasons,” which was approved.

E.5: In the Headline Statement of the subsection on **financial flows and accelerated international financial cooperation as an enabler of low-carbon and just transitions**, INDIA suggested replacing “cooperation” with “support.” NORWAY called for review of how the terms “barriers” and “enablers” are used throughout the SPM. JAMAICA called for inclusion of more quantitative data. Authors proposed changing a reference to “tracked financial flows falling short of the levels needed,” to “mitigation investments need to increase significantly” to achieve mitigation goals across all sectors and regions. BOLIVIA and CHINA objected, and the original sentence was approved with no change. Delegates accepted the US call for deleting “fundamental” inequities in access to finance to align with agreed language in the subsection.

In a paragraph on mitigation investment gaps, INDIA suggested text clarifying that fundamental inequities in access to finance result in a worsening outlook for a just transition. Noting that only AFOLU is cited in this paragraph, NORWAY asked if there are mitigation gaps for other sectors, such as energy and transport. The US favored deleting this paragraph.

On the availability of global capital, INDIA called for text referencing international climate finance access for vulnerable and developing countries. TRINIDAD AND TOBAGO called for greater specificity on barriers to closing investment gaps. SAINT LUCIA suggested referencing the persistent climate financing gap, as cited in the technical summary.

On scaled-up public grants to adaptation and mitigation funding for low-income and vulnerable regions, JAPAN suggested replacing “climate finance flows” with “private finance flows.” BRAZIL suggested referring to developing countries as a whole instead of specific regions. The US said the examples listed focus on the supply side, not on improving the demand for mitigation finance. On a list of options for scaling up mitigation in developing regions, the US proposed deleting “changing the enabling operational definitions.” After some discussion authors accepted this and the paragraph was approved. CAN-I urged noting that the USD100 billion figure needs to be increased to trillions.

On **clear signaling by governments and the international community**, SAUDI ARABIA called for reference to national circumstances. Delegates agreed to add “depending on national contexts.” Delegates also accepted SAUDI ARABIA’s suggestion to refer to increasing consideration of climate-related “investment opportunities” for shifting the systemic underpricing of climate-related risk. On a sentence on aligning financial flows with funding needs, MEXICO, supported by CHILE and ARGENTINA but opposed by BOLIVIA, SAUDI ARABIA, and BRAZIL, requested keeping “carbon pricing” from the original draft in the text as an example of “economic instruments,” along with “emissions pricing,” or, alternatively, referring to “carbon taxes and emissions trading schemes.” Neither proposal was accepted.

Figure SPM.9: On this figure on mitigation investment flows, INDIA said the figure was highly model-specific, not accounting for the fact that developed countries are supposed to provide finance to developing countries to close the investment gap. GERMANY called for a clear definition of the difference between developing and developed countries and noted that while the caption stated that infrastructure investments were not included, the figure referred to electricity and transport. The US said the datasets used were incompatible, expressed concern about the classification of developed and developing countries, and said the figure needed significant revision.

After discussion in contact groups and huddles pertaining to both E.5 and Figure SPM.9, the authors presented a revised version that categorizes investment needs by region, dropping references to development status. CHINA insisted the figure must specify “developing” and “developed” countries, as in the original draft provided by the authors. The US preferred the regional categorization, stating they could not accept the original draft since it was policy prescriptive, whereas the revision provided the same information without prejudice.

The authors pointed to associated text in E.5 that elaborates multiple times on the specific needs and circumstances of developing countries, reflecting the content of their chapter.

After further discussion could not resolve the conflict, the Co-Chair, expressing deep regret, announced the Bureau had decided the figure was being withdrawn. He acknowledged the extraordinary efforts by the authors, the TSU, and graphics team.

TANZANIA expressed sympathy for the author team and urged the Co-Chair to try one more time to find consensus. TRINIDAD AND TOBAGO appealed to governments to exercise flexibility.

CHINA, supported by BOLIVIA and ECUADOR, said that specifying developing and developed countries did not change the meaning of the figure and reiterated they could not accept it.

FINLAND, NORWAY, the UK, the NETHERLANDS, SWEDEN, UKRAINE, SWITZERLAND, FRANCE, MEXICO, CHILE, AUSTRALIA, CANADA, and JAPAN expressed their support for the revised version of the figure, stressed its importance in conveying a clear message to policymakers, and expressed disappointment for authors and prospective readers. BELGIUM asked whether it might be an option to at least retain the panel with the sectoral information as a visual.

CAN-I said the figure contained very important information about the need to change investment patterns, and while he was sympathetic with developing countries’ concerns, the value of the figure was in showing the financial sector what needs to be done. He called its deletion a major failure of the IPCC.

The figure was withdrawn.

E.6: On the Headline Statement for the subsection on **international cooperation**, the US called for listing more remaining gaps or referring to “gaps” generally. BRAZIL sought reference to the UNFCCC and the Paris Agreement.

On international agreements, INDIA called for stating “there are conflicting views on whether the Paris Agreement’s mechanisms will lead to the attainment of its goals,” and for reference to “international support in finance, technology transfer, and capacity building.” The US said increasing national ambition can drive international financial support.

Discussion continued in a contact group co-facilitated by Kenya and Germany. In a subsequent plenary, INDIA and BRAZIL called for explicit reference to the UNFCCC and the Kyoto Protocol

alongside the Paris Agreement, which was agreed. The group also agreed to a suggestion by BRAZIL and the REPUBLIC OF KOREA to add reference to “actions and support,” in addition to emissions, when referring to the transparency requirements for national reporting under the Paris Agreement.

On a sentence stating that “international financial, technology and capacity support will enable more ambitious national contributions and greater implementation,” the US, supported by SWITZERLAND and GERMANY but opposed by INDIA, BRAZIL, and TRINIDAD AND TOBAGO, objected to the “one-sided” nature of the statement, saying that more ambitious NDCs also enable support flow. The authors explained that there was no evidence in the chapter to support it.

On technological innovation and cooperation and transnational partnerships, INDIA called for recognizing uncertainty on feasibility and costs of efforts listed and on their advancement of climate mitigation. ARGENTINA requested reference to the need for higher mitigation investment and FRANCE, to international cooperation on scientific research. The US suggested adding technology “support” and deleting a reference to “Paris Agreement instruments.” INDIA requested adding a reference to the role of national governments in facilitating transnational partnerships, especially in developing countries. Noting this was not supported by the underlying chapter, the authors declined.

On sectoral agreements and institutions, INDIA urged softening wording on international agreements and institutions “helping” and “contributing to” reducing emissions and mitigating climate change. With SAUDI ARABIA, she favored deleting reference to international agreements on trade and investment “reinforcing the role of fossil fuels and acting as barriers to mitigation.” The US suggested simply noting that not all trade liberalization instruments have accelerated mitigation. SWEDEN and NORWAY suggested wording on the importance of action in the immediate future. BRAZIL noted the UNFCCC covers GHGs, not just sectors.

FRANCE called for reinstating a paragraph on international governance of solar radiation management from a previous draft, as consistent with the assessed scientific literature.

On a sentence indicating that many international sectoral agreements and institutions are stimulating low-carbon investment and emissions reductions, INDIA requested clarification on the role of sectoral agreements, and, with SAUDI ARABIA, suggested replacing “many” with “some.” The authors explained that the term “sectoral” refers to agreements that are aimed at specific problems rather than climate change as a whole. The US queried whether the term covers a sufficient scope of activities.

SAUDI ARABIA requested replacing “low carbon” with “low emissions.” COLOMBIA, supported by the US, called for specifying “GHG emissions.” IRELAND suggested adding a reference to international environmental agreements. The authors agreed to these requests.

INDIA said it is unclear whether trade and investment agreements are stimulating mitigation or limiting countries’ abilities to adopt climate policies. SAUDI ARABIA called for deleting references to trade, saying this is not for discussion under the IPCC. The authors responded that trade assessment was specifically requested by governments. GERMANY and the US favored retaining the sentence, which indicates that there are cases of trade agreements reinforcing fossil fuel use and acting as barriers to mitigation. SAUDI ARABIA offered to work with the authors on an alternative formulation.

Closing of WGIII-14

The Working Group completed its work on Sunday night, 3 April. Co-Chair Skea announced the approved SPM would be posted to the online portal early Monday morning for delegates' review prior to its formal approval.

On Monday, 4 April, WGIII-14 convened for its final session to review the clean version of the SPM. SAUDI ARABIA, BELGIUM, GERMANY, and FWCC identified a small number of editorial issues, which Co-Chair Skea said would be dealt with through the error protocol. Subject to these minor amendments, WGIII-14 approved the SPM and accepted the underlying technical report.

Before closing WGIII-14, Co-Chair Jim Skea thanked all delegates and expressed his deep appreciation for the hard work of everyone involved.

Closing of IPCC-56

On Monday morning, 4 April, IPCC Chair Lee opened the resumed IPCC-56 plenary and introduced the SPM and underlying scientific-technical assessment, as approved by WGIII-14. The Panel accepted the actions taken at WGIII-14.

Place and date of IPCC-57: Secretary Mokssit announced that IPCC-57 will take place in person 26-30 September 2022, in Geneva, Switzerland.

Closing statements: Many delegates welcomed the SPM and thanked the IPCC Secretariat, WGIII Co-Chairs, Technical Support Unit and interpreters for their efforts to make the meeting a success. They also expressed gratitude to the authors who prepared the SPM and underlying report, praising their work to make the reports robust and scientifically accurate. Several delegates called for a return to in-person meetings, noting the technical and time zone challenges of virtual participation.

While welcoming the underlying technical assessment, INDIA said the SPM is "factually incorrect" on several issues, including: GHG emission flows dating from only 1990; scenarios that do not consider regional differentiation and equity; inadequate discussions of finance for developing countries as an enabler for mitigation; and the use of models rather than signaling responsibility for emissions using classification of developed and developing countries.

AUSTRALIA welcomed the increased integration across all three working groups. IRELAND called for clear information on how global warming can be reduced to be conveyed in the synthesis report.

BELGIUM called for active participation of observer organizations in future IPCC processes, saying any changes to restrict their participation must be discussed in plenary, and stressed that the length of SPMs should be limited to 10 pages plus figures.

FRANCE applauded the outcomes but expressed concern about the approval process, saying some delegations took far too long to accept the balanced compromises based on scientific facts. JAPAN noted the negotiations had been extremely difficult and congratulated WGIII for producing a science-based, policy-relevant SPM. SWITZERLAND emphasized that trust in the authors is a governing principle of IPCC work. THE NETHERLANDS said the authors' scientific findings were well reflected in the SPM but expressed serious concern about insertion of detailed information into the SPM, which slowed the process and negatively affected readability. SWEDEN said the "long two weeks" perhaps reflected the increasing urgency and knowledge about what can be done to mitigate climate change. CANADA called for partnership in improving constructive dialogue about the assessment's findings while protecting its scientific integrity.

The EU expressed gratitude to the authors for their remarkable dedication, saying they should have the last word and calling on IPCC to improve on this for the next session.

SAINT KITTS AND NEVIS lamented that the lack of flexibility shown by some delegates had forced everyone to work beyond the call of duty, noting this was particularly difficult for small delegations. She underscored that deep and urgent reductions of GHGs is a matter of survival for SIDS. ARGENTINA and MEXICO called on delegates to remember that what the IPCC does is for the most marginalized people of our societies.

KENYA called for improvement in gender balance and the representation of developing country scientists as authors. TANZANIA highlighted challenges in the approval process for developing country delegates and hoped WGIII-14 would be the last virtual session. JAMAICA noted the difficulties of participating in the meeting as a small delegation and urged improving the approval process to ensure a more balanced approach and efficient use of time. She called the IPCC process essential for SIDS. Noting its position as a leading country in the climate regime, BRAZIL aligned with developing countries on supporting the IPCC process as much as possible. He expressed hope that the IPCC will continue to maintain its high scientific integrity in guiding the world forward.

CHINA said that the IPCC has shown its scientific and objective spirit, which should be the basis of the assessment report. FINLAND said WGIII-14 represented the beginning of a new era for climate action, for current and future generations and the beauty of the Earth.

TRINIDAD AND TOBAGO said the session was at times painful and expressed hope for improving efficiency, but congratulated the authors, thanked everyone for their guidance, and welcomed this policy-relevant report that will underpin climate action going forward.

The US saluted the Co-Chairs for leading the process with great equanimity. He said the US is determined to work with all countries to maximize the possibility for success, calling the report foundational in work to strengthen our response to climate change.

The UK expressed disappointment that her country was unable to host the meeting in person, but pride in having hosted the Secretariat and in headquartering the TSU over AR6. She urged reflection on how to improve ways of working during sessions going forward.

ITALY expressed concerns about the challenge of climate change that the world is already facing even now and called the WGIII report a critically important guidance document for addressing this challenge. The REPUBLIC OF KOREA noted in particular the IPCC's work on mitigation strategies, AFOLU, finance, and governance. CHILE said WGIII's report is essential for transmitting the urgency of the situation and for helping governments take decisions in this regard.

CAN-I said decarbonization and just transition will not happen in the absence of equity and human rights, stressed participatory approaches for furthering these principles and, noting that "the technical" is important but does not work by itself, called on scientists to "remember the direction in which we must go."

FWCC echoed calls for civil society to feel a part of climate action and to benefit from it, urging participation and transparency.

Additionally, many delegates deplored the Russian invasion of Ukraine and expressed their deep appreciation for the Ukrainian delegation to the IPCC. In her closing statement, Ukraine stated that several members of her delegation were supporting her from bomb shelters and emphasized that the invasion "is a consequence in many

senses of the use of fossil fuels. We do our work here in Ukraine for all humanity in the world.” She said this report makes it now impossible to refute that far more finance is still invested in fossil fuels than in climate change mitigation, saying it will arm everyone with evidence to convince others to stop buying oil, coal and gas.

Chair Lee lauded authors for their scientific knowledge and delegates for their respect for the science, saying everyone in the world has a stake in this. He declared IPCC-56 closed at 11:26 am UTC.

A Brief Analysis of IPCC-56 and WGIII-14

With greenhouse gas emissions at historic highs and rising, the need for urgent, transformative action to avoid catastrophic global warming is clear. At its fourteenth session, Working Group III (WGIII) of the Intergovernmental Panel on Climate Change (IPCC) sought to produce a clear, usable Summary for Policymakers (SPM) of its report on mitigation of climate change. The SPM captures key messages from its technical assessment of a broad swath of academic literature on the economic, social, political, and technological aspects underpinning mitigation strategies and options; 354 contributing authors from 65 countries reviewed over 18,000 scientific papers to inform an assessment of the rapid and deep transformation needed to avoid the worst impacts of climate change. The challenge is unprecedented, but as WGIII Co-Chair Jim Skea put it, “We know what to do, we know how to do it, and the time to act is now.”

Despite universal agreement on the need for urgent action, reaching consensus on how to present the findings of WGIII’s technical assessment illustrated the complexity of the issues and the challenges of initiating transformative change. This brief analysis will consider some of the key points of contention and their implications for the next stages of the IPCC’s work.

Policy Relevant, but not Policy Prescriptive

The IPCC plays a critical role in global governance of climate change; its outputs constitute formal scientific input to the UN Framework Convention on Climate Change (UNFCCC) and are widely used by governments and other stakeholders. With this in mind, a central issue was the alignment between the IPCC’s assessment and the UNFCCC’s Paris Agreement.

One example of this issue, which took considerable time and effort, was specification of scenario categories in line with the Paris Agreement. These scenario categories are tools for analyzing how different combinations of demographic, socio-economic, and technological factors may influence future emission outcomes. Several countries, mainly small island developing states, argued that the SPM should include at least one scenario that adheres to both Articles 2 and 4 of the Paris Agreement, to limit warming to 1.5°C and reach net-zero-GHG emissions in the second half of the century. They also emphasized that a scenario reflecting likely warming of 2°C does not meet the Paris Agreement’s goal to limit warming “well below 2°C” and expressed deep concern about the risk and feasibility of scenarios with high temperature overshoots. As one delegate put it, even if the IPCC does not specify a “Paris-compatible pathway,” policymakers will turn to the SPM for an answer to that question.

Delegates also referenced the UNFCCC as they tackled the challenge of classifying regions and countries, an issue that has deep ties to attribution of responsibility for historical emissions. This challenge is not new; it was also a major stumbling block

during the approval of WGIII’s contribution to the fifth Assessment Report (AR5) in 2014. While scientifically straightforward, illustrating countries’ shares in emissions comes perilously close to assigning blame and responsibility. The US and many European countries wanted to avoid using the terminology of “developed” and “developing” countries, especially in the context of emission shares or finance, pointing to differences in income, emissions, and socio-economic development levels within the developing world. Some emerging economies and developing countries defended the use of this terminology, especially given cumulative and historical emissions linked to developed countries, and opposed categories based on income levels. Adding fuel to the fire, the UN Statistical Division, which provides the basis for regional groupings used in WGIII, recently dropped the classification of developing and developed countries.

A huddle chaired by IPCC Vice-Chair Youba Sokona met over the course of several days to find a solution, but with limited success. Entrenched disagreement on appropriate referencing of developing and developed countries led to the deletion of a figure on existing and required financial investments for mitigation “due to four words,” as an increasingly frustrated Co-Chair put it. For observed emissions, the focus on terminology may have paved the way for one of the most striking new features of the SPM: data showing the emissions-inequality within countries and between high-income households and the large part of the world’s population that doesn’t have access to basic services.

Representation of equity, historic responsibility, and the different realities of poor populations and developing countries is critical for policymakers from the global South. Several countries lamented a perceived over-reliance on scenarios and integrated assessment models and cautioned against using them to guide international and national policy. In particular, these models and scenarios do not reflect the carefully calibrated balance of goals and principles enshrined in the UNFCCC, such as historic responsibility for emissions, the right to sustainable development, equity, just transition, enabling adaptation, and financial support, which makes them hard for developing countries to accept.

Evergreen Issues and Newcomers

Unlike WGII, which addresses impacts and adaptation, WGIII focused largely on technological solutions, with limited reference to ecosystems. Some delegations called for giving more weight to the role of so-called “nature-based solutions” (NbS) in mitigating climate change, however there was little appetite among delegates and Co-Chairs to repeat the long debates that NbS sparked during the WGII approval a few weeks earlier. Similarly, language on food system change was controversial, with some delegates resisting calls to specify the climate benefits of “plant-based foods.”

As expected, carbon dioxide removal (CDR) features more prominently in the WGIII report than ever before, with lengthy discussions on caveats, risks, and feasibility concerns related to its implementation. While the SPM is clear that substantial amounts of CDR are necessary to stay below 2°C, many doubted the scope and scale projected in some scenarios and stressed that betting on its feasibility could not justify delays in immediate action. Similar concerns shaped discussions about the potential of carbon capture and storage to prolong the use of fossil fuels. Painstaking edits to the language resulted from demands to “focus on emissions, not sources” and include all low-emissions technologies. With this in mind, some delegates called for changing references to “low-carbon” to “low-emissions,” and removing references to the “phase-

out of,” “subsidies for” or “adverse side effects from” fossil fuels. As a result, some parts of the SPM may need some reverse translation to make it accessible to the climate community. It is advisable to read the full report, since the edits made during IPCC-56 apply only to the SPM.

An Uphill Battle

The WGIII SPM approval was the third approval session to be conducted virtually, following WGI in August 2021 and WGII in February 2022. The Co-Chairs and Secretariat drew lessons from the previous meetings, including organizing the initial review of text thematically, and participants applauded the management of this meeting. However, delegates still felt the unavoidable limitations of virtual meetings, including unstable internet connections, poor audio quality, and the exhaustion that comes with scheduling a meeting across time zones. Furthermore, the lack of opportunities for personal exchanges or quick bilaterals significantly slowed progress on several issues and contributed to the multi-day extension of this meeting, which concluded three days after its scheduled end. Late in the process, one delegate with connectivity issues commented “Even my internet is tired.” An exceptional burden fell on those in the Pacific time zones; since the Technical Support Units and interpreters were based in Europe, most of the work was done during their nighttime.

Despite frequent admonishments from the Co-Chairs and delegates to work flexibly, efficiently, and with trust in the authors, the approval process was slow. Discussions were dominated by a few countries who sought to make significant changes to the proposed text of the SPM, but many insisted on including more details. With these additions, the document ballooned from 43 to 63 pages, including 32 additional footnotes.

Looking Ahead

With the intensity of this two-week meeting, the outside world faded to the background for many delegates. Still, during the opening and closing plenaries, the Ukrainian delegation reminded the Panel of the immediate and brutal consequences of our dependence on fossil fuels. The current energy crisis fueled by Russia’s war on Ukraine has prompted renewed interest in energy security and demand-side options to reduce consumption. Furthermore, with many COVID-recovery packages failing to prioritize investment in green and sustainable infrastructure, some delegates underscored that the work of WGIII is critical to catalyzing system-scale transformation.

While the scientific assessment is done, there is one last challenge for the sixth assessment cycle: the AR6 Synthesis Report, a stand-alone product summarizing the most relevant findings from the reports of each working group. The Synthesis Report, currently under review and due for approval in September 2022, is a key input to the 27th meeting of the Conference of the Parties to the UNFCCC. Delegates will seek to draw lessons on process, seeking to ensure robust, focused, and effective deliberations as they produce this critical report. The challenge will be to once again provide clear, policy-relevant messages that can facilitate meaningful action around the world.

Upcoming Meetings

Seventh Our Ocean Conference: This conference will identify solutions to sustainably manage marine resources, increase the ocean’s resilience to climate change and safeguard its health for

generations to come. The conference will focus on, among others: marine protected areas for communities, ecosystems, and climate; confronting the ocean-climate crisis; and creating sustainable blue economies. **dates:** 13-14 April 2022 **location:** Palau **www:** ourocean2022.pw

SEforALL Forum 2022: The 2022 Sustainable Energy for ALL (SEforALL) Forum will focus on the theme, “Building Speed, Reaching Scale, Closing the Gap.” It aims to provide a global platform to mobilize resources, connect partners and showcase action to realize the promise of the sustainable energy revolution for everyone. The event will bring together energy stakeholders to take stock of progress towards implementing SDG 7. It will also seek to raise ambition of nationally determined contributions (NDCs) under the Paris Agreement on climate change. **dates:** 17-19 May 2022 **location:** Kigali, Rwanda **www:** seforall.org/forum

Bonn Climate Change Conference: The 56th sessions of the UNFCCC Subsidiary Body for Implementation (SBI) and Subsidiary Body for Scientific and Technological Advice (SBSTA) will prepare for the 27th meeting of the Conference of the Parties, which is scheduled to take place in November 2022 in Egypt. **dates:** 6-16 June 2022 **location:** Bonn, Germany **www:** unfccc.int/SB56

IPCC-57: IPCC-57 will meet to, among other things, approve the AR6 Synthesis Report and its Summary for Policymakers. **dates:** 26-30 September 2022 **location:** Geneva, Switzerland **www:** www.ipcc.ch/calendar

For additional upcoming events, see: sdg.iisd.org/

Glossary

AFOLU	Agriculture, forestry, and other land use
AR6	Sixth Assessment Report
AR7	Seventh Assessment Report
CAN-I	Climate Action Network International
CCS	Carbon capture and storage
CCU	Carbon capture and utilization
CDR	Carbon dioxide removal
COP	Conference of the Parties
FWCC	Friends World Committee for Consultation
GDP	Gross domestic product
GHG	Greenhouse gas
IMPs	Illustrative mitigation pathways
IPCC	Intergovernmental Panel on Climate Change
LDCs	Least developed countries
LULUCF	Land use, land-use change, and forestry
NbS	Nature-based solutions
NDCs	Nationally determined contributions
SDGs	Sustainable Development Goals
SIDS	Small island developing states
SPM	Summary for Policymakers
SRI.5	Special Report on Global Warming of 1.5°C
SRCCCL	Special Report on Climate Change and Land
TSU	Technical Support Unit
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WG	Working Group
WMO	World Meteorological Organization