

## Changes to the Underlying Scientific-Technical Assessment to ensure consistency with the approved Summary for Policymakers

### 1. Background

Consistent with Section 4.5 of Appendix A to the Principles Governing IPCC Work, Coordinating Lead Authors have identified some changes to the underlying report to ensure consistency with the language used in the approved Summary for Policymakers or to provide additional clarification as agreed at the Joint Working Group Session. These changes do not alter any substantive findings of the final draft of the underlying report as distributed to governments on 29 August 2018.

Note that the final draft of the underlying report is also subject to copy-editing and corrections in proof as normally applied to scientific reports.

### 2. Changes to be made to the underlying report

The following table lists those changes that will be made in the underlying report following the line by line approval of its Summary for Policymakers.

Note that page and line numbers for the SPM are based on the numbering used in the revised final draft as distributed to Governments on 30 September 2018; page and line numbers for the underlying report are based on the numbering used in the final draft as distributed to Governments on 29 August 2018.

SPM Page:Line or Section	Chapter	Chapter Page:Line	Summary
5:20	1	4:30	Reconcile confidence assessment to medium for general statement about past emissions committing us to 1.5C on all timescales.
4:8	1	7:40	Avoid the use of 1.5C-consistent pathways throughout Chapter 1, clarifying whether statements are referring to no-or-limited-overshoot versus high-overshoot in all cases.
14:2	1	32:1	CDR is considered distinct from the above mitigation activities", or some equivalent usage that does not imply explicitly that CDR is considered a type of mitigation. Propagate throughout chapter.
7	1	1:46	Revise figure in FAQ and associated TA description including table of parameters in simple model used to ensure precise consistency with final production version of SPM1. Revisions are of the order of individual line thicknesses and hence do not affect the visual impact and message of the figure.
5:22-23	1	26:11	"Around 2040" was revised to "likely between 2030 and 2052" requires traceability to the chapter. Insert on page 26, line 11, following "immediately": "Applying a similar approach to the multi-dataset average GMST used in this report, now at 1.04°C, increasing at 0.215°C per decade, and accounting for correlated uncertainties between estimated warming level and warming rate, gives a one-standard-error range for warming reaching 1.5°C of 2030 to 2052.
13:40	2	13:12	At end of sentence after "both CO2 and non-CO2 emissions" add "(see glossary)" due to trickleback of new footnote on non-CO2 emissions that's related to the final C1.2 but is related to the non-CO2 discussion that occurs here in the FGD SPM.
3:24	2	8:53	after "emission pathway" add "(see glossary)" due to trickleback of new definition that may now be added to glossary
C2.3	2	55	Table 2.6: split to distinguish "no or low overshoot" and "high overshoot" pathways
C2.3	2	55	Table 2.7: split to distinguish "no or low overshoot" and "high overshoot" pathways

C2.2	2	Page 51-57	Section 2.4.2: Include ranges for subset of pathways consistent with their use in SPM
C2.3	2	Page 57-67	Section 2.4.3: Include ranges for subset of pathways consistent with their use in SPM
C1	2	4	2030 emissions, interquartile emission ranges and year ranges estimated from Table 2.4 need adding to ES
C1	2	23	2010 emissions, interquartile emission ranges and year ranges calculated from from Table 2.4 need adding to Section 2.3
C1.3	2	22	Insert surface air temperature based remaining budgets into Table 2.2 through extra rows at 0.53C and 1.03. These remaining carbon budgets for 0.53°C are 840, 560, and 420 GtCO <sub>2</sub> for a 33, 50, and 66% probability, respectively, given a historical GSAT warming of 0.97°C (and thus 1.5°C from 1850-1900); and 2030, 1500, and 1170 GtCO <sub>2</sub> for a 33, 50 and 66% probability, respectively, for 1.03°C (or 2°C from 1850-1900).
C1.3	2	17:21	41GtCO <sub>2</sub> needs to be 43 +/-3 GtCO <sub>2</sub> - and add high confidence
C1.3	2	17	show AR5 budget and ranges from 2018 start of with surface air temperature from new table row
C1.3	2	5	show AR5 budget and ranges from 2018 start of with surface air temperature from new table row in ES
C1.3 (footnote)	2	17	introduce framing of total carbon budget context in 2.2.2 and historic emissions to date from Table 2.1 and give medium confidence to historic emissions to date. Matching footnote 1 for C1.3
C1.3 - footnote 2	2	17	explain reason for 300 GtCO <sub>2</sub> difference from AR5 and level of confidence
C1.3	2	17	Add sentence on ar5 difference in Executive Summary, explicitly mentioning the 300GtCO <sub>2</sub>
C1.3	2	20:53	Add "more thereafter" to ES feedbacks estimate
C.13	2	18	Update Figure 2.3 for baselines from both budget estimates
C1.3	2Annex	99	Replace figure 2.A.3 illustrating two types of temperature change
C1.3	2	5:33	Add "more thereafter" to ES feedbacks estimate
C1.3	2	5:34	Exchange 50% uncertainty range in budgets with absolute uncertainty range
SPM3a	2	29	Include scenario selection in caption Figure 2.5
14: 27	2	75: 10	Replace "avoiding the need" with "reducing the reliance"
19:36-37, 48	2	78: 37	Add the following sentence at the end of the 1st paragraph of section 2.5.2.1: "Explicit carbon pricing is briefly addressed here to the extent it pertains to the scope of Chapter 2. For detailed policy issues about carbon pricing see Section 4.4.5."
19:36-37, 48	2	79:1-3	Delete last sentence "Considering incomplete..... (see section 4.4.5.)."
19:36-37, 48	2	79:39-44	Move sentences "In addition, the revenue recycling effect.....is achieved (Sands, 2018)." to p.80 line 16 and insert them right after "(Sonnenschein et al., 2018)."
19:36-37, 48	2	80:10	Replace "price of carbon" with "carbon price"
19:36-37, 48	2	80:21	Delete "would need to" and add "s" to "increase"
19:36-37, 48	2	80:24	Replace "the price of carbon" with "carbon pricing"
19:20	2	83:25	Add "including conditional" to ("NDC") in the caption. ie. ("NDC", including conditional NDCs)
25:35	2	24:5	Change 1.5°C-consistent pathway to 1.5°C pathway
SPM3b	2	25:Table 2.3	Adjust wording in description of SSP narratives for consistency with SPM3b

C3	2	2.3.4	Adjust ranges to pathways limiting warming with no or limited overshoot
C1	2	2.3.2	Adjust ranges to pathways limiting warming with no or limited overshoot
C1, D1	2	2.3.5	Adjust ranges to pathways limiting warming with no or limited overshoot
25:35	2	27:1	Change 1.5°C-consistent pathway to 1.5°C pathway
25:35	2	28:35	Change 1.5°C-consistent pathway to 1.5°C pathway
25:35	2	28:54	Change 1.5°C-consistent pathway to 1.5°C pathway
25:35	2	39:11	Change 1.5°C-consistent pathway to 1.5°C pathway
25:35	2	39:37	Change 1.5°C-consistent pathway to 1.5°C pathway
25:35	2	44:22	Change 1.5°C-consistent pathway to 1.5°C pathway
25:35	2	46:8	Change 1.5°C-consistent pathway to 1.5°C pathway
C1.3	2	17	give footnote explaining that the table left column is globally surface air temperature from a base of either GMST or surface air temperature
C1.3	2	48	Update Figure 2.10 with budgets mentioned in SPM.
C2.3	2	54	Figure 2.16: split to distinguish "no or low overshoot" and "high overshoot" pathways
C2.3	2	56	Figure 2.17: split to distinguish "no or low overshoot" and "high overshoot" pathways
C2.2	2	6	Update ranges in ES to pathway definitions used in SPM
C2.3	2	6	Update ranges in ES to pathway definitions used in SPM
	3	131:2	Figure 3.20 & Figure 3.21 add confidence to embers bars
	3	131:2 & 133:1	Correct caption of Figure 3.20 & 3.21 to match approved version of SPM2 caption
	3	131:2 / 132:28	Titles, Figure caption and subtitles in embers figures in Ch 3 need to be modified to match the SPM version.
7:38 (B4.2)	3	p8 (ES), p52	Changes to allow indicative range to be given in (new) B2.1. Text that allows indicative range for GMSLR for 1.5C at 2100. Reword ES accordingly.
7:38 (B4.1)	3	p8	Reword final line of ES statement on GMSLR on threshold temperatures.
9:6 (B2.3)	3	p9, p165, p136	Reword ES statement and subsection summary on permafrost to include projected range; amend range given in on 3.5.2.5 RFC1
9:14 (B3.1)	3	p 8, p50	Clarify timescale on sea ice recovery (decadal) in summary of subsection and ES
9:14 (B3.1)	3	p 8, p50	Add definition for ice-free Arctic in section and ES (as footnote). AR5 "nearly ice-free when the sea ice extent is less than 106 km <sup>2</sup> for at least five consecutive years."
10:39 (B5.7)	3	p 140-1	Update confidence associated with RCF5 (medium)
B3.2	3	p.68:23	Change 7 to 6.5% (and consider ES statement p. 9: 110)
	3	6:27	Replace "Changes in temperature extremes and heavy precipitation indices are detectable in observations for the 1991-2010 period compared with 1960-1979, when a global warming of approximately 0.5°C occurred ( <i>high confidence</i> ). The observed tendencies over that time frame are consistent with attributed changes since the mid-20th century ( <i>high confidence</i> ) {3.3.1, 3.3.2, 3.3.3}." with "Trends in intensity and frequency of some climate and weather extremes have been detected over time spans during which about 0.5°C of global warming occurred ( <i>medium confidence</i> ). This assessment is based on several lines of evidence, including attribution studies for changes in extremes since 1950. {3.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4}."
	3	6-31	Add: "Several regional changes in climate are assessed to occur with global warming up to 1.5°C compared to pre-industrial levels, including warming of extreme temperatures in many regions ( <i>high confidence</i> ), increases in frequency, intensity and/or amount of heavy precipitation in several regions ( <i>high confidence</i> ), and an increase in intensity or frequency of droughts in some regions ( <i>medium confidence</i> ). {3.3.1, 3.3.2, 3.3.3, 3.3.4, Table 3.2}"

	3	7:5	Replace "Substantial changes in regional climate occur between 1.5°C and 2°C [...]" with "Climate models project robust <sup>^</sup> FOOTNOTE#5 differences in regional climate between present-day and global warming of 1.5 <sup>^</sup> FOOTNOTE#6, and between 1.5°C and 2°C#6"; FOOTNOTE#5: "Robust is here used to mean that at least two thirds of climate models show the same sign of changes at the grid point scale, and that differences in large regions are statistically significant [...]."; FOOTNOTE#6: "Projected changes in impacts between different levels of global warming are determined with respect to changes in global mean surface air temperature" (This is not strictly a trickle back since it was proposed by the authors prior to the approval session following comments on the FGD version of the SPM, but it is required to support changes in SPM; Exception: "mean" in "global mean surface air temperature" was added as a result of a comment from the floor)
	3	7:24	Replace "Tropical cyclones are projected to increase in intensity (with associated increases in heavy precipitation) although not in frequency (low confidence, limited evidence)" with "Tropical cyclones are projected to decrease in frequency but with an increase in the number of very intense cyclones (limited evidence, low confidence). Heavy precipitation associated with tropical cyclones is projected to be higher at 2°C compared to 1.5°C global warming (medium confidence)"
	3	7:25	Add "Heavy precipitation when aggregated at global scale is projected to be higher at 2.0°C than at 1.5°C of global warming ( <i>medium confidence</i> )."
	3	7:26	Replace "drought and risks associated with water availability" with "drought, precipitation deficits, and risks associated with water availability"
	3	17:12	Add "It should also be noted that attributed changes in extremes since 1950 that were reported in the IPCC AR5 report (IPCC, 2013) generally correspond to changes in global warming of about 0.5°C (see 3.SM.1)"
	3	19:19	Add "This in particular also applies to attributed changes in extremes since 1950 that were reported in the IPCC AR5 report (IPCC, 2013; see also 3.SM.1)"
	3	38:28	Add "These analyses suggest that increases in drought, dryness or precipitation deficits are projected at 1.5°C or 2°C global warming in some regions compared to the pre-industrial or present-day conditions, as well as between these two global warming levels, although there is substantial variability in signals depending on the considered indices or climate models (Lehner et al. 2017, Schleussner et al. 2017, Greve et al. 2018) ( <i>medium confidence</i> ). Generally, the clearest signals are found for the Mediterranean region ( <i>medium confidence</i> )."
	3	59 (Table 3.2, row "drought and dryness")	Add in column "projected changes at 1.5°C [...]": "Increases in drought, dryness or precipitation deficits projected in some regions compared to the pre-industrial or present-day conditions, but substantial variability in signals depending on considered indices or climate model ( <i>medium confidence</i> )."

	3	59 (Table 3.2, row "drought and dryness")	Add in column "projected changes at 2°C [...]": "Increases in drought, dryness or precipitation deficits projected in some regions compared to the pre-industrial or present-day conditions, but substantial variability in signals depending on considered indices or climate model ( <i>medium confidence</i> )."
	3	63 (Table 3.2, row "tropical and extra-tropical cyclones")	The text for the "observed change" column should stay the same. However, the remaining text (currently a single column for 1.5 degrees C of warming, 2 degrees C of warming and differences between 1.5 and 2 degrees C of warming) should be removed. Text should then be added to the three different columns as follows: changes at 1.5°C [...] "Increases in heavy precipitation associated with tropical cyclones ( <i>medium confidence</i> )"; changes at 2°C [...] "Further increases in heavy precipitation associated with tropical cyclones ( <i>medium confidence</i> )"; Differences between 2°C and 1.5° [...] "Heavy precipitation associated with tropical cyclones is projected to be higher at 2°C compared to 1.5°C global warming ( <i>medium confidence</i> ); Limited evidence that the global number of tropical cyclones will be lower under 2°C of global warming compared to under 1.5°C of warming, but an increase in the number of very intense cyclones ( <i>low confidence</i> )".
SPM2	3	131	Figure 3-20 - Change text: 'Risks for specific natural, managed and human systems' to 'Risks and/or impacts for specific natural, managed and human systems'
SPM2	3	131	Figure 3-20 -Text describing colours here needs to be same as that is SPM figure (which it currently is)
SPM2	3	131	Figure 3-20 - Delete the text "Assessment of risks at 2°C or higher are beyond the scope of the present assessment" as in SPSM2
SPM2	3	131	Figure 3-20 - Remove 2.5°C from both y-axes as in SPM-2
SPM2	3	131	Figure 3-20 - Remove text '0.87°C' and add grey band labelled '2006–2016' in top and bottom figures – like in SPM-2.
SPM2	3	131	Figure 3-20 - Remove text: "The average global surface temperature was converted to GMST for marine related embers (warm water corals, mangroves, and small scale fisheries, low latitude) by adjusting for the small difference between GMST and SST across a range of CMIP5 climate models" - Just like in SPM2
SPM2	3	131	Figure 3-20 - Change text: 'y axes (top and bottom) need to be: 'Global mean surface temperature change above pre-industrial levels (oC).' Just like in SPM2
SPM2	3	131	Figure 3-20 - Edge of all embers above 0.87°C need to be dashed as in SPM-2 figure.

SPM2	3	131	Figure 3-20 - Add confidence levels as letters as per figure SPM-2. The lines connect the transition temperatures - as in SPM2.
SPM2	3	88	Figure 3-18 - Change text: 'Risks and adaptation limits for specific marine and coastal organisms, ecosystems and sectors' to 'Risks and/or impacts for specific marine and coastal organisms, ecosystems and sectors'
SPM2	3	88	Figure 3-18 -Text describing colours here needs to be same as that is SPM figure (which it currently is)
SPM2	3	88	Figure 3-18 -Delete the text "Assessment of risks at 2°C or higher are beyond the scope of the present assessment" as in SPSM2
SPM2	3	88	Figure 3-18 - Remove 2.5°C from both y-axes as in SPM2
SPM2	3	88	Figure 3-18 - Remove text '0.87°C' and add grey band labelled '2006–2016' in top and bottom figures – like in SPM-2.
SPM2	3	88	Figure 3-18 - Change text: 'y axes (top and bottom) need to be: 'Global mean surface temperature change above pre-industrial levels (oC).' Just like in SPM2
SPM2	3	88	Figure 3-18 - Edge of all embers above 0.87°C need to be dashed as in SPM-2 figure.
SPM2	3	88	Figure 3-18 - Add confidence levels as letters as per figure SPM-2. The lines connect the transition temperatures - as in SPM2.
SPM2	3	132	Figure 3-21 - Change text: 'Risks associated with Reasons for Concern' to 'Risks and/or impacts associated with Reasons for Concern'
SPM2	3	132	Figure 3-21 - Text describing colours here needs to be same as that is SPM figure (which it currently is)
SPM2	3	132	Figure 3-21 - Remove 2.5°C from both y-axes as in SPM2
SPM2	3	132	Figure 3-21 - Remove text '0.87°C' and add grey band labelled '2006–2016' in top and bottom figures – like in SPM-2.
SPM2	3	132	Figure 3-21 - Change text: 'y axes (top and bottom) need to be: 'Global mean surface temperature change above pre-industrial levels (oC).' Just like in SPM2
SPM2	3	132	Figure 3-21 - Edge of all embers above 0.87°C need to be dashed as in SPM-2 figure.
SPM2	3	132	Figure 3-21 - Add confidence levels as letters as per figure SPM-2. The lines connect the transition temperatures - as in SPM2.
SPM2	3	131	Figure 3-21 - Delete the text "Assessment of risks at 2°C or higher are beyond the scope of the present assessment" as in SPSM2
	3	3-11:6-13	Change "Any increase in global temperature (e.g., +0.5°C) is expected to affect human health (high confidence). Risks are lower at 1.5°C than at 2°C for heat-related morbidity and mortality (very high confidence), particularly in urban areas because of urban heat island effects (high confidence). Risks of ozone-related mortality would also be lower at 1.5°C than at 2°C of global warming assuming that emissions related to the formation of ozone remain the same (high confidence), and the same applies to risks of undernutrition (medium confidence). Risks are projected to change for some vector-borne diseases, such as malaria and dengue fever (high confidence), with positive or negative trends

			occurring depending on the disease, region and extent of change (high confidence). Incorporating estimates of adaptation into projections reduces the magnitude of risks (high confidence). {3.4.7, 3.4.7.1} " to "Any increase in global warming is projected to affect human health, with primarily negative consequences (high confidence). Lower risks are projected at 1.5°C than at 2°C for heat-related morbidity and mortality (very high confidence) and for ozone-related mortality if emissions needed for ozone formation remain high (high confidence). Urban heat islands often amplify the impacts of heatwaves in cities (high confidence). Risks from some vector-borne diseases, such as malaria and dengue fever, are projected to increase with warming from 1.5°C to 2°C, including potential shifts in their geographic range (high confidence). {3.4.7, 3.4.8, 3.5.5.8}"
	3	3-10:7-8	Change "Global warming of 1.5°C (as opposed to 2°C) is projected to reduce climate induced impacts on crop yield and nutritional content in some regions (high confidence)." to "Limiting warming to 1.5°C, compared with 2°C, is projected to result in smaller net reductions in yields of maize, rice, wheat, and potentially other cereal crops, particularly in sub-Saharan Africa, Southeast Asia, and Central and South America; and in the CO2 dependent, nutritional quality of rice and wheat (high confidence)."
	3	3-10:12-13	Change "Risks of food shortages are lower in the Sahel, southern Africa, the Mediterranean, central Europe, and the Amazon at 1.5°C of global warming when compared to 2°C (medium confidence)." to "Reductions in projected food availability are larger at 2°C than at 1.5°C of global warming in the Sahel, southern Africa, the Mediterranean, central Europe, and the Amazon (medium confidence). "
	3	3-9:45-46	Change "Risks to water scarcity are greater at 2°C than at 1.5°C of global warming in some regions (medium confidence)." to "Depending on future socioeconomic conditions, limiting global warming to 1.5°C, compared to 2°C, may reduce the proportion of the world population exposed to a climate-change induced increase in water stress by up to 50%, although there is considerable variability between regions (medium confidence). "
	3	3-9:46 to 3:10:1-3	Delete the text "Limiting global warming to 1.5°C would approximately halve the fraction of world population expected to suffer water scarcity as compared to 2°C, although there is considerable variability between regions (medium confidence). Socioeconomic drivers, however, are expected to have a greater influence on these risks than the changes in climate (medium confidence)"
	3	3-11:28-32	Change "Globally, the projected impacts on economic growth in a 1.5°C warmer world are larger than those of the present-day (about 1°C), with the largest impacts expected in the tropics and the Southern Hemisphere subtropics (limited evidence, low confidence). At 2°C substantially lower economic growth is projected for many developed and developing countries (limited evidence, medium confidence), with the potential to also limit economic damages at 1.5°C of global warming." to "Risks to global aggregated economic growth due to climate change impacts are projected to be lower at 1.5°C than at 2°C by the end of this century (medium confidence). This excludes the costs of mitigation, adaptation investments and the benefits of adaptation. Countries in the tropics and Southern Hemisphere subtropics are projected to experience the largest impacts on economic

			growth due to climate change should global warming increase from 1.5°C to 2 °C (medium confidence)."
	3	3-7:37-41	Change "Some regions are projected to experience multiple compound climate-related risks at 1.5°C that will increase with warming of 2°C and higher (high confidence). Some regions are projected to be affected by collocated and/or concomitant changes in several types of hazards. Multi-sector risks are projected to overlap spatially and temporally, creating new (and exacerbating current) hazards, exposures, and vulnerabilities that will affect increasing numbers of people and regions with additional warming." to "Exposure to multiple and compound climate-related risks increases between 1.5°C and 2°C of global warming, with greater proportions of people both exposed and susceptible to poverty in Africa and Asia (high confidence). For global warming from 1.5°C to 2°C, risks across energy, food, and water sectors could overlap spatially and temporally, creating new and exacerbating current hazards, exposures, and vulnerabilities that could affect increasing numbers of people and regions (medium confidence) "
9:6 (B2.3)	3	p9, p165, p136	Reword ES statement and subsection summary on permafrost to include projected range; amend range given in on 3.5.2.5 RFC1 as well as in Table 3.7 (p 3 -151)
A3.2	3		The ES FGD text used to read 'Future risks at 1.5°C will depend on the mitigation pathway and on the possible occurrence of a transient overshoot (high confidence). The impacts on natural and human systems would be greater where mitigation pathways temporarily overshoot 1.5°C and return to 1.5°C later in the century, as compared to pathways that stabilizes at 1.5°C without an overshoot. The size and duration of an overshoot will also affect future impacts (e.g. loss of ecosystems, medium confidence). Changes in land use resulting from mitigation choices could have impacts on food production and ecosystem diversity {Sections 3.6.1 and 3.6.2, Cross-Chapter boxes 7 and 8 in this Chapter}.' in ES. In the SPM, the statement A3.2 reads A3.2. Future climate-related risks depend on the rate, peak and duration of warming. In the aggregate they are larger if global warming exceeds 1.5°C before returning to that level by 2100 than if global warming gradually stabilizes at 1.5°C, especially if the peak temperature is high (e.g., about 2°C) (high confidence). Some impacts may be long-lasting or irreversible, such as the loss of some ecosystems (high confidence). {3.2, 3.4.4, 3.6.3, Cross-Chapter Box 8}'. To make the ES consistent, the statement should be edited to read "Future risks at 1.5°C will depend on the mitigation pathway and on the possible occurrence of a transient overshoot (high confidence). The impacts on natural and human systems would be greater where mitigation pathways temporarily overshoot 1.5°C and return to 1.5°C later in the century, as compared to pathways that stabilizes at 1.5°C without an overshoot (high confidence). The size and duration of an overshoot will also affect future impacts (e.g. irreversible loss of some ecosystems, high confidence). Changes in land use resulting from mitigation choices could have impacts on food production and ecosystem diversity {Sections 3.6.1 and 3.6.2, Cross-Chapter boxes 7 and 8 in this Chapter}.'
B3 and B3.1	3		Edit ES statement to make the confidence levels consistent with the SPM and specify the exact numbers as in the SPM. This means to edit from "Risks of local species losses and, consequently, risks of extinction are much less in a 1.5°C versus a 2°C warmer world (medium confidence). The number of species projected to lose over half of their



		<p>climatically determined geographic range (about 18% of insects, 16% of plants, 8% of vertebrates) is reduced by 50% (plants, vertebrates) or 66% (insects) at 1.5°C versus 2°C of warming (high confidence). Risks associated with other biodiversity-related factors such as forest fires, extreme weather events, and the spread of invasive species, pests, and diseases, are also reduced at 1.5°C versus 2°C of warming (high confidence), supporting greater persistence of ecosystem services {3.4.3.2, 3.5.2}.' to 'Risks of local species losses and, consequently, risks of extinction are much less in a 1.5°C versus a 2°C warmer world (high confidence). The number of species projected to lose over half of their climatically determined geographic range at 2°C warming (18% of insects, 16% of plants, 8% of vertebrates) is projected to be reduced to 6% of insects, 8% of plants and 4% of vertebrates at 1.5°C warming (medium confidence). Risks associated with other biodiversity-related factors such as forest fires, extreme weather events, and the spread of invasive species, pests, and diseases, are also reduced at 1.5°C versus 2°C of warming (high confidence), supporting greater persistence of ecosystem services {3.4.3.2, 3.5.2}.'. It will also be important to ensure that the confidence levels in the underlying text also match this.</p>
<p>A3.2</p>	<p>3</p>	<p>For consistency with A2, in the ES the statement 'Overshooting poses large risks for natural and human systems, especially if the temperature at peak warming is high, because some risks may be long-lasting and irreversible, such as the loss of many ecosystems (high confidence).' should be edited to read 'Overshooting poses large risks for natural and human systems, especially if the temperature at peak warming is high, because some risks may be long-lasting and irreversible, such as the loss of some ecosystems (high confidence).' Also check underlying text.</p>

A3.2	3	<p>The ES FGD text used to read 'Future risks at 1.5°C will depend on the mitigation pathway and on the possible occurrence of a transient overshoot (high confidence). The impacts on natural and human systems would be greater where mitigation pathways temporarily overshoot 1.5°C and return to 1.5°C later in the century, as compared to pathways that stabilizes at 1.5°C without an overshoot. The size and duration of an overshoot will also affect future impacts (e.g. loss of ecosystems, medium confidence). Changes in land use resulting from mitigation choices could have impacts on food production and ecosystem diversity {Sections 3.6.1 and 3.6.2, Cross-Chapter boxes 7 and 8 in this Chapter}.' in ES. In the SPM, the statement A3.2 reads A3.2. Future climate-related risks depend on the rate, peak and duration of warming. In the aggregate they are larger if global warming exceeds 1.5°C before returning to that level by 2100 than if global warming gradually stabilizes at 1.5°C, especially if the peak temperature is high (e.g., about 2°C) (high confidence). Some impacts may be long-lasting or irreversible, such as the loss of some ecosystems (high confidence). {3.2, 3.4.4, 3.6.3, Cross-Chapter Box 8}'. To make the ES consistent, the statement should be edited to read "Future risks at 1.5°C will depend on the mitigation pathway and on the possible occurrence of a transient overshoot (high confidence). The impacts on natural and human systems would be greater where mitigation pathways temporarily overshoot 1.5°C and return to 1.5°C later in the century, as compared to pathways that stabilizes at 1.5°C without an overshoot (high confidence). The size and duration of an overshoot will also affect future impacts (e.g. irreversible loss of some ecosystems, high confidence). Changes in land use resulting from mitigation choices could have impacts on food production and ecosystem diversity {Sections 3.6.1 and 3.6.2, Cross-Chapter boxes 7 and 8 in this Chapter}.'</p>
B3 and B3.1	3	<p>Edit ES statement to make the confidence levels consistent with the SPM and specify the exact numbers as in the SPM. This means to edit from "Risks of local species losses and, consequently, risks of extinction are much less in a 1.5°C versus a 2°C warmer world (medium confidence). The number of species projected to lose over half of their climatically determined geographic range (about 18% of insects, 16% of plants, 8% of vertebrates) is reduced by 50% (plants, vertebrates) or 66% (insects) at 1.5°C versus 2°C of warming (high confidence). Risks associated with other biodiversity-related factors such as forest fires, extreme weather events, and the spread of invasive species, pests, and diseases, are also reduced at 1.5°C versus 2°C of warming (high confidence), supporting greater persistence of ecosystem services {3.4.3.2, 3.5.2}.' to 'Risks of local species losses and, consequently, risks of extinction are much less in a 1.5°C versus a 2°C warmer world (high confidence). The number of species projected to lose over half of their climatically determined geographic range at 2°C warming (18% of insects, 16% of plants, 8% of vertebrates) is projected to be reduced to 6% of insects, 8% of plants and 4% of vertebrates at 1.5°C warming (medium confidence). Risks associated with other biodiversity-related factors such as forest fires, extreme weather events, and the spread of invasive species, pests, and diseases, are also reduced at 1.5°C versus 2°C of warming (high confidence), supporting greater persistence of ecosystem services {3.4.3.2, 3.5.2}.'. It will also be important to ensure that the confidence levels in the underlying text also match this.</p>

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B3.2	3		<p>The SPM wording is B3.2. "Approximately 4% (interquartile range 2–7%) of the global terrestrial land area is projected to undergo a transformation of ecosystems from one type to another at 1°C of global warming, compared with 13% (interquartile range 8–20%) at 2°C (medium confidence). This indicates that the area at risk is projected to be approximately 50% lower at 1.5°C compared to 2°C (medium confidence). {3.4.3.1, 3.4.3.5}" and the FGD ES wording was 'The terrestrial area affected by ecosystem transformation (13%) at 2°C, which is approximately halved at 1.5°C global warming (high confidence)' . In the ES, this latter sentence needs to be edited to read "The global terrestrial land area projected to be affected by ecosystem transformation (13%, interquartile range 8–20%) at 2°C, is approximately halved at 1.5°C global warming to 4% (interquartile range 2–7%) (medium confidence)."</p>
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B3.3	3		<p>In ES add B3.3, add and will proceed with further warming' after "High-latitude tundra and boreal forests are particularly at risk of climate change-induced degradation and loss, with woody shrubs already encroaching into the tundra (high confidence)".</p>
A3.2	3		<p>The ES FGD text used to read 'Future risks at 1.5°C will depend on the mitigation pathway and on the possible occurrence of a transient overshoot (high confidence). The impacts on natural and human systems would be greater where mitigation pathways temporarily overshoot 1.5°C and return to 1.5°C later in the century, as compared to pathways that stabilizes at 1.5°C without an overshoot. The size and duration of an overshoot will also affect future impacts (e.g. loss of ecosystems, medium confidence). Changes in land use resulting from mitigation choices could have impacts on food production and ecosystem diversity {Sections 3.6.1 and 3.6.2, Cross-Chapter boxes 7 and 8 in this Chapter}.' in ES. In the SPM, the statement A3.2 reads A3.2. Future climate-related risks depend on the rate, peak and duration of warming. In the aggregate they are larger if global warming exceeds 1.5°C before returning to that level by 2100 than if global warming gradually stabilizes at 1.5°C, especially if the peak temperature is high (e.g., about 2°C) (high confidence). Some impacts may be long-lasting or irreversible, such as the loss of some ecosystems (high confidence). {3.2, 3.4.4, 3.6.3, Cross-Chapter Box 8}'. To make the ES consistent, the statement should be edited to read "Future risks at 1.5°C will depend on the mitigation pathway and on the possible occurrence of a transient overshoot (high confidence). The impacts on natural and human systems would be greater where mitigation pathways temporarily overshoot 1.5°C and return to 1.5°C later in the century, as compared to pathways that stabilizes at 1.5°C without an overshoot (high confidence). The size and duration of an overshoot will also affect future impacts (e.g. irreversible loss of some ecosystems, high confidence). Changes in land use resulting from mitigation choices could have impacts on food production and ecosystem diversity {Sections 3.6.1 and 3.6.2, Cross-Chapter boxes 7 and 8 in this Chapter}.'</p>
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B3.3	3		In ES add B3.3, add and will proceed with further warming' after "High-latitude tundra and boreal forests are particularly at risk of climate change-induced degradation and loss, with woody shrubs already encroaching into the tundra (high confidence)" .
B5.7	3		In ES the text read 'There are multiple lines of evidence that there has been a substantial increase since AR5 in the levels of risk associated with four of the five Reasons for Concern (RFCs) for global warming levels of up to 2°C (high confidence). The word 'assessed' should be inserted before 'risk'
B5.7	3		Replace RFC text with text in SPM
6:26	4	33:42	Replace '>70%' with 'to between 75 and 90% (interquartile range)'
13:6	4	Across the chapter	Replace '1.5°C-consistent pathways' with 'pathways limiting global warming to 1.5°C with no or limited overshoot'.
14:9	4	Across the chapter	Replace '2°C-consistent pathways' with 'pathways limiting global warming to below 2°C'. <b>[NOTE: In the approved SPM this is in C2.7, second sentence, as an example.]</b>
22:40	4	87:6	Change 'over 2015-2035' to 'between 2016-2035'. <b>[NOTE: In the approved SPM this is in the line under D4.3]</b>
22:49-50	4	13:35	Change 'threefold' to '3-4 times' <b>[NOTE: This bullet is C2.7 in the approved SPM]</b>
25:20	4	44:35	In the context of 1.5°C pathways (Chapter 2), they serve to offset residual emissions that take longer to abate or to reduce emissions after overshooting the 1.5°C carbon budget' CHANGE TO 'In the context of 1.5°C pathways (Chapter 2), they serve to offset residual emissions and, in most cases, achieve net-negative emissions to return to 1.5°C from an overshoot.'
SPM3b	4		Update Table 4.1: update numbers to be consistent with SPM
C2.3	4		Update Table 4.1 for pathway classification used in SPM
12:14	5	15:17-18	Include Table 3.5 in traceability count (see Chapter 3.....)
SPM4	5		Update Figure 5.2: red coloured circle segment corresponding to SDG9 in, circle Trade-offs (negative interaction) energy demand options, to be replaced by white
25:3	Glossary	25:22	Global mean surface temperature (GMST) - replace glossary definition with version in SPM Box 1: Estimated global average of near-surface air temperatures over land and sea-ice, and sea surface temperatures over ice-free ocean regions, with changes normally expressed as departures from a value over a specified reference period. When estimating changes in GMST, near-surface air temperature over both land and oceans are also used.

			[FOOTNOTE] FOOTNOTE: Past IPCC reports, reflecting the literature, have used a variety of approximately equivalent metrics of GMST change.
25:3	Glossary	N/A (New)	Add the following definition for Global mean surface air temperature (GSAT) - Global average of near-surface air temperatures over land and oceans. Changes in GSAT are often used as a measure of global temperature change in climate models but are not observed directly.
25:8	Glossary	42:16	Pre-industrial - replace glossary definition with version in SPM Box 1: The multi-century period prior to the onset of large-scale industrial activity around 1750. The reference period 1850–1900 is used to approximate pre-industrial global mean surface temperature (GMST).
25:12	Glossary	25:29	Global warming - replace glossary definition with version in SPM Box 1: The estimated increase in global mean surface temperature (GMST) averaged over a 30-year period, or the 30-year period centered on a particular year or decade, expressed relative to pre-industrial levels unless otherwise specified. For 30-year periods that span past and future years, the current multi-decadal warming trend is assumed to continue.
25:20	Glossary	8:49	Carbon dioxide removal (CDR) - replace glossary definition with version in SPM Box 1: Anthropogenic activities removing CO <sub>2</sub> from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical sinks and direct air capture and storage, but excludes natural CO <sub>2</sub> uptake not directly caused by human activities.
25:20	Glossary	36:24	Mitigation (of climate change) - Remove "Note that this encompasses carbon dioxide removal (CDR) options."
25:20	Glossary		Negative emissions - Remove "For CO <sub>2</sub> , negative emissions can be achieved with direct capture of CO <sub>2</sub> from ambient air, bioenergy with carbon capture and sequestration (BECCS), afforestation, reforestation, biochar, ocean alkalization, among others."
25:31	Glossary	39:1	Overshoot - change name of term to 'Temperature overshoot' to be consistent with SPM Box 1