Cross-Chapter Box 8, Table 1: Different worlds resulting from 1.5°C and 2°C mitigation (prospective) pathways, including 66% (probable) best-case outcome, and 5% worst-case outcome, based on Chapter 2 scenarios and Chapter 3 assessments of changes in regional climate. Note that the pathway characteristics estimates are based on computations with the MAGICC model (Meinshausen et al., 2011) consistent with its set-up used in AR5 WGIII (Clarke et al., 2014), but are uncertain and will be subject to updates and adjustments (see Chapter 2 for details).

		B1.5_LOS (below 1.5°C with low overshoot) with 2/3 "probable best-case outcome"[a]	B1.5_LOS (below 1.5°C with low overshoot) with 1/20 "worst-case outcome"[b]	L20 (lower than 2°C) with 2/3 "probable best-case outcome"[a]	L20 (lower than 2°C) with 1/20 "worst-case outcome"[b]
General characteristics of pathway	**Overshoot > 1.5°C in 21[st] century[c]**	**Yes (51/51)**	**Yes (51/51)**	**Yes (72/72)**	**Yes (72/72)**
	Overshoot > 2°C in 21[st] century	**No (0/51)**	**Yes (37/51)**	**No (72/72)**	**Yes (72/72)**
	Cumulative CO_2 emissions up to peak warming (relative to 2016)[d]	610–760	590–750	1150–1460	1130–1470
	Cumulative CO_2 emissions up to 2100 (relative to 2016)[d] [$GtCO_2$]	170–560		1030–1440	
	Global GHG emissions in 2030[d] [$GtCO_2$ y-1]	19–23		31–38	
	Years of global net zero CO_2 emissions[d]	2055–2066		2082–2090	
Possible climate range at peak warming (regional+global)	**Global mean temperature anomaly at peak warming**	**1.7°C (1.66–1.72°C)**	**2.05°C (2.00–2.09°C)**	**2.11°C (2.05–2.17°C)**	**2.67°C (2.59–2.76°C)**
	Warming in the Arctic[e] (TNn[f])	4.93°C (4.36, 5.52)	6.02°C (5.12, 6.89)	6.24°C (5.39, 7.21)	7.69°C (6.69, 8.93)
	Warming in the Central North America[e] (TXx[g])	2.65°C (1.92, 3.15)	3.11°C (2.37, 3.63)	3.18°C (2.50, 3.71)	4.06°C (3.35, 4.63)
	Warming in Amazon region[e] (TXx)	2.55°C (2.23, 2.83)	3.07°C (2.74, 3.46)	3.16°C (2.84, 3.57)	4.05°C (3.62, 4.46)
	Drying in the Mediterranean region[e]	-1.11 (-2.24, -0.41)	-1.28 (-2.44, -0.51)	-1.38 (-2.58, -0.53)	-1.56 (-3.19, -0.67)
	Increase in heavy precipitation events[e] in Southern Asia[e]	9.94% (6.76, 14.00)	11.94% (7.52, 18.86)	12.68% (7.71, 22.39)	19.67% (11.56, 27.24)
Possible climate range in 2100 (regional+global)	**Global mean temperature warming in 2100**	**1.46°C (1.41—1.51°C)**	**1.87°C (1.81—1.94°C)**	**2.06°C (1.99—2.15°C)**	**2.66°C (2.56—2.76°C)**
	Warming in the Arctic[i] (TNn)	4.28°C (3.71, 4.77)	5.50°C (4.74, 6.21)	6.08°C (5.20, 6.94)	7.63°C (6.66, 8.90)
	Warming in Central North America[i] (TXx)	2.31°C (1.56, 2.66)	2.83°C (2.03, 3.49)	3.12°C (2.38, 3.67)	4.06°C (3.33, 4.59)
	Warming in Amazon region[i] (TXx)	2.22°C (2.00, 2.45)	2.76°C (2.50, 3.07)	3.10°C (2.75, 3.49)	4.03°C (3.62, 4.45)
	Drying in the Mediterranean region[i]	-0.95 (-1.98, -0.30)	-1.10 (-2.17, -0.51)	-1.26 (-2.43, -0.52)	-1.55 (-3.17, -0.67)
	Increase in heavy precipitation events in Southern Asia[i]	8.38% (4.63, 12.68)	10.34% (6.64, 16.07)	12.02% (7.41, 19.62)	19.72% (11.34, 26.95)

Cross-Chapter Box 8, Table 2: Storylines of possible worlds resulting from different mitigation options. The storylines build upon Cross-Chapter Box 8, Table 1, and the assessments of Chapters 1-5. These are only a few of possible storylines; their choice is for illustrative purposes.

Scenario 1 [one possible storyline among best-case scenarios]: **Mitigation: Early move to**	**In 2020, strong participation and support for the Paris Agreement and its ambitious goals for reducing CO_2 emissions by an almost unanimous international community led to a time frame for net-zero emissions that is compatible with halting of global temperature warming to 1.5°C by 2100.** There is strong participation in all major world regions at national, state and/or city levels. Transport is strongly decarbonized through a shift to electric vehicles, with

decarbonisation, decarbonisation designed to minimise land footprint, coordination and rapid action of world's nations towards 1.5°C goal by 2100 **Internal climate variability: Probable (66%) best-case outcome for global and regional climate responses.**	more cars with electric than combustion engines being sold by 2025 (**Chapter 2, Section 2.4.3; Chapter 4, Section 4.3.3**). Several industry-sized plants for carbon capture and storage are installed and tested in the 2020s (**Chapter 2, Section 2.4.2; Chapter 4, Sections 4.3.4 and 4.3.7**). Competition for land between bioenergy cropping, food production, and biodiversity conservation is minimised by sourcing bioenergy for carbon capture and storage from agricultural wastes, algae, and kelp farms (**Cross-Chapter Box 7 in Chapter 3; Chapter 4, Section 4.3.2**). Agriculture is intensified in countries with coordinated planning associated with a drastic decrease in food wastage (**Chapter 2, Section 2.4.4; Chapter 4, Section 4.3.2**). This leaves many natural ecosystems relatively intact, supporting continued provision of most ecosystem services, although relocation of species toward higher latitudes and altitudes resulted in changes in local biodiversity in many regions, particularly in mountain, tropical coastal, and Arctic ecosystems (**Chapter 3, Section 3.4.3**). Adaptive measures such as the establishment of corridors for the movement of species and parts of ecosystems become a central practice within conservation management (**Chapter 3, Section 3.4.3; Chapter 4, Section 4.3.2**). The movement of species presents new challenges for resource management as novel ecosystems, and pests and disease, increase (**Cross-chapter Box 6 in Chapter 3**). Crops are grown on marginal land and no-till agriculture deployed, and large areas are reforested with native trees (**Chapter 2, Section 2.4.4; Chapter 3, Section 3.6.2; Cross-Chapter Box 7 in Chapter 3; Chapter 4, Section 4.3.2**). Societal preference for healthy diets reduces meat consumption and associated GHG emissions (**Chapter 2, Section 2.4.4; Chapter 4, Section 4.3.2; Cross-Chapter Box 6 in Chapter 3).** By 2100, global mean temperature is on average 0.5°C warmer than it was in 2018 (**Chapter 1, Section 1.2.1**). Only a minor temperature overshoot occurs during the century (**Chapter 2, Section 2.2**). In mid-latitudes, there are frequent hot summers and precipitation events tend to be more intense (**Chapter 3, Section 3.3**). Coastal communities struggle with increased inundation associated with rising sea levels and more frequent and intense heavy rainfall (**Chapter 3, Sections 3.3.2 and 3.3.9; Chapter 5, Box 5.3 and Section 5.3.2; Cross-Chapter Box 12 in Chapter 5; Chapter 4, Section 4.3.2**), and some respond by moving, in many cases, with consequences for urban areas. In the Tropics, in particular in mega-cities, there are frequent deadly heatwaves whose risks are reduced by proactive adaptation (**Chapter 3, Sections 3.3.1 and 3.4.8; Chapter 4, Section 4.3.8**), overlaid on a suite of development challenges and limits in disaster risk management (**Chapter 4, Section 4.3.3; Chapter 5, Sections 5.2.1 and 5.2.2; Cross-Chapter Box 12 in Chapter 5**). Glaciers extent decreases in most mountainous areas (**Chapter 3, Sections 3.3.5 and 3.5.4**). Reduced Arctic sea ice opens up new shipping lanes and commercial corridors (**Chapter 3, Section 3.3.8; Chapter 4, Box 4.3**). Small Island Developing States (SIDS), Coastal and low-lying areas have faced significant changes but have largely persisted in most regions (**Chapter 3; Sections 3.3.9 and 3.5.4; Box 3.5**). The Mediterranean area becomes drier (**Chapter 3, Section 3.3.4 and Box 3.2)** and irrigation of crops expands, drawing the water table down in many areas (**Chapter 3, Section 3.4.6**). The Amazon is reasonably well preserved (through avoided risk of possible large changes in regional temperature means and hot extremes and the probability of most extreme droughts (**Chapter 3, Sections 3.3.3, 3.3.4 and 3.4.3; Chapter 4, Box 4.3)** as well as through reduced deforestation (**Chapter 2, Section 2.4.4; Cross-Chapter Box 7 in Chapter 3; Chapter 4, Section 4.3.2**)) and the forest services are working with the pattern observed at the beginning of the 21st century (**Chapter 4, Box 4.3).** While some climate hazards become more frequent (**Chapter**

	3, Section 3.3), timely adaptation measures help reduce the associated risks for most, although poor and disadvantaged groups continue to experience high climate risks to their livelihoods and wellbeing (**Chapter 5, Section 5.3.1; Cross-Chapter Box 12 in chapter 5; Chapter 3, Boxes 3.4 and 3.5; Cross-Chapter Box 6 in Chapter 3**). Summer sea ice has not completely disappeared from the Arctic (**3.4.4.7**) and coral reefs having been driven to a low level (10-30% of levels in 2018) have partially recovered after extensive dieback by 2100 **(Chapter 3, Section 3.4.4.10 and Box 3.4)**. The Earth system, while warmer, is still recognizable compared to the 2000s and no major tipping points are reached **(Chapter 3, Section 3.5.2.5)**. Crop yields remain relatively stable **(Chapter 3, Section 3.4)**. Aggregate economic damage of climate change impacts is relatively small, although there are some local losses associated with extreme weather events **(Chapter 3, Section 3.5; Chapter 4)**. Human well-being remains overall similar to that in 2020 (**Chapter 5, Section 5.2.2**).
Scenario 2 [one possible storyline among mid-case scenarios]: **Mitigation: Delayed action (ambitious targets reached only after warmer decade in the 2020s due to internal climate variability), overshoot at 2°C, decrease towards 1.5°C afterward, with no efforts to minimize the land and water footprints of bioenergy.** **Internal climate variability: First, 10% worst-case outcome (2020s), then normal internal climate variability**	**The international community continues to largely support the Paris Agreement and agrees in 2020 on reduction targets for CO_2 emissions and time frames for net-zero emissions. However, these targets are not ambitious enough to reach stabilization at 2°C warming, let alone 1.5°C.** **In the 2020s, internal climate variability leads to higher warming than projected, in a reverse development to what happened in the so-called "hiatus" period of the 2000s.** Temperatures are regularly above 1.5°C warming although radiative forcing is consistent with a warming of 1.2°C or 1.3°C. Deadly heatwaves in major cities (Chicago, Kolkata, Beijing, Karachi, São Paulo), droughts in Southern Europe, South Africa and the Western Sahel, and major flooding in Asia, all intensified by the global and regional warming **(Chapter 3, Sections 3.3.1, 3.3.2, 3.3.3, 3.3.4 and 3.4.8; Chapter 4, Cross-Chapter Box 11 in Chapter 4**), lead to increasing levels of public unrest and political destabilization (**Chapter 5, Section 5.2.1**). An emergency global summit in 2025 moves to much more ambitious climate targets. Costs for rapidly phasing out fossil fuel use and infrastructure, while rapidly expanding renewables to reduce emissions, are much higher than in Scenario 1 due to a failure to support economic measures to drive the transition **(Chapter 4)**. Disruptive technologies become crucial to face up to the adaptation measures needed **(Chapter 4, Section 4.4.4)**. Temperature peaks at 2°C by the middle of the century before decreasing again due to intensive implementation of bioenergy plants with carbon capture and storage **(Chapter 2)**, without efforts to minimize the land and water footprint of the bioenergy production **(Cross-Chapter Box 7 in Chapter 3)**. Reaching 2˚C for several decades eliminates or severely damages key ecosystems such as coral reefs and tropical forests **(Chapter 3, Section 3.4)**. The elimination of coral reef ecosystems and the deterioration of their calcified frameworks, as well as serious losses of coastal ecosystems such as mangrove forests and seagrass beds **(Chapter 3, Box 3.4, Box 3.5, 3.4.4.10, 3.4.5)**, leads to much reduced levels of coastal defence from storms, winds and waves increases the vulnerability and risks facing communities in tropical and sub-tropical regions with consequences for many coastal communities **(Chapter 5, Cross-Chapter Box 12 in Chapter 5)** These impacts are being amplified by steadily rising sea levels **(Chapter 3, Section 3.3.9)** and intensifying storms **(Section 3.4.4.3)**. The intensive area required for the production of bioenergy combined with increasing water stress sets pressures on food prices

	(Cross-Chapter Box 6 in Chapter 3), driving elevated rates of food insecurity, hunger, and poverty **(Chapter 4, Section 4.3.2; Cross-Chaper Box 6 in Chapter 3; Cross-Chapter Box 11 in Chapter 4)**. Crop yields decline significantly in the tropics, leading to prolonged famines in some African countries **(Chapter 3, Section 3.4; Chapter 4 Section 4.3.2)**. Food trumps environment in terms of importance in most countries with the result that natural ecosystems decrease in abundance due to climate change as well as of land-use change **(Cross-Chapter Box 7 in Chapter 3)**. The ability to implement adaptive action to prevent the loss of ecosystems is frustrated under the circumstances and is consequently minimal **(Chapter 3, Section 3.4.4.10)**. Many natural ecosystems, in particular in the Mediterranean, are lost due to the combined effects of climate change and land use change, and extinction rates increase greatly **(Chapter 3, Section 3.4 and Box 3.2)**. By 2100, temperature has decreased but is still higher than 1.5°C, and the yields of some tropical crops are recovering **(Chapter 3, Section 3.4.3)**. Several of the remaining natural ecosystems experience irreversible climate-change related damages whilst others have been lost to land use change, with very rapid increases in the rate of species extinctions **(Chapter 3, Section 3.4; Cross-Chapter Box 7 in Chapter 3; Chapter 4, Cross-Chapter Box 11 in Chapter 4)**. Migration, forced displacement, and loss of identity are extensive in some countries, reversing some achievements in sustainable development and human security **(Chapter 5, Section 5.3.2)**. Aggregate economic impacts of climate change damage are small, but the loss in ecosystem services creates large economic losses **(Chapter 4, Sections 4.3.2 and 4.3.3)**. The health and well-being of people generally decrease from 2020, while the levels of poverty and disadvantage increase very significantly **(Chapter 5, Section 5.2.1)**.
Scenario 3 [one possible storyline among worst-case scenarios]: **Mitigation: Uncoordinated action, major actions late in the 21st century, 3°C warming in 2100.** **Internal climate variability: First unusual (ca. 10%) best-case scenario for one decade, then normal internal climate variability**	**In 2020, despite past pledges, the international support for the Paris Agreement starts to wane. In the years that follow, CO_2 emissions are reduced at local and national level but efforts are limited and not always successful.** **Radiative forcing increases and, due to chance, the most extreme events tend to happen in less populated regions thus not increasing global concerns.** Nonetheless, there are more frequent heatwaves in several cities and less snow in mountain resorts in the Alps, Rockies, and Andes **(Chapter 3, Section 3.3)**. 1.5°C warming is reached by 2030, but no major changes in policies occur. Starting with an intense El Niño-La Niña phase in the 2030s, several catastrophic years occur while global temperature warming starts to approach 2°C. There are major heatwaves on all continents, with deadly consequences in tropical regions and Asian megacities, especially for those ill-equipped for protecting themselves and their communities from the effects of extreme temperatures **(Chapter 3, Sections 3.3.1, 3.3.2 and 3.4.8)**. Droughts occur in regions bordering the Mediterranean Sea, Central North America, the Amazon region and southern Australia, some of which are due to natural variability and others to enhanced greenhouse forcing **(Chapter 3, Section 3.3.4; Chapter 4, Section 4.3.2; Cross-Chapter Box 11 in Chapter 4)**. Intense floodings occur in high-latitude and tropical regions, in particular in Asia, following increases in heavy precipitation events **(Chapter 3, Section 3.3.3)**. Major ecosystems (coral reefs, wetlands, forests) are destroyed over that period **(Chapter 3, Section 3.4)** with massive disruption to local livelihoods **(Chapter 5, Section 5.2.2 and Box 5.3; Cross-Chapter Box 12 in Chapter 5)**. An unprecedented drought leads to large impacts on the Amazon rain forest **(Chapter 3, Sections 3.3.4 and 3.4)**, which is also affected by deforestation **(Chapter 2)**. A hurricane with intense rainfall and

	associated with high storm surges **(Chapter 3, Section 3.3.6)** destroys a large part of Miami. A 2-year drought in the Great Plains and a concomitant drought in Eastern Europe and Russia decrease global crop production **(Chapter 3, Section 3.3.4)**, resulting in major increases in food prices and eroding food security. Poverty levels increase to a very large scale and risk and incidence of starvation increase very significantly as food stores dwindle in most countries; human health suffers (**Chapter 3, Section 3.4.6.1; Chapter 4, Sections 4.3.2 and 4.4.3; Chapter 5, Section 5.2.1**). There are high levels of public unrest and political destabilization due to the increasing climatic pressures, resulting in some countries becoming dysfunctional (**Chapter 4, Sections 4.4.1 and 4.4.2**). The main countries responsible for the CO_2 emissions design rapidly conceived mitigation plans and try to install plants for carbon capture and storage, in some cases without sufficient prior testing (**Chapter 4, Section 4.3.6**). Massive investments in renewable energy often happen too late and are uncoordinated; energy prices soar as a result of the high demand and lack of infrastructure. In some cases, demand cannot be met, leading to further delays. Some countries propose to consider sulphate-aerosol based SRM (**Chapter 4, Section 4.3.8**), however intensive international negotiations on the topic take substantial time and are inconclusive, because of overwhelming concerns about potential impacts to monsoon rainfall and risks in case of termination **(Cross-Chapter Box 10 in Chapter 5)**. Global and regional temperatures continue to strongly increase while mitigation solutions are being developed and implemented. Global mean warming reaches 3°C by 2100 but is not yet stabilized despite major decreases in yearly CO_2 emissions, as a net-zero CO_2 emissions budget could not yet be achieved and because of the long life-time of CO_2 concentrations **(Chapters 1, 2 and 3)**. The world as it was in 2020 is no longer recognizable, with decreasing life expectancy, reduced outdoor labour productivity, and lower quality of life in many regions because of too frequent heatwaves and other climate extremes (**Chapter 4, Section 4.3.3**). Droughts and water resources stress renders agriculture economically un-viable in some regions **(Chapter 3, Section 3.4; Chapter 4, Section 4.3.2)** and contributes to increases in poverty **(Chapter 5, Section 5.2.1; Cross-Chapter Box 12 in Chapter 5)**. Progress on the sustainable development goals is largely undone and poverty rates reach new highs **(Chapter 5, Section 5.2.3)**. Major conflicts take place **(Chapter 3, Section 3.4.9.6; Chapter 5, Section 5.2.1)**. Almost all ecosystems experience irreversible impacts, species extinction rates are high in all regions, forest fires escalate, and biodiversity strongly decreases, resulting in extensive losses to ecosystem services. These losses exacerbate poverty and reduce quality of life **(Chapter 3, Section 3.4; Chapter 4, Section 4.3.2)**. Life, for many indigenous and rural groups, becomes untenable in their ancestral lands **(Chapter 4, Box 4.3; Chapter 5, Cross-Chapter Box 12 in Chapter 5)**. The retreat of the West Antarctic ice sheet accelerates **(Chapter 3, Sections 3.3 and 3.6)**, leading to more rapid SLR **(Chapter 3, Section 3.3.9; Chapter 4, Section 4.3.2)**. Several small island states give up hope to survive in their place and look to an increasingly fragmented global community for refuge **(Chapter 3, Box 3.5; Chapter 5, Cross-Chapter Box 12 in Chapter 5)**. Aggregate economic damages are substantial owing to the combined effects of climate changes, political instability, and losses of ecosystem services **(Chapter 4, Sections 4.4.1 and 4.4.2; Chapter 3, Box 3.6 and Section 3.5.2.4)**. The general health and well-being of people substantially decreased compared to the conditions in 2020 and continues to worsen over the following decades (**Chapter 5, Section 5.2.3**).