

1 Introduction

2
3 This Synthesis Report (SYR) brings forward the main findings of the 5th Assessment Report (AR5) of the
4 Intergovernmental Panel on Climate Change (IPCC). The report integrates the key findings of the Working
5 Group contributions: The Physical Science Basis (Working Group I), Impacts, Adaptation and Vulnerability
6 (Working group II), and Mitigation of Climate Change (Working Group III). In addition, the two Special
7 Reports (Special Report on Extreme Events) and Special Report on Renewable Energy) serve as a source.
8 The Synthesis Report combines observations and understanding climate change, future projections and
9 consequences for humanity and ecosystems. It provides options to cope with climate change by adaptation
10 and mitigation and gives scientific information related to the long term objective of the UN Framework
11 Convention on Climate Change (Article 2).

12
13 Human interference with the climate system is occurring, and climate change poses risks for human and
14 natural systems. This report assesses all aspects of climate change and provides information to support
15 decision making in this field. Climate change will alter human and natural systems, and responding to it
16 involves issues of equity, justice, and fairness, requiring collective action at the global scale.

17
18 Some of these risks will be limited to a particular sector or region, and others will have cascading effects
19 across natural and economic systems. The IPCC's Fifth Assessment Report (AR5) evaluates the changing
20 climate, the shifting patterns of risks and potential benefits, and opportunities for reducing risks through
21 mitigation and adaptation.

22
23 The challenges presented by climate change involve many uncertainties. Because there is a wide range of
24 possible outcomes, responding to climate change involves managing risks. Despite the challenges, there are
25 many opportunities for reducing the risks related to climate change and for capitalizing on synergies with
26 other social, economic, and development objectives.

27
28 Near-term choices affect the risks of climate change throughout the 21st century. Societal responses,
29 particularly adaptation actions, will influence near-term outcomes. In the second half of the 21st century and
30 beyond, levels of climate change increasingly diverge across emission scenarios. Near-term and longer-term
31 mitigation and adaptation, interacting with many aspects of social, economic, and technological
32 development, will determine the risks of climate change over this timeframe.

33
34 Treatment of uncertainties and risks is important in all Topics of this report. Therefore, the context of these
35 notions is explained in Box Introduction.1.

36 **Box Introduction.1: Risk and uncertainty associated with future climate change**

37
38 As for many other complex phenomena, our understanding of climate change and its effects is subject to
39 uncertainty. 'Uncertainty' refers to a state of incomplete knowledge, which may even be irreducible in some
40 cases. Uncertainty can result from a lack of information or from disagreement about what is known.

41
42
43 Uncertainty about past and future climate changes arises from insufficient or imperfect measurements (of
44 atmospheric and ocean temperatures, for example) and our limited ability to understand and model many
45 features of the climate system, including the central role of human behavior and the impact of climate change
46 on a wide range of natural and human-managed systems. Several types of uncertainty discussed in this report
47 are important in evaluating model projections of climate responses and their associated impacts, arising from
48 emissions of greenhouse gas and other forcing agents.

49
50 Uncertainty about future emissions is caused by our limited ability to predict factors that underlie those
51 emissions, including future climate policies toward mitigation and adaptation. Uncertainties in emissions
52 scenarios are related to our limited knowledge of future economic output and population growth, the
53 development and deployment of technologies, the likelihood with which regulations will be enacted and
54 enforced over the lifetime of firms' investments, and the impact of these uncertainties on the choices of
55 mitigation and adaptation measures made by key decision makers. {WGIII:2.3.1}

1 Climate change exposes humans, societies, economic sectors, and ecosystems to risk. Risk is also created by
2 policies that aim to mitigate climate change or adapt to it. For example, policies which induce conversion of
3 land from cultivation of crops for food to crops for energy production bear risks for ecosystems. ‘Risk’ refers
4 to the potential, when the outcome is uncertain, for adverse effects on lives, livelihoods, health status, assets
5 (economic, social and cultural), environmental and other services, infrastructure and ecosystems. Both risk
6 and uncertainty may be understood qualitatively or quantitatively. {WGII: 1.1.2; 19.3; WGIII 2.1}

7
8 The risk from an event may be measured by the ‘expected value’ of resulting harm, which is defined as the
9 event’s probability multiplied by the value of the harm that will result from it. To assess a risk defined in this
10 way, the probability must be estimated, and a value attached to the resulting harm. For a quantitative
11 example, it is estimated that without protection, 72 million people would be displaced due to land loss from
12 submergence and erosion assuming global mean sea level increases by 0.5m by 2100. {WGII: 5.4} Such a
13 sea level rise is *likely* (17-83% probability, WGI fig. SPM.9) under any RCP. So the expected value of harm
14 is between 12M and 60M people displaced. For a qualitative example, it is *more likely than not* that tropical
15 cyclone activity in the Western North Pacific and North Atlantic will increase over the 21st century. Thus the
16 risk from more intense tropical cyclones to human life and wellbeing, to economic value, and to nature
17 increases. In other cases, the value of the resulting harm may take into account its distribution across people
18 and countries. To the extent that likelihood and outcomes are based on personal knowledge or perception that
19 an individual has about a given situation, risk is subjective. {WGI: Table SPM.1; WGII:19.1; WGIII:2.4}

20
21 Measuring risk by expected value as mentioned above shows that unlikely events may be more important to
22 decision-making than likely events if their consequences are extremely harmful. Concentrating solely on
23 likely events may therefore miss possibilities that are critical in designing policy. Comprehensive risk
24 management takes into account the full range of events, including unlikely ones.

25 For example, the collapse of a substantial part of the Antarctic ice sheet is *unlikely* in this century but the
26 consequences would be very severe. Accordingly, the probability of such an event is taken into account in
27 assessing risk associated with sea level rise. {WGIII: Box 3.8.1; WGI: 13.4; WGII: 19.6}

28
29 Comprehensive risk management described in this report recognizes the importance of linking formal
30 approaches with descriptive models of choice that encompass a variety of psychological, cultural, and social
31 assumptions and biases, on the part of both laypeople and experts. This may be an iterative process. Even
32 when only qualitative judgments are possible, the concept of risk as the product of likelihood and
33 consequence is useful as a tool with which to organize ideas and identify opportunities for managing or
34 ameliorating risk. {WGII: 2.4; 2.5}

35
36 The *Guidance Note on Uncertainty* provides a detailed explanation of the language used to describe
37 uncertainty in a consistent manner throughout the AR5. {WGI: SPM, WGII: SPM, WGIII:2.1} The
38 uncertainty language in the SYR is identical to those of the Working Group Reports and consists of the terms
39 ‘evidence’, ‘agreement’, ‘confidence’ and ‘(un)likely’. The terms to describe evidence are: *limited*, *medium*,
40 or *robust*; and agreement: *low*, *medium*, or *high*. Confidence in the validity of a finding synthesizes the
41 evaluation of evidence and agreement. Levels of confidence include five qualifiers: *very low*, *low*, *medium*,
42 *high*, and *very high*. The likelihood, or probability, of some well-defined outcome having occurred or
43 occurring in the future can be described quantitatively through the following terms: *virtually certain*, 99–
44 100% probability; *extremely likely*, 95–100%; *very likely*, 90–100%; *likely*, 66–100%; *more likely than not*,
45 >50–100%; *about as likely as not*, 33–66%; *unlikely*, 0–33%; *very unlikely*, 0–10%; *extremely unlikely*, 0–
46 5%; and *exceptionally unlikely*, 0–1%. Unless otherwise indicated, findings assigned a likelihood term are
47 associated with *high* or *very high* confidence. Where certainty is highest, findings are formulated without
48 using uncertainty qualifiers. {WG II SPM}