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## **SIXTH ASSESSMENT REPORT (AR6) PRODUCTS**

### **Outline of the Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems**

(Prepared by the Scientific Steering Committee for the Scoping of the Special Report)

(Submitted by the Secretary of the IPCC)

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# Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

## Information note on the organization of the scoping meeting

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## 2. INTRODUCTION

At its 43rd Session (Nairobi, Kenya, 11 – 13 April 2016), the IPCC Panel decided to prepare a Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems.

In Paragraph 3 of Decision IPCC/XLIII-6 on the Sixth Assessment Report Products - Special Reports - the Panel decided “to prepare a Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. The scoping process may consider challenges and opportunities for both adaptation and mitigation”.

In Paragraph 2 of Decision IPCC/XLIII-7 on the Sixth Assessment Report Products – Strategic Planning – the Panel decided “to consider the outline of the Special Report on climate change, desertification, land degradation, sustainable land management, food security and greenhouse gas fluxes in terrestrial ecosystems at the 45th Session of the IPCC in 2017”.

Thereafter, the Chair of the IPCC established a Scientific Steering Committee (SSC), chaired by Mr Youba Sokona, IPCC Vice-Chair, to undertake the scoping of the Special Report under the joint scientific leadership of Working Groups I, II, III and the Task Force on Inventories (TFI) with support from the Working Group III Technical Support Unit (WGIII TSU). The SSC formed four sub-committees to progress its work covering: background documentation; participant selection; stakeholder consultation; and meeting design.

The Terms of Reference of the SSC, including its membership and membership of sub-committees, is provided in Annex I.

## 3. CALL FOR NOMINATIONS

A call for nominations was issued to IPCC Member States and Observer Organizations on 5 September 2016 by the IPCC Secretariat. Experts were sought to collectively cover the following topics, areas of expertise, climate change perspectives and regional perspectives:

Topics covered by the Report

- Desertification
- Other aspects of land degradation
- Sustainable land management
- Food security
- Greenhouse gas fluxes in terrestrial ecosystems

Areas of Expertise as applied to the topics covered by the report:

- Agricultural systems
- Agroclimatology and agrometeorology
- Biomass for energy generation and fuels
- Carbon cycle and other biogeochemical cycles
- Climate observations and projections
- Demand-side management
- Detection and attribution
- Eremology

- Food systems
- Land economy
- Land-atmosphere interactions and biogeophysics
- Monitoring and reporting of information relating to AFOLU inventories
- Nutrition and nutrition-related health, food quality and access
- Plant and animal physiology
- Rangeland management
- Rural development and livelihoods
- Soil science
- Sustainable consumption
- Urban and forestry aspects of sustainable land management
- Water and biodiversity in relation to land-uses within the scope of the report

#### Climate Change Perspectives:

- Contribution to climate change drivers
- Climate change impacts
- Climate change adaptation options
- Climate change mitigation options
- Adaptation and mitigation interactions

#### Regional Expertise

- WMO Region I: Africa
- WMO Region II: Asia
- WMO Region III: South America
- WMO Region IV: North America, Central America and the Caribbean
- WMO Region V: South-West Pacific
- WMO Region VI: Europe

The call for nominations closed on 3 October 2016. 469 nominations were received from 64 member governments, 14 observer organisations and members of the IPCC Bureau. Consolidating for those individuals who were nominated by more than one source resulted in a total of 458 experts. Of the total nominations received, 75% were male and 25% were female. 50% of nominated experts were from developed countries and 50% from developing countries or countries with economies in transition (based on nominees self-declared citizenship). 69 participants were selected for the final list which together with the 31 Bureau Members who planned to attend resulted in 100 invitees in total.

## 4. PARTICIPANT SELECTION

A selection process, based on IPCC procedures, was agreed upon by WGI, WGII, WGIII and Task Force Bureau (TFB) Co-Chairs. The SSC for the scoping of the Special Report facilitated a sequential process whereby the Working Group Bureau Members proposed suitable invitees ensuring an appropriate balance of expertise and regional representation and ensuring IPCC balance criteria were met. The final list of proposed participants was presented to, and agreed by, the Bureau Members of all three Working Groups and the TFB Co-Chairs on 23 November 2016. Invitations were extended on 2 December 2016. The process is documented in detail in Annex II, with a summary of key statistics for each stage of the process. Following consultation meetings with stakeholder organisations, the decision was made to invite representative experts from two major stakeholders: the United Nations

Convention to Combat Desertification (UNCCD) and United Nations Framework Convention on Climate Change (UNFCCC). This decision was agreed by the SSC on 16 January 2017 and two additional experts were included in the final participant list.

An analysis of the composition of the list of invited participants is provided in Annex II. The list of participants, together with the Bureau Members, IPCC Secretariat and WGIII TSU staff and others present at the meeting, is provided in Annex V.

## 5. BACKGROUND DOCUMENT

The SSC produced a Background Document ahead of the Scoping Meeting, to provide a summary of the available knowledge from previous IPCC reports and other relevant sources. The main objective of the Background Document was to highlight scientific advances since the Fifth Assessment Report (AR5) and stimulate informed discussions at the Scoping Meeting. The document is available on the Special Report webpage: <https://www.ipcc.ch/report/sr2/>.

The Background Document first provided contextual information about the Panel decision to produce a Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. This was followed by a summary of scientific issues and key findings from previous IPCC assessments surrounding these topics. The Background Document also summarised key insights from previous non-IPCC UN Intergovernmental processes under other Conventions, such as the UNCCD, the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES), and the Intergovernmental Technical Panel on Soils (ITPS). This was followed by a summary of key knowledge gaps and issues that have become more prominent since AR5. Interactions were noted between the various topics to be addressed in this report. The document also identified potential links between the Special Report and the UN Sustainable Development Goals.

## 6. STAKEHOLDER CONSULTATION

Consultation with governments and stakeholders comprised a questionnaire circulated to all Focal Points and Observer Organisations and in depth discussion with three key international stakeholder bodies: IPBES), UNCCD and the Food and Agriculture Organisation of the United Nations (FAO). A report summarising the results of both the questionnaire and in-depth discussion was compiled by WGIII TSU and provided to participants in advance of the Dublin Scoping Meeting.

### 6.1 Questionnaire

The SSC stakeholder consultation sub-committee together with WGIII TSU prepared a questionnaire to solicit views on the content and structure of the Special Report. The intention was that this would complement the information included in the original proposals. The questionnaire was circulated to all IPCC Focal Points and Observer Organisations on 27 October 2016 with the request that they consult widely in preparation of their response. The closing date for responses was 25 November 2016, at which point 60 responses had been received with somewhat patchy regional representation. At the sub-committee's suggestion the closing date was extended to the 13 January 2017, and a reminder to complete the questionnaire was issued by the IPCC Secretariat. By the extended closing date a total of 94 responses had been received and regional representation was much improved.

## 6.2 Discussions with key stakeholders

In addition to the questionnaire, the SSC held in-depth discussions with representatives of IPBES, UNCCD and FAO. Each consultation was carried out through a WebEx conference of up to two hours involving representatives of the international bodies, scientists whom they had nominated, members of the SSC and members of the WGIII TSU. Summaries of these consultations were circulated to the WebEx meeting participants and where comments were received these were taken into account.

## 6.3 Insights from consultation

The full report is available on the Special Report webpage: <https://www.ipcc.ch/report/sr2/>. The key insights from the consultation are as follows:

- Respondents to the questionnaire hope the report will be of practical value informing how governments prioritise response options underpinning the implementation of the Paris Agreement.
  - UNCCD sees an opportunity to provide the scientific basis on which to initiate policies aligned with the 2016 UN Sustainable Development Goals (SDG).
  - FAO sees an opportunity to make a clear link to the Paris Agreement identifying trade-offs in Nationally Determined Contributions (NDCs) between different land uses.
  - IPBES sees an opportunity to examine interactions between climate and land degradation and highlight impacts and trade-offs of restorative actions such as afforestation.
- The highest priority questions identified by respondents include:
  - What are the drivers of desertification, land degradation, changes in GHG fluxes and food security? And how do they relate to climate change? FAO consultees see food security as the main driver for the report and a major gap in previous IPCC assessment; they made the case that institutions, markets, and policies could not be ignored and food security should be considered across the four dimensions: *availability, accessibility, utilization* and *stability*. IPBES, however, caution against turning the Special Report into an assessment of food security as they consider it too large a topic for this report.
  - How can land based mitigation and adaptation measures contribute to food security and resilience? IPBES consultees emphasised the need to assess the impacts of mitigation and adaptation actions that can affect both climate and outcomes such as biodiversity. UNCCD emphasised the need to assess how future climate could affect how sustainable land management practices are designed and implemented.
  - What response options are there? And which ones are cost effective?
  - What is the feedback between sustainable land management choices and impacts on desertification, land degradation, food security, and GHG fluxes?
  - What is the role of water management in tackling each of the areas in the special report?
  - What is the current state of land degradation, desertification, and food insecurity?
  - Other issues identified as important include: Innovation and technology deployment; metrics and accounting approaches; security and migration;

SDGs and poverty alleviation; the need to include indigenous knowledge; local and regional impacts; forests, cities, mountains and wetlands.

- Respondents consider the unique added value of this Special Report to be the opportunity to undertake a holistic and integrated assessment. The structure of AR6 is considered too rigid to examine inter-linkages effectively.
  - UNCCD, FAO and IPBES consultees were in agreement that the benefit of the report will only be realised if the five areas are discussed in an integrated fashion. UNCCD emphasised feedback loops between climate change and land management practices. FAO identified the opportunity to focus on the interrelationships between biophysical issues, food availability and changes to climate change, as well as interdependencies across regions. IPBES emphasised the interactions between land and climate change.
- There are divergent views on how the report should be structured. Around 30% of respondents consider the report should be organised around interlinkages between areas. Around 25% of respondents consider the report should be organised directly around the five areas identified in the IPCC mandate.
  - UNCCD suggested structuring the report around four perspectives: *drivers, impacts, opportunities, policy options*.
  - FAO suggested merging desertification and land degradation and structuring the report around three perspectives: *land degradation, GHG fluxes, food security*.
  - IPBES suggested structuring the report around three perspectives: i) climate change as a driver of land degradation (sustainable land management and desertification); ii) land degradation as a driver of climate change (physical processes); iii) dynamics of the coupled system (feedback and tipping points).
- There is a crowded landscape of other international reports being produced in parallel with the Special Report or recently published.
- There were no strong views expressed around the content of the Special Report compared to the content of AR6.

## 7. SCOPING MEETING

The Scoping Meeting for the Special Report was held in Dublin, Ireland, from 13 to 16 February 2017. The presentations and meeting documentation are available on the Scoping Meeting webpage (<http://www.ipcc.ch/report/sr2/>). The agenda is provided in Annex III.

Participants were invited to discuss all aspects of the scope, outline, and contents of the report. A pre-defined structure for the report was purposefully not provided to the participants. Instead a facilitated process was used which allowed an outline to emerge during the course of the meeting through a series of structured discussions (see Figure 1).

The SSC was mindful of the need to enable full participation of experts attending the Scoping Meeting and facilitating cross disciplinary engagement of all the areas within the mandate of the Special Report. It was also felt that the process should be informed by the experts. Therefore the agenda of the meeting was very flexible, with only day one fixed in terms of the structured format on the discussions. Regretably three IPCC Bureau members were unable to attend the meeting in person due to visa issues (see annex II). For these

individuals arrangements were made for remote participation in plenary sessions and SSC meetings.

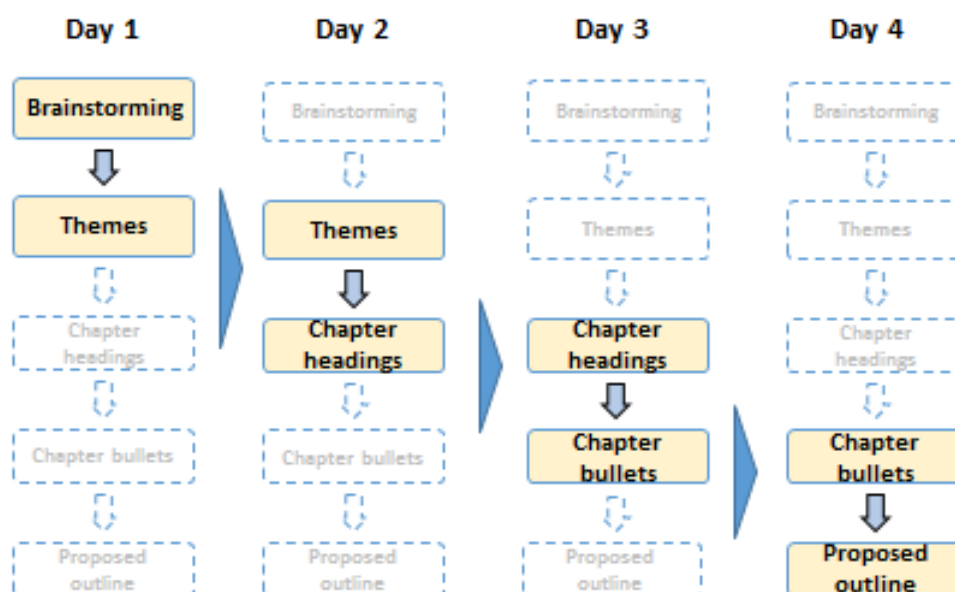


Figure 1. Meeting structure and progression

### 7.1 Scene setting presentations

At the opening of the plenary session the background, history and general assessment of the IPCC was introduced by Abdalah Mokssit (Secretary of the IPCC), while Jim Skea (WGIII Co-Chair) provided further background on how this Special Report came into existence and the aims of the Scoping Meeting. A summary of the key findings of the stakeholder consultation was presented by Raphael Slade (WGIII TSU Head of Science). A report from the FAO-IPCC Expert Meeting on Climate Change, Land Use and Food Security, which took place 23 - 25 January 2017, was delivered by Martial Bernoux (FAO).

Keynote presentation topics were selected by the SSC to provide a sample of the range of topics that could be covered by the Special Report. The keynote presentations were grouped (mostly in pairs) to provide various perspectives for each area. Ten minutes was allowed for each presentation, followed by five minutes discussion for each pair. The scene setting keynote presentations and presenters were comprised at follows:

- Presentation 1: Greenhouse Gas Fluxes in Terrestrial Ecosystems  
*Josep Canadell with co-authorship of Jean-François Soussana*
- Presentation 2: Food Security and Climate Change  
*John Porter and Cynthia Rosenzweig*
- Presentation 3: Land Degradation and Climate Change  
*Bob Scholes and Karen Seto*
- Presentation 4: Desertification and Climate Change  
*Alisher Mirzabaev and Sonia Seneviratne*



- Presentation 5: Cross-Cutting Issues  
Pete Smith

## 7.2 Break out groups and plenary sessions

Open exchange of ideas and detailed discussions of possible options for the content and structure of the report took place during four successive breakout group (BOG) sessions, each followed by a stocktaking session of reporting and discussion in plenary. BOG sessions were designed to progressively move from an initial phase of brainstorming on possible topics and questions to be addressed in the report, to discussion around a series of focused themes, and finally to the identification of possible chapter titles and bullets of indicative content. After each BOG all participants reconvened in a plenary to take stock of the ideas emerging from across the different groups, discuss and clarify key issues, identify commonalities emerging from the discussions, and highlight key challenges, gaps and overlaps.

### 7.2.1 Day one: brainstorming

An inclusive and cross-disciplinary engagement was enabled by means of two brainstorming BOG sessions. The first session was organised around facilitated discussions within small groups (approximately 10 people) where each group was asked to consider topics across all areas. In the second BOG session, the participants were invited to coalesce into 3 groups (approximately 30 people) to collate and consolidate the material from the first session and identify clusters and themes within the mandated areas of the report. The summary material from the BOGs was presented to Plenary at the end of the day (see Figure 2). The results were then used by the SSC to inform the structure of the agenda for day two.

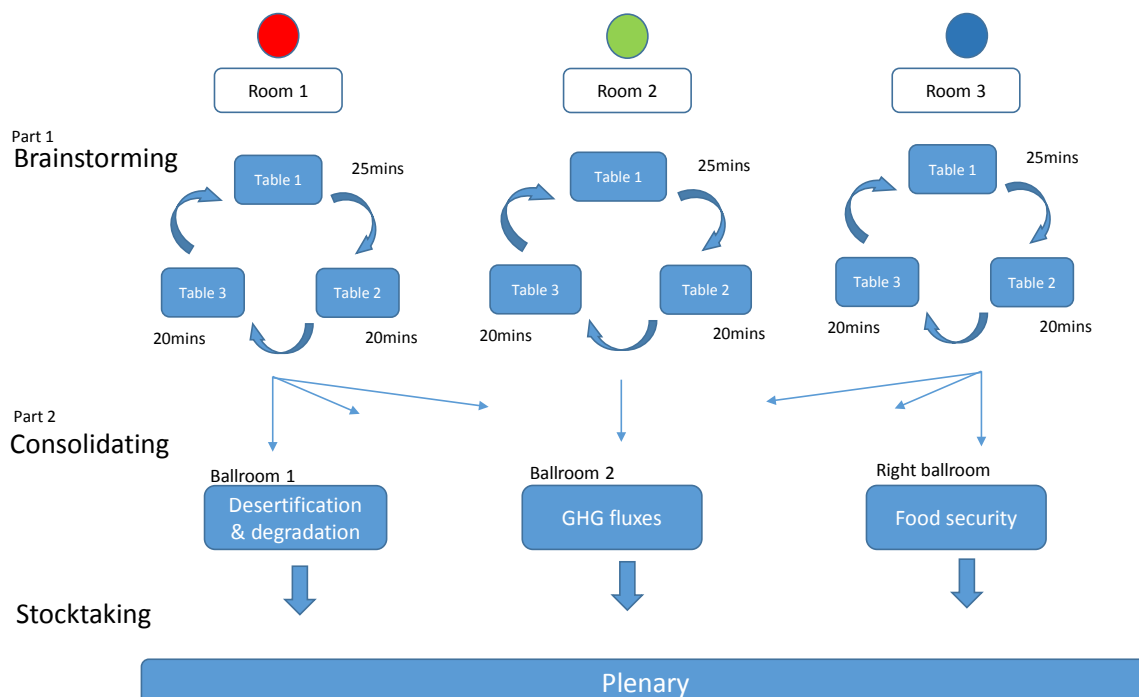


Figure 2: Day one breakout groups and brainstorming

### *7.2.2 Day two: clustering topics into themes*

Based on the deliberations of the SSC, day 2 was organised around the following six cross-cutting themes:

- Climate change impacts and response options in relation to SDGs (e.g. livelihoods, poverty, equity, socioeconomic impact, ecosystem services)
- Adaptation/mitigation interactions (synergies, trade-offs, co-benefits, side-effects)
- Competition for land, including negative emissions
- Coupled system dynamics: processes, scales
- Emergent risks (e.g. security, migration, ...)
- Governance, management, decision-making
- Water and soils

Participants were asked to self-select BOGs, each discussing one of the cross-cutting themes. The charge to each BOG was to identify the relevance of each cross-cutting theme to each of the five areas within the scope of the report, not only to the specific topics but also difference, commonalities and interactions across the five areas. All the BOGs reported back to plenary to further clarify the priority themes and topics, and provide pointers towards a structured approach for the report. Two key messages emerged:

- The Special Report must clearly be seen to address the diverse areas within the mandate
- The Special Report must address the linkages and interactions between these areas

### *7.2.3 Day three: structuring the themes into a coherent narrative and chapters*

Based on the work of the first two days of the meeting, the SSC proposed a hybrid structure for the report based on three cross-cutting chapters supporting three topic focussed chapters, which directly addressed specific areas in the mandate. The cross-cutting chapters were: introduction; impacts and process; emergent and cross cutting aspects. The topic focussed chapters were: desertification; land degradation; food security.

The participants were asked to consider this draft structure in BOGs that focused on each proposed chapter. As in the previous phase, this was an iterative processes involving feedback to the plenary and further BOG discussions, including cross chapter bilateral discussions as necessary. This enabled refinement of the potential content within each chapter and identification of the cross cutting topics and interlinkages. As a result of this discussion it was proposed that the third cross cutting chapter be split into two. At this point in the meeting the consensus was that the report should have seven chapters: 1 introduction; 2 impacts and process; 3 desertification; 4 land degradation; 5 food security, 6 interactions and linkages; 7 emergent risks.

The coordinators and rapporteurs of each of the chapter BOGs were invited to the SSC meeting at the end of day three to review the outcome. This also ensured that the SSC had clarity on what participants intended for inclusion in each chapter. The SSC then deliberated in preparation for day four, and developed a straw man outline for further discussion and deliberation.

### *7.2.4 Day four: report structure; chapter headings and bullets*

The final phase of the scoping exercise was to refine the topics and themes into a report outline, including chapter headings and bullets which would provide meaningful guidance to

authors of the Special Report. This phase took place in plenary, with consensus agreement on the text. The plenary considered the SSC recommendations on the potential number of pages for each chapter. It was agreed to recommend some flexibility in the number of pages within some chapters, but to recommend the maximum length of the Special Report [300 pages]. Additionally, participants unanimously supported the proposed title of the Special Report to be “Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems”.

## 8. ANNOTATED OUTLINE OF CHAPTERS

This section provides additional information on the Special Report outline, based on expert discussions reported throughout the Scoping Meeting, and particularly those discussions emerging during BOG III and the final plenary. The annotations are based on input material from the chairs and rapporteurs of BOG III groups lightly edited by the WG III TSU for consistency. The annotated material has been sent to the Scientific Steering Committee for comment. The annotations have not been sent to all attendees at the Scoping Meeting and may therefore not reflect the views of all participants.

### Chapter 1: Framing and context (~15 pages)

*Input from Anita Wreford and Jean-Francois Soussana*

- Socio-economic, biogeochemical, and biophysical interactions between climate change and desertification, land degradation, food security and GHG fluxes
- Land as a finite resource under climate change, current and additional demands
- The contribution of this report in relation to reports by IPCC and other relevant institutions
- Key concepts and definitions
- Treatment of uncertainties
- Integrated storyline of report, chapter narrative, sequence, linkages

Chapter 1 will frame the Special Report introducing key concepts and issues, identifying challenges related to the five elements of the report and interactions between the different elements.

The first bullet is intended to address interactions between the use and management of land resources (including, where appropriate, water resources). The assessment of interactions might include: drivers, impacts, associated climate feedbacks (e.g. GHG fluxes, albedo, aerosols); land climate dynamics and interactions including long-term climate change, climatic variability, the role of climate extremes and how they interact with land (e.g. degradation, land cover, implications for water fluxes; mutual linkages among drivers of land degradation-desertification, sustainable management, food security, climate change and policy responses). Also discussed were interactions between adaptation and mitigation; and implications for land use.

The second bullet is intended to address the additional and competing demands for land and the associated environmental pressures under climate change. This could include competition for land use due to socio-economic drivers providing incentives for land-use

change (e.g. population growth; changing market prices due to a range of factors including climate change impacts), impacts of land use change on adaptation and mitigation potentials and, conversely, implications of adaptation and mitigation responses (for instance bio-energy) on food and nutrition security and climate.

The third bullet signals that other related reports (for instance AR5, IPBES, FAO, UNCCCD, SR1.5, SROCC) are relevant. The broader policy context and ways of informing the implementation of the Paris Agreement might also be considered.

The fourth bullet indicates that key concepts and definitions may need to be introduced in order to help the reader; this would require careful cross-checking with the authors of the other chapters of the Special Report and ensure consistency. Examples of definitions that it may be appropriate to include are for instance: spatial scale (e.g. regions, biomes) and temporal scales (as related to land and climate processes).

The fifth bullet recognises that the treatment of uncertainties will require consideration in this report, within the framework of the overall IPCC uncertainty guidance. Limits to knowledge, for example uncertainties in observing systems and limitations to ability to measure change, e.g. soil observations could be discussed.

Finally, the chapter will require an outline of the narrative for the Special Report and an explanation of the logic of the proposed flow of chapters and their interlinkages.

## Chapter 2: Land–climate interactions (~50 pages)

*Input from Jo House, Roberto Sanchez Rodriguez and Elena Shevliakova*

- Climate change and variability that influence desertification, land degradation, food security, sustainable land management and greenhouse gas (GHG) fluxes in terrestrial ecosystems
- Terrestrial GHG fluxes and related stocks: methods, status, trends, projections, and drivers
- Biophysical and non-GHG feedbacks and forcings on climate
- Consequences for the climate system of land-based adaptation and mitigation options, including negative emissions

The first bullet covers a brief updated global assessment of past and projected changes in climate trends and variability, including extremes, which are pertinent to terrestrial ecosystems. This would build on AR5 to include updates in the literature.

Regional information critical to understanding the impacts on key biophysical and socio-ecological processes for the specific areas of interest to this report (including the identification of hot spot regions) might also be considered here. It is anticipated that this information will provide background and context for more detailed explanations in chapters 3, 4 and 5.

The second bullet addresses GHG fluxes and related stocks in both managed and unmanaged terrestrial ecosystems including the status, trends and projections of GHG fluxes with updates since AR5. Also in scope are the methodologies for Measuring,

Reporting and Verification of greenhouse gas fluxes and the importance of enhancing transparency in understanding and interpretation of GHG flux estimates.

This bullet includes drivers of changes in GHG fluxes including the interlinkages between socio-economic, political, cultural, ecological and biophysical processes. There is likely to be a focus on GHG fluxes related to desertification, degradation and food security with linkages to be expanded upon in other chapters of the report. Areas of new process understanding, including feedbacks such as CO<sub>2</sub> fertilisation, acclimation, water and nutrient limitation and soil processes may be considered in scope.

The third bullet focusses on the land-based, biophysical and other non-GHG feedbacks and climate forcings related to land use and land cover changes that will be an important aspect of this chapter. This could include hydrological processes (e.g. soil moisture limitation, irrigation), land surface characteristics (e.g. albedo and roughness), and aerosols (e.g. dust).

The final bullet addresses the consequential climate implications of current and projected land-based mitigation and adaptation options. It explores the multiple dimensions of land – climate interactions for specific areas of interest such as afforestation, negative emissions in the land sector, and the contribution of land to achieving net zero emissions, including potential socioeconomic, political and ethical dimensions.

### Chapter 3: Desertification (~35 - 40 pages)

*Input from Victor Castillo and Alisher Mirzabaev*

- The specific nature of desertification
- Status, current trends and future projections of desertification linked to climate change, globally and regionally
- Climatic and anthropogenic direct and indirect drivers of desertification
- Attribution: distinguishing between climatic- and human-induced changes
- Desertification feedbacks to climate, including sand and dust storms
- Climate-desertification interactions, including past observations and future projections
- Impacts of desertification on natural and human systems in a changing climate
- Technological, socio-economic and policy responses to desertification under a changing climate, including economic diversification, enabling conditions, co-benefits
- Hotspots and case-studies

The first bullet addresses the specific characteristics of desertification as affected by climate change. Desertification is a type of land degradation of drylands, therefore it is anticipated that Chapter 3 and Chapter 4 will be closely interrelated. Characteristics relevant to discuss could include water scarcity, high temporal climate variability, exposure to extremely hot temperatures, concentrations of poverty, importance of pastoral livelihoods and tipping points which may substantially affect desertification. The challenges of implementing measures to avoid, reduce or reverse desertification, through restoration and rehabilitation are also relevant.

The second bullet considers future projections of desertification and could involve the evaluation of different models/scenarios used for these projections including global and

regional scale analyses. For some areas climate change may, for instance, may be considered to have positive impacts regarding land use / land productivity.

The third bullet addresses climatic and human drivers of desertification, both direct and indirect. Examples of direct climatic drivers could include changes in mean and extreme temperatures, increases in CO<sub>2</sub>, precipitation, wind, as well as in sand and dust storms. Indirect climatic drivers could include soil erosion, salinization and loss of vegetation. It was considered important to maintain a strong focus on climate change and it is anticipated that the discussion on human drivers of desertification would be on those that may also be affected by climate change. It will be necessary to ensure the discussion complements and is consistent with Chapter 4.

The fourth bullet reflects debate about available evidence for distinguishing between climatic and human drivers of desertification including their relative roles in causing or reversing desertification. Given the context-specific nature of these interactions, a regional focus or specific examples may be warranted.

The fifth bullet considers the feedbacks of desertification on climatic change. Processes identified that it may be relevant to consider include sand and dust storms, aerosols, changes in surface albedo, and loss of carbon sinks.

The sixth bullet builds on the previous one and considers how climate change interacts with desertification and the role of past observations and future projections. This may include discussion of past climate change and desertification inter-linkages from paleo-climatic records. Global and regional scale analyses could provide a potential resource for this analysis. How climate change scenarios inform projections of desertification could also be discussed.

The seventh bullet focusses on feedback effects of desertification on natural and human systems. This could include impacts on ecosystems, including impacts on water, soil and soil carbon, vegetation cover, biodiversity, aerosols and dusts, and impacts on socio-ecological systems (for example, impacts on poverty, migration, food security and livelihoods). Desertification-induced land use and land cover changes under climate change and their impacts on GHG fluxes may also be relevant. This bullet has significance for other chapters, notably Chapter 4 on land degradation and Chapter 5 on food security.

The eighth bullet point addresses responses to desertification under a changing climate including the potential impact of global mitigation efforts on dry lands and potential boundary conditions for responses to desertification under climatic changes. The chapter might cover the potential and limits for both adaptation and mitigation responses, and their co-benefits. Responses may include technological, socio-economic and policy actions. Sustainable land management may be discussed in the context of technologies and land use practices, land use change, land restoration and land rehabilitation, protection of natural areas, water management, and livestock management. Socio-economic responses could also be pertinent, for example, economic diversification and mobility. Policy responses and enabling policy frameworks involving, for example, institutional frameworks relating to the security of property and land tenure, may also be relevant.

The ninth bullet identifies that it may be appropriate to highlight case studies and hotspots where climate change affects desertification and hotspots of situations where desertification affects regional climate. Such case studies may also identify effective response options.

## Chapter 4: Land degradation (~40 pages)

*Input from Mariam Akhtar-Schuster and Ian Noble*

- Processes that lead to degradation and their biophysical, socio-economic, and cultural drivers across multiple temporal and spatial scales
- Linkages and feedbacks between land degradation and climate change, and their effects on ecosystems and livelihoods
- Status, current trends and future projections of land degradation linked to climate change, globally and regionally
- Attribution: distinguishing between climatic- and human-induced changes
- Direct and indirect impacts of climate change on land degradation, land degradation on climate change, and reactive and proactive response options for key socio-ecological systems
- Impacts of land degradation on natural and human systems in a changing climate
- Integrated higher-level responses, e.g. sustainable land management (SLM) (where possible related to the sustainable development goals (SDGs), including considerations of cost, incentives and barriers
- Hotspots and case studies

Although the chapter title refers to an adverse change, it is anticipated that the chapter will discuss situations, processes and drivers which lead to both degradation and improvement of land. Reactive and proactive response options to combat land degradation in the context of climate change are expected to be an important component. This discussion is also relevant to a number of the Sustainable Development Goals (SDG). It should be noted that there are strong interrelationships between Chapter 3 and Chapter 4. The discussion of Land Degradation will also need to be consistent with the definitions provided in Chapter 1.

The first bullet focusses on the current understanding of processes that lead to land degradation (other than those discussed in Chapter 3) and the responses and options which can be deployed to address degradation. This could include a detailed exploration of processes which relate to climate change and consideration of processes that specifically lead to degradation and their drivers (e.g., soil-water-vegetation interactions, and social, economic and cultural drivers operating at multiple temporal and spatial scales). Other international bodies including UNCCD/SPI, IPBES, and the UNEP International Resources Panel have produced a body of relevant and complementary literature.

The second bullet explores linkages between climate change and land degradation including their effects on livelihoods and implications for sustainable land management (SLM). Both managed and natural (unmanaged) land, and associated ecosystem services and ecosystem functions, are in scope. Distinctions between managed and unmanaged land provides important reference points for the attribution of change.

The third bullet extends the discussion to include both global and regional scale analyses exploring how climate change scenarios inform projections of land degradation.

The fourth bullet addresses evidence and approaches for distinguishing between climatic- and human-induced change. The chapter may discuss resilience and tipping points in landscapes, in the context of climate projections. The chapter may also discuss means to monitor land degradation in the light of climate change.

The fifth bullet focusses on cause and effect relationships and processes and how these may relate to each other within a global framework of land degradation, and within the context of specific socio-ecological systems (e.g. forested land, wetlands, croplands, urban lands, rangelands and including landscape mosaics). Response options and effects could also be considered (e.g. land use change, land conversion and reversion).

The sixth bullet focusses on feedback effects of land degradation on natural and human systems. The evaluation of observed and projected impacts might include direct and indirect impacts of climate change on land use and cover; changes/loss in biodiversity and habitats; changes in land productivity or function, and associated processes affecting ecosystem services and livelihoods. Examples of direct impacts might include drying and droughts (with due regard to Chapter 3), phenological response to gradual changes in climate parameters, extreme events, variability and irregularity in monsoon cycles, and impacts on water resources. Examples of indirect impacts might include increased and changed seasonality of wildfires, and chronic stress on humans and ecosystems.

The seventh bullet focusses on direct and indirect changes in radiative forcing caused by land use and land cover change. Direct changes in radiative forcers might include losses of carbon stocks and change in land surface albedo. Indirect changes in radiative forcers might include expansion of cropping and grazing lands into forests. The chapter may also consider feedbacks of land degradation, and land management more generally, on climate, including discussion of possible adaptation and mitigation actions. Reactive and proactive response options including avoiding, reducing and reversing land degradation and their associated synergies and trade-offs in the context of integrated higher-level responses, e.g., sustainable land management are in scope. Considerations of costs, benefits, incentives and barriers, and the relationship to the SDGs may also be addressed.

The eighth bullet identifies that it may be appropriate to highlight case studies. For example to illustrate the efficacy of response options or to demonstrate instances where climate change is affecting land degradation (and vice versa).

## Chapter 5: Food Security (~50 pages)

*Input from John Porter and Cynthia Rosenzweig*

- Framing and Context: food and nutrition security (availability, access, utilization, stability), food system, farming systems including agroforestry, food-energy-water nexus, and the role of desertification and land degradation
- Status, current trends and future projections of food and nutrition security linked to climate change, globally and regionally
- Attribution: distinguishing between climatic- and human-induced changes
- Impacts of climate change on food and nutrition security, including food production, prices and livelihoods
- Impacts of food and nutrition security on climate change
- Responses in terms of adaptation considering the full range of options, and their use
- GHG mitigation responses and their influence on food and nutritional security
- Synergies and trade-offs between adaptation and mitigation (considering scales, linkages, and co-benefits), sustainable land management



- Consequences of measures to enhance food and nutrition security for adaptation and mitigation in a changing climate
- Hotspots and case-studies

Food and nutrition security is a large and complex topic, and the chapter is expected to maintain a strong focus on links to climate change. The chapter will consider livestock and crop systems, as well as forestry. Aquaculture and freshwater fisheries may be relevant in the context of the potential for land and water management options to result in environmental impacts. It is recommended that the authors should signpost the relationship of this chapter with other relevant reports as appropriate to ensure to avoid duplication of effort and ensure complementarity.

The first, second and third bullets emphasise how climate change is intercalated with the four dimensions of food security: availability, access, utilization, and stability.

The fourth bullet considers the direct and indirect impacts of climate change on food and nutrition security. Examples of impacts that may be relevant include extreme events (e.g., flooding, drought), yield and nutrient composition responses to different temperature, precipitation, and CO<sub>2</sub> regimes, and changing pests and diseases. Indirect impacts might include price shocks and restricted access to food in urban areas due to disruption of food production and supply chains.

The fifth bullet focusses on feedback mechanisms whereby options to maintain and enhance food security may impact on climate change. Net GHG emissions from agricultural practices, land use, non-GHG forcings, food system value chain including energy use and food demand, loss and waste may be relevant here.

The sixth bullet explores adaptation options and their use. Examples might include, farm and water management, community-based adaptation, safety networks, ecosystem-based adaptation, climate risk management, demand-side management, as well as the capacity development required to achieve them.

The seventh bullet focusses on the impact of mitigation options on food and nutritional security such as the impact of measures to reduce GHG emissions (including methane and N<sub>2</sub>O emissions), carbon sequestration and land-based mitigation (including competition for land), new technologies and demand-side measures (e.g., diet, food loss and waste), cost incentives and barriers.

The eighth bullet expands on the concept of sustainable land management in the context of climate change and food security. Sustainable land management means different things in different contexts. One way to address this may be to identify examples of synergies, trade-offs, side-effects or co-benefits associated with response options designed to maintain and enhance food and nutrition security in the context of climate change adaptation and mitigation.

The ninth bullet addresses actions to improve efficient production of higher-nutritional value food that may increase land availability for mitigation and adaptation.

Similarly to the two preceding chapters the tenth bullet identifies that it may be appropriate to highlight case studies.

## Chapter 6: Interlinkages and integrative response options (~40 pages)

*Input from Karen Seto and Cecile de Klein*

- Combined and interactive effects between desertification, land degradation, food security and GHG fluxes, and scenarios
- Synergies/trade-offs/side-effects/co-benefits between response options including sustainable land management
- Impacts of land-based mitigation options on land degradation, desertification, food security, and ecosystems and their services
- Impacts of land-based adaptation options on land degradation, desertification, food security, and ecosystems and their services
- Land-based negative emissions
- Adaptation-mitigation interactions and co-benefits
- Competition for land

The focus of Chapter six should be upon the cross cutting relationships arising from the issues discussed in the previous chapters, while taking care to avoid unnecessary duplication. It will also be important to maintain a focus on issues that relate to climate change and ensure the chapter is complementary to chapter 7.

The first bullet focusses on linkages and interdependencies, for instance the UNCCD defines desertification as one extreme on the spectrum of land degradation. Land degradation can lead to reduction in ecosystem productivity, with associated risk to food security. Similarly loss of soil carbon due to land degradation can lead to increased GHG emissions. It may be appropriate here to provide a quantitative assessment of the combined effects of desertification and land degradation on food security and GHG emissions.

The second bullet extends the discussion on the effects of response options identified in previous chapters (i.e. response options to address desertification, land degradation, food security and terrestrial GHG emissions) with respect to the potential knock-on impacts. The concept of sustainable land management in the context of multiple drivers and pressures is relevant here. It may be helpful to provide examples of synergies, trade-offs, side-effects or co-benefits associated with the implementation of response options. Case studies of observed examples may also be useful.

The third bullet focusses on the potential cross cutting impacts of land-based mitigation options on land degradation, desertification, food security, and ecosystems and their services which go beyond those discussed in the earlier chapters. For example, effects of GHG emissions reduction; increased carbon sequestration to soils; biomass and other carbon pools; surface/albedo modification. Mitigation options may be implemented on many land types and impacts on ecosystem services provided by land including biodiversity and water may also be considered.

The fourth bullet focusses on the potential cross cutting impacts of land-based adaptation options on land degradation, desertification, food security, and ecosystems and their services which go beyond those discussed in the earlier chapters. For example, the impact of river management to prevent flooding of urban areas may have downstream impact on agricultural land. It could be appropriate to consider the possible impact on the range of ecosystem services provided including biodiversity, water etc.

The fifth bullet recognises the importance of negative emission options in many mitigation scenarios and the relevance to policy of an integrative cross cutting assessment. Negative emissions options may affect many land types. Possible impacts on the range of ecosystem services provided (including biodiversity, water etc.) may be considered. Of particular relevance to this discussion will be the findings of the Special Report Global Warming of 1.5°C with respect to emissions and removals pathways.

The sixth bullet considers interactions between mitigation and adaptation options and potential co-benefits and trade-offs.

The seventh bullet builds on the overview of competition for land that will be presented in Chapter 1 envisaging that a more detailed assessment of the current and projected demands for land and the ecosystems services may be required. The role of sustainable land management could be further explored in this context. In addition, consideration could be given to the scale at which policy intervention can be effective to manage multiple and often competing demands for land and land based resources.

## Chapter 7: Emergent risks, decision making, and sustainable development (~40 pages)

*Input from John Morton and Margot Hurlbert*

- Emergent risks from interaction of climate change with desertification, land degradation, and food security
- Management responses to areas of substantive risk arising from climate change
- Synergies and trade-offs of response options that affect sustainable development and climate change adaptation and mitigation
- Governance, institutions and decision-making across multiple scales that advance adaptation and mitigation, in the context of desertification, land degradation, food security and sustainable land management

The first bullet focusses on the processes of conceptualising and identifying emergent and substantive risks within the context of the definition of emergent risk provided in the IPCC AR5 WG2 glossary. Important characteristics of emergent risks that might be considered include non-linear transitions as environmental processes exceed system tipping points, compounding risks from more than one environmental process, and the cascading of environmental risks into complex social processes. Such risks may arise from the interaction of climate change and processes arising in at least one (but perhaps more) of the domains of desertification, land degradation, and food insecurity. Other substantive areas of emergent risk that it may be relevant to discuss include the overwhelming of humanitarian systems, migration, and conflict resulting from degradation of natural resources. Specific examples, for instance multi-bread basket failure, might be covered in this chapter or Chapter 5, as although this risk relates specifically to food insecurity, the risk cascades from and compounds with risks linked to degradation, desertification, shared management and governance responses.

The second bullet focusses on management responses to the identified areas of substantive risk and emergent risk, with the scale of the risks making it likely that most responses will be at the level of regional, national or international policy, and policy instruments supporting management responses.

The third bullet further develops the theme of synergies and trade-offs between the responses identified in Chapters 3, 4 and 5 to the combined impacts of climate change, desertification, land degradation and food insecurity, and other policies, instruments, and processes that promote sustainable development should be discussed. A discussion of such synergies and responses with reference to the 17 SDGs may be useful here, but other, longer-term framings of sustainable development and promoting sustainable livelihoods could also be useful.

The fourth bullet focusses on the role of governance and formal and informal institutions in decision-making processes that promote sustainable development. There are multiple scales at which governance structures and decision-making processes may be assessed. Examples identified during the group discussion included global through to national, sub-national, community and individual, geographical scales and from the earth system through river basins, to field scale, and timescales from the immediate to the multi-decadal. There may also be governance and institutional pre-conditions for public or community participation in addressing environmental risks, for example as mentioned in Article 6 of the UNFCCC, the SDGs and the UNCCD.

## 9. NEXT STEPS AND TIMELINE

Subject to Panel approval, a call for nominations of Coordinating Lead Authors (CLAs), Lead Authors (LAs) and Review Editors (REs) will be issued after the 45th Session of the IPCC in March 2017. Approval and acceptance of the Special Report is planned for the 50th Session of the IPCC in September 2019. In order to achieve this, the timetable for the Special Report is as follows:

Call for author nominations	10 April – 21 May 2017
Selection of authors	9 July 2017
1 <sup>st</sup> Lead Author Meeting	9 - 13 October 2017
2 <sup>nd</sup> Lead Author Meeting	26 – 30 March 2018
First Order Draft Expert Review	4 June – 22 July 2018
3 <sup>rd</sup> Lead Author Meeting	3 - 7 September 2018
Second Order Draft Expert and Government Review	29 October - 23 December 2018
4th Lead Author Meeting	11 - 15 February 2019
Final Government Review of Summary for Policymakers (SPM)	22 April – 16 June 2019
IPCC acceptance/adoption/approval	2 - 8 September 2019

## ANNEX I: Steering Committee terms of reference

Scientific Steering Committee for the scoping of the Special Report on ‘Climate change and land use’<sup>1</sup>

### TERMS OF REFERENCE

#### Introduction

In Paragraph 3 of Decision IPCC/XLIII-6 on the Sixth Assessment Report Products - Special Reports - the Panel decided “to prepare a Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. The scoping process may consider challenges and opportunities for both adaptation and mitigation”.

In Paragraph 2 of Decision IPCC/XLIII-7 on the Sixth Assessment Report Products – Strategic Planning – the Panel decided “to consider the outline of the Special Report on climate change, desertification, land degradation, sustainable land management, food security and greenhouse gas fluxes in terrestrial ecosystems at the 45th Session of the IPCC in 2017”.

In Paragraph 1 of Decision IPCC/XLIII-10 on Communications for the Sixth Assessment Report (AR6) the Panel decided “to request the respective Working Group Bureau, or in the case of the Synthesis Report, the IPCC Chair, in preparing a Scoping Meeting:

- to engage with governments and a wide range of stakeholders in the scoping process, seek greater input from stakeholder groups in the scoping process, and identify, with the help of governments and observer organizations, audiences and stakeholders who can provide input;
- to consider different options to enable stakeholders to contribute to the scoping process, for instance through a call for submissions or other pre-scoping contacts;

The Special Report will be developed under the joint scientific leadership of Working Groups I, II, III and the Task Force on Inventories (TFI) with support from the Working Group III Technical Support Unit.

The Chair of the IPCC herein establishes a Scientific Steering Committee (SSC) to lead the scoping of the Special Report.

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<sup>1</sup> The term “Land use” is used to denote all of the elements covered in Paragraph 3 of Decision IPCC/XLIII-6 and is without prejudice to the final scope of the report decided by the Panel.

## Composition of the Scientific Steering Committee

### Chair of SSC

Youba Sokona (IPCC Vice-Chair)

### Members

Valerie Masson-Delmotte, WG-I Co-Chair

Hans Pörtner, WG-II Co-Chair

Debra Roberts, WG-II Co-Chair

PR Shukla, WG-III Co-Chair

Jim Skea, WG-III Co-Chair

Eduardo Calvo, TFI Co-Chair

Caroline Vera, WG-I Vice-Chair

Jan Fuglestad, WG-I Vice-Chair

Noureddine Yassaa, WG-I Vice-Chair

Mark Howden, WG-II Vice-Chair

Carlos Mendez, WG-II Vice-Chair

Taha Zadari, WG-II Vice-Chair

Sergey Semenov, WG-II Vice-Chair

Ramon Pichs-Madruga, WG-III Vice-Chair

Nagmeldin Goutbi Elhassan Mahmoud, WG-III Vice-Chair

Andy Reisinger, WG-III Vice-Chair

Diana Urge-Vorsatz, WG-III Vice-Chair

Cheikh Mbow (Senegal), Lead Author, WG-III AR5 AFOLU Chapter 11

Josep Canadell (Australia), Lead Author, WG-I AR5 Chapter 6

Pete Smith (UK), CLA, WG-III AR5 AFOLU Chapter 11

The Chair of the SSC may appoint a vice-chair in consultation with the WG-III Co-chairs. The Vice-chair will chair meetings in the absence of the Chair. The SSC may invite additional members after consultations with leading scientific bodies.

### Mandate

The role of the SSC is to support the convening of and reporting on the Scoping Meeting for the Special Report in accordance with paragraph 4.1 of Appendix A to the Principles Governing IPCC Work, "Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports".

The specific mandate of the SSC is as follows:

- To facilitate the process by which the IPCC Bureau<sup>1</sup> selects participants to be invited by the Secretariat to the Scoping Meeting.
- To prepare the draft agenda for the Scoping Meeting.
- To prepare the necessary documentation to inform the Scoping Meeting, taking into account different options to enable stakeholders to contribute to the scoping process, for instance through a call for submissions or other pre-scoping contacts.
- To prepare a document with the outcomes of the Scoping Meeting to be transmitted, through the Secretariat, to the 45th Session of the Panel for their consideration.

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<sup>1</sup> The IPCC principles refer to "relevant respective Working Group Bureau/Task Force Bureau". As the Special Report is under the scientific leadership of Working Groups I, II, III and the TFI, the selection will be made by the whole Bureau.

## Structure and membership of sub-committees

Four sub-committees of the SSC were established under the direction of the SSC Chair in consultation with the Vice-Chairs and WG-III co-chairs and taking into consideration interested expressed by SSC members. A summary of the tasks of each sub-committee, and their membership is detailed below.

### Sub-Committee on Background Documentation

The sub-committee was charged with producing a Background Document of not more than 20 pages for the Scoping Meeting, the purpose of which is to inform participants at the meeting and stimulate discussions leading to a proposed structure for the Special Report.

It was specified that the Background Document should, *inter alia*, include the following elements:

- The relevant context, including international agreements, prior IPCC activity and proposals for related Special Reports made by countries and IPCC observer organisations
- Key messages from previous IPCC reports
- Key messages from other international organisations with relevant expertise
- Emerging areas of science relevant to the topic of the Special Report
- The identification of key thematic areas and questions whose discussion at the Scoping Meeting will assist in the development of a proposed report structure

The composition of the sub-committee was as follows:

#### Chair

- Pete Smith (UK), CLA, WG-III AR5 AFOLU Chapter 11

#### Members

- Mark Howden, WG-II Vice-Chair
- Thelma Krug, IPCC Vice-Chair
- Valerie Masson-Delmotte, WG-I Co-Chair
- Cheikh Mbow (Senegal), Lead Author, WG-III AR5 AFOLU Chapter 11
- Andy Reisinger, WG-III Vice-Chair
- Hans Pörtner, WG-II Co-Chair

### Sub-Committee on Meeting Design

The sub-committee was charged with:

- Designing the structure and timetable of the Scoping Meeting based on a mixture of plenary sessions, breakout groups and other means of interaction;
- Identifying appropriate stages and milestones within the meeting with a view to ensuring that the objectives of the meeting, as specified in the Terms of Reference for the SSC, are met;
- Identifying speakers, chairs, facilitators and rapporteurs as required for individual sessions (in consultation with the sub-committee on Background Documentation).

The composition of the sub-committee was as follows:

#### Chair

- Carolina Vera, WG-I Vice-Chair

#### Members

- Ko Barrett, IPCC Vice-Chair
- Nagmeldin Goutbi Elhassan Mahmoud, WG-III Vice-Chair

- Carlos Mendez, WG-II Vice-Chair
- Sergey Semenov, WG-II Vice-Chair

#### Sub-Committee on Government and Stakeholder Consultation

The sub-committee was charged with:

- Identifying and recommending key scientific and other organisations and stakeholder groups to be consulted about the Special Report in terms of its coverage, content, length and other elements (FAQs, Technical Summary etc);
- Identifying and recommending appropriate methods of consultation (e.g. questionnaire, attending workshops, ad hoc interviews);
- Identifying and recommending appropriate opportunities for appropriate engagement and co-sponsorship of relevant meetings with other stakeholders;
- Implementing the consultation process in association with the WG-III TSU;
- Producing a report on the consultation for consideration by participants in the Scoping Meeting and to ensuring that relevant information is passed to the Sub-Committees on Background Document and Meeting Design and Organisation in a timely way.

The composition of the sub-committee was as follows:

##### Chair

- Taha Zatari, WG-II Vice-Chair

##### Members

- Jan Fuglestedt, WG-I Vice-Chair
- Nouredine Yassaa, WG-I Vice-Chair
- Ramon Pichs-Madruga, WG-III Vice-Chair
- Jim Skea, WG-III Co-Chair

#### Sub-Committee on Nominations

The sub-committee was charged with

- Determining a number of areas of expertise (including regional expertise), on the basis of the areas proposed by SSC members, in order to define the call for nominations for participants in the Scoping Meeting;
- Devising a method (developed upon previous Special Report experience) for selecting participants taking account of: the relevant range of scientific, technical and socio-economic expertise and range of views as appropriate, geographical as well as representation within same region as appropriate; a mixture of experts with and without previous experience in IPCC; gender balance; the maximum capacity of the meeting; and the availability of IPCC Trust Funds to support developing country and economies in transition participation;
- Proposing an initial list of participants including reserve to be considered by the SSC and IPCC Bureaux;
- Adjusting the proposed list of participants in the light of comments from the SSC IPCC and Bureaux;
- Endorsing a report produced with support from the WG-III TSU documenting how the selection process has been conducted.



The composition of the sub-committee was as follows:

Chair

- Eduardo Calvo, TFI Co-Chair

Members

- Diana Urge-Vorsatz, WG-III Vice-Chair
- Panmao Zhai, WG-I Co-Chair
- Debra Roberts, WG-II Co-Chair
- PR Shukla, WG-III Co-Chair

Report on Scoping Meeting Participant Selection Process

Overview

Participants to the Scoping Meeting were selected following a process consistent with the IPCC policies and procedures. The selection process was undertaken by Bureau Members and the Scientific Steering Committee (SSC) for the Special Report.

The objective of the selection process was to select around 60 experts considering all criteria as stated in Appendix A of the Principles Governing IPCC Work:

*"In selecting scoping meeting participants, consideration should be given to the following criteria: scientific, technical and socio-economic expertise, including the range of views; geographical representation; a mixture of experts with and without previous experience in IPCC; gender balance; experts with a background from relevant stakeholder and user groups, including governments."*

Nominations for 458 experts were received, taking into account 11 experts who were nominated by more than one source. 69 participants were selected for the final list, taking into account expertise and all criteria as stated in Appendix A of the Principles Governing IPCC Work. Citizens coming from developing countries represented 50% of applications; women represented 25% of applications. 64 National Focal Points participated in the nomination process, nominating 383 experts from 63 citizenships; 75 experts from 33 different citizenships were nominated by 14 Observer Organisations.

Overview of selection process

The expert selection process occurred in three stages.

*Stage 1 – Evaluation of candidate's expertise*

All members of the IPCC Bureau were involved in identifying priority participants on the basis of their expertise.

*Stage 2 – Identification and filling major gaps*

The nominations sub-committee identified key gaps in expertise, regional representation, and gender balance, taking into account feedback from the SSC. The SSC agreed the criteria that should be used to fill the remaining places, and suitable candidates to fill these gaps were proposed by members of the nominations sub-committee and the SSC with support of WG III TSU.

*Stage 3 – Fine tuning and approval*

The penultimate list was circulated to the IPCC Bureau. Comments and feedback were used to further refine the list to take account of balance and expertise. The SSC adopted the final list unanimously on 23 November 2016, followed by approval from the IPCC Bureau.

Invitations were extended on 2 December 2016. The final list consisted of 48% developed country citizens and 52% citizens of developing countries or countries with economies in transition. 55% were male and 45% were female. In response to regrets received, an additional two experts from the reserve list were invited. Two additional experts from key

stakeholder organisations were included, including one from the UNFCCC and one from the UNCCD.

#### Invited participant list

In addition to the 69 invited experts, 31 Bureau Members were invited to participate in the Scoping Meeting. Of the total invited participants, 57% were from developing countries and countries with economies in transition, and 43% were from developed countries. 41 nationalities (citizenship) are represented. 26% of experts are citizens of countries that are not represented on the Bureau. Of these, 17 experts are citizens of countries not represented on the Bureau. When including Bureau Members, 46 nationalities (citizenship) were represented.

61% of invitees were male and 39% of invitees were female. 73% of participants had previous IPCC experience, while 27% were new to the IPCC. The break-down of invitees across a number of criteria is shown in Figures 1 through 5. Table 1 provides a break-down of invitees by country of citizenship.

Several of the invited participants were unable to attend due to visa difficulties. This issue had a particular effect on participation of experts from Africa, and three male SSC members were prevented from attending, including the Chair of the SSC. To enable their participation in the meeting to the maximum extent possible WebEx conference calls were set-up and provided during plenary discussions and SSC meetings. The full list of participants who attended the meeting is provided in Annex V.

Figure 1 : Percentage of participants from developed and developing countries (and economies in transition)

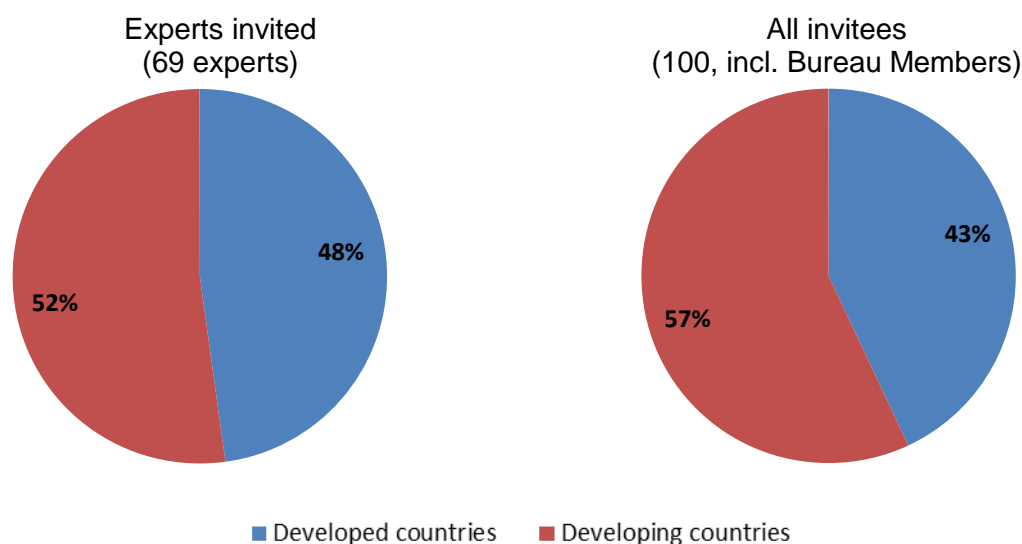


Figure 2: Distribution of participants across WMO Regions (based on citizenship)

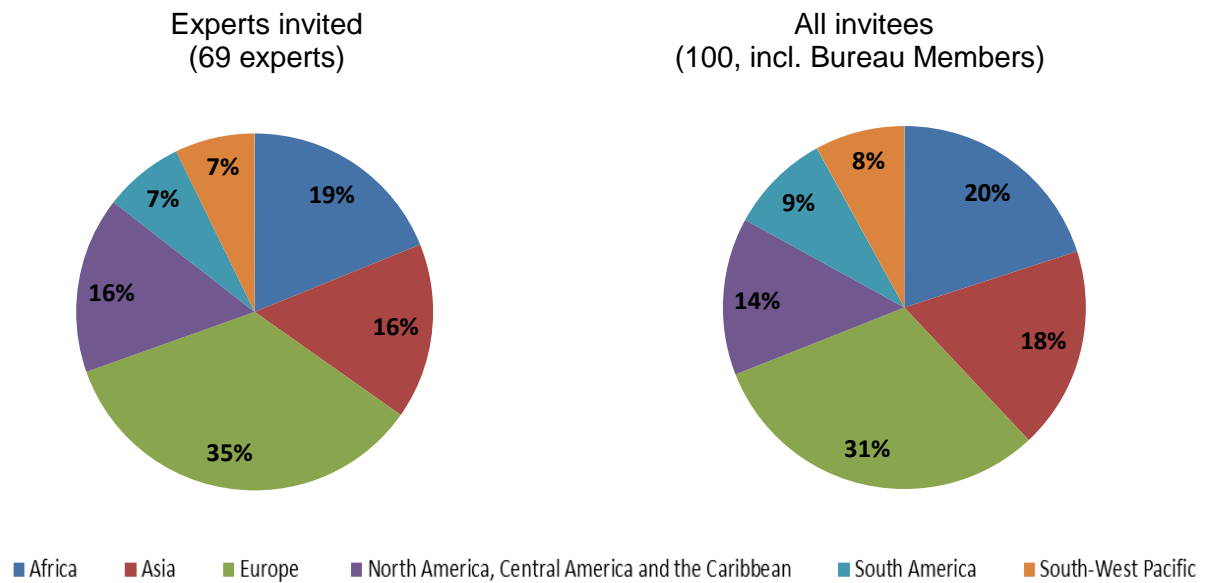


Figure 3: Gender balance of participants

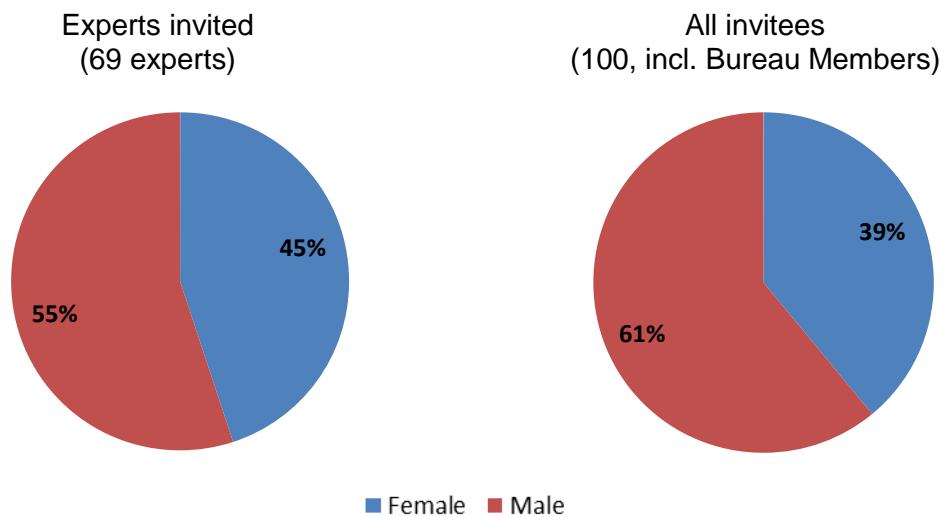


Figure 4: Nomination Source

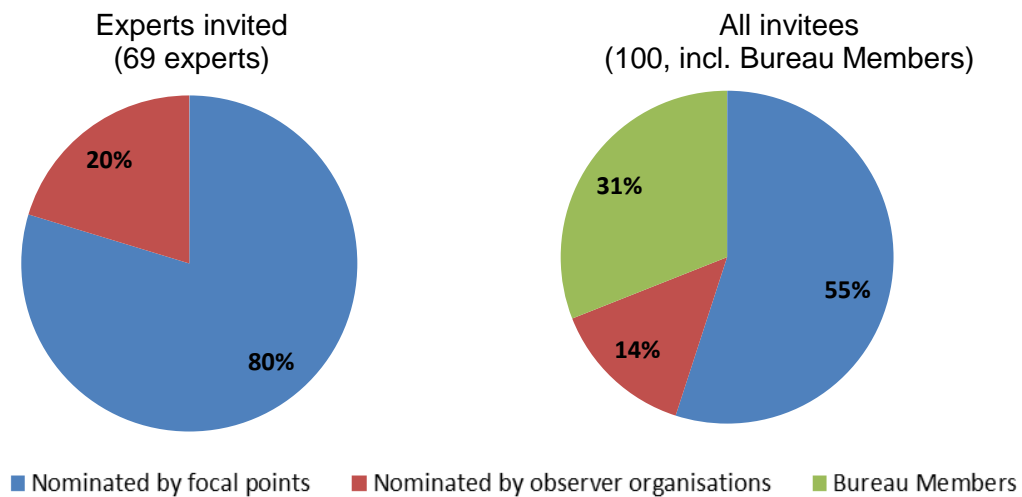


Figure 5: IPCC Experience

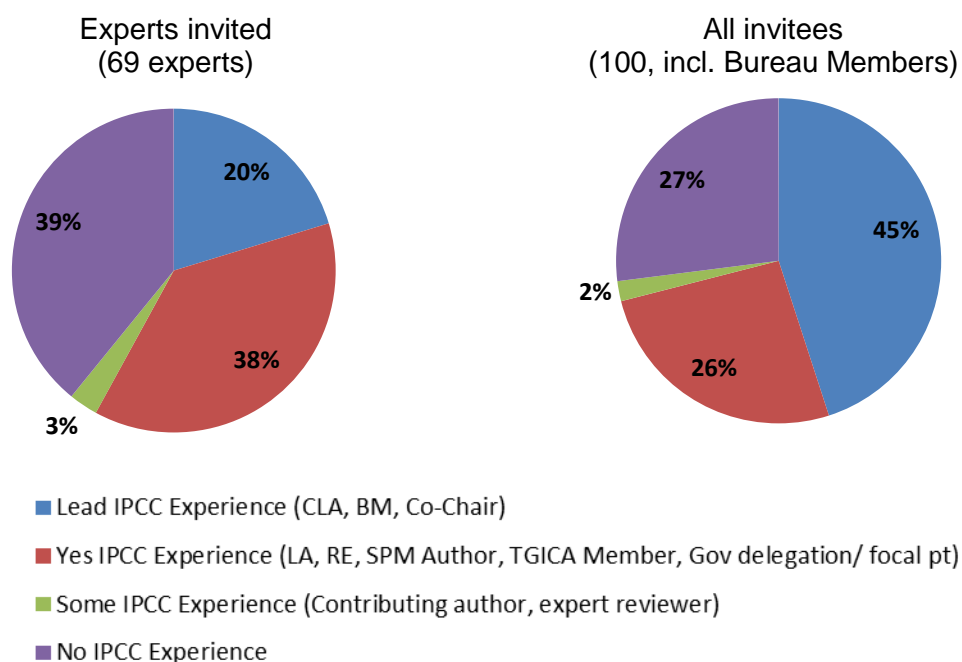


Table 1: Regional distribution (citizenship) of Scoping Meeting participants

Country (citizenship)	Experts Selected (69 Experts)	Total Participants (100, incl. Bureau Members)
Algeria	1	2
Argentina	0	1
Australia	2	3
Belgium	1	1
Brazil	3	4
Canada	2	2
Chile	1	1
China	3	4
Costa Rica	1	1
Cuba	1	2
Ecuador	1	1
Egypt	2	2
Ethiopia	0	1
France	3	4
Germany	3	4
Ghana	1	1
Hungary	1	2
India	3	4
Indonesia	1	2
Ireland	1	1
Italy	2	2
Japan	1	2
Kenya	1	1
Malaysia	0	1

Country (citizenship)	Experts Selected (69 Experts)	Total Participants (100, incl. Bureau Members)
Maldives	1	2
Mali	0	1
Mexico	0	1
Morocco	2	3
Nepal	1	1
Netherlands	1	1
New Zealand	2	3
Norway	1	2
Pakistan	0	1
Peru	0	1
Russian Federation	2	3
Saudi Arabia	0	1
Senegal	1	1
Serbia	1	1
South Africa	2	3
Sudan	2	3
Sweden	1	1
Switzerland	1	2
Thailand	1	1
Turkey	1	1
Uganda	1	1
UK	4	5
Ukraine	1	1
United Republic of Tanzania	0	1
USA	7	8
Uzbekistan	1	1
Venezuela	0	1

## ANNEX III: Scoping meeting programme

## Scoping Meeting Programme

Monday, 13 February 2017

08:00	Meeting Registration (Conference Centre lobby)	
09:00	Opening Ceremony (Plenary room)	Chair: Thelma Krug
09:00	Welcome Remarks	
	<ul style="list-style-type: none"> <li>• Hoesung Lee, IPCC Chair</li> <li>• Laura Burke, Director General of the Environmental Protection Agency</li> <li>• Bill Callanan, Chief Inspector of the Department of Agriculture, Food and the Marine</li> </ul>	
09:30	IPCC Report Process	Abdalah Mokssit
09:45	<i>Short Break</i>	
09:55	Plenary Session 1 (Plenary room)	Chair: Andy Reisinger
09:55	Introductory presentation	Jim Skea
10:10	Greenhouse Gas Fluxes in Terrestrial Ecosystems	Josep Canadel
10:35	<i>Morning Break</i>	
11:05	Plenary Session 1 continued	Chair: Andy Reisinger
11:05	Food security and Climate Change	John Porter, Cynthia Rosenzweig
11:30	Land Degradation and Climate Change	Bob Scholes, Karen Seto
11:50	Desertification and Climate Change	Alisher Mirzabaev, Sonia Seneviratne
12:10	Cross-Cutting Issues	Pete Smith
12:15	Discussion	

12:45	<i>Lunch</i>	
14:15	Plenary Session 1 continued	Chair: Mahmoud Nagmeldin
14:15	Stakeholder Consultation & Questionnaire results	Raphael Slade
14:30	Report from FAO-IPCC expert meeting	Martial Bernoux
14:45	Introduction to Breakout Group Session 1	Carolina Vera
14:55	BOG1 Logistics	Lizzie Huntley
15:00	Breakout Group Session 1 (Part 1: Brainstorming topics)	
16:15	<i>Afternoon Break</i>	
16:45	Breakout Group Session 1 (Part 2: Clustering topics)	
16:45	Stocktaking Session 2 (Plenary room)	Chair: Thelma Krug
18:00	Presentations and discussion of BOG1 outcomes	
18:30	Adjourn	



Tuesday, 14 February 2017

09:00	Plenary Session 2 (Plenary room)	Chair: Mark Howden
09:00	Plenary Discussion of emerging themes	Andy Reisinger
09:45	Introduction to Breakout Group Session 2	Andy Reisinger
10:00	Breakout Group Session 2 - Themes	
11:00	<i>Morning Break</i>	
11:30	Breakout Group Session 2 – Themes continued	
12:30	<i>Lunch</i>	
14:00	Additional Welcome Remarks (Plenary Room)	Chair: Thelma Krug
	Welcome Remarks	
14:00	<ul style="list-style-type: none"><li>• Denis Naughten T.D, Minister for Communications, Climate Action and Environment</li></ul>	
14:15	Stocktaking Session 2 (Plenary room)	Chair: Eduardo Calvo
14:15	Presentations and discussion of BOG2 outcomes	
16:15	<i>Afternoon Break</i>	
16:15	Continuation of Plenary discussion	
18:15	Adjourn	
18:15	SSC Meeting - with BOG2 chairs	
19:30	Welcome Reception (An Bord Bia, The Food Board) Hosted by Michael Creed T.D, Minister for Agriculture Food and the Marine	

Wednesday, 15 February 2017

08:30	Plenary Session 3 (Plenary room)	Chair: Ramon Pichs-Madruga
08:30	Presentation of first-order report outline	Andy Reisinger
08:45	Discussion of first-order report outline	
09:20	Introduction to Breakout Group Session 3	Andy Reisinger
09:30	Breakout Group Session 3 – Chapter Bullets	
11:00	<i>Drop-in Morning Break</i>	
11:15	Breakout Group Session 3 – Chapter Bullets continued	
12:30	<i>Lunch</i>	
13.30	Stocktaking Session 3 (Plenary room)	Chair: Mahmoud Nagmeldin
13:30	Presentations of preliminary BOG3 outcomes	
14:00	Discussion of BOG3 outcomes	
15:15	Introduction to Breakout Group Session 4	
15:30	<i>Afternoon Break</i>	
16:00	Breakout Group Session 4 – Chapter Headings	
17:30	Stocktaking Session 4 (Plenary room)	Chair: Ko Barrett
18:30	Adjourn	

Thursday, 16 February 2017

09:00	Concluding Plenary (Plenary room)	Co-Chairs: Ko Barrett and Mahmoud Nagmeldin
09:00	Presentation of draft report outline	
10:30	<i>Morning Break</i>	
11:00	Concluding Plenary continued	Co-Chairs: Ko Barrett and Mahmoud Nagmeldin
11:00	Finalisation of the report outline	
12:30	<i>Lunch</i>	
14:00	Concluding Plenary continued	Co-Chairs: Ko Barrett and Mahmoud Nagmeldin
14:00	Discussion of structural issues	
15:30	Closing remarks	
16:00	End of Scoping Meeting	

## Proposed Outline of Chapters

Title: Climate Change and Land:

An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

### List of Contents

Front matter (2 pages)

Summary for Policy Makers (~10 pages)

Chapter 1: Framing and Context (~15 pages)

Chapter 2: Land-Climate Interactions (~50 pages)

Chapter 3: Desertification (~35-40 pages)

Chapter 4: Land Degradation (~40 pages)

Chapter 5: Food Security (~50 pages)

Chapter 6: Interlinkages and Integrative Response Options (~40 pages)

Chapter 7: Emergent Risks, Decision Making and Sustainable Development (~40 pages)

Case Studies, Frequently Asked Questions and Boxes (up to 20 pages)

Total: up to 300

### Chapter 1: Framing and Context

- Socio-economic, biogeochemical, and biophysical interactions between climate change and desertification, land degradation, food security and GHG fluxes
- Land as a finite resource under climate change, current and additional demands
- The contribution of this report in relation to reports by IPCC and other relevant institutions
- Key concepts and definitions
- Treatment of uncertainties
- Integrated storyline of report, chapter narrative, sequence, linkages

### Chapter 2: Land–Climate Interactions

- Climate change and variability that influence desertification, land degradation, food security, sustainable land management and GHG fluxes in terrestrial ecosystems
- Terrestrial GHG fluxes and related stocks: methods, status, trends, projections, and drivers
- Biophysical and non-GHG feedbacks and forcings on climate
- Consequences for the climate system of land-based adaptation and mitigation options, including negative emissions

### Chapter 3: Desertification

- The specific nature of desertification
- Status, current trends and future projections of desertification linked to climate change, globally and regionally
- Climatic and anthropogenic direct and indirect drivers of desertification
- Attribution: distinguishing between climatic- and human-induced changes
- Desertification feedbacks to climate, including sand and dust storms
- Climate-desertification interactions, including past observations and future projections
- Impacts of desertification on natural and human systems in a changing climate

- Technological, socio-economic and policy responses to desertification under a changing climate, including economic diversification, enabling conditions, co-benefits
- Hotspots and case-studies

#### Chapter 4: Land Degradation

- Processes that lead to degradation and their biophysical, socio-economic, and cultural drivers across multiple temporal and spatial scales
- Linkages and feedbacks between land degradation and climate change, and their effects on ecosystems and livelihoods
- Status, current trends and future projections of land degradation linked to climate change, globally and regionally
- Attribution: distinguishing between climatic- and human-induced changes
- Direct and indirect impacts of Climate Change on Land Degradation, Land Degradation on Climate Change, and reactive and proactive response options for key socio-ecological systems
- Impacts of land degradation on natural and human systems in a changing climate
- Integrated higher-level responses, e.g. SLM (where possible related to the SDGs), including considerations of cost, incentives and barriers
- Hotspots and case-studies

#### Chapter 5: Food Security

- Framing and Context: food and nutrition security (availability, access, utilization, stability), food system, farming systems including agroforestry, food-energy-water nexus, and the role of desertification and land degradation.
- Status, current trends and future projections of food and nutrition security linked to climate change, globally and regionally
- Attribution: distinguishing between climatic- and human-induced changes
- Impacts of climate change on food and nutrition security, including food production, prices and livelihoods
- Impacts of food and nutrition security on climate change
- Responses in terms of adaptation considering the full range of options, and their use
- GHG mitigation responses and their influence on food and nutritional security
- Synergies and trade-offs between adaptation and mitigation (considering scales, linkages, and co-benefits), sustainable land management
- Consequences of measures to enhance food and nutrition security for adaptation and mitigation in a changing climate
- Hotspots and case-studies

#### Chapter 6: Interlinkages and integrative response options)

- Combined and interactive effects between desertification, land degradation, food security and GHG fluxes, and scenarios
- Synergies/trade-offs/side-effects/co-benefits between response options including sustainable land management
- Impacts of land-based mitigation options on land degradation, desertification, food security, and ecosystems and their services
- Impacts of land-based adaptation options on land degradation, desertification, food security, and ecosystems and their services
- Land-based negative emissions
- Adaptation-mitigation interactions and co-benefits
- Competition for land

## Chapter 7: Emergent risks, decision making, and sustainable development

- Emergent risks from interaction of climate change with desertification, land degradation, and food security
- Management responses to areas of substantive risk arising from climate change
- Synergies and trade-offs of response options that affect sustainable development and climate change adaptation and mitigation
- Governance, institutions and decision-making across multiple scales that advance adaptation and mitigation, in the context of desertification, land degradation, food security and sustainable land management

## Annex V: Scoping meeting participants

### List of scoping meeting participants

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