

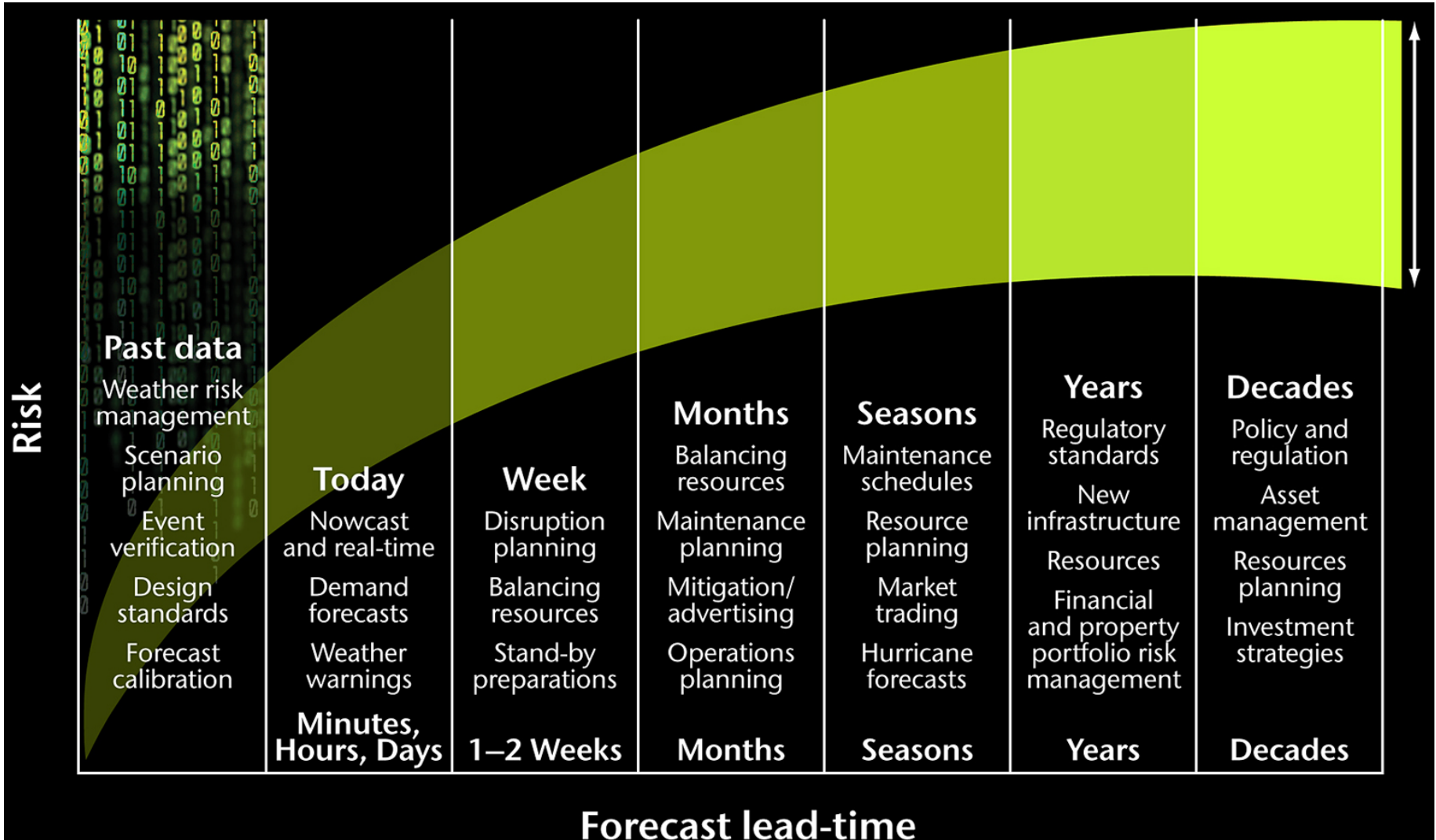


# Climate information needs for Africa

*Engaging science & user & policymaker communities*

Wilfran Moufouma-Okia  
Head of science, Technical Support Unit  
IPCC Working Group I  
ANACIM, Dakar, Senegal, 21-25 Nov, 2016

# Changing Africa's narrative: Transformation via managing climate risks and opportunities



# Global responses to climate change

## Paris Agreement (COP21, 2016)

- Holding the increase of global average temperature to “well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels”, with the aim to achieve global peaking of GHGs as soon as possible;
- Nationally determined contributions will be evaluated every 5-years through a global stocktaking mechanism to start in 2018;

## Sustainable Development Goals (SDGs, 2016)

- Goal 13: “Take urgent action to combat climate change and its impacts”

## Sendai Framework for Disaster Risk Reduction 2015-2030 (2015)

- It aims for substantial reduction of disaster risk and losses in lives, livelihoods and health over the next 15 years

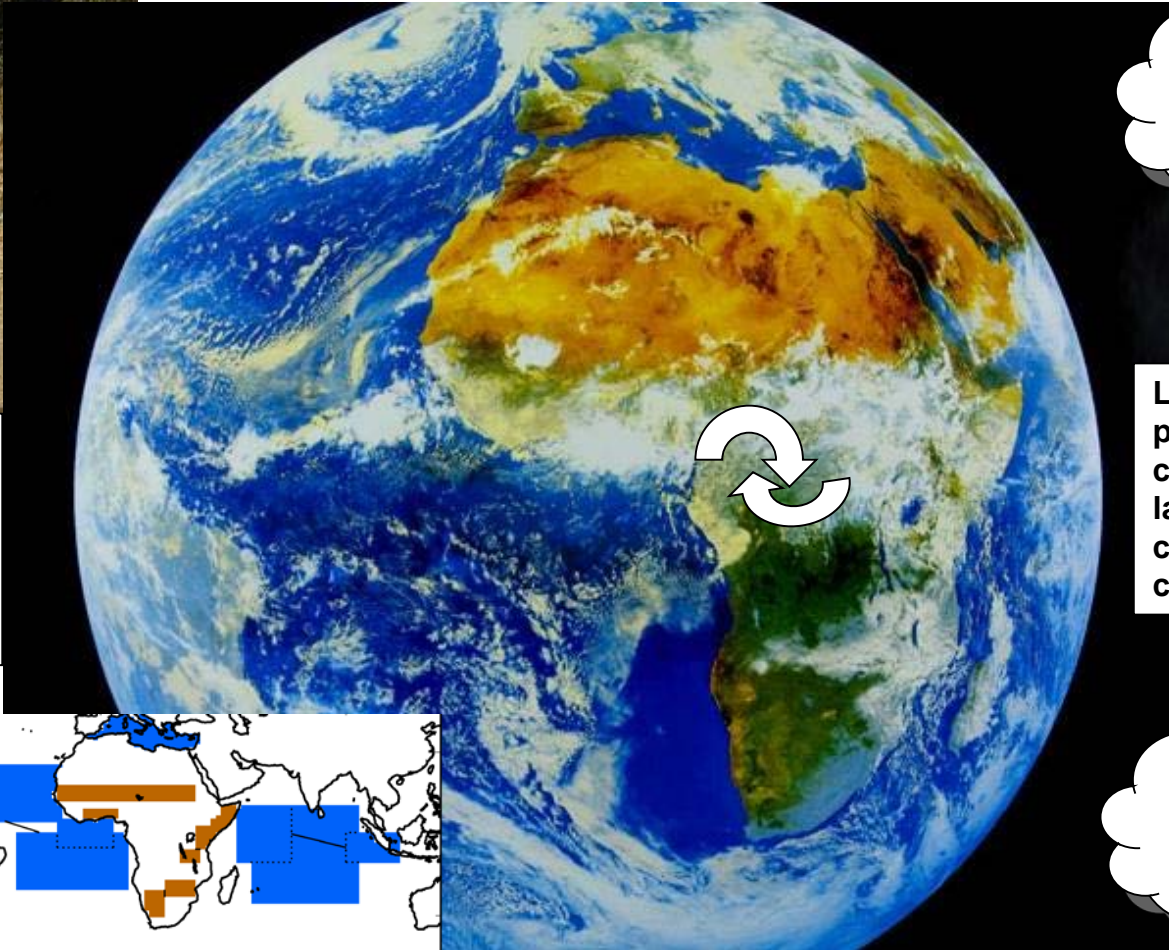
## Article 2 of the UNFCCC (1992)

- “To achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”

# Africa: a lab for improved understanding climate processes across time&space scales



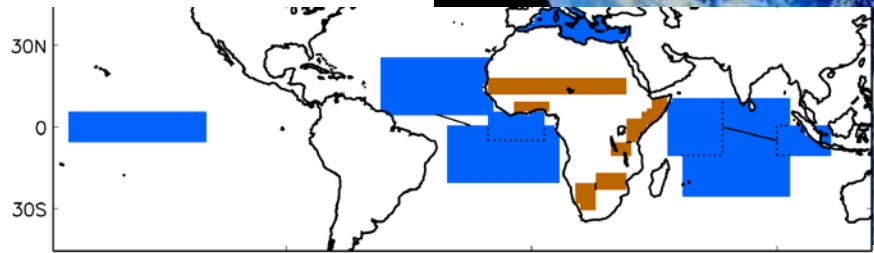
**Remote drivers:**  
ocean/atmosphere interactions ->  
“pathways” to Africa  
-> Africa impacts  
(important all timescales)



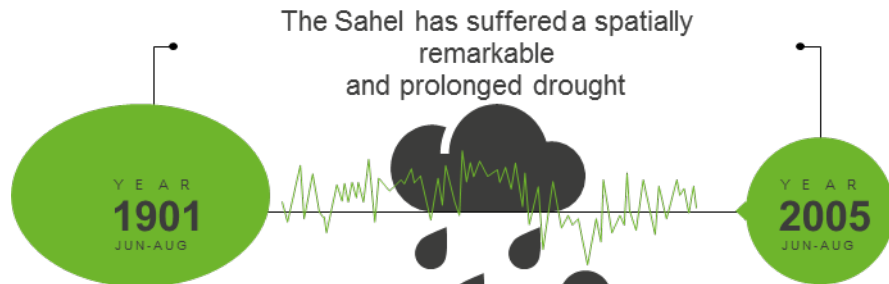
Aerosols and boundary layer interactions

**Local/regional processes:**  
convection;  
land-atmosphere coupling; land use change.

Greenhouse gases, climate change

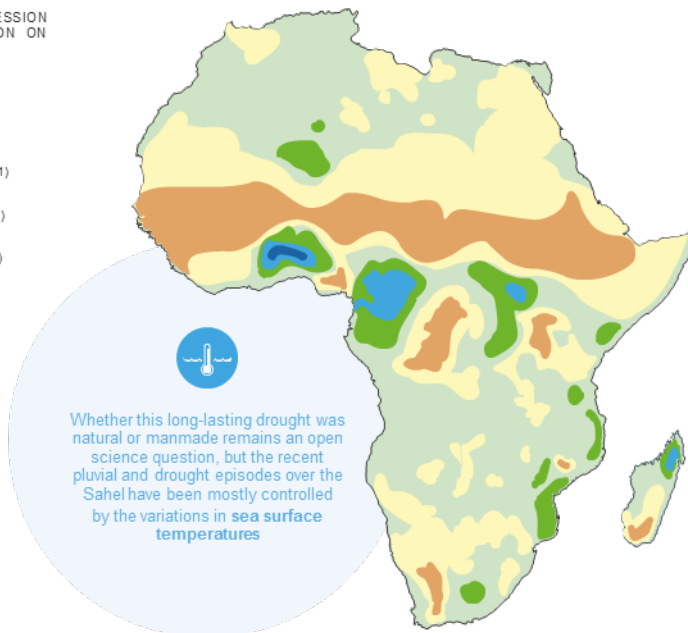
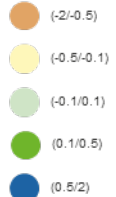


# Africa's climate variability and change



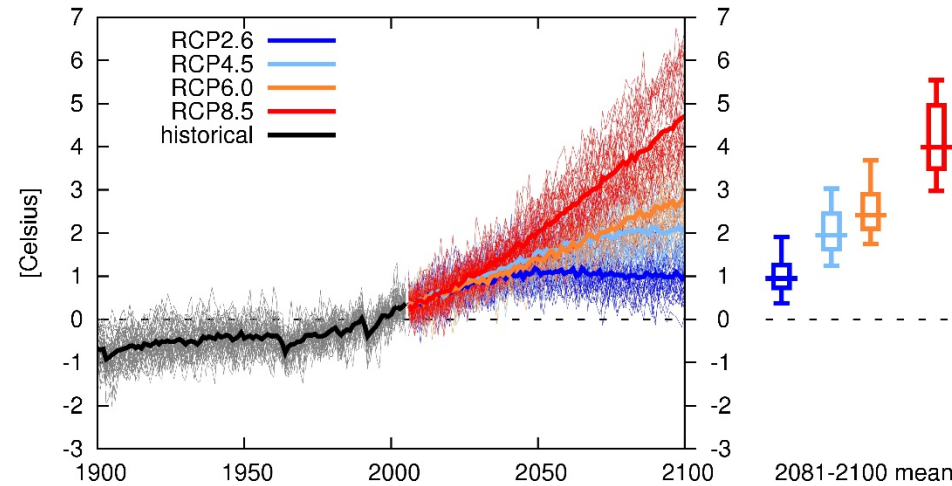
MEAN REGRESSION PRECIPITATION ON TIME 1901-2005

[mm/dy/100yr]

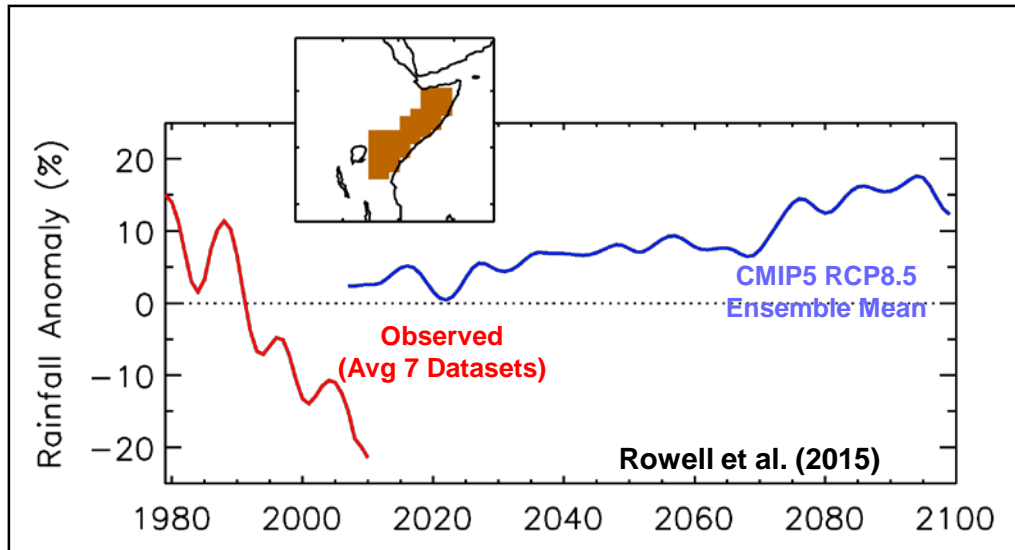


Whether this long-lasting drought was natural or manmade remains an open science question, but the recent pluvial and drought episodes over the Sahel have been mostly controlled by the variations in sea surface temperatures

Temperature change East Africa Jan-Dec wrt 1986-2005 AR5 CMIP5 subset



# Past and Future Trends: A Contradiction?



## Possible Explanations to Reconcile these Trends:

- Recent droughts may have been an exceptional natural event. But probably not the only explanation.
- And/or recent droughts might have been due to remote aerosol emissions. But current models cannot prove or refute this.
- And/or models' may miss some important processes, so perhaps their predictions are unreliable.

## Key Questions:

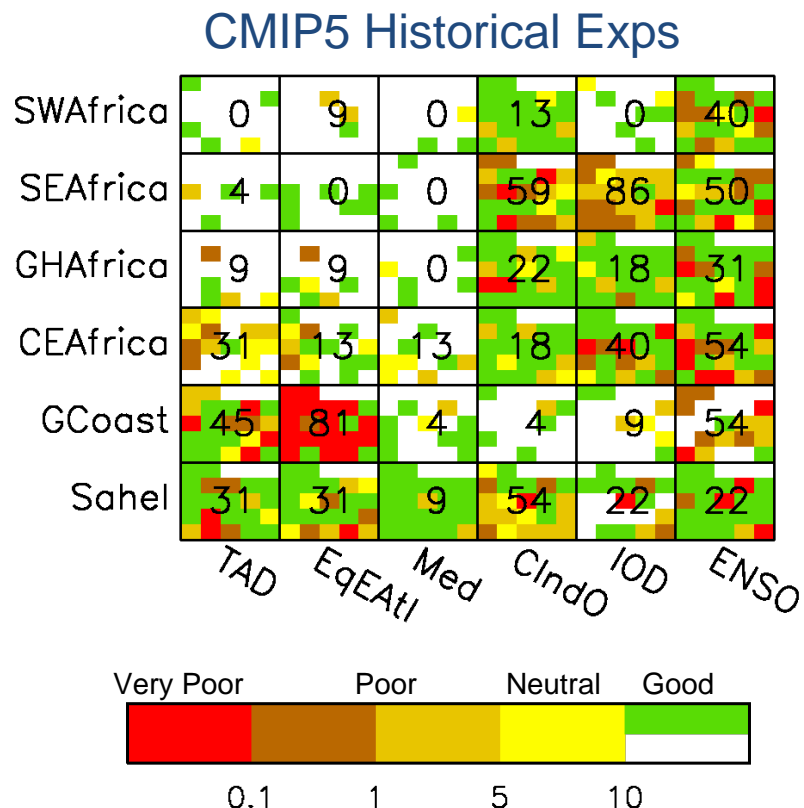
- Are the model predictions for East Africa reliable?
- If 'yes', when might the drought turn to abundant rainfall (or more frequent flooding)?

## Priorities for further Work (HyCRISTAL):

- Better understand the mechanisms of natural variability over East Africa
- Improve the modelling of the impact of aerosols on East Africa during recent decades
- Understand the models' mechanisms of future change and validate these against observations
- Consider the uncertain future roles of aerosol emissions and local land-use change

# Science challenges: Teleconnection

*What is the state of the art in simulating large-scale teleconnections to Africa?*



- Teleconnections that are easier to model:
  - Mediterranean – Sahel
  - Central Indian Ocean – SW Africa
- Teleconnections that pose substantial challenges to models:
  - IOD – SE Africa
  - Equatorial E. Atlantic – Guinea Coast
- **Little overall change CMIP3->CMIP5: need targeted ‘top down’ approach**
- **Coupled model SST errors main source of teleconnection errors**

**Skill Indicator:** Significance level for rejection of a null hypothesis that model and observed SST-rainfall correlations derive from the same population

# The IPCC fifth assessment report (AR5)

- ❖ Introduction Chapter 1
- ❖ **Observations** and Paleoclimate Information Chapters 2, 3, 4, 5
- ❖ Process Understanding Chapters 6, 7
  - Clouds and aerosols*
- ❖ From Forcing to Attribution of Climate Change Chapters 8, 9, 10
  - Model evaluation*
  - Detection and attribution of climate change : from global to regional*
- ❖ Future Climate Change and Predictability Chapters 11, 12
  - Near-term climate change : projections and predictions*
  - Long-term climate change : projections, commitments and irreversibility*
- ❖ Integration Chapters 13, 14
  - Climate phenomena and their relevance for future regional change*

**WGI Annex I: Atlas of Global and Regional Climate Projections**

**WGII Part B : Regional Aspects (continents, polar regions, small islands, ocean)**



# AR5 sensitive issues from WGI

## ❖ Links with global targets

It is *more likely than not* that the mean global mean surface air temperature for the period 2016–2035 will be more than 1°C above the mean for 1850–1900, and *very unlikely* that it will be more than 1.5°C above the 1850–1900 mean (*medium confidence*).

## ❖ Arctic sea ice

A nearly ice-free Arctic Ocean (sea ice extent less than  $1 \times 10^6$  km<sup>2</sup>) in September before mid-century is *likely* under RCP8.5 (*medium confidence*), based on an assessment of a subset of models that most closely reproduce the climatological mean state and 1979–2012 trend of the Arctic sea ice cover.

## ❖ Rate of global warming

The observed recent warming hiatus, defined as the reduction in GMST trend during 1998–2012 as compared to the trend during 1951–2012, is attributable in roughly equal measure to a cooling contribution from internal variability and a reduced trend in external forcing (expert judgement, *medium confidence*).

## ❖ Hydrological cycle

*Confidence is low* for a global-scale observed trend in drought or dryness (lack of rainfall) since the middle of the 20th century, owing to lack of direct observations, methodological uncertainties and geographical inconsistencies in the trends.

# The IPCC fifth assessment report :

## What's in there for Africa?

- Africa's climate is already changing and the impacts are already being felt
- Further climate change is inevitable in the coming decades
- **Climate change poses challenges to growth and sustainable development in Africa**
- Adaptation is fundamentally about managing risks and opportunities



- **Africa's Adaptation will bring immediate benefits and reduce the impacts of climate change in Africa**
- Some options from low-carbon development pathway may be less costly in the long run and could offer range of economic opportunities for Africa
- Africa stands to benefit from integrated climate adaptation, mitigation and development
- International cooperation and partnerships are critical to avert dangerous climate change

# IPCC sixth assessment cycle (2016-2022)

*Chair* : Hoesung Lee (Korea)

*Co-chairs* :

Thelma Krug (Brazil) - Youba Sokona (Mali) - Ko Barrett (USA)



## **Principles:**

- ❖ rigour
- ❖ robustness
- ❖ transparency
- ❖ comprehensiveness

## **WGI basis for peer-reviewed literature:**

- ❖ Observations, process-based understanding, modelling
- ❖ Global to regional scales
- ❖ Past, present and future
- ❖ Climate information with communication of uncertainty

# Pre-scoping considerations

## ❖ From global to regional aspects

- *strengthen regional assessment (incl. extreme events)*
- *strengthen process-based understanding (e.g. clouds-circulation)*

## ❖ Observations :

*Skills of reanalysis products (atmosphere, land, ocean)  
for assessments of regional trends, extreme events...*

## ❖ Integration between WGI and WGII :

*Regional aspects at the interface between climate response and impacts  
incl. mountains, cities, small islands*

*End-user / sectorial needs*

*Near-term (including volcanic eruption) / long term*

## ❖ Model evaluation :

*Regional aspects, processes*

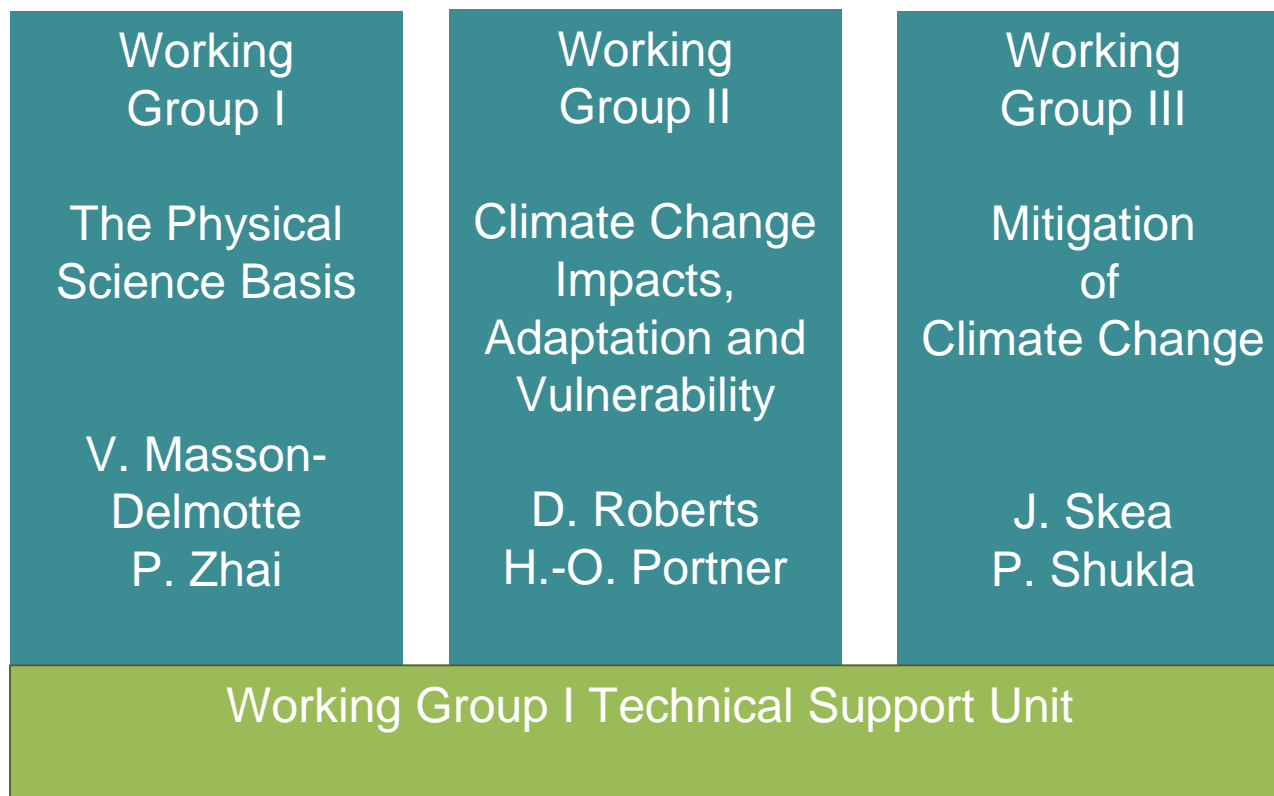
*Lessons learnt from forecast and hindcast*

*Role of ocean surface state on regional climate*

*From evaluation to model selection?*

# Special Report on global warming of 1.5°C

To be developed under the joint scientific leadership of  
Working Groups I, II and III  
Support from the WGI Technical Support Unit (TSU)



# SR1.5 – Adopted outline

44th Session of the IPCC, 17-20 October 2016, Bangkok, Thailand

Title: Global warming of 1.5°C

Front Matter (2 pages)

Summary for Policy Makers (up to 10 pages, incl. headline statements, tables, figures)

Chapter 1: Framing and context (15 pages)

Chapter 2: Mitigation pathways compatible with 1.5°C in the context of sustainable development (40 pages)

Chapter 3: Impacts of 1.5°C global warming on natural and human systems (60 pages)

Chapter 4: Strengthening and implementing the global response to the threat of climate change (50 pages)

Chapter 5: Sustainable development, poverty eradication and reducing inequalities (20 pages)

Boxes - integrated case studies/regional and cross-cutting themes (up to 20 pages)

FAQs (10 pages)

Total: up to 225

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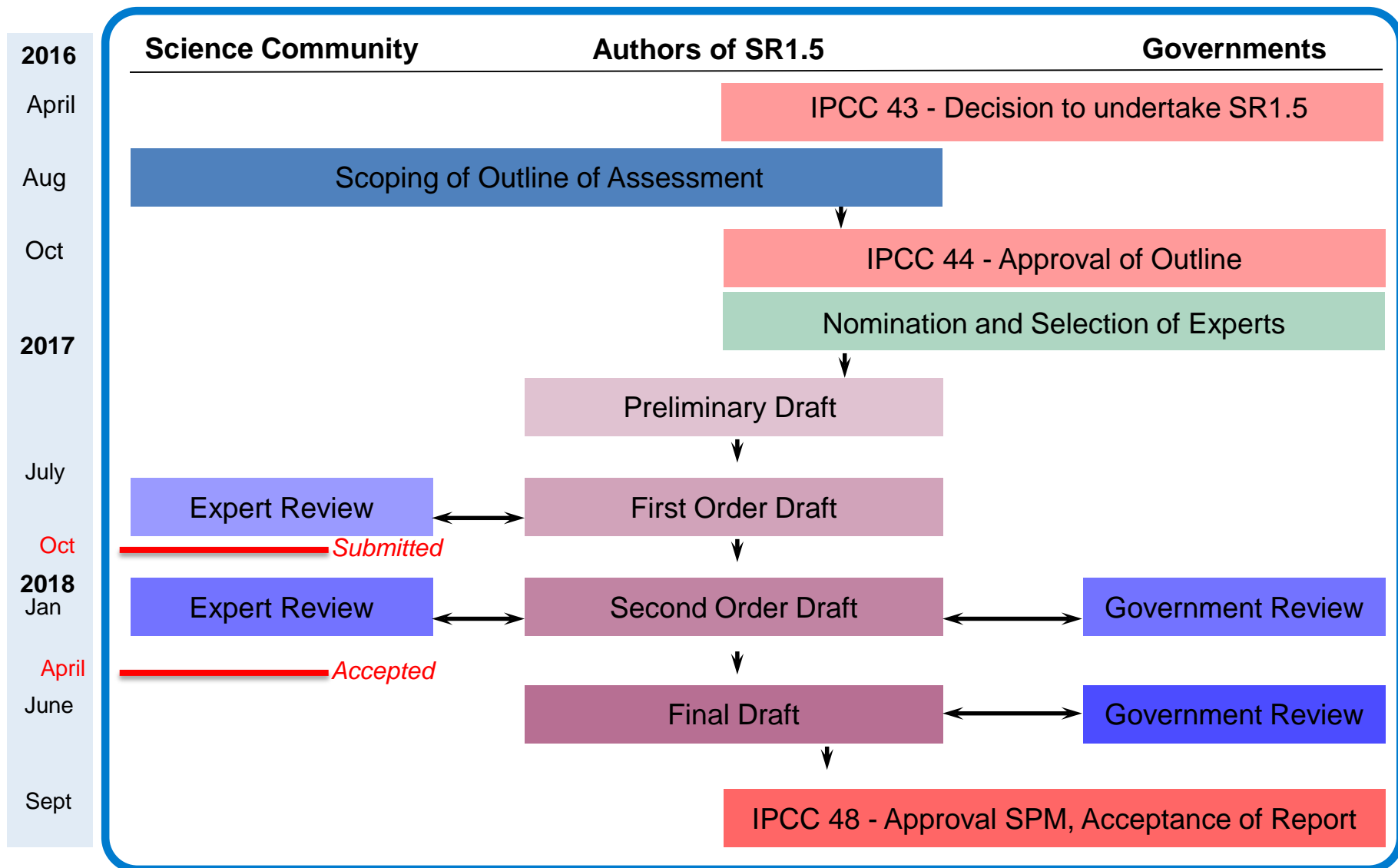
INTERGOVERNMENTAL PANEL ON climate change



# SR1.5 Chapter 3: Impacts of 1.5°C global warming on natural and human systems

- Methods of assessment
- Observed and attributable global and regional climate changes and impacts and the adaptation experience
- Key global and regional climate changes, vulnerabilities, impacts, and risks at 1.5°C, including adaptation potential and limits
- Key sectoral vulnerabilities, impacts, and risks at 1.5°C, taking into account adaptation potential, limits to adaptive capacity and socio-economic aspects
- Avoided impacts and reduced risks at 1.5°C compared to 2°C and higher as relevant
- Timeframe, slow vs fast onset, irreversibility and tipping points
- Implications for impacts, adaptation and vulnerability of different mitigation pathways reaching 1.5°C, including potential overshoot

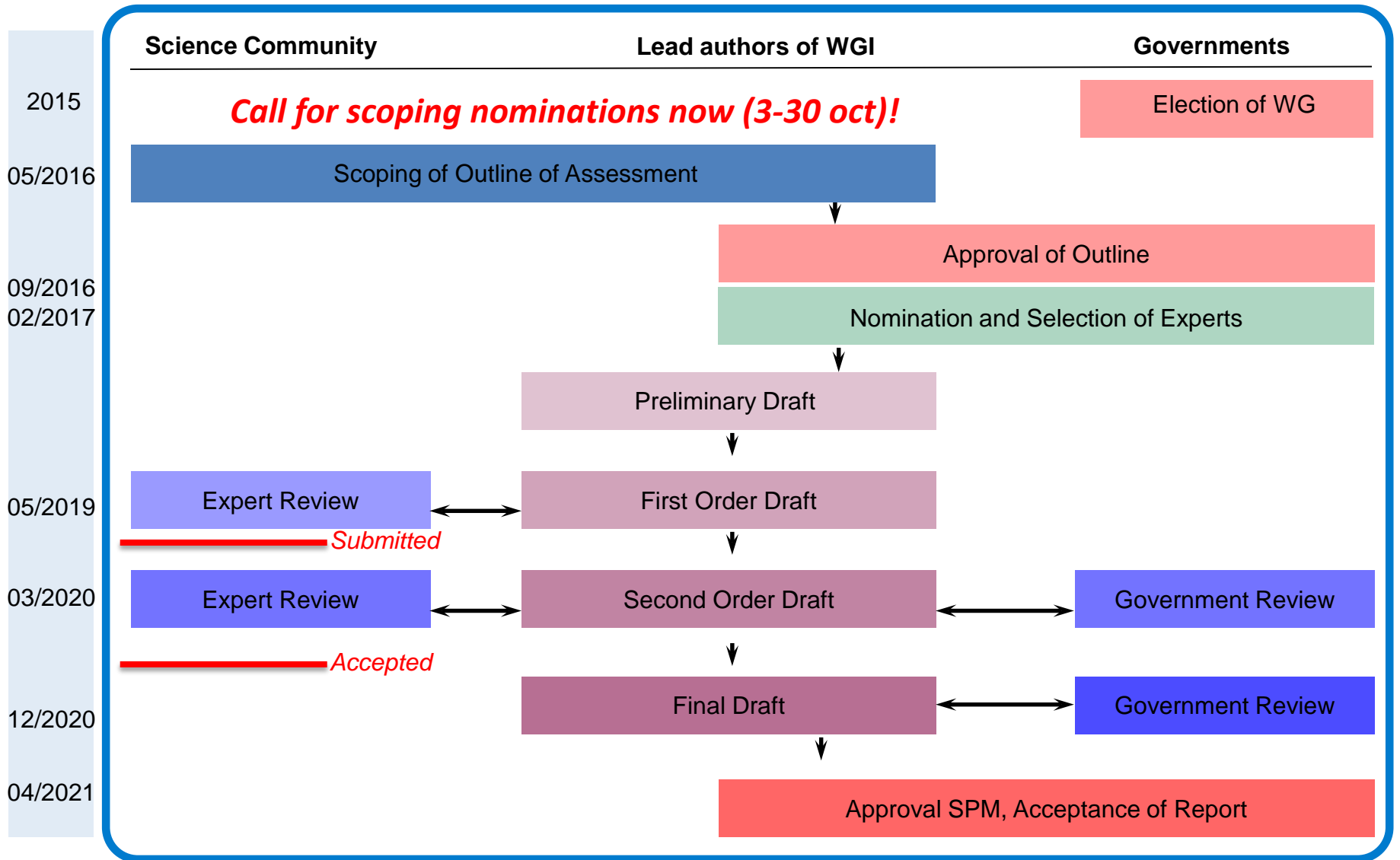
# SR1.5: timeline



Literature to be assessed: submitted by **October 2017** to be included in the Second Order Draft for review, and accepted by **April 2018** to be included in the Final Draft review.



# WGI AR6 schedule



# WGI Technical Support Unit (TSU)

université  
PARIS-SACLAY



ADEME

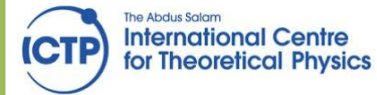


Agence de l'Environnement  
et de la Maîtrise de l'Énergie



Head

Anna Pirani



Science

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officer

IT officer



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# Take home message

- Link between climate knowledge and development challenges in Africa
- Opportunities for reflecting Africa's contributions to science advances and perspectives on climate change
- Relevance of knowledge and experience from local to global, including case studies and integrated planning

# IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways

*in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*

Where is the information:

<http://www.ipcc.ch/report/sr15/>

44<sup>th</sup> IPCC Session Plenary Documents ([www.ipcc.ch](http://www.ipcc.ch))

Doc.11 (IPCC-XLIV/Doc. 11)

INF. 6 (IPCC-XLIV/INF. 6)

Contact IPCC Working Group I TSU:

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[wg1.ipcc.ch](http://wg1.ipcc.ch)

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INTERGOVERNMENTAL PANEL ON climate change



# Reminder of AR5 outline

- ❖ Introduction **Chapter 1**
- ❖ Observations and Paleoclimate Information **Chapters 2, 3, 4, 5**
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