Constructing regional climate information relevant for risk assessments and decision making

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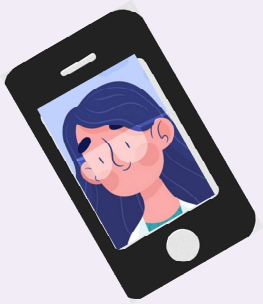
And other colleagues: V. Hernández, T. Shepherd

Outline

- How **values** and **context** influence in the construction of information and why we should make them explicit
- The **distillation approach** to climate information construction
- What is a **storyline** and why is it useful for risk assessments and regional decision making

Traditional “knowledge supply chain” approach

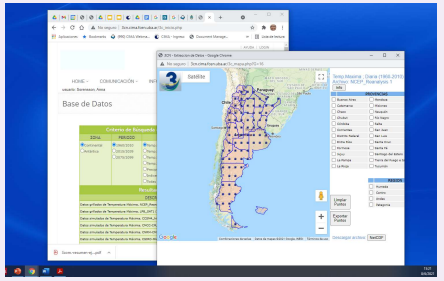
User contract service from scientist



Production or extraction of data

Processing data (maps, numbers)

Preparation of communication material



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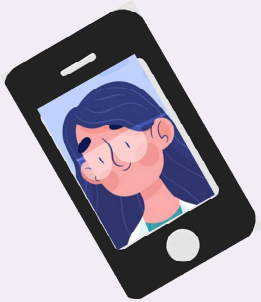

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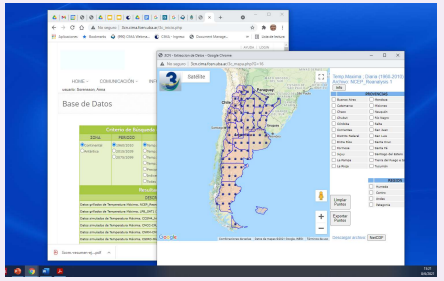

Choices and **assumptions** based on the ***values*** of the scientist

Traditional “knowledge supply chain” approach

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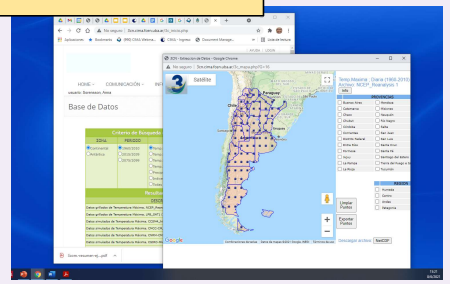
- Misunderstandings of how to interpret the information.
- The information might not be optimally useful for risk assessment and decision making. *(IPCC AR6 WGI Ch10.5)*

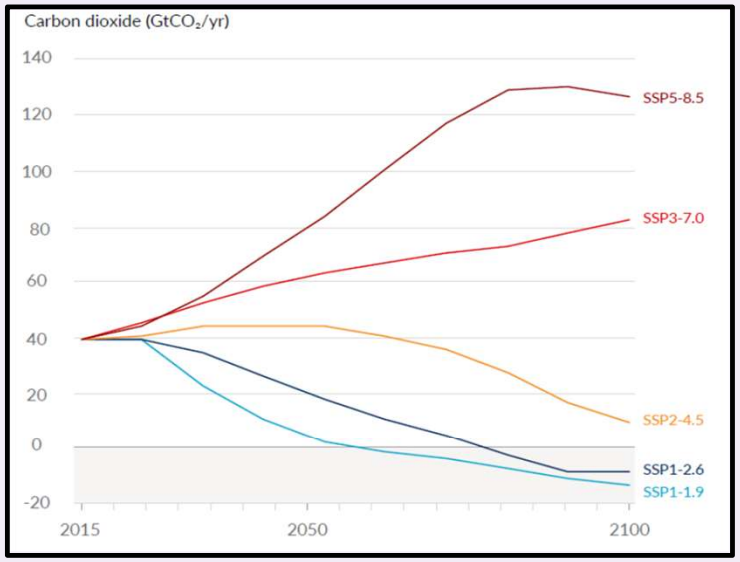


Choices and **assumptions** based on the ***values*** of the scientist

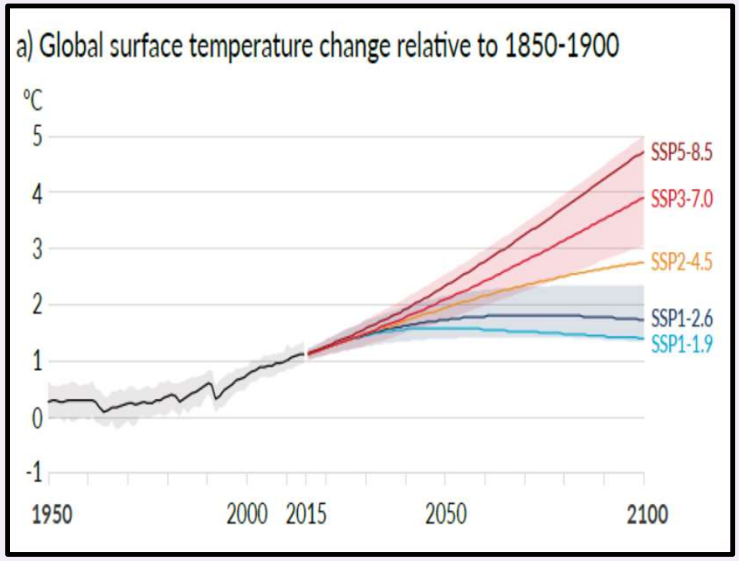
Values in the assumptions and choices of the scientist

EXAMPLE

I only have 40T of disc space!
Which scenario do I use?



IPCC AR6 WGI SPM



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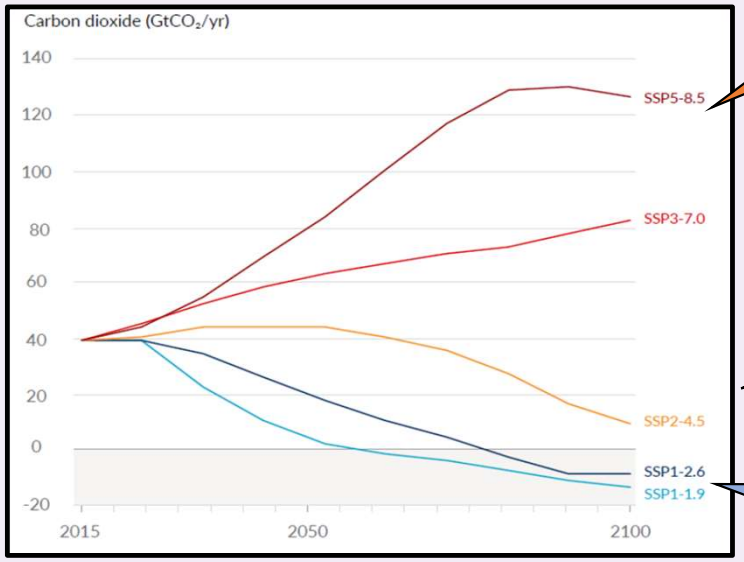
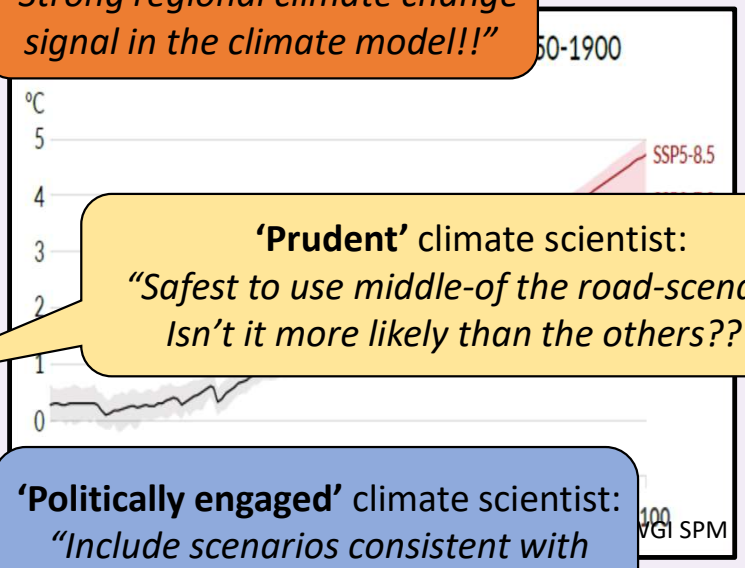


IPCC AR6 WGI SPM

'Traditional' climate scientist:
"Strong regional climate change signal in the climate model!!"



WGI SPM

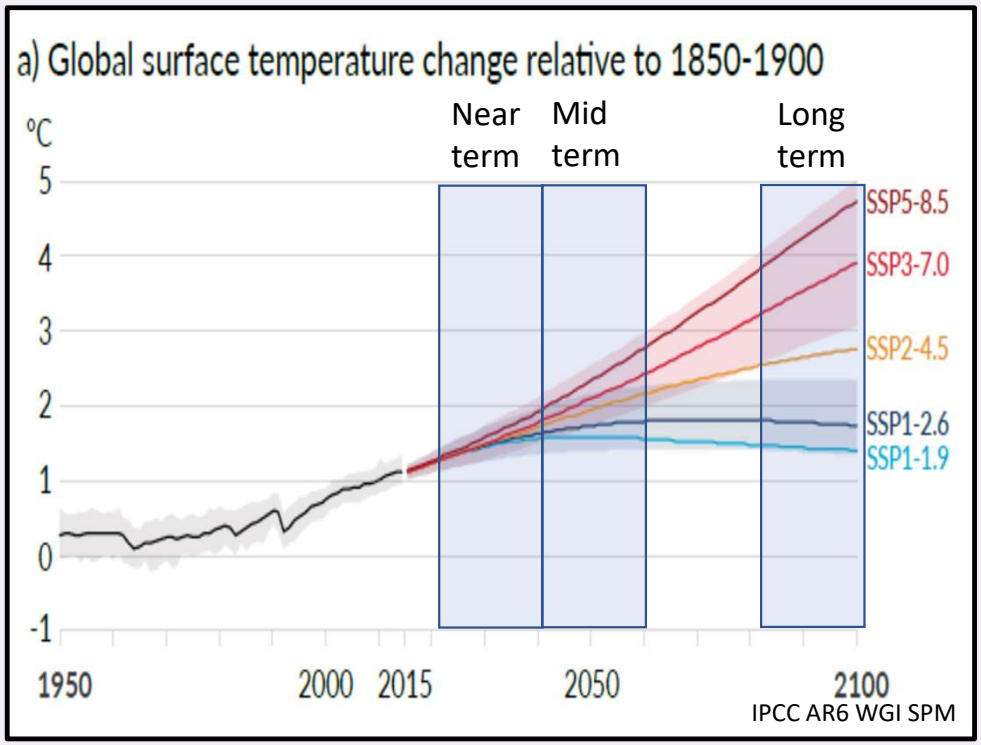
'Prudent' climate scientist:
"Safest to use middle-of the road-scenario? Isn't it more likely than the others???"

'Politically engaged' climate scientist:
"Include scenarios consistent with Paris Agreement!!"

Context of the scientist and the user

EXAMPLE

Temporal scales of projections and decision making

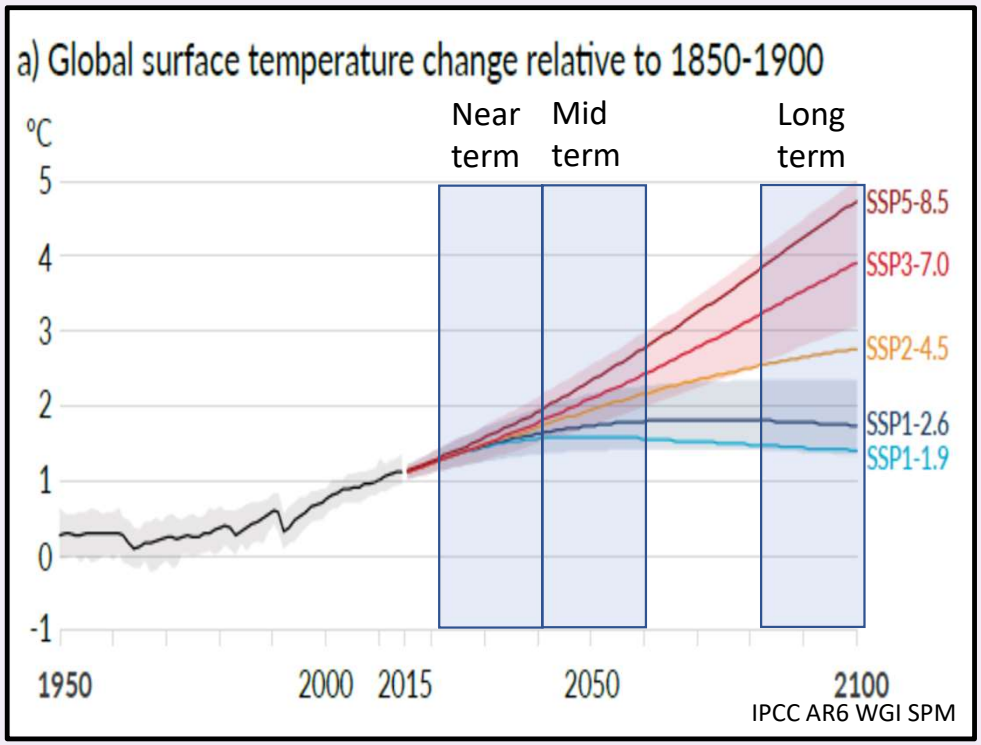


- Traditional focus on long term from climate scientists (end of century)
- Near term challenging due to internal variability (next 20 years)
- Mid term is now given more attention (mid-century)

Context of the scientist and the user

EXAMPLE

Temporal scales of projections and decision making



Still issues with useful time scales:

- Mismatch in time scales of climate information and political cycles of 4-5 years *(Gawith et al. 2009; Agrawala et al. 2012; Jones et al. 2016)*
- …this is particularly true for developing countries *(Ziervogel and Zermoglio, 2009; Jones et al. 2016)*
- In Africa and India there are very few clear examples of long-term climate information being used to inform decisions *(Singh et al. 2017).*
- Successful examples use information on scales of weeks to seasons *(Singh et al. 2017).*

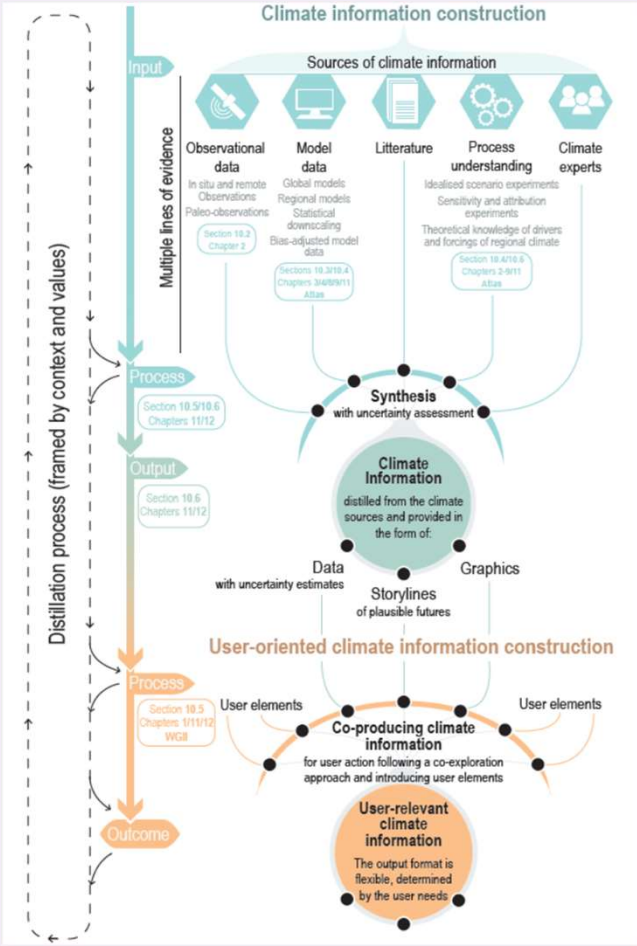
Other areas where choices are influenced by values and context

1. Selection of sources of information
   - Types of observations (in situ, gridded, satellite)
   - Global / Regional / Convective Permitting Climate Models
   - Statistical downscaling
   - Process understanding
   - Attribution
   - User knowledge, indigenous knowledge
2. Spatial scale
3. Prioritized metrics for model development
4. Handling of uncertainties
5. Prioritize avoiding “type 1 errors” (false alarms) or “type 2 errors” (missed warnings)
6. …
7. …

More details:
IPCC AR6 WGI Ch1: Section 1.2.3
IPCC AR6 WGI Ch10: Section 10.5.2.2

The ***distillation approach*** *(as assessed in IPCC AR6 WGI Ch10)*

- **Co-produce** climate information together with the user, considering the **values and the context** of everyone involved in the process.
- **Use all sources of information** available that are relevant for the **context** (fit for purpose).
- Distill climate information from the different sources in form of **storylines**, graphics, data with uncertainty estimates.
- Generate **user-oriented** climate information for communication.



IPCC AR6 WGI Ch10 Figure 10.1

Storylines to construct information about risks for regions

DEFINITION:
"A way of making sense of a situation or a series of events through the construction of a set of explanatory elements. Usually, it is built on logical or causal reasoning. In *climate* research, the term storyline is used both in connection to *scenarios* as related to a future trajectory of the climate and human systems or to a weather or climate event. In this context, storylines can be used to describe plural, conditional possible futures or explanations of a current situation, in contrast to single, definitive futures or explanations."
(IPCC AR6 Glossary)

EXAMPLES:

1. **Dynamical storylines** *(Zappa and Shepherd 2017; Mindlin et al. 2020, IPCC AR6 WGI Ch10 Box 3)*
2. **Event storylines** *(Shepherd et al., 2018; Sillmann et al. 2020 , IPCC AR6 WGI Ch10 Box 3)*
3. **Climate sensitivity storylines** *(IPCC AR6 WGI Ch4)*
4. **Climate narratives** to communicate possible climate futures or events *(Jack et al. 2019, storyline SR1.5 https://www.ipcc.ch/report/infographic/worlds-apart/es/ , IPCC AR6 WGI Ch10 Box 3)*
5. **…**
6. **….**

Storylines to construct information about risks for regions

- There is high confidence in thermodynamic aspects of climate change.
- Dynamical aspects of climate change are much more uncertain.
- Projected changes in large scale circulation differ substantially amongst models and gives high uncertainty in future regional precipitation changes.

(Shepherd 2019)

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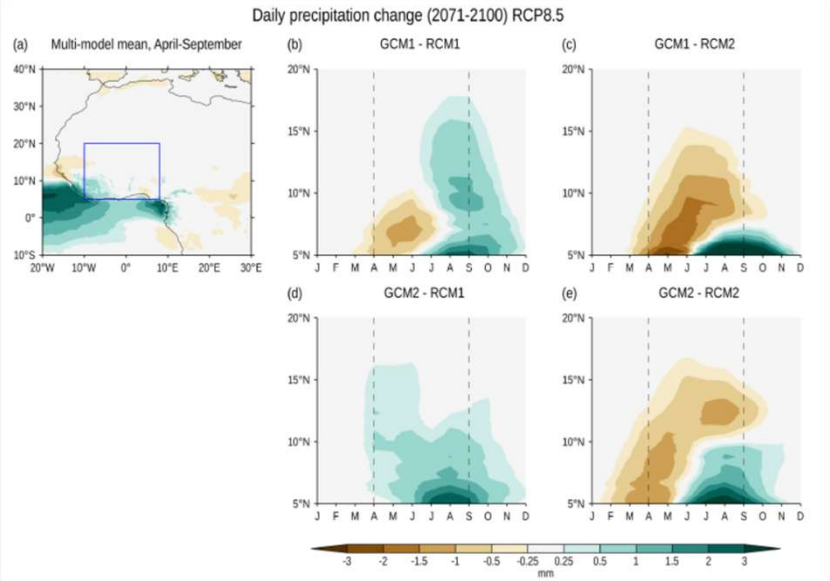

Showcase of model disagreement from IPCC AR6 WGI Ch10: Figure 10.16

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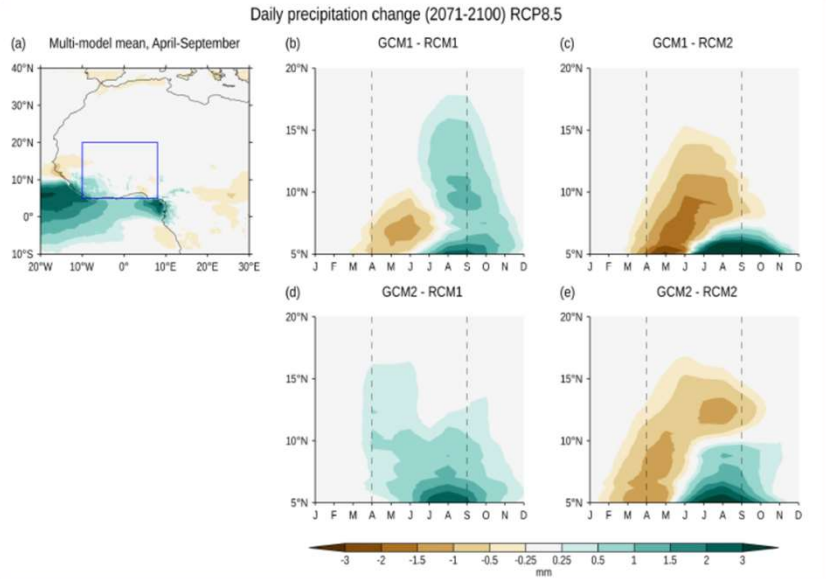
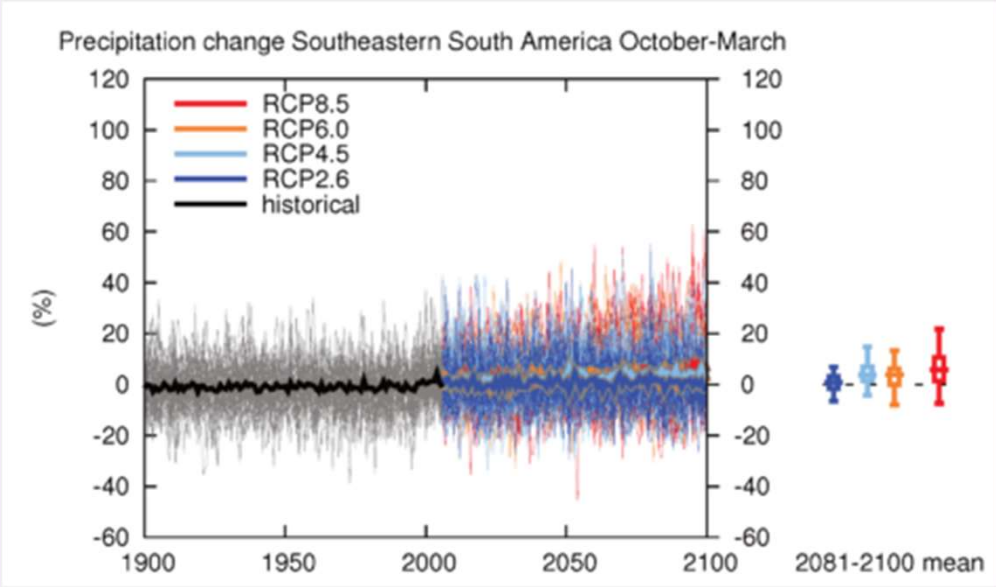


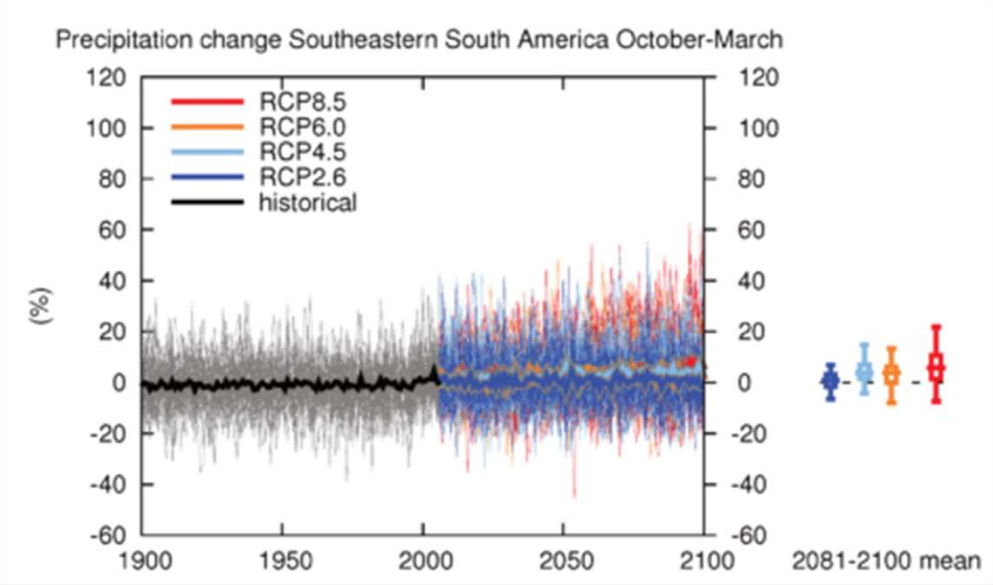
Showcase of model disagreement from IPCC AR6 WGI Ch10: Figure 10.16



IPCC AR5 WGI Atlas Figure AI.34

Storylines to construct information about risks for regions

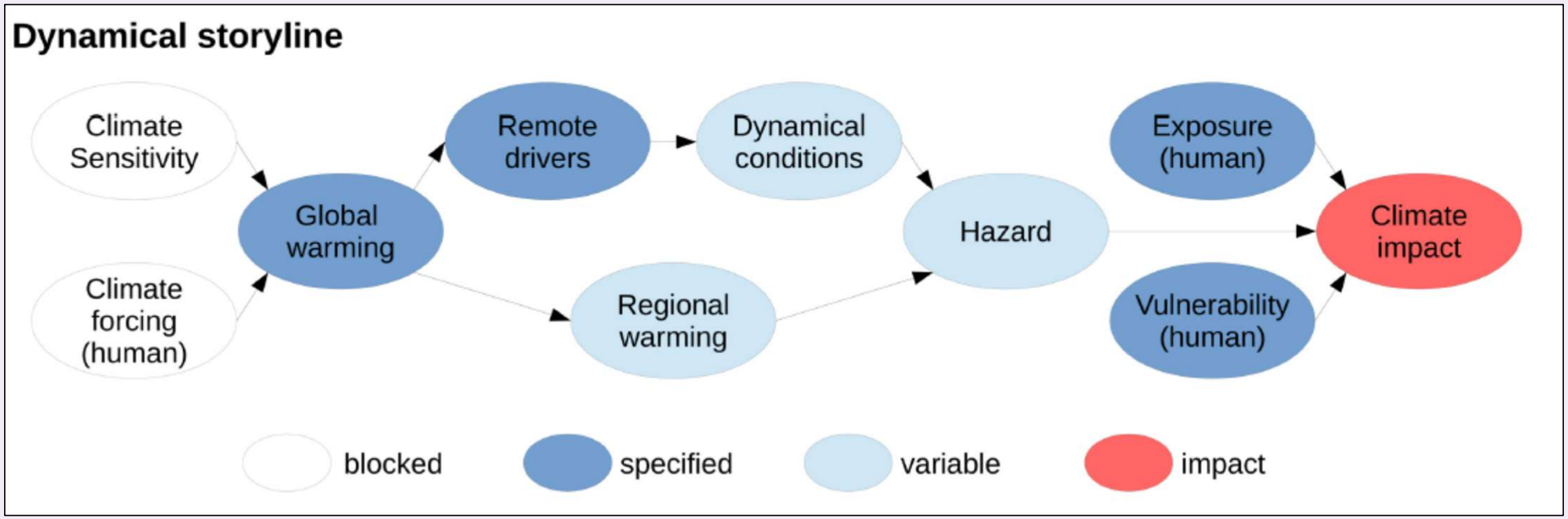
- Multi-model mean change can be close to zero – but that does not mean that risk is low *(Shepherd 2019).*
- The multi-model mean can't be interpreted as the best estimate of climate change *(Knutti et al. 2010; 2012; Zappa and Shepherd 2017)*.
- Communication of the full range of outcomes can be a barrier to the uptake and use of the result *(Lemos et al. 2012; Daron et al. 2018).*



IPCC AR5 WGI Atlas Figure AI.34

Storylines to construct information about risks for regions

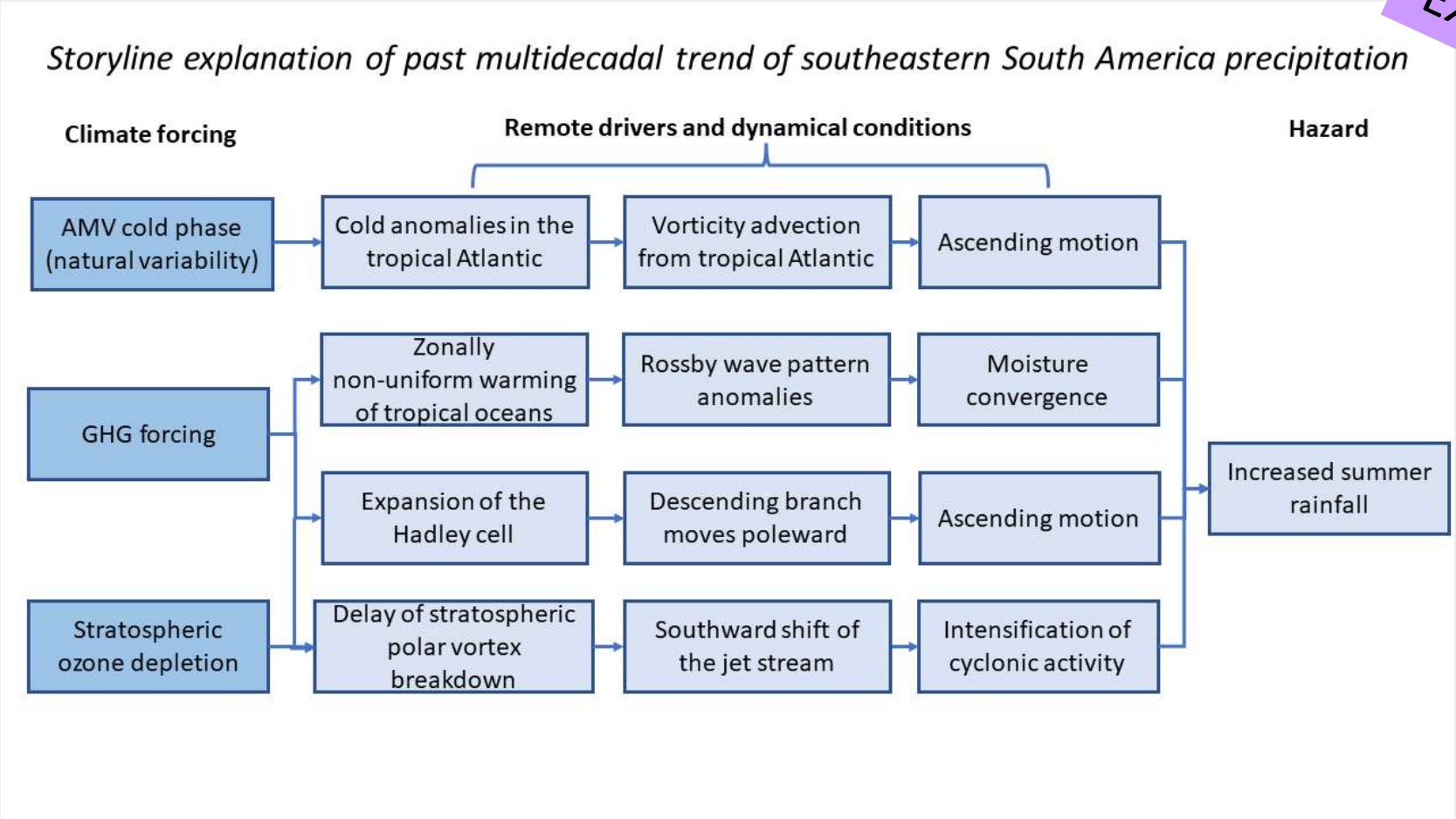
A storyline is a way of making sense of a situation or a series of events, with focus on the risks or impact. Storylines can be used to describe plural, conditional possible futures or explanations of a current situation. *(IPCC AR6 Glossary)*



From IPCC AR6 WGI Ch10 Box 3 Figure 1

Storylines to construct information about risks for regions

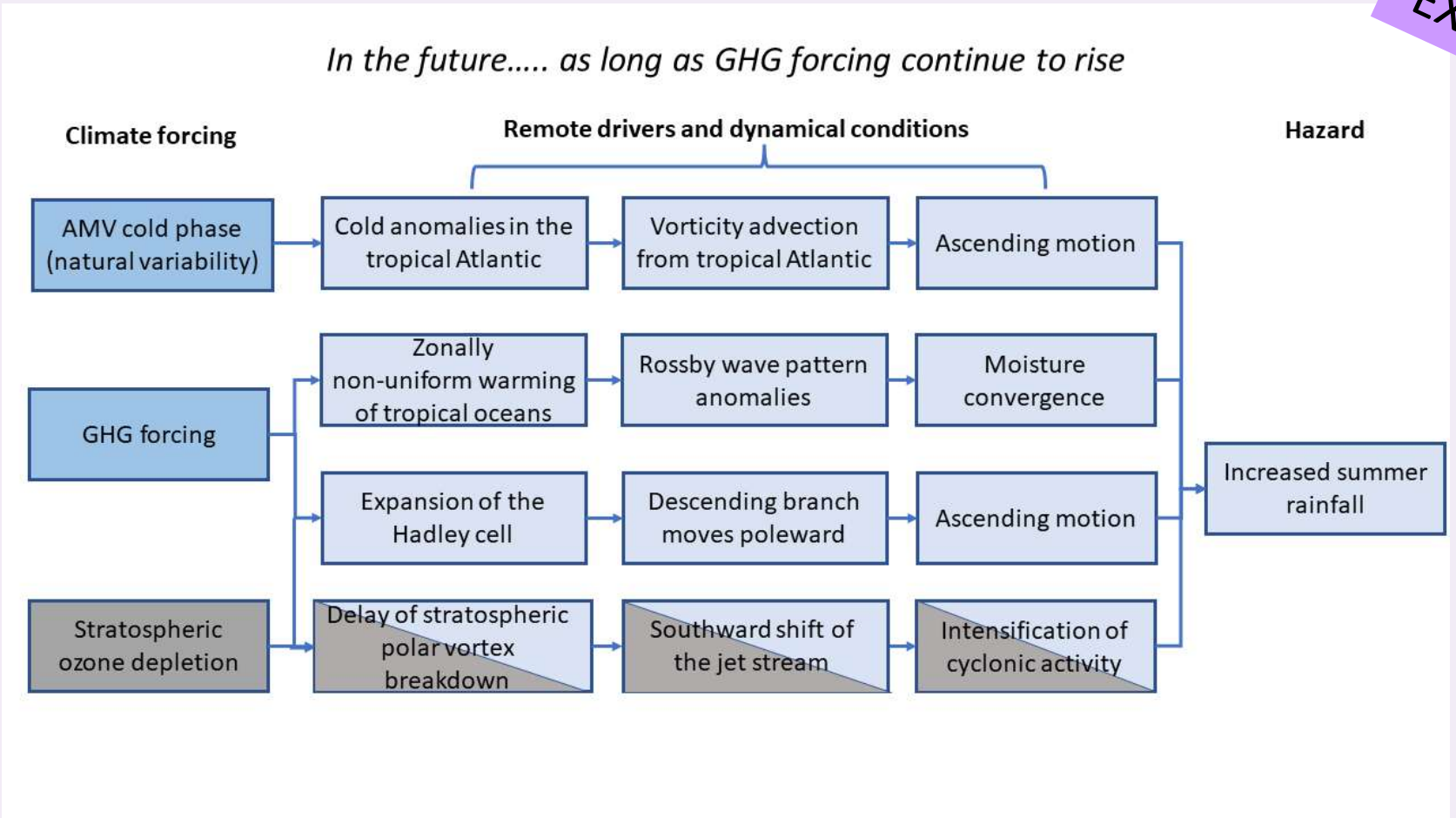
EXAMPLE



Based on IPCC AR6 WGI Ch10 Figure 10.12

Storylines to construct information about risks for regions

EXAMPLE



Based on IPCC AR6 WGI Ch10 Figure 10.12

Regional climate information “key messages”

Make **values** and **context** explicit and take into account the values and contexts of all actors (user and producer).

Let the context and the **fitness for purpose** guide the selection of **sources of information**.

Storylines are tools for studying and communicating regional climate change that make sense of a situation or a series of events.

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