A synthesis of past assessments of regional information characteristics to enhance usefulness: **shortcomings and opportunities in assessing regional information**

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Brief summary of Regional information in TAR, AR4, AR5

Observations are highly heterogeneous by region

- Limitations of historical record constrained regional messages
- Visibility of global gridded products

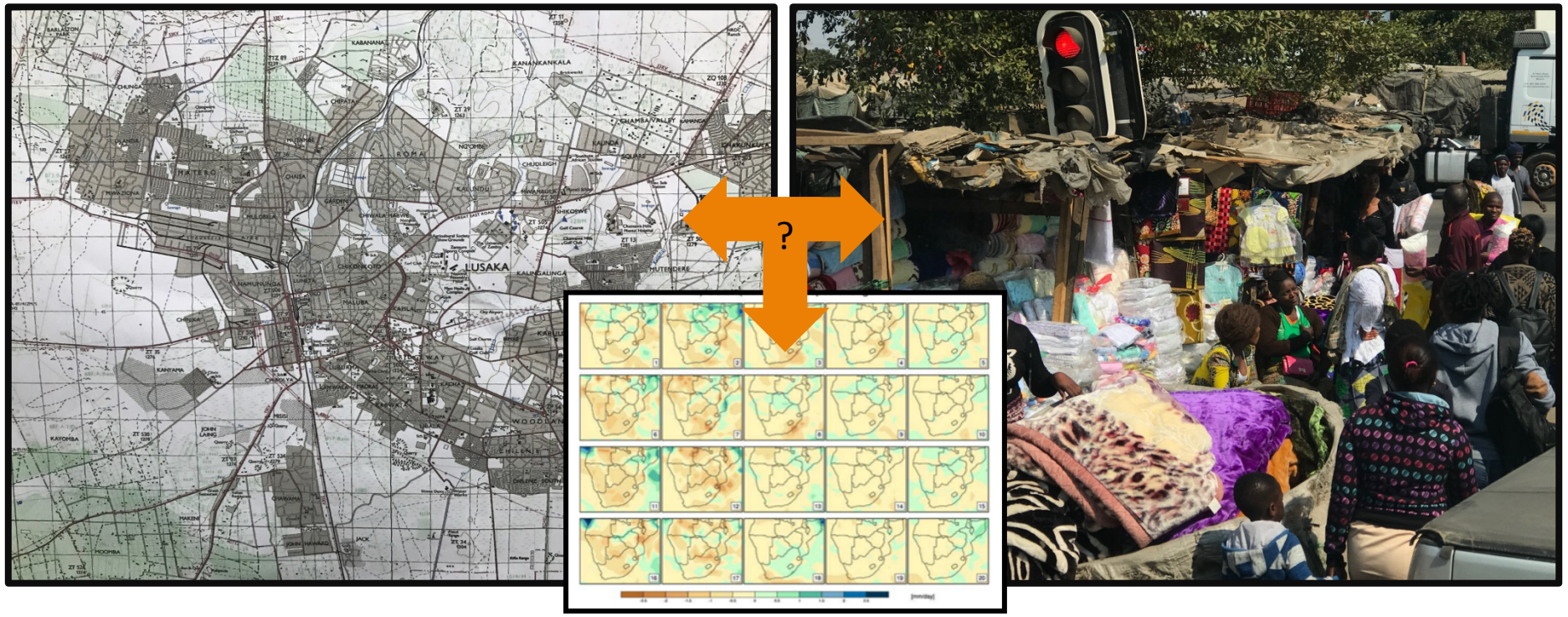
Future projections were heavily dependent on GCMs

- Map based presentations invited visual interpolation
- Regional statements generally with low confidence
- AR5 introduces changes in phenomena as a message of regional importance.

Structure of TAR, AR4, and AR5 had mixed regional emphasis:

- WG1 had only one regional chapter in each report with limited additional regional information dispersed through remaining chapters.
- Regional chapters in in WG2, mostly predicated on WG1 GCM assessments
- AR5 WG1 Atlas (GCM-based inviting visual interpolation)
- AR5 WG2 included a chapter “Regional Context” to frame the interpretation of regional information.

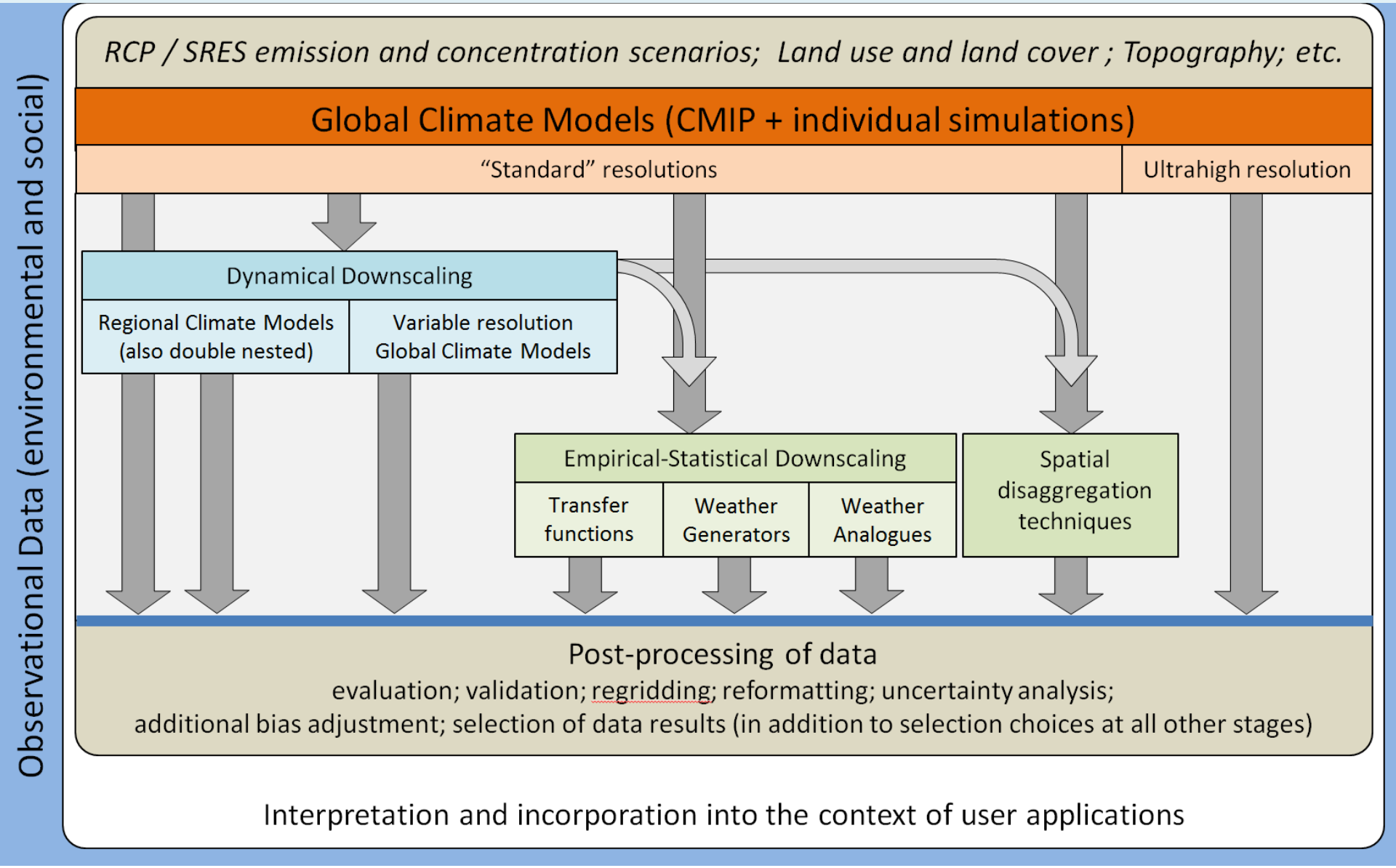
Three fundamental constraints for users of the IPCC Assessments reports



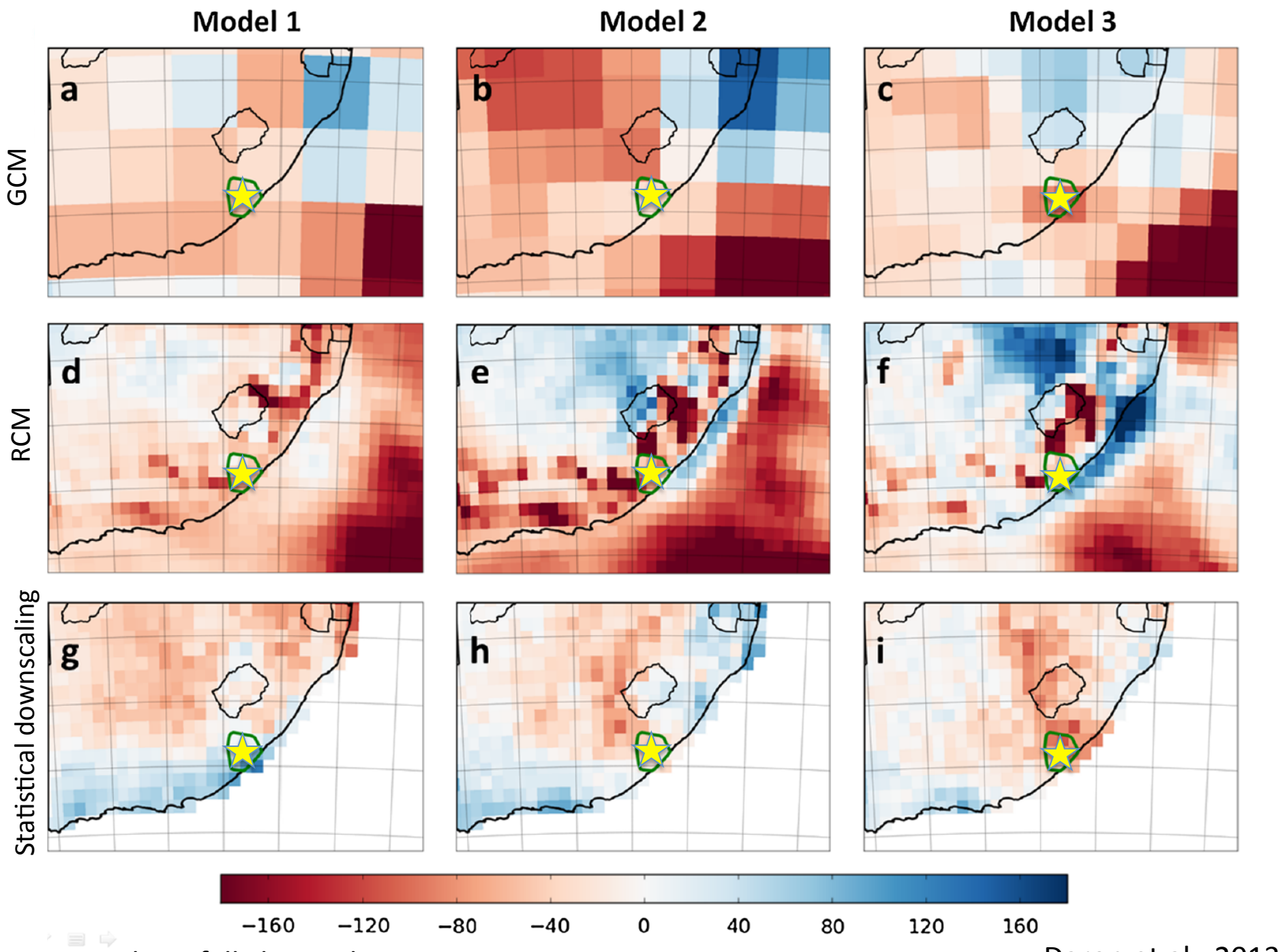
1. Scale translation – basic climate information has a large disconnect from the decision scale

2. Linear supply chain model decouples information from context – if knowledge is defined as information in context, then a linear supply chain introduces significant limitations.

3. Contrasting messages from multiple information choices



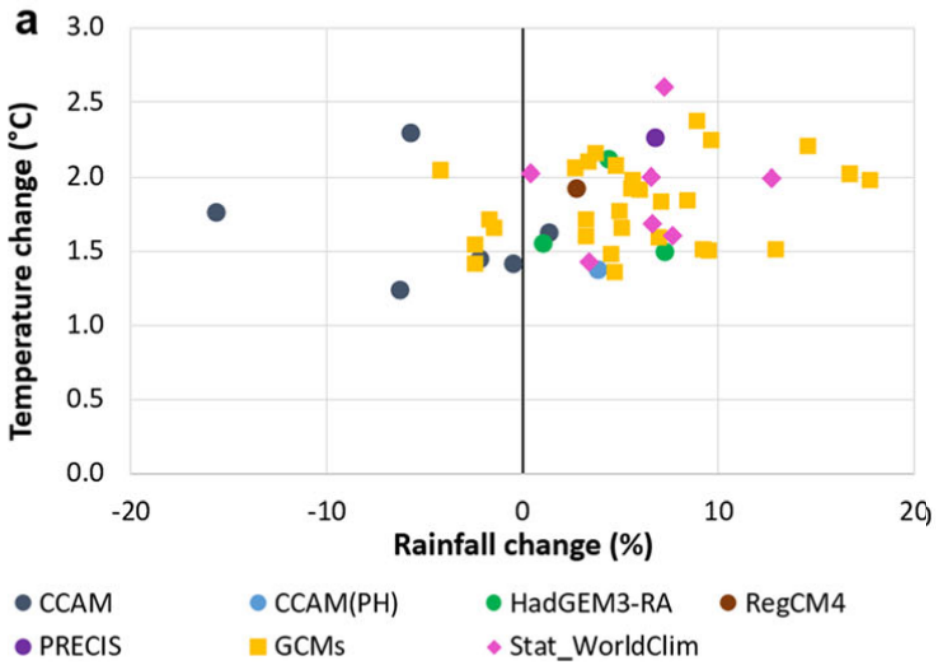
The key challenge of DISTILLATION

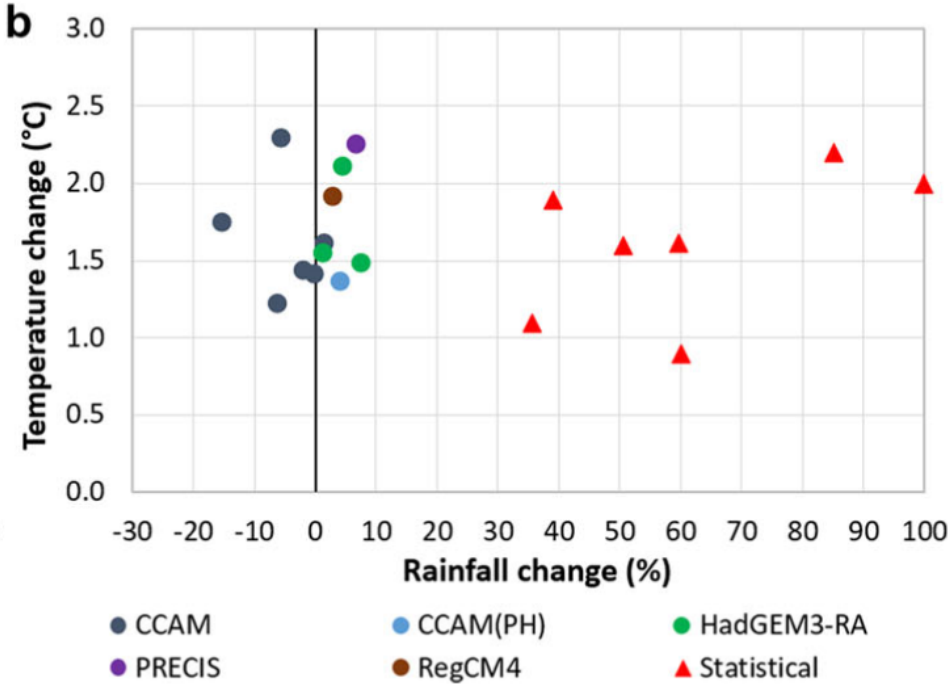


Projected rainfall change by 2050

Daron et al., 2013

Projected changes in total annual rainfall and annual mean temperature in the Philippines by mid-21st century (RCP8.5)



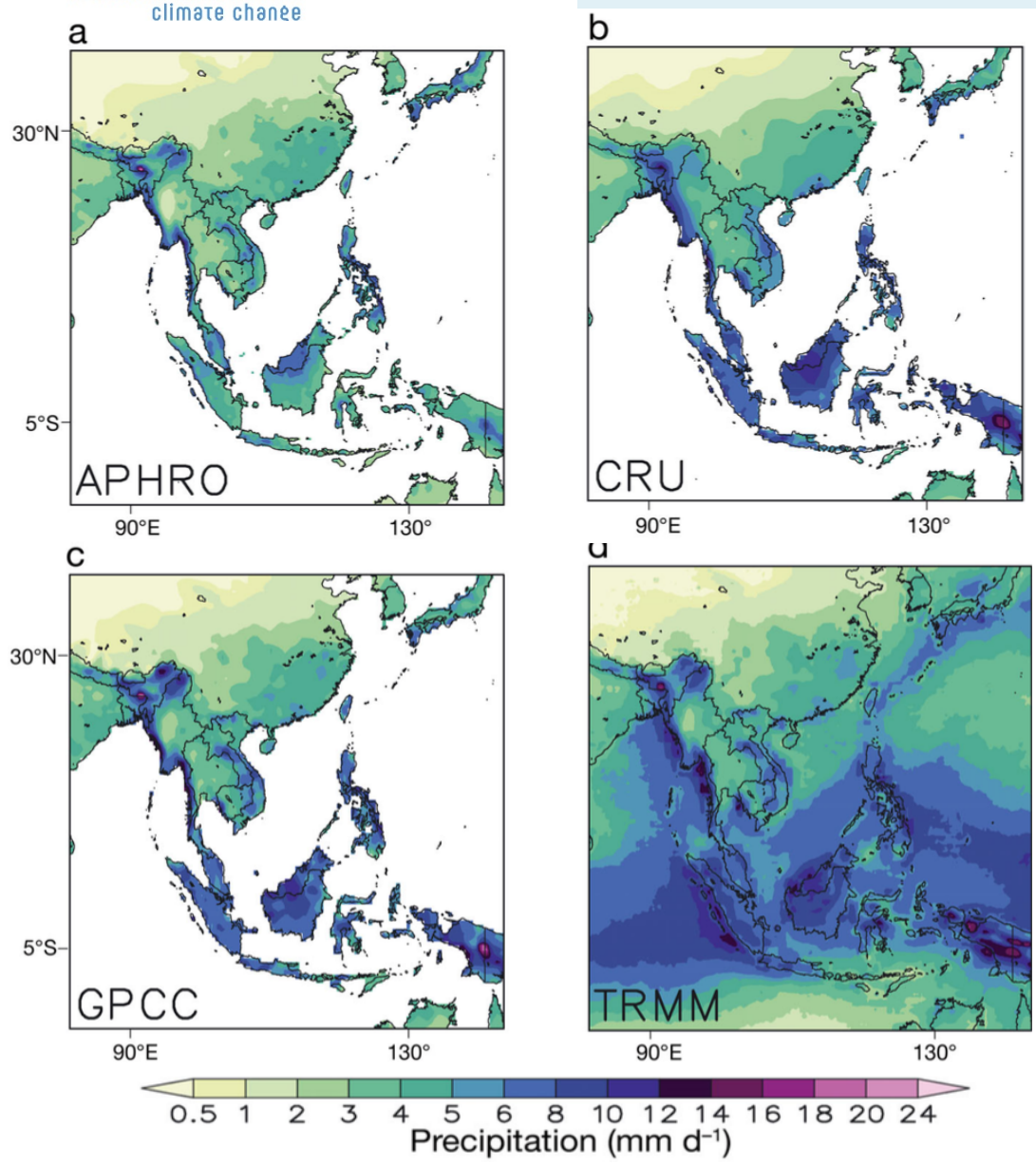


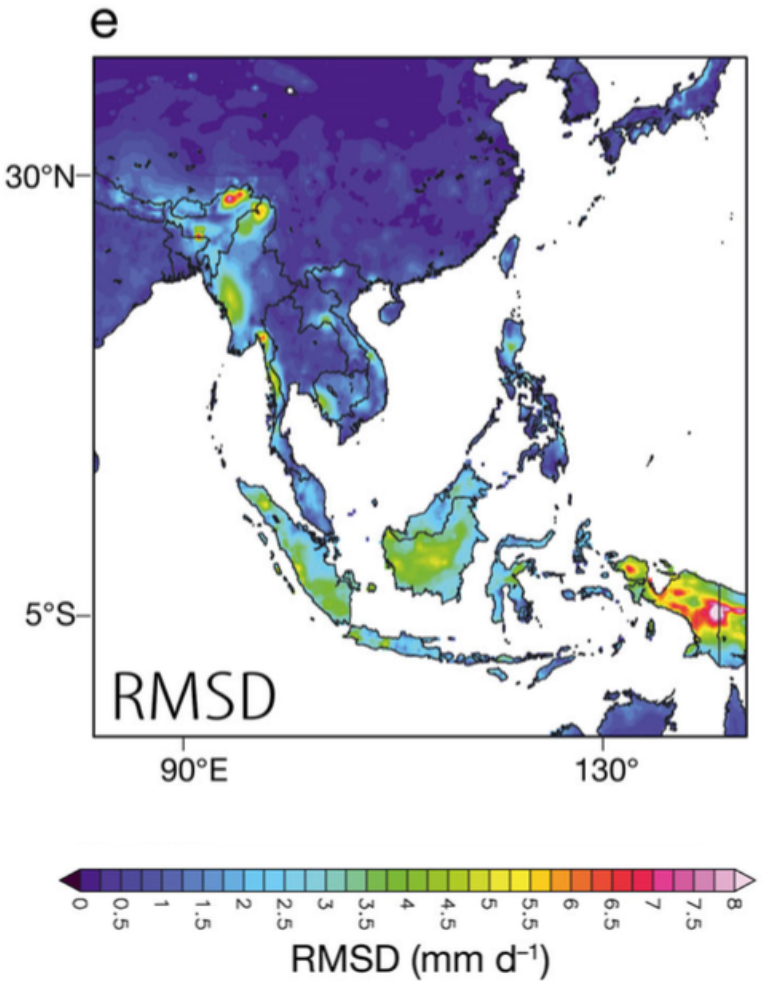
- Range of changes from GCMs (yellow) and downscaling
- More temperature increase, wider range of precipitation change

- Dynamical and statistical (red) downscaled changes
- Comparison of models uncovered error in statistical technique applied

Daron et al., Climatic Change, 2018

Integrity of “observations”





Juneng et al., Clim Res, 2016

Placing information in context

After Davies, 2017

Contextualised

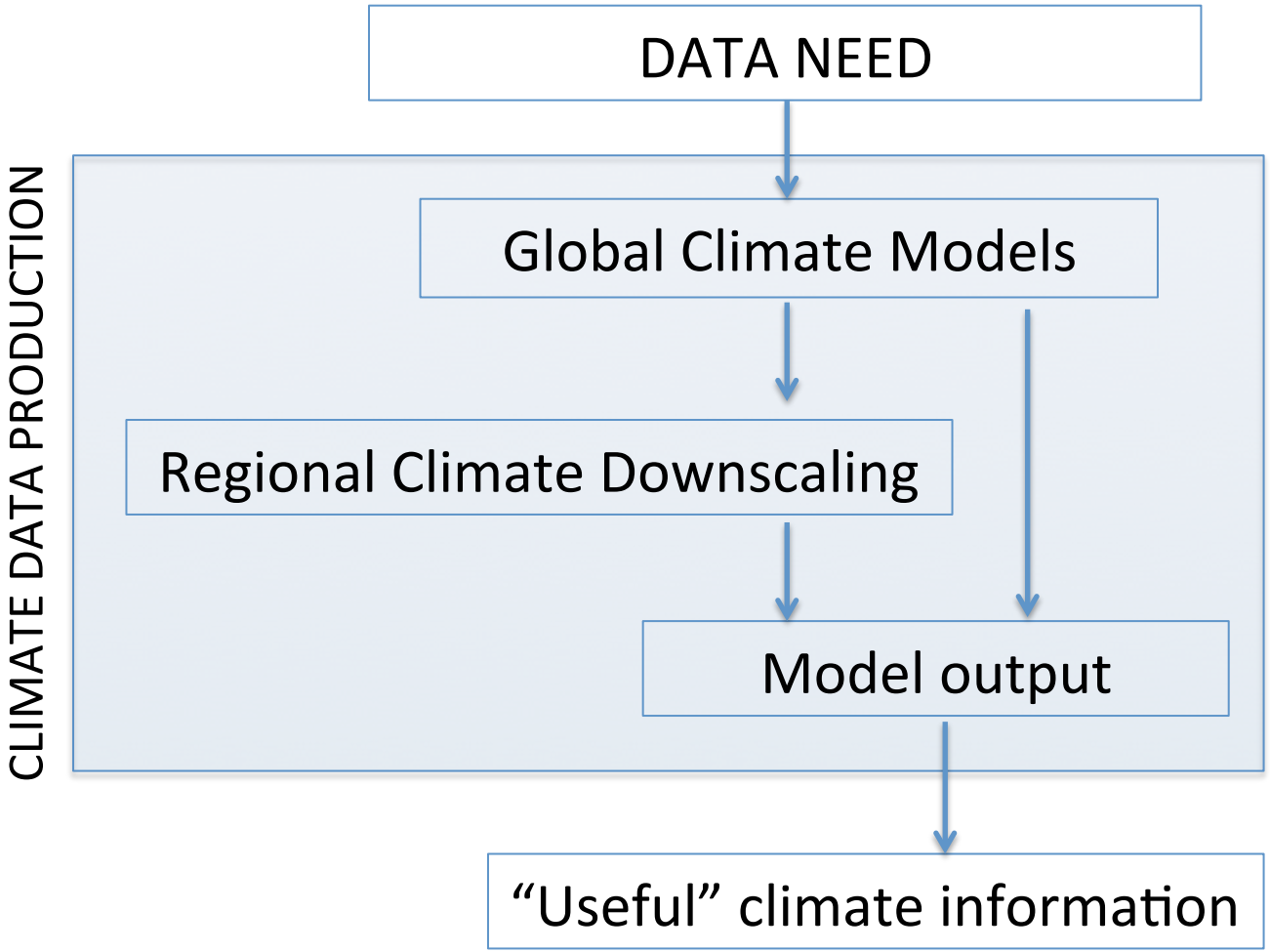
- High level projections
  - General policy
  - Strategic areas
  - No regrets decisions

  It will get warmer ✓
- Narratives and storylines
  - Large scale planning
  - Decisions related to e.g. temperatures
  - Rough idea of scale of infrastructure needed

  The experience of the change will include … (✓)
- Detailed projections incl timing, magnitude
  - Investment choices
  - Exact technology choices
  - Exact locations of networks, infrastructure, and development approvals

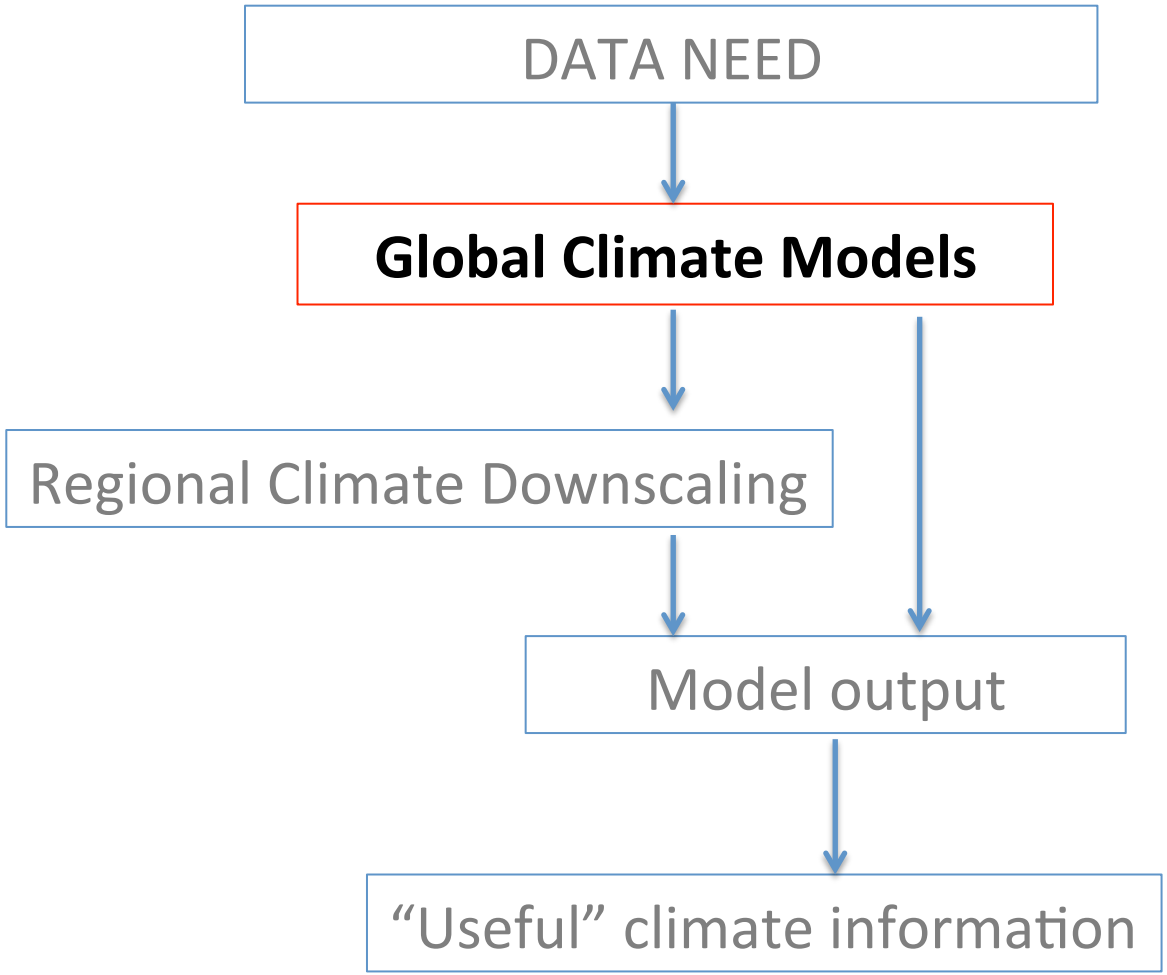
  In this location you will get x% change in flood frequency ✗

Breakdown of some key issues
Data need → Climate information



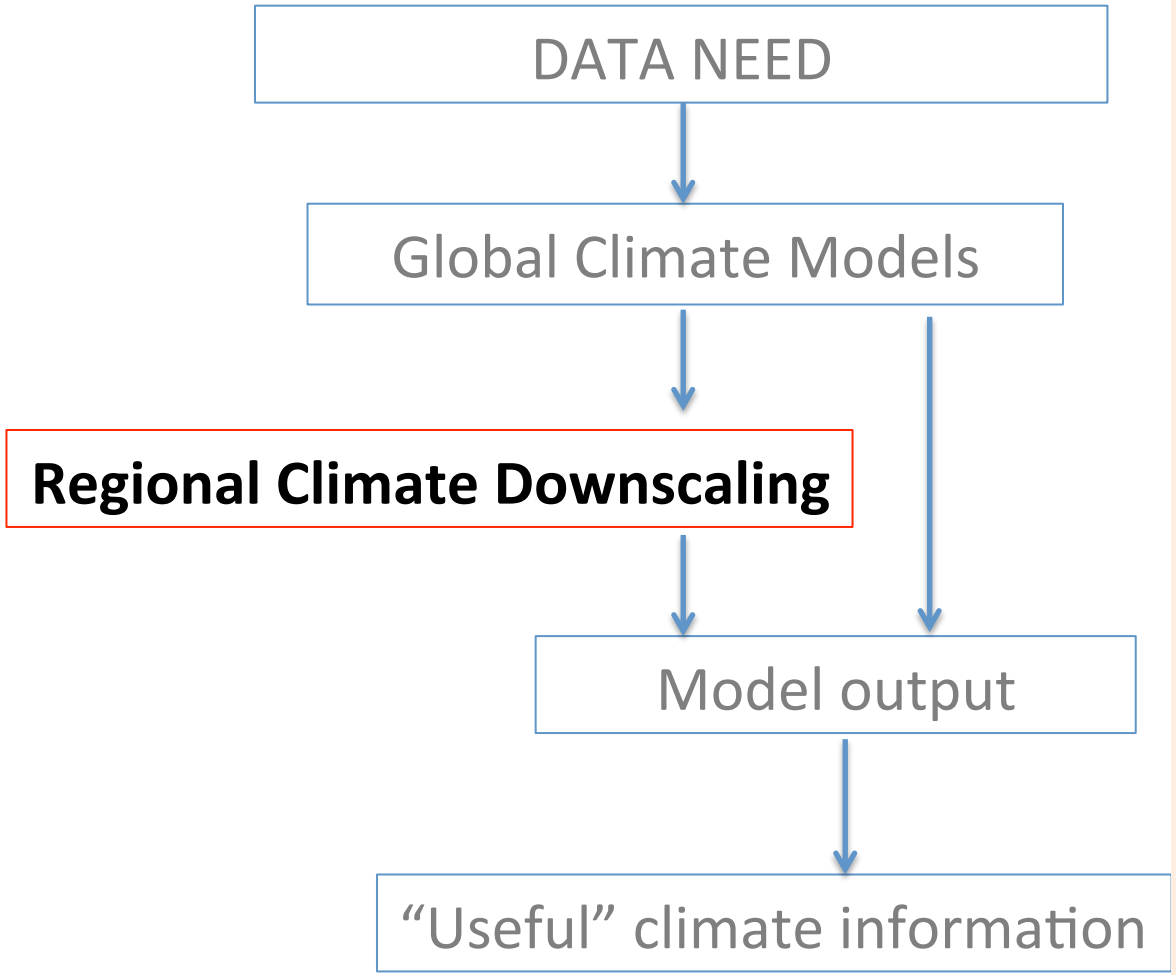
- **Understanding, communicating process of producing multi-method, multi model projections** ***("scientific credibility")***
- **"Simplifying" information** to meet specific user needs." *(Daron et al., Climatic Change, 2018)*

Global Climate Models



- **Model selection and number of models:** process based analysis vs. model opportunity / availability, uncertainty analysis and to develop a wide range of possible/plausible futures
- **Scenario selection** RCPs, "older scenarios"

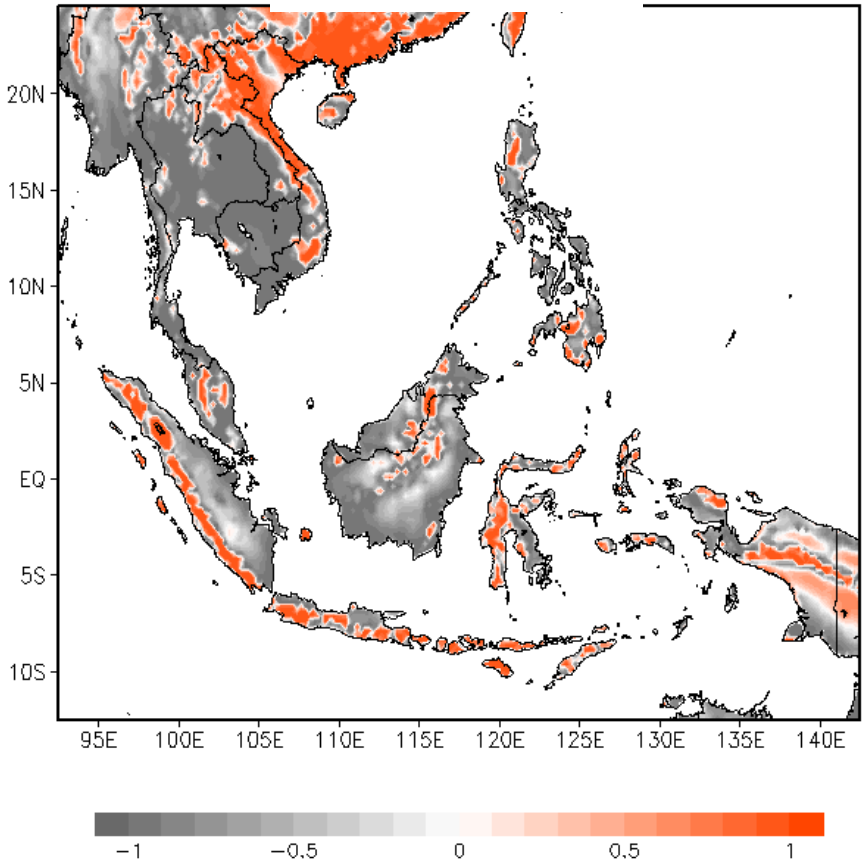
Climate Downscaling



- **Choice of methods, and number of downscaled outputs:**
  - multiple GCM, single RCM; multiple GCM, multiple RCM,
  - Statistical vs dynamical,
  - Relevant spatial and temporal resolution,
  - CO_2 forcing only;
  - relevance of local land use and change;
  - local aerosol impacts;
  - ocean-atmosphere interaction

Assessing what added value comes from Downscaling

UNWEIGHTED
MAM 1986-2005



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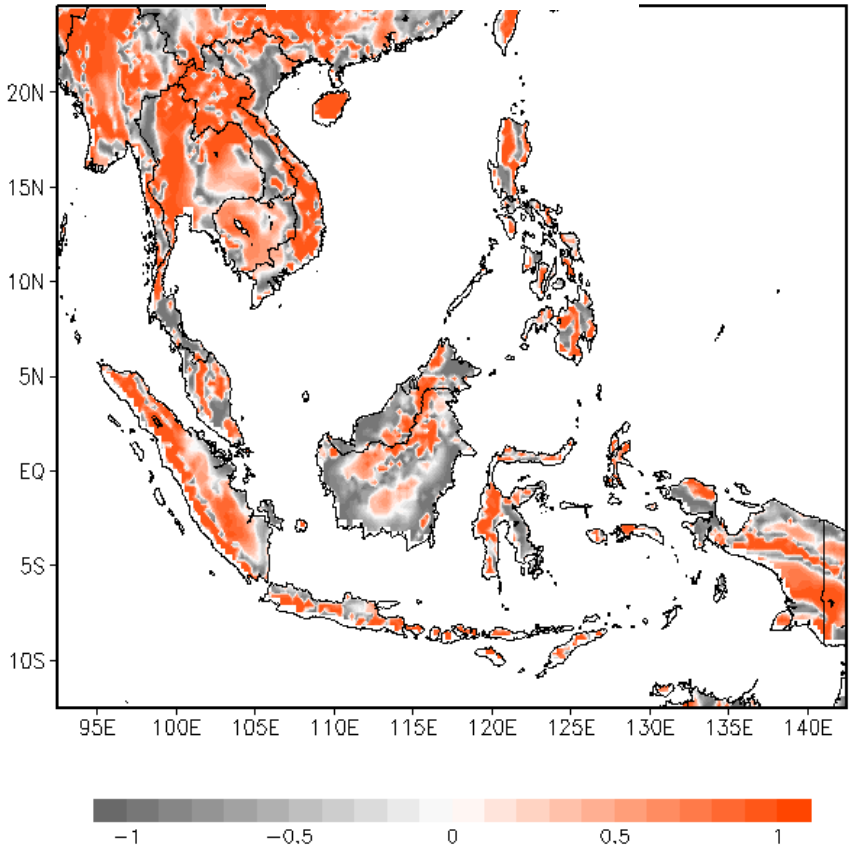
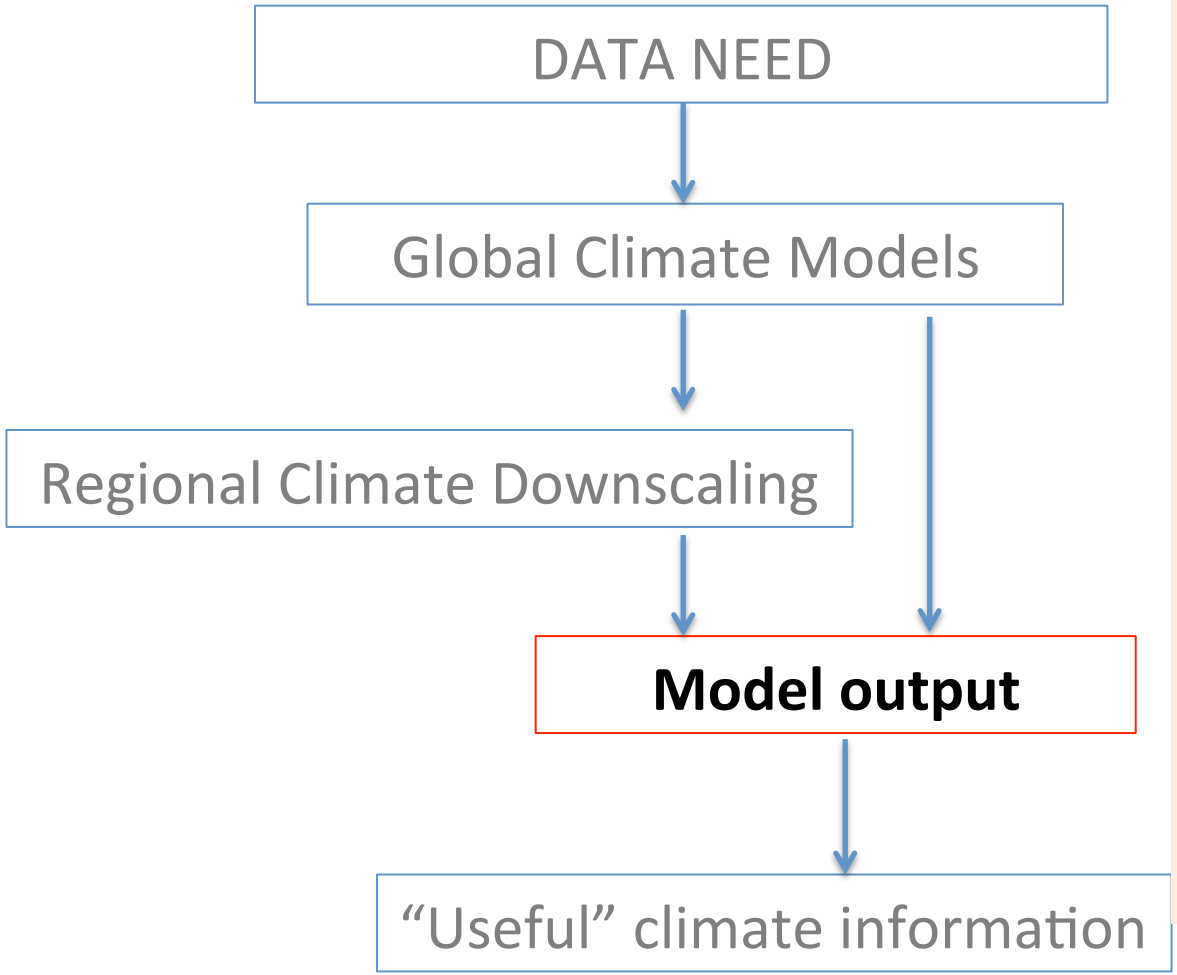


Added value defined as where CORDEX represents observations better than GCMS

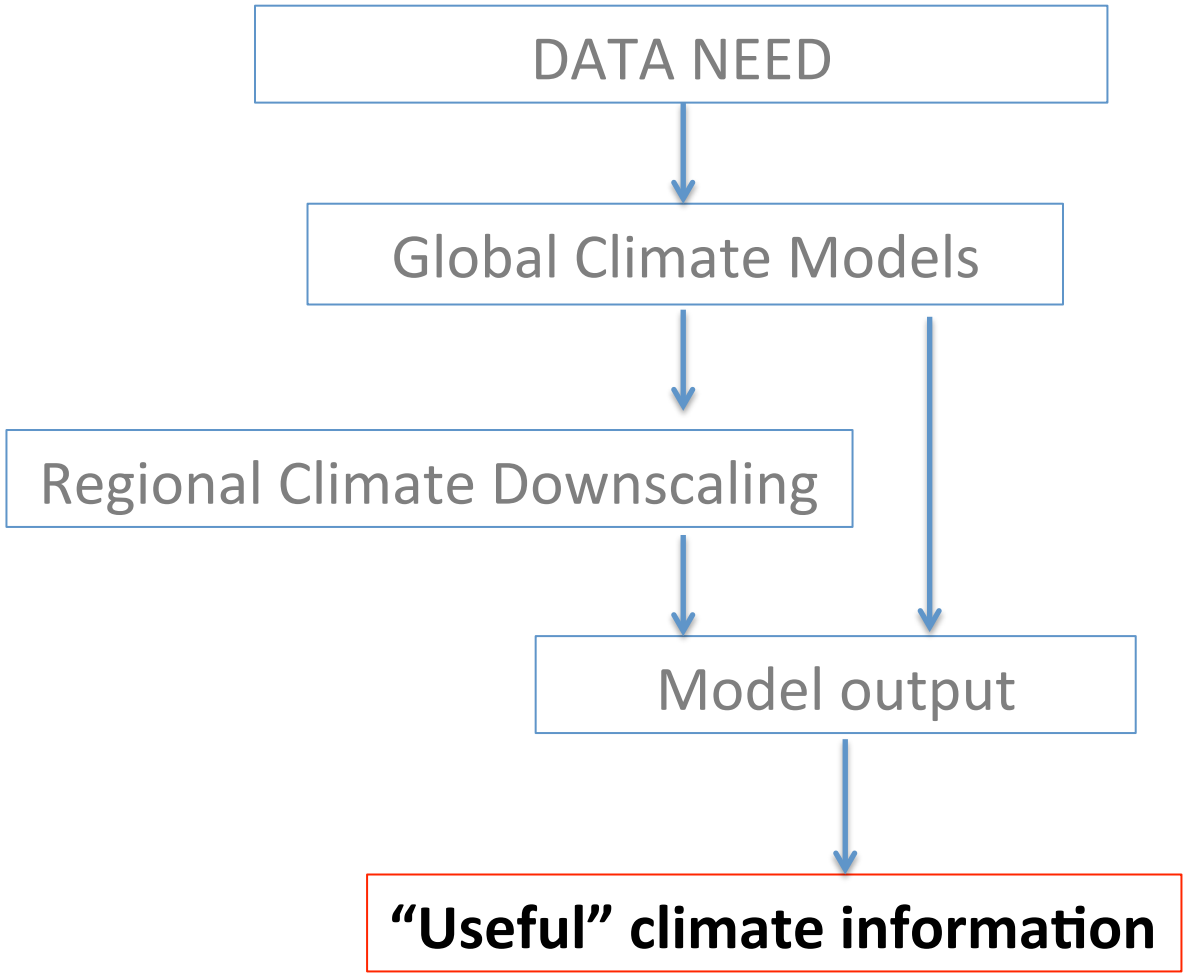
AV < 0: No added value ; AV > 0: RCM yields better approximation than GCM

Model output



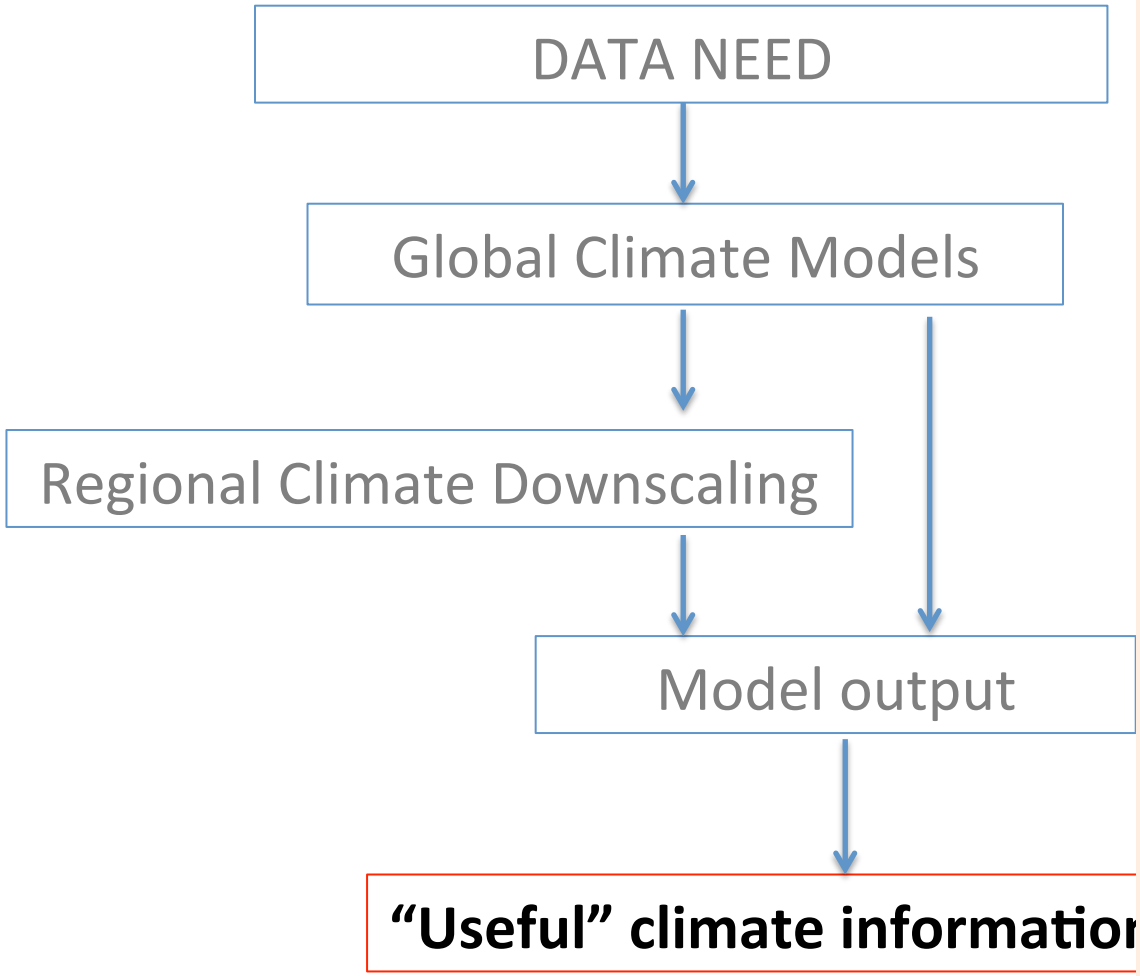
- **Evaluation / Validation**
  - Process based analysis – right precipitation for the wrong dynamics
  - Integrity and confidence in and availability of observation data (meteorological, flux data, etc)

Constraints on constructing "Useful" climate information



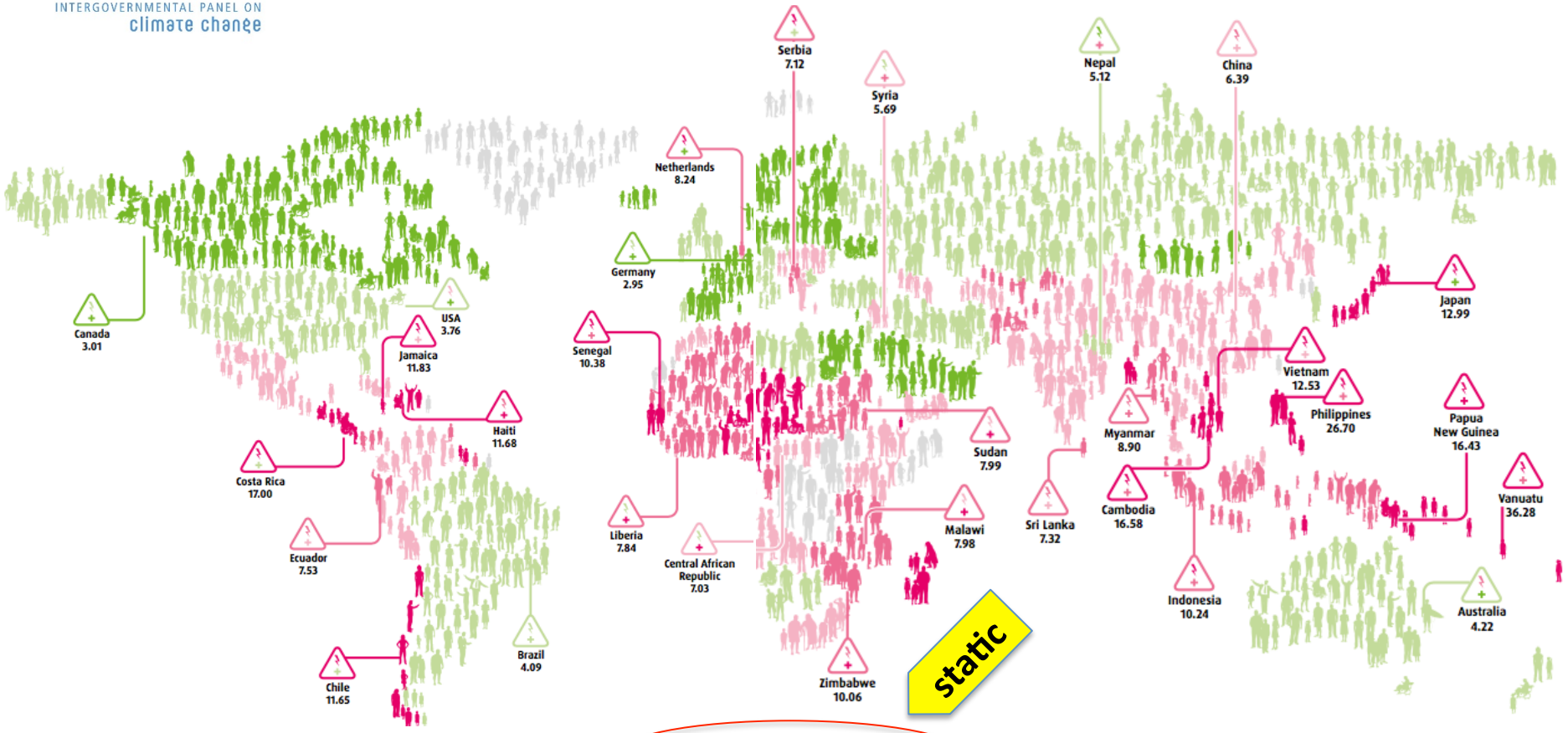
- **Ensembles: size and weighting**
- **Bias correction**
- **Defining, assessing managing uncertainty (guidance)**
- **Defining range of possibilities (guidance)**

Constraints on constructing "Useful" climate information



- **"Ensemble of opportunity";** Address integration, coherence, synthesis of information
- **"Impacts based"** useful, region-specific, sector-relevant variables, indices (temporal vs. aggregate statistics, climatology)
- **Risk framing and consistency of definition of terms**

Risk framing: World Risk Index



Risk = Hazard sphere x Vulnerability – Societal sphere

Exposure to earthquakes, storms, droughts, floods, sea level rise

Susceptibility, Coping Capacity, Adaptive Capacity

Rank	Country	Risk (%)
1.	Vanuatu	36.28
2.	Tonga	29.33
3.	Philippin	26.70
4.	Guatema	19.88
5.	Banglade	19.17

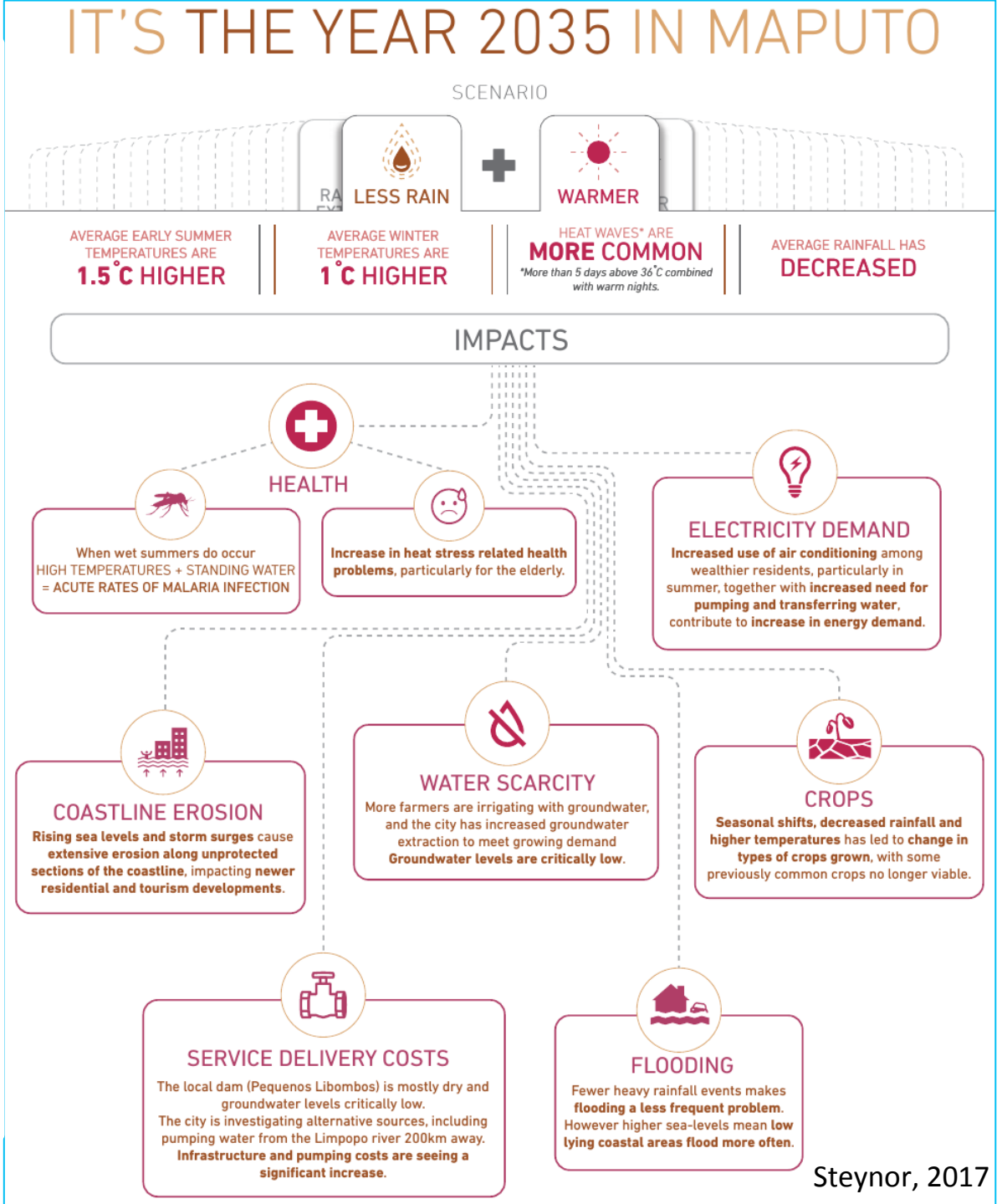
World Risk Report, Bündnis Entwicklung Hilft, UNU-EHS, 2016

Decisions are (idealy) based on knowledge about context relevant risk

Knowledge = Information in Context

- What is "Information"?
- How well do we understand context?

Issues of values and ethics in influencing message construction



Steynor, 2017

Opportunities

Leveraging major new developments such as **CORDEX***, FCFA, etc.

1. Integration across multiple information sources

- GCM + Downscaling + Observations → DISTILLATION
- Leveraging information from changes in phenomena

2. Enhanced recognition of context in constructing messages

- Increased understanding of scales of decision
- Stronger messaging around story lines of relevance

3. Greater co-assessment within and between working groups

- Stronger integration of evidence based messages between chapters
- More effective and targeted **handshake*** between working groups

4. More rigorous assessment of information usefulness

- Better understanding of bias correction implications
- Evaluation of added value from disaggregation and downscaling techniques
- Enhanced assessment of information choices in defining ranges of futures

5. Authoritative reference (guidance) on the selection, interpretation, and application of climate information in the context of decisions and policy