GREEN CLIMATE FUND

Session 2

Preparing adaptation project pipelines with strong climate rationale

Moderated by Clifford Polycarp

Session 2

Expected Outcomes

- Understand the earth climate system and drivers of climate variability and change;
- Understand how climate information and early warning services are generated and applied to a range of decision timelines;
- Identify the range of climate information and early services for each of the GCF focus areas and sectors;
- Understand steps for establishing climate rationale in project design – determine what constitute a low-emission climate-resilient development project versus a traditional development project;
- Awareness and access to available GCF technical assistance and support to enhance the country's science capacity

Enhancing the Climate Rationale in the Design of GCF Funding Proposals

Joseph Intsiful (PhD)
Senior Climate Information and EWS Specialist
Division of Mitigation and Adaptation

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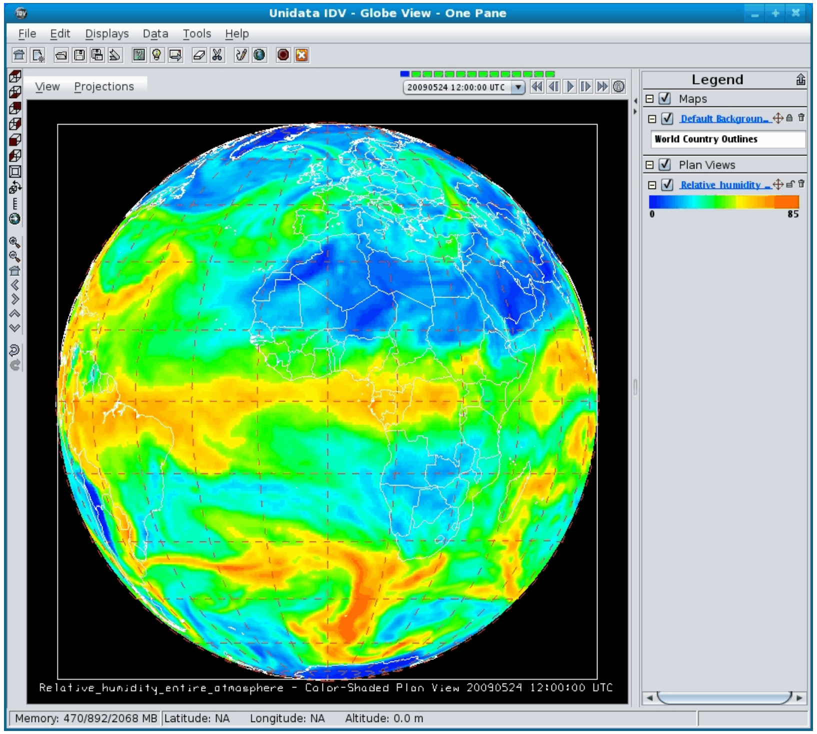
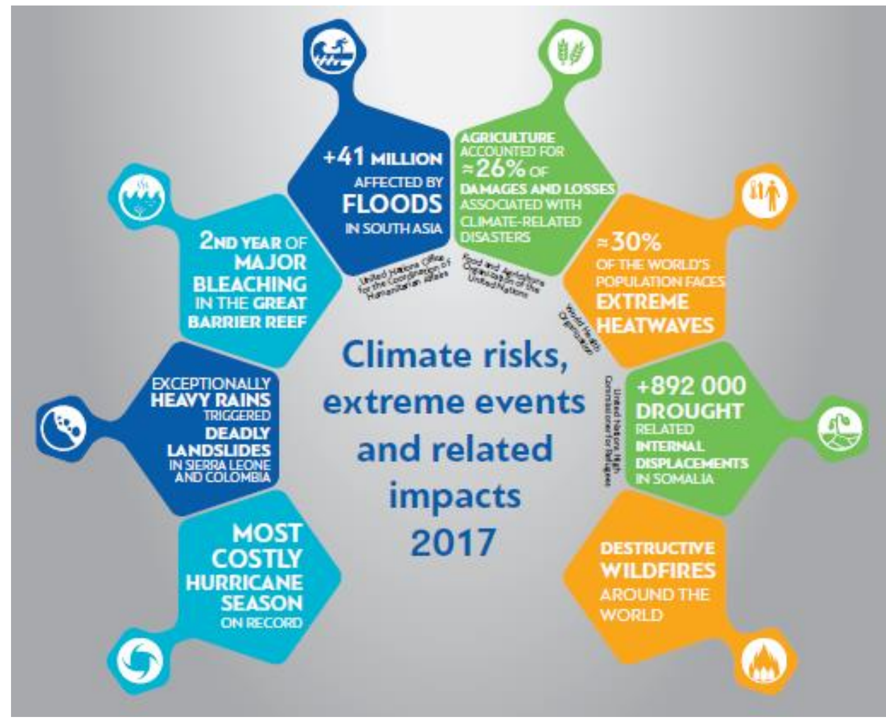
Content

1. Background and Context:
   - State of the global climate
   - Climate extremes, disaster risk and sustainable development
   - Framework for establishing a strong climate rationale

2. Secretariat Efforts for Enhancing Climate Rationale in Project Design

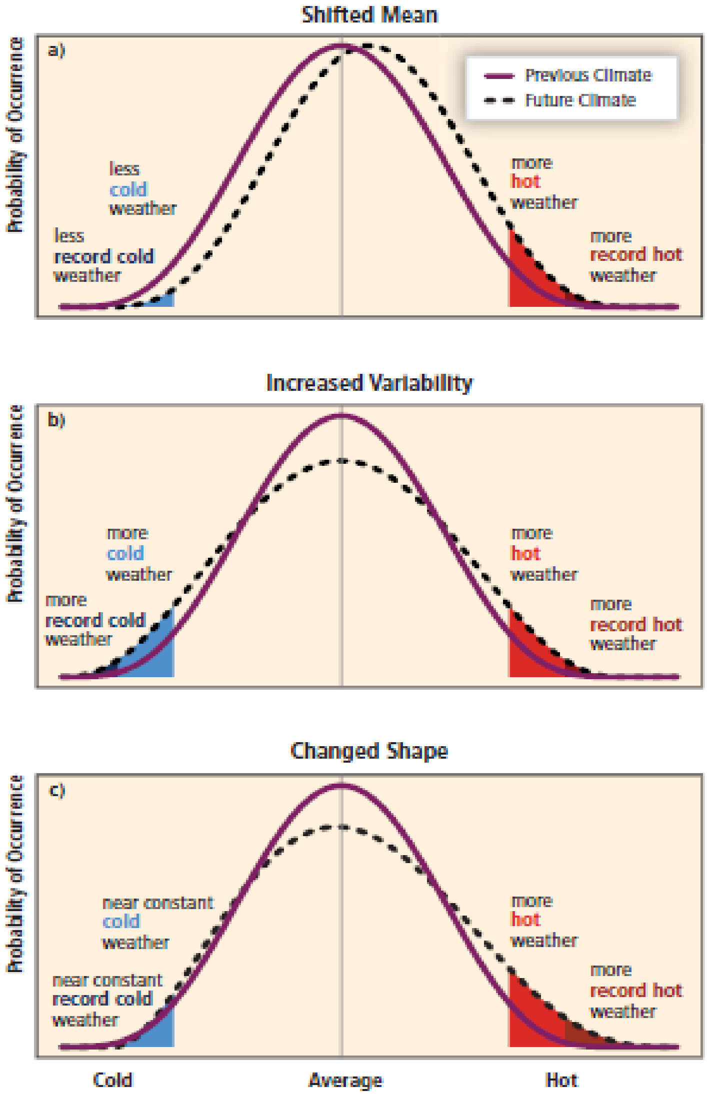


Climate Extremes and Related Disasters are on the Rise



WMO Statement on the State of the Global Climate for 2017 (WMO-No. 1212)

Climate Change is causing changes in Distribution of Extreme Climates

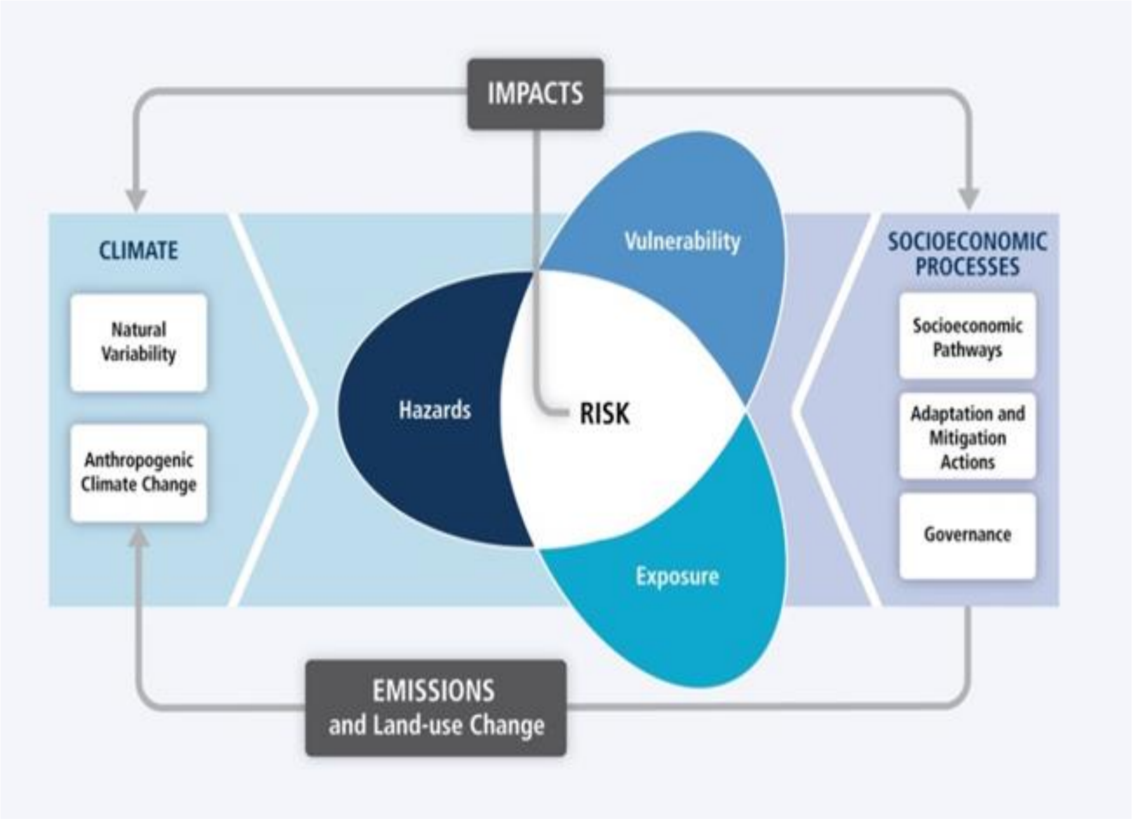


A changing climate leads:

- Threshold changes in mean, variability and extremes
- Changes in frequency, intensity, spatial extent, duration of extreme climates
- Timing of extreme events can result in unprecedented extreme climate events.

Key Concepts:
Disaster Risk, Climate Change and Low-Emission Climate-Resilient Development

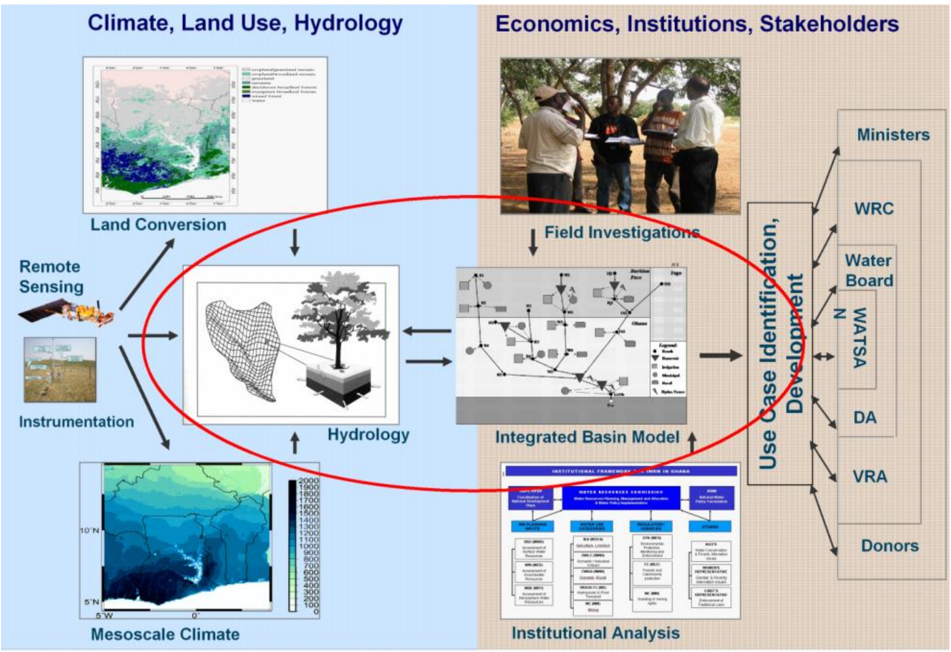
Climate disasters occur when **extreme climatic events** interact with **vulnerable social, economic and environmental conditions** leading to **severe alterations** in normal functioning of a community or a society.



Source: IPCC, SREX 2013

- **Disaster risk** – intersection of exposure, vulnerability and hazard/extreme events
- Climate events affect vulnerability to future extreme events by modifying resilience, coping capacity, and adaptive capacity

Establishing Robust Climate Rationale



Decision Support System for transboundary Volta Basin (Source: GLOWA-Volta Basin Project)

- Credible science, robust assessment of impacts and disaster risks (IPCC)
- A set of optimal interventions that comprehensively addresses underlying climate risks
- Integrating interventions into decision-making for long-term low-emission climate resilient development

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Project Development Process

Establishing the climate case

Step 1: Climate driver
Understanding the earth climate system and its drivers

Step 2: Hazard
Understanding how climate services are generated and applied for adaptation planning

Step 3: Impacts, exposure, vulnerability and risks
Understanding/identifying climate impacts, exposure, vulnerability and risks. Understanding how risks are derived from hazard, exposure and vulnerability

Developing interventions

Step 4: Problem identification and analysis
Defining core problem based on climate rationale as a starting point for project design

Step 5: Transformation of problem to project objectives
Reversing negative statements from the problem analysis into projects objectives and desired effects

Step 6: Creation of theory of change
Creating theory of change tree to lay out a detailed strategy to achieve expected results

Step 7: Development of Logical Framework from theory of change
Translating the theory of change tree into projects' goals, outcomes, outputs and activities

Step 8: Concept note development
Understanding how a proposed design fit into GCF Project idea/concept

Steps to enhance the climate rationale of GCF supported activities *(document GCF/B.21/Inf.08)*

1) Climate Science Basis
Scientific underpinning for evidence-based climate rationale and theory of change of all GCF funded projects and activities

Adaptation

2a) Climate impacts the project/programme aims to address

2b) Vulnerabilities and risks of these climate impacts to human wellbeing

Mitigation

2c) Emission trajectory for the relevant country and sector

2d) Potential pathways to shift projected emissions trajectory

3) Prioritized interventions for addressing barriers based on analysis of available options

4) Integration into broader domestic and international policy and decision-making processes

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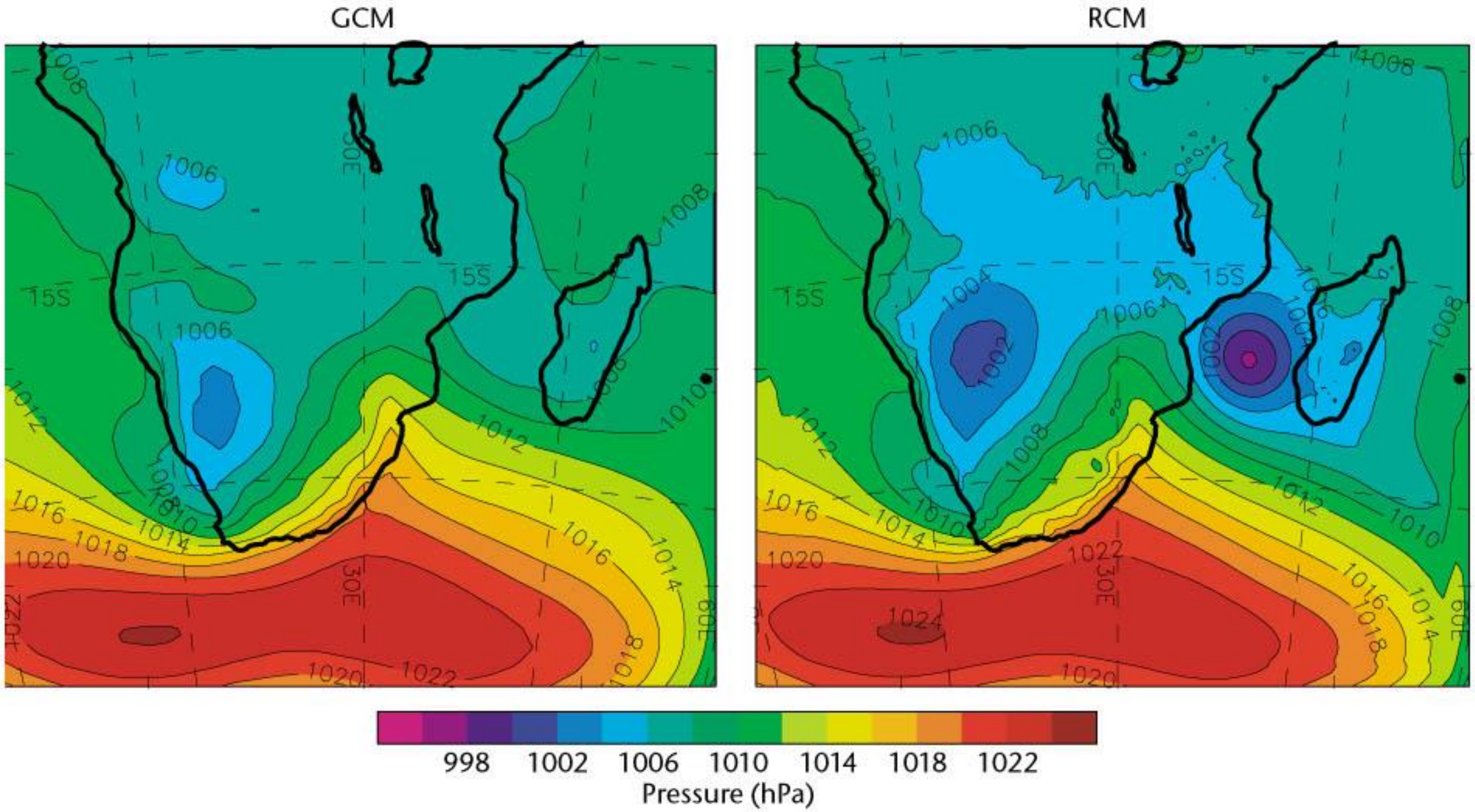
Climate Services for Climate-Resilient Development Planning

Short- to medium-term weather forecasts	Seasonal to inter-annual climate forecasts	Decadal climate trend analysis	Climate change scenarios
Next hour to 10 days	**Season to year**	**Decade**	**Long term climate change**
• Short-term planning • Emergency preparedness	• Medium-term operational planning • Risk assessment and management	• Long-term strategic planning • Infrastructures planning, retrofitting • Land zoning	International negotiations with national policy implications

Decision-making timelines →

Relevance of High-Resolution Climate Models



Project scale requirement for simulating extreme events e.g. tropical cyclones

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Mandates for Enhancing Climate Science and Rationale into Decision-Making Processes

Paris Agreement

Sub-paragraph 7(c) mentions: "*..strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making…"*

At B.07

Board *Decision B.07/04* (b) (iii) mentions the need for: "*… increased generation and use of climate information in decision-making.."*

At B.19

The Board called on the Secretariat to develop an integrated approach to enhance the climate rationale of GCF-supported activities (*Decision B.19/06*).

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GCF's Integrated Approach to Resolving Interrelated Issues

Governing Instrument

Strategic Plan

Strategic Frameworks

- Results Management Framework
- Risk Management Framework
- Investment Framework
- Country and Entity Programmes
- Business Plan

Operational Policies

- **Climate Rationale**
- Incremental Costs
- Full Costs
- Concessionality
- Co-financing

Implementation Tools and Guidance

- Terms and Conditions of Fund Instruments
- Accredited Entity Fees
- Investment Criteria Indicators
- Financial and Economic Analysis
- Eligibility Criteria
- Grant Equivalence Calculator

In place | Partially done / periodic review | To be developed

Secretariat's Work on Enhancing Climate Rationale

Objective

Develop the concept, scientific methodology, guidelines, data and other technical resources, and an implementation approach for enhancing the climate rationale of all GCF-financed projects and activities

Value Proposition

- Provide the means for analysis as well as inputs that can strengthen the articulation of the climate rationale in country programs and GCF funded activities and investments
- Promote climate information development and improve project climate rationale
- Provide technical assistance to entities and NDAs in designing of Concept Notes and Funding Proposals

Expected Outcomes

(1 of 2)

Better GCF projects

- Climate risk-proofing of GCF investments
- Climate effectiveness – Value for investment
- Improve the quality of GCF funded activities based on objective, scientific, evidence-based, data-driven conclusions and analysis
- Robustness of climate information at project scale

Alignment to mandate

- Focus on climate change vs. development (transformational projects)
- Incremental and full costs of proposals
- Concessionality
- Co-financing

Addressing of country priorities

- Better and evidence-based country climate priority setting as reflected in NDCs – linked to the Paris Agreement Global Stocktake 2020
- Input to IPCC reports

Strengthening of country capacity

- Better country capacity on climate analysis and delivery of climate services
- Strengthen National Meteorological and Hydrological Services (NMHS)
- Business driven, hands-on, capacity building for climate services provision

Expected Outcomes

(2 of 2)

Enhanced availability of data and science on climate rationale

- Climate rationale based on internationally acknowledged best data and science
- Providing appropriate interpretation of large volumes of data
- Determination of appropriate response options based on objective interpretation of data (prioritization criteria)

Impact beyond the GCF

- Global public benefit

Simplicity for countries and entities

- Climate rationale concept, methodology, and GCF guidelines easily understood and applied
- Translating vast amounts of data and science into simpler, understandable ways for non-climate science policy makers to make decisions.

Common standards

- Headline indicators that can be used by all countries and projects
- Context-specific indicators related to 8 GCF results areas

Q&A

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Climate indices for adaptation

Strengthening your climate adaptation rationale

Nicholas Herold (borrowing from the work of many others)
WMO

WORLD METEOROLOGICAL ORGANIZATION

UNSW THE UNIVERSITY OF NEW SOUTH WALES

Contents

1. *Scientific framework of the climate rationale*
2. *Climate indices*
3. *ClimPACT2*
4. ~~*The need for good data*~~

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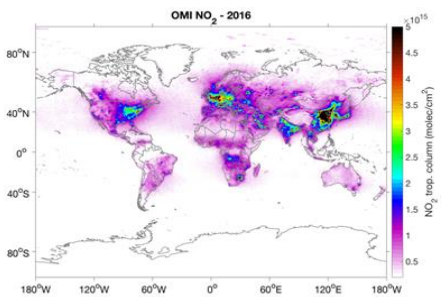
Scientific framework of the climate rationale



Global climate indicators

State of the climate system

Sector specific indexes

Socio-economically relevant sectors

High impact events

Widespread, multi-sectoral impacts

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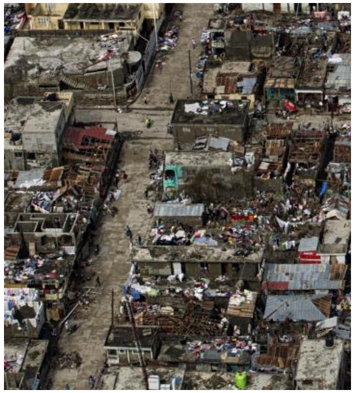
Climate information can aid decision-makers at all levels

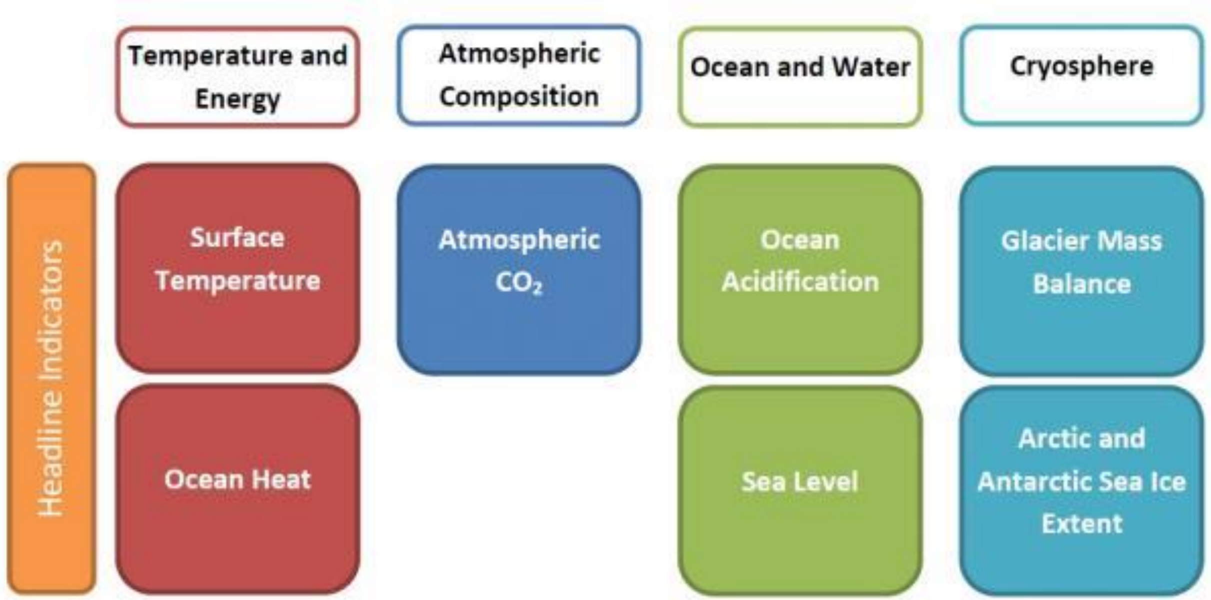
Short to medium term weather forecasts	Seasonal to inter-annual climate forecasts	Decadal climate trend analysis	Climate change scenarios
Next hour to 10 days	**Season to year**	**Decade**	**Multi-decade to centennial**



Decision-making timelines →

MANAGE DISASTER RISK	SECTORAL DEVELOPMENT	ADAPTATION PLANNING	PLAN FOR FUTURE RISK

Global climate indicators

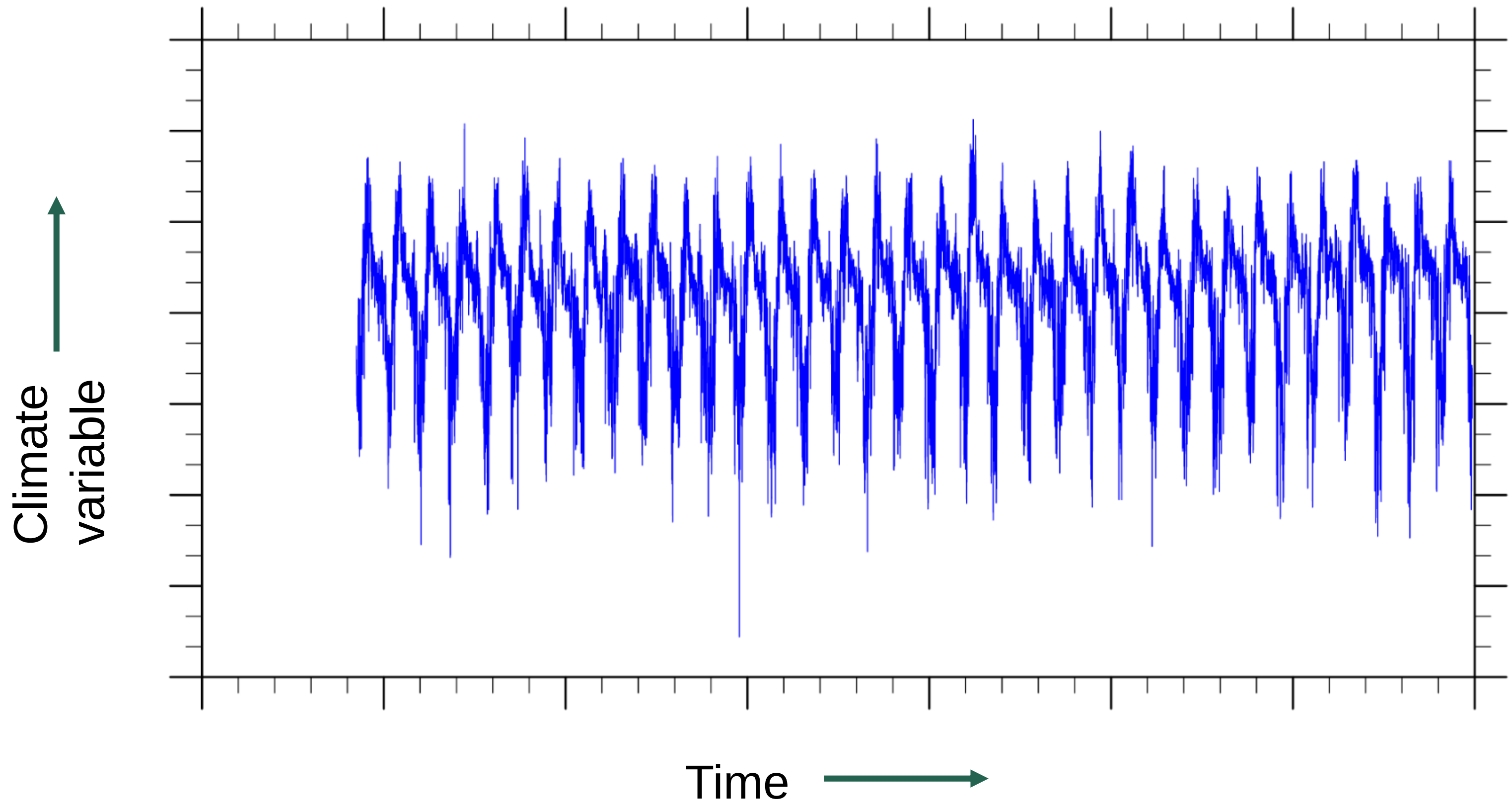


- Seven parameters that describe the changing climate.
- Established through the WMO.
- Meant for public consumption without being overly simplistic.

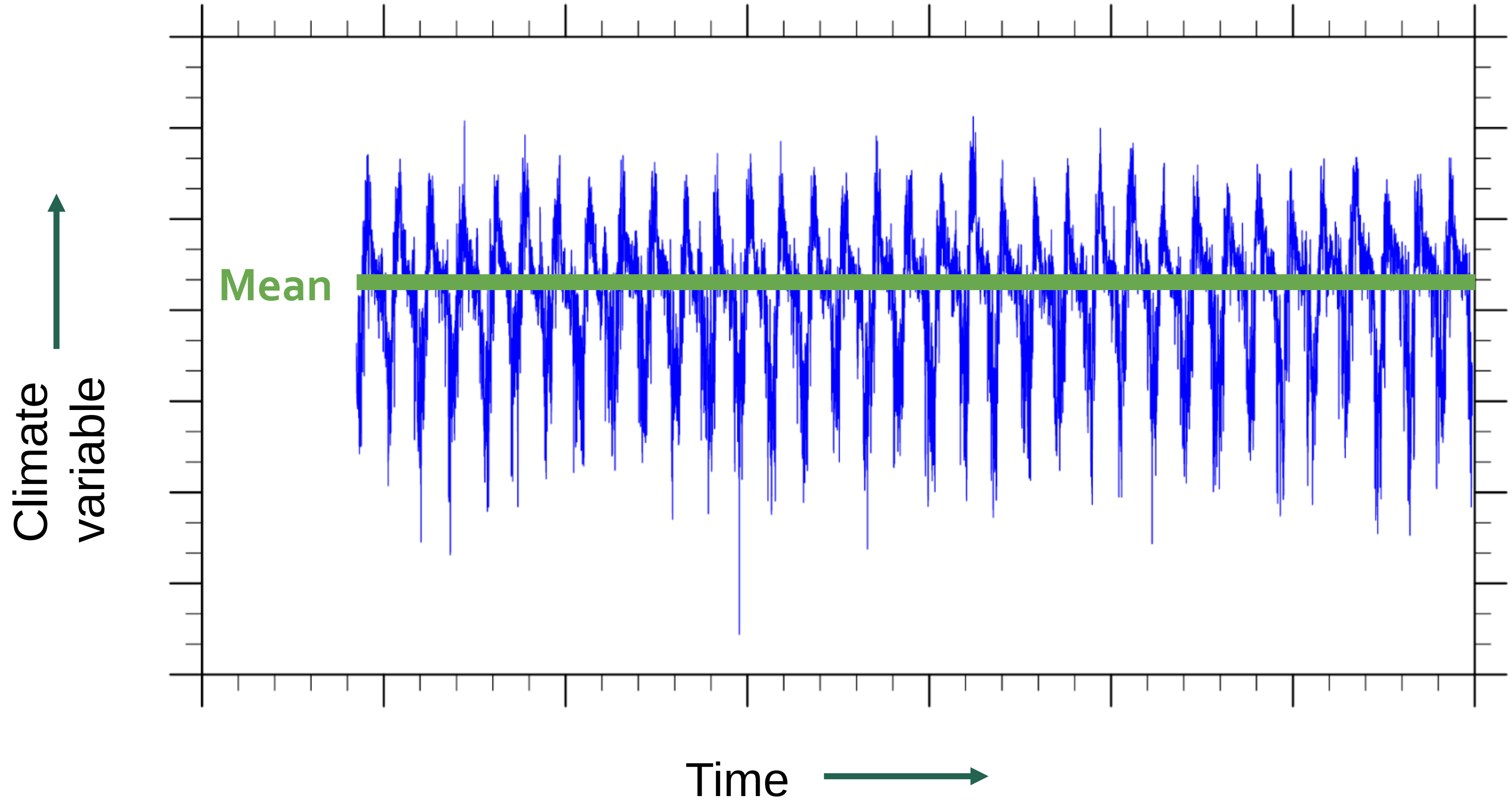
Climate indices

1. What is a climate index and how are they helpful?
2. Sector-specific climate indices

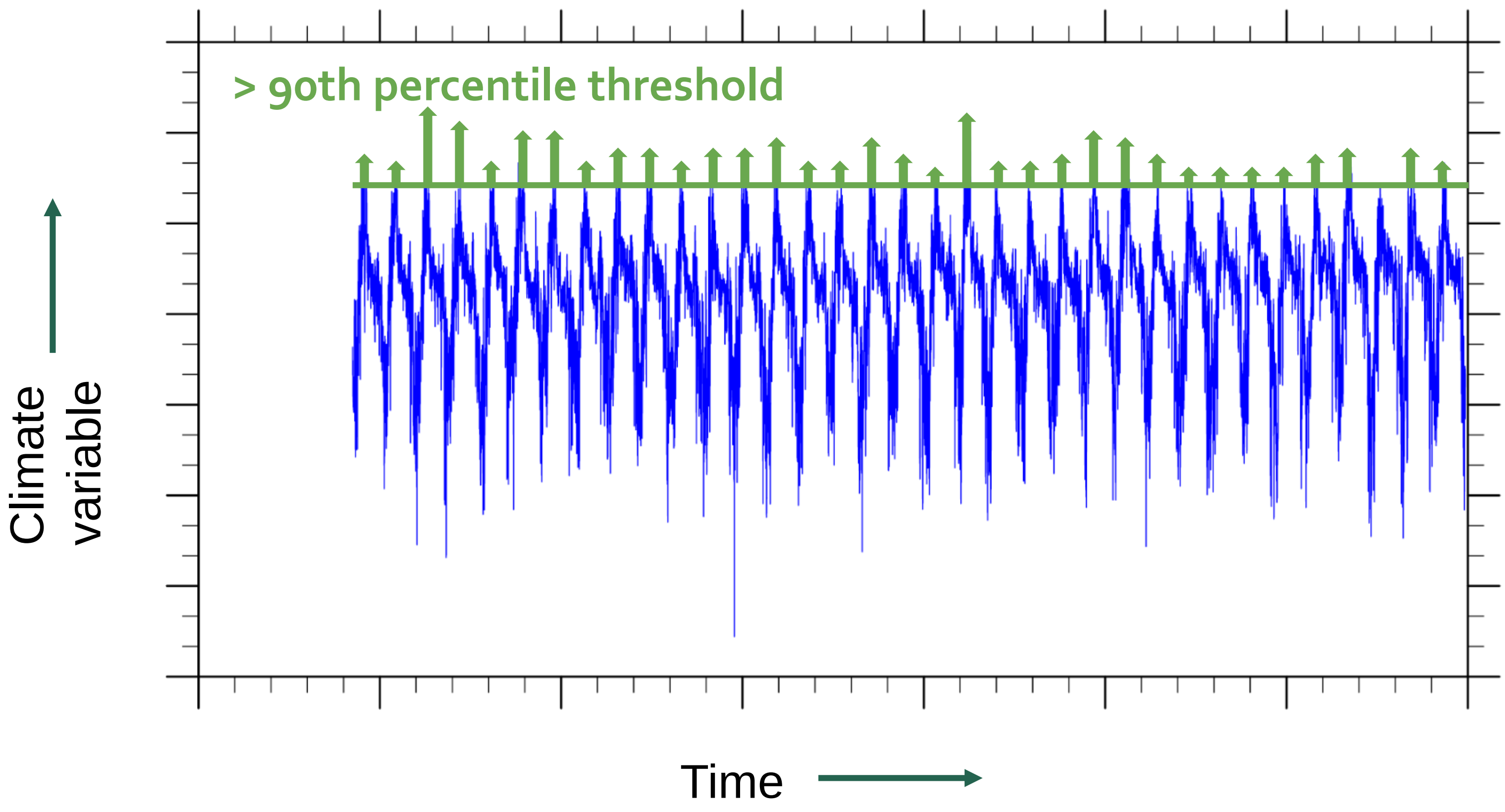
What is a climate index?



What is a climate index?



What is a climate index?



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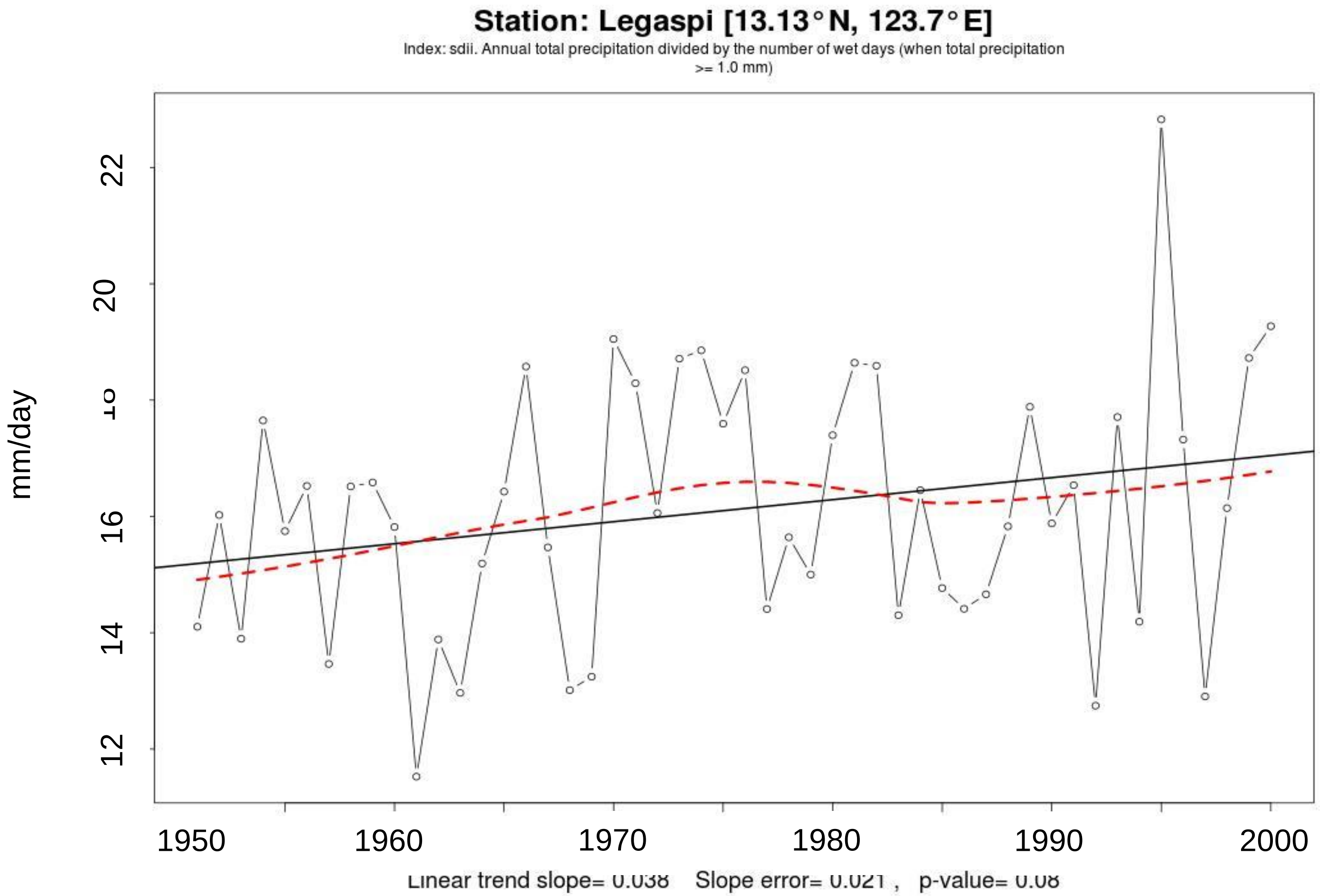
Example: average rainfall on rainy days



Means vs Extremes

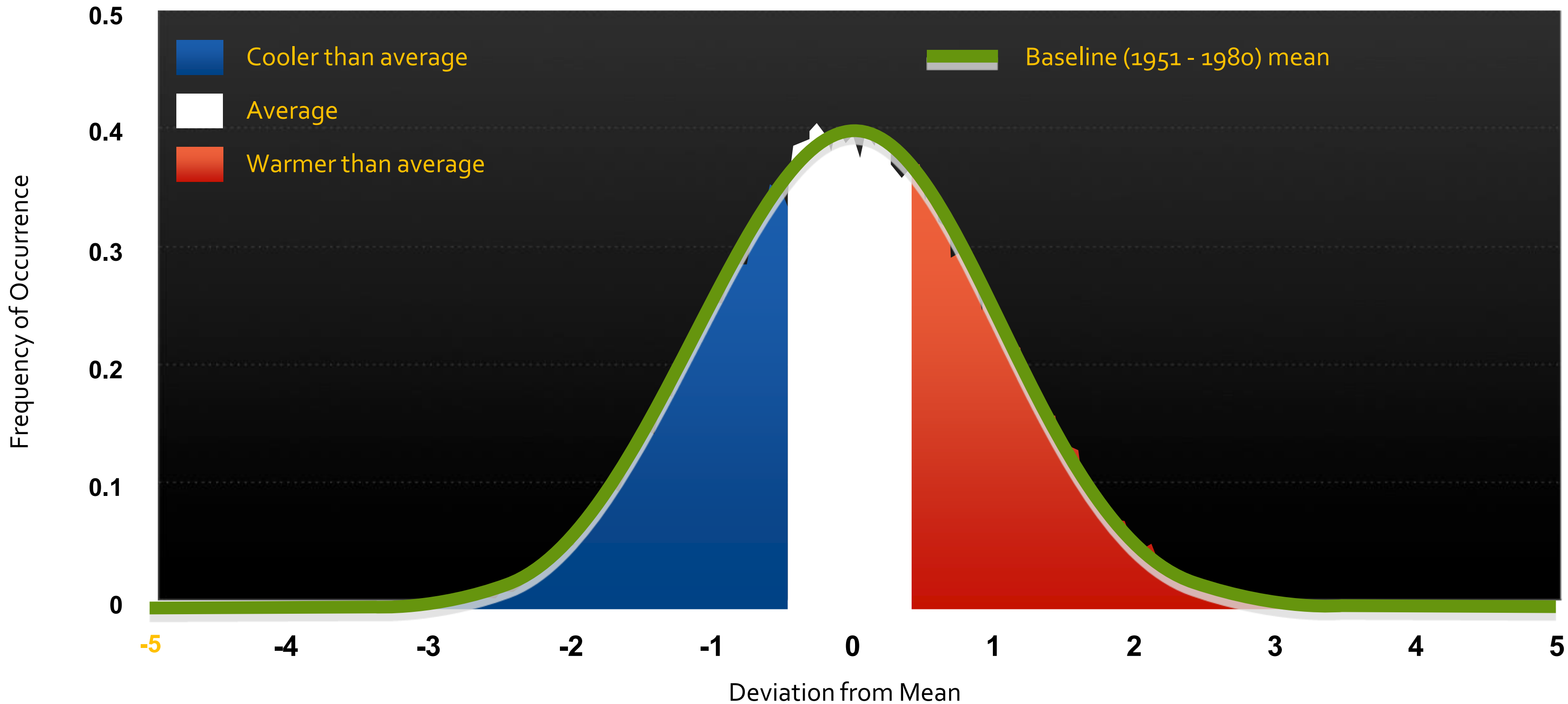
Drought in South Africa

Typhoon in the Philippines

Heatwave melting pavement in India

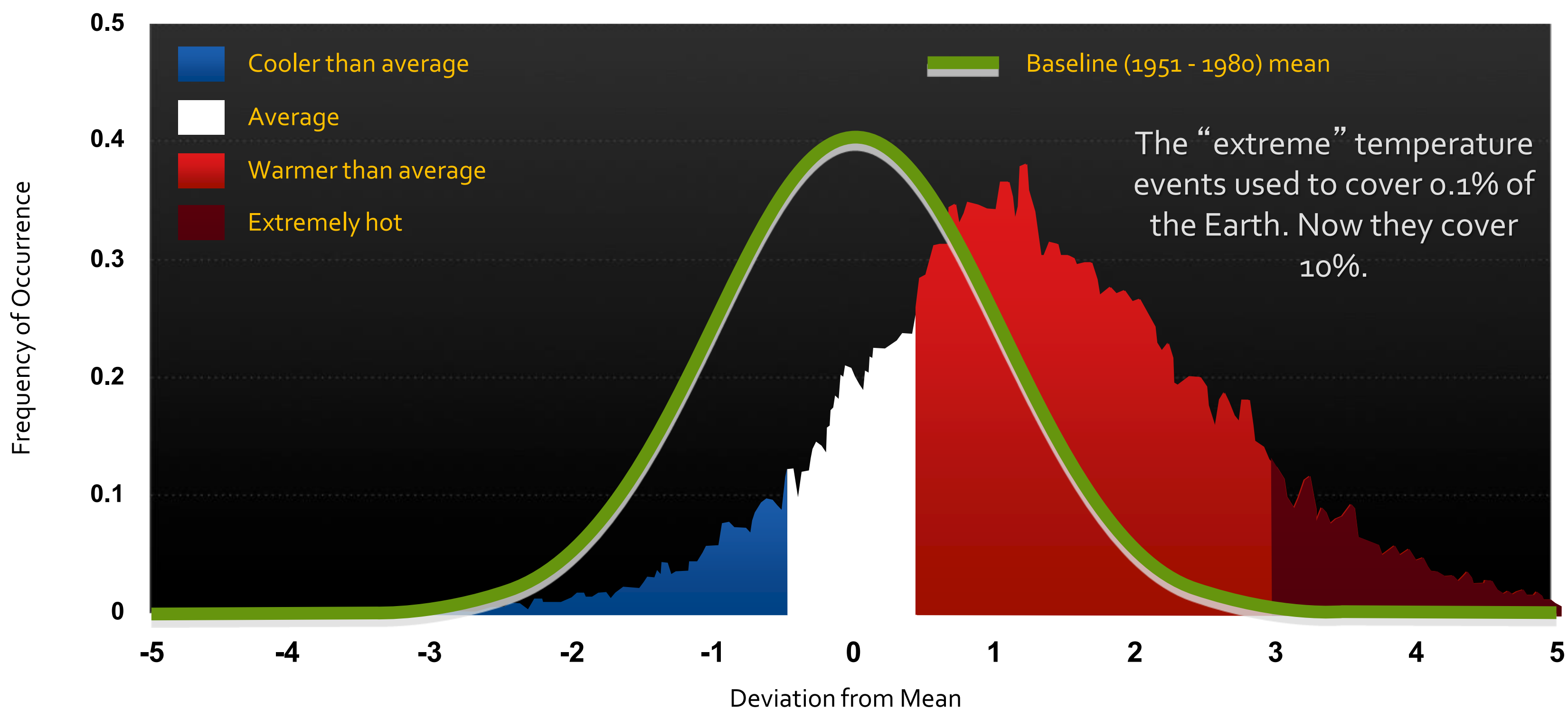
“rain bomb” in the USA

Summer Temperatures 1951–1980



Source: NASA/GISS; Hansen, et al., "Perceptions of Climate Change," Proc. Natl. Acad. Sci. USA 10.1073, August 2012

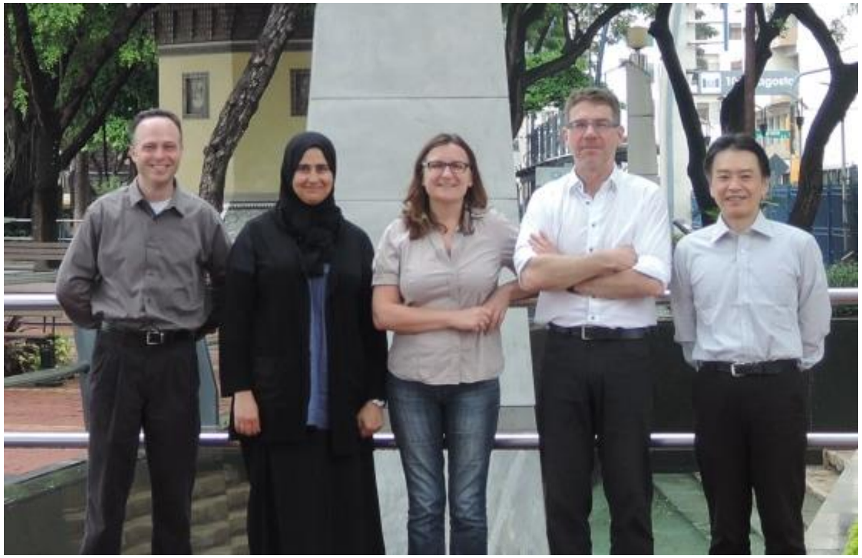
Summer Temperatures 2001–2011



Source: NASA/GISS; Hansen, et al., “Perceptions of Climate Change,” Proc. Natl. Acad. Sci. USA 10.1073, August 2012

Sector-specific indices by the ET-SCI

- The Expert Team on Sector-specific Climate Indices (ET-SCI).
- Established by WMO to develop sector-relevant indices that can be;
  - Applied across a wide number of sectors
  - Applied across a wide number of regions
  - Flexible according to needs of sectors
  - Used to understand historical changes as well as make useful future predictions
- Not an easy task!
- Currently over 60 indices.
- Only based on temperature and rainfall.



The expert team on sector-specific climate indicates.
http://www.wmo.int/pages/prog/wcp/ccl/opace/opace4/ET-SCI-4-1.php

Examples of sector-specific indices

- **Drought indices**: Standardised Precipitation Index (SPI), maximum consecutive dry days.
- **Heatwave indices**: Multiple definitions including the Excess Heat Factor (EHF).
- **Extreme rainfall indices**: Maximum 1 day rainfall, maximum 5 day rainfall.
- **Agricultural indices**: Growing Season Length (GSL), multiple temperature thresholds.



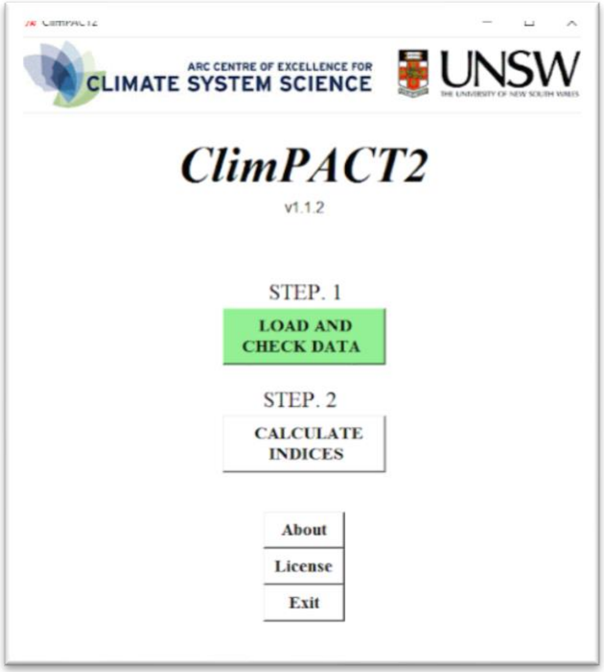

ClimPACT2

1. What does the software do?
2. How to get it and training with the World Meteorological Organisation

ClimPACT2

- Software package developed at UNSW using the R programming language.
- R and ClimPACT2 available for free.
- Calculates over 60 climate indices and produces over 140 files.
- ClimPACT2 is a collaborative effort.

https://www.r-project.org/



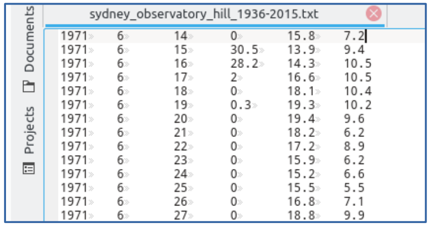
https://github.com/ARCCSS-extremes/climpact2

Current capabilities of ClimPACT2

Read in daily temperature and precipitation

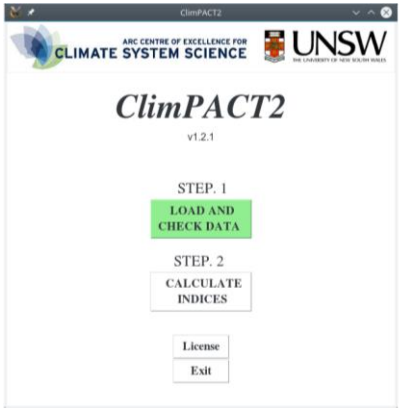
Output monthly and annual indices

Text data for a single location

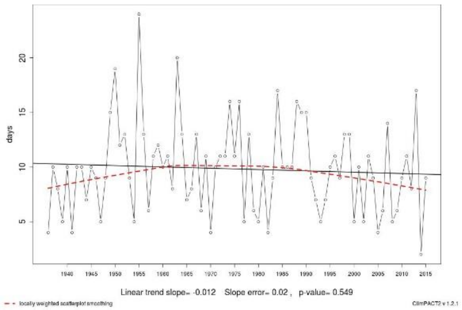


1971	6	14	0	15.8	7.2
1971	6	15	30.5	13.9	9.4
1971	6	16	28.2	14.3	10.5
1971	6	17	2	16.6	10.5
1971	6	18	0	18.1	10.4
1971	6	19	0.3	19.3	10.2
1971	6	20	0	19.4	9.6
1971	6	21	0	18.2	6.2
1971	6	22	0	17.2	8.9
1971	6	23	0	15.9	6.2
1971	6	24	0	15.2	6.6
1971	6	25	0	15.5	5.5
1971	6	26	0	16.8	7.1
1971	6	27	0	18.8	9.9

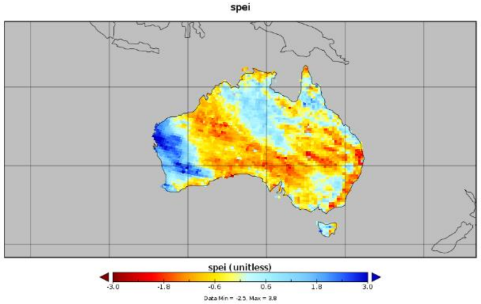
Spatial data for a region



Time-series output

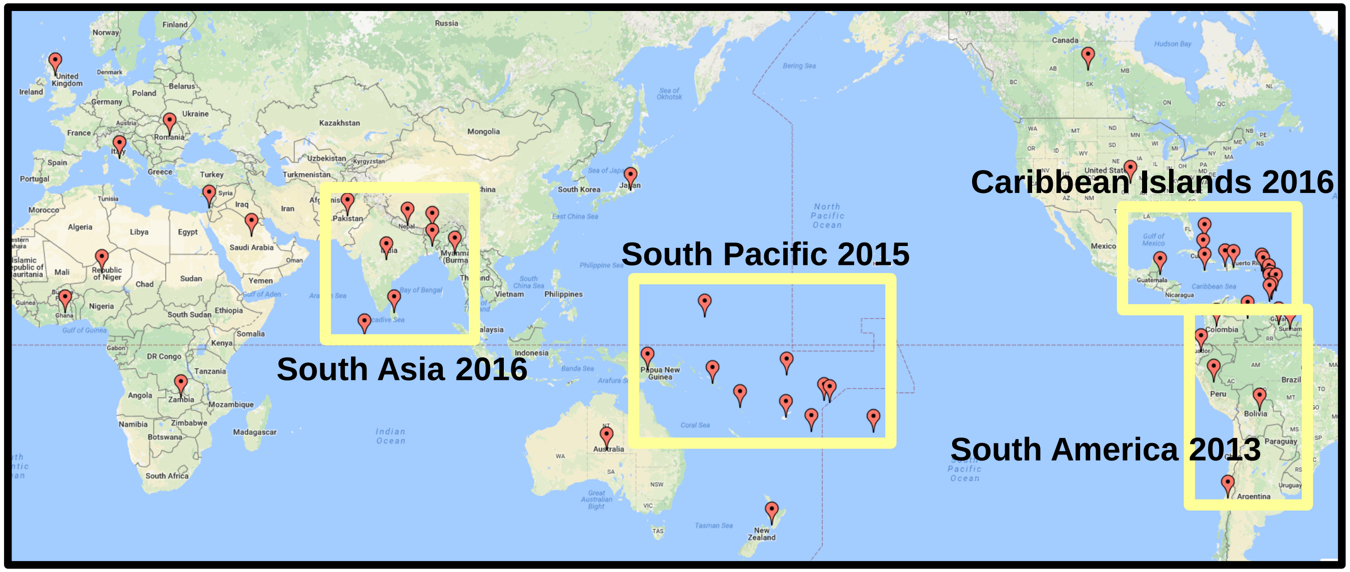


Gridded output



ClimPACT2 user base

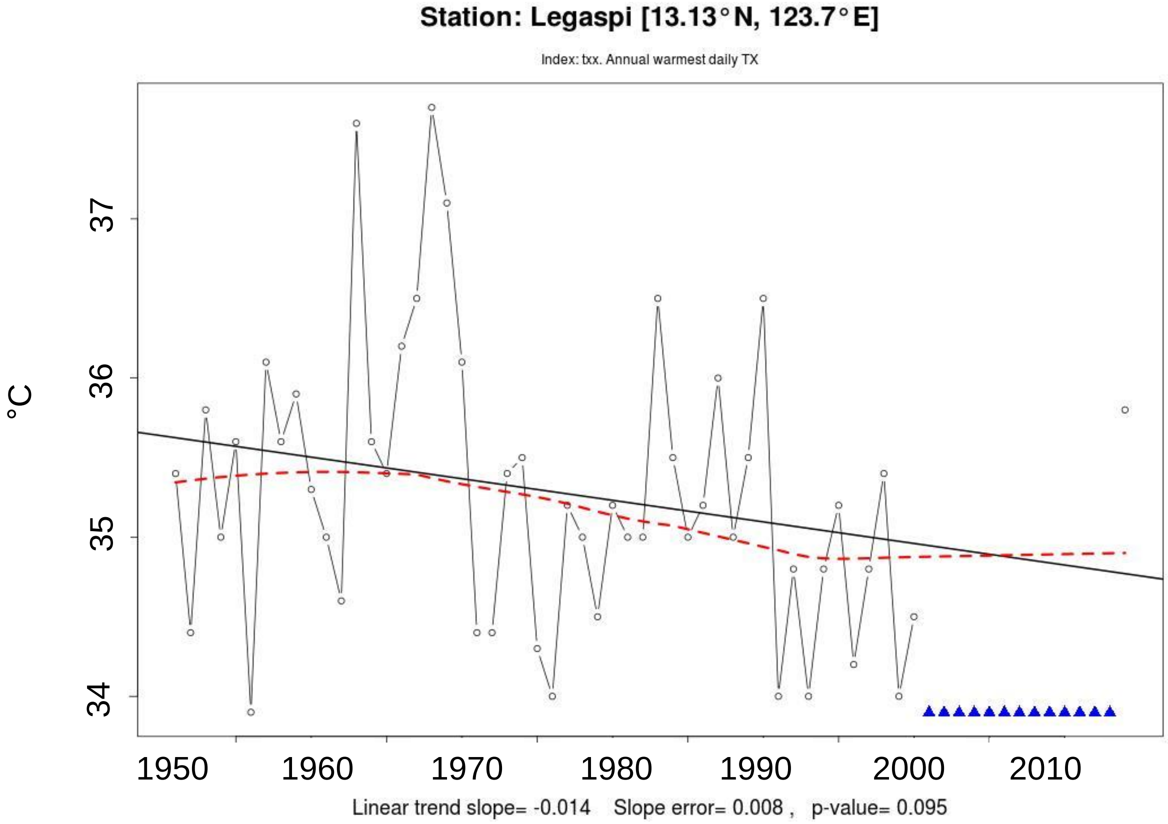
1) Sector specialists and national meteorological/hydrological services.
2) Scientists.
3) Private enterprise.



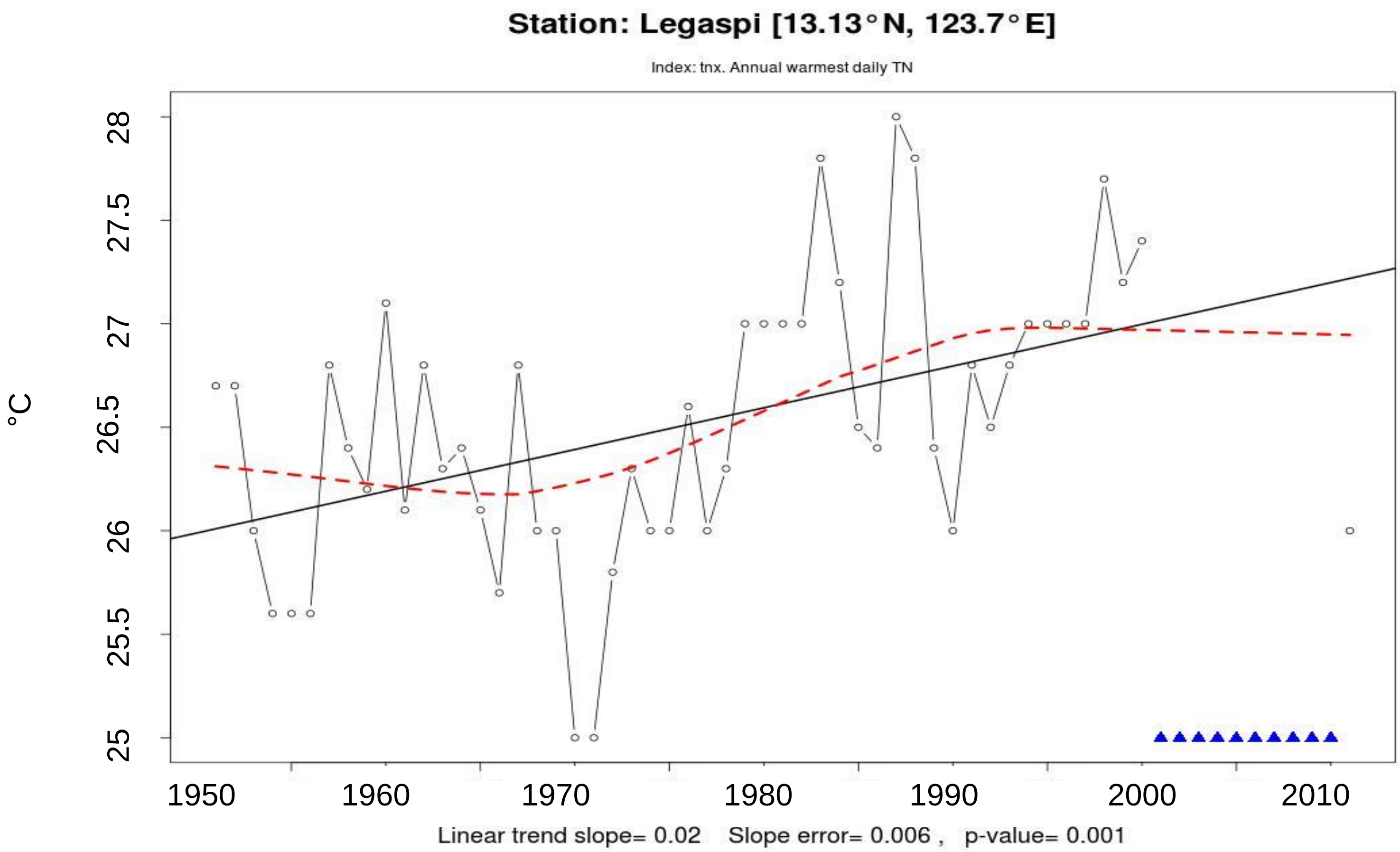
Current ClimPACT2 users by country

https://github.com/ARCCSS-extremes/climpact2

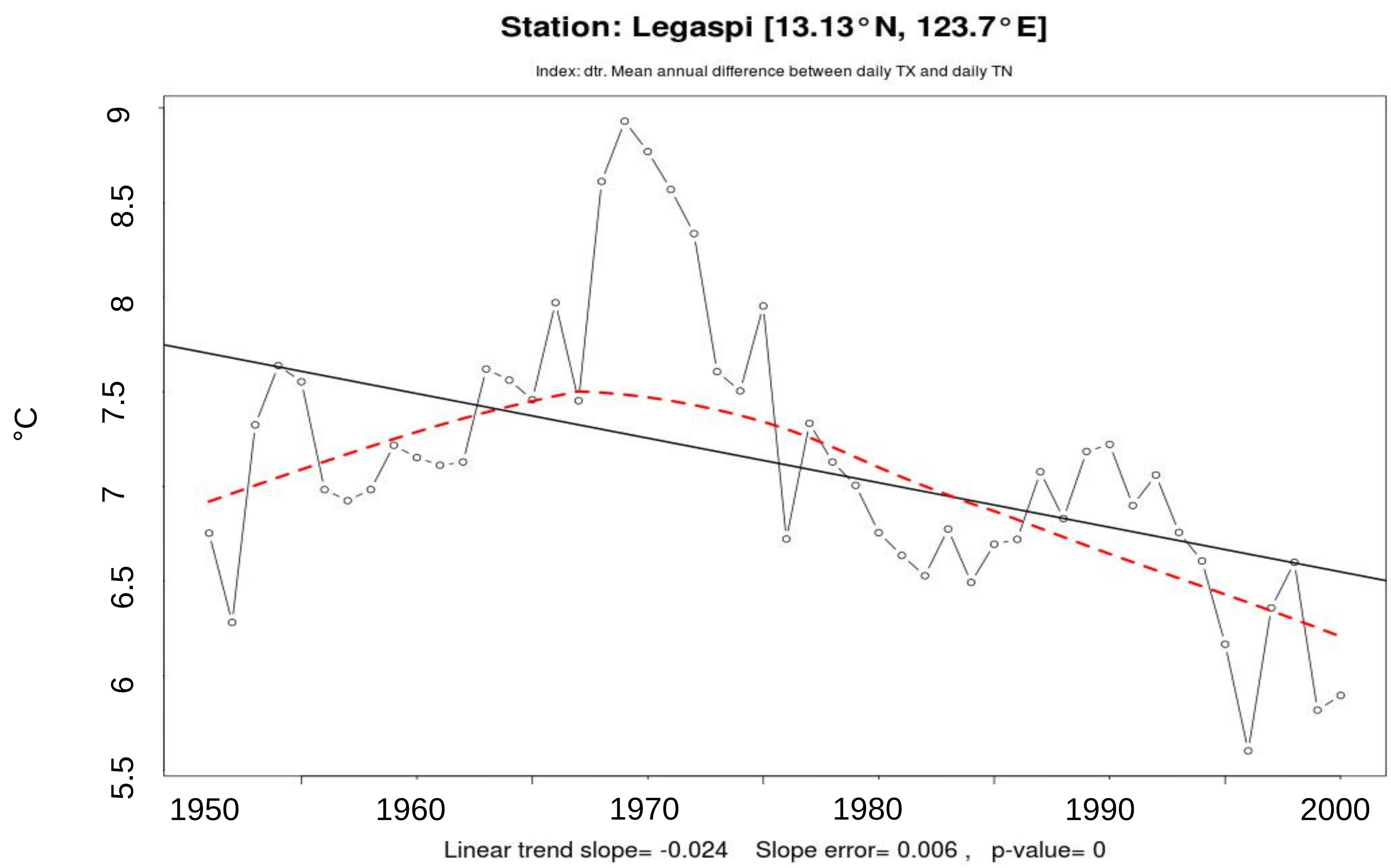
Example: hottest day each year



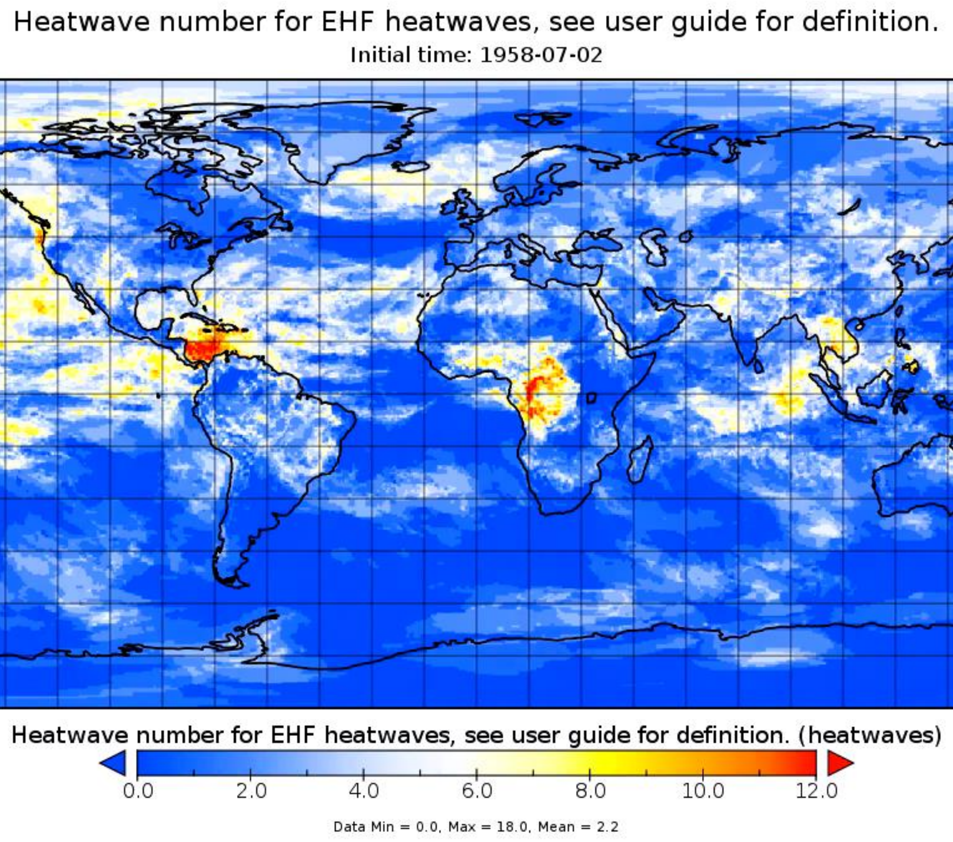
Example: hottest night each year



Example: average day-night temperature difference



ClimPACT2 spatial data: number of heatwaves



ClimPACT2 indices

TABLE A1: Core ET-SCI indices (As agreed July 2011. Updated index names and definitions May 2016). Bold indicates also ETCCDI index.

Short name	Long name	Definition	Plain language description	Units	Time scale	Sector(s)
FD	Frost Days	Number of days when TN < 0 °C	Days when minimum temperature is below 0°C	days	Mon/Ann	H, AFS
TNlt2	TN below 2°C	Number of days when TN < 2 °C	Days when minimum temperature is below 2°C	days	Mon/Ann	AFS
TNltm2	TN below -2°C	Number of days when TN < -2 °C	Days when minimum temperature is below -2°C	days	Mon/Ann	AFS
TNltm20	TN below -20°C	Number of days when TN < -20 °C	Days when minimum temperature is below -20°C	days	Mon/Ann	H, AFS
ID	Ice Days	Number of days when TX < 0 °C	Days when maximum temperature is below 0°C	days	Mon/Ann	H, AFS
SU	Summer days	Number of days when TX > 25 °C	Days when maximum temperature exceeds 25°C	days	Mon/Ann	H
TR	Tropical nights	Number of days when TN > 20 °C	Days when minimum temperature exceeds 20°C	days	Mon/Ann	H,AFS
GSL	Growing Season Length	Annual number of days between the first occurrence of 6 consecutive days with TM > 5 °C and the first occurrence of 6 consecutive days with TM < 5 °C	Length of time in which plants can grow	days	Ann	AFS
TXx	Max TX	Warmest daily TX	Hottest day	°C	Mon/Ann	AFS
TNn	Min TN	Coldest daily TN	Coldest night	°C	Mon/Ann	AFS
WSDI	Warm spell duration indicator	Annual number of days contributing to events where 6 or more consecutive days experience TX > 90th percentile	Number of days contributing to a warm period (where the period has to be at least 6 days long)	days	Ann	H, AFS, WRH
WSDId	User-defined WSDI	Annual number of days contributing to events where *d* or more consecutive days experience TX > 90th percentile	Number of days contributing to a warm period (where the minimum length is user-specified)	days	Ann	H, AFS, WRH
CSDI	Cold spell duration indicator	Annual number of days contributing to events where 6 or more consecutive days experience TN < 10th percentile	Number of days contributing to a cold period (where the period has to be at least 6 days long)	days	Ann	H, AFS

ClimPACT2 user guide lists all 60+ indices

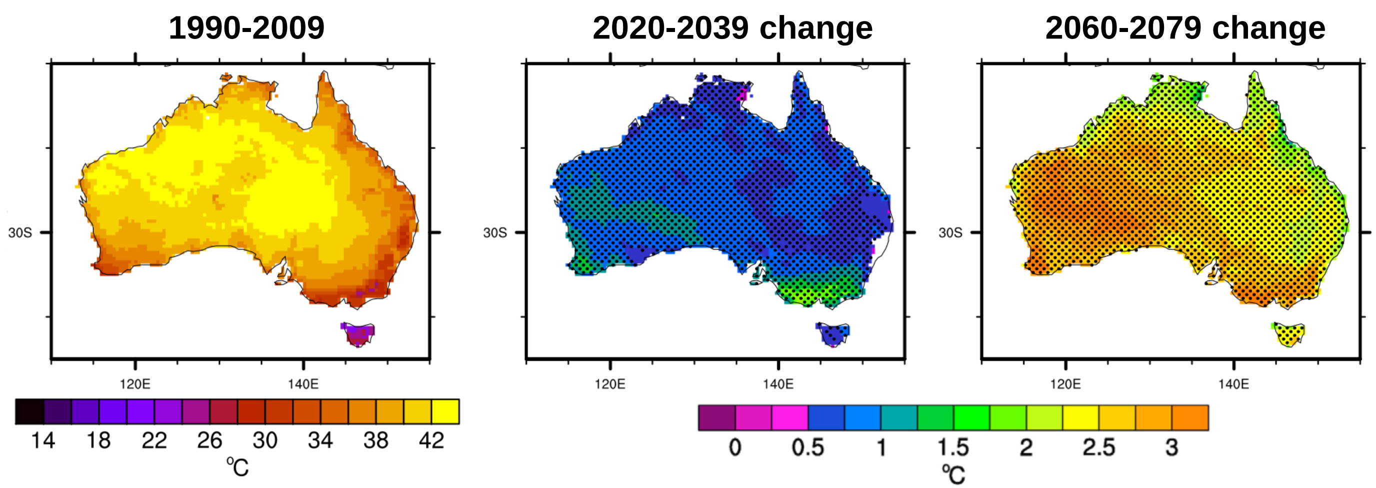
How might climate indices be used in adaptation?

Contents lists available at ScienceDirect
Weather and Climate Extremes
journal homepage: www.elsevier.com/locate/wace
ELSEVIER

Australian climate extremes in the 21st century according to a regional climate model ensemble: Implications for health and agriculture

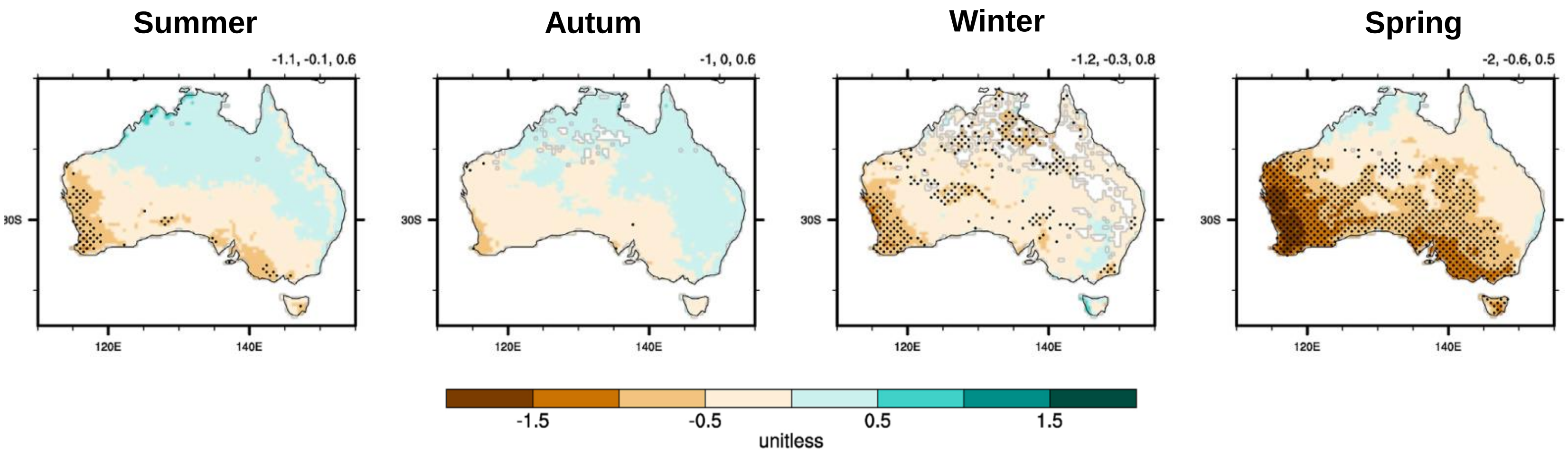
N. Herold [a,*], M. Ekström [b], J. Kala [c,a], J. Goldie [d,a], J.P. Evans [e]

Hottest spring day



How might climate indices be used in adaptation?

Far future drought relative to the present



Thank you

Dr. Nicholas Herold
nicholas.herold@unsw.edu.au

Some resources:

- Expert Team on Sector-specific Climate Indices: WMO group advocating sector-relevant climate indices.
- ClimPACT2: Software to calculate indices.
- WMO Climate services toolkit: Database of online tools, resources and training for climate change.
- Climdex: an online portal to calculate SOME indices at a global scale using observational datasets.

Q&A

Extra slides

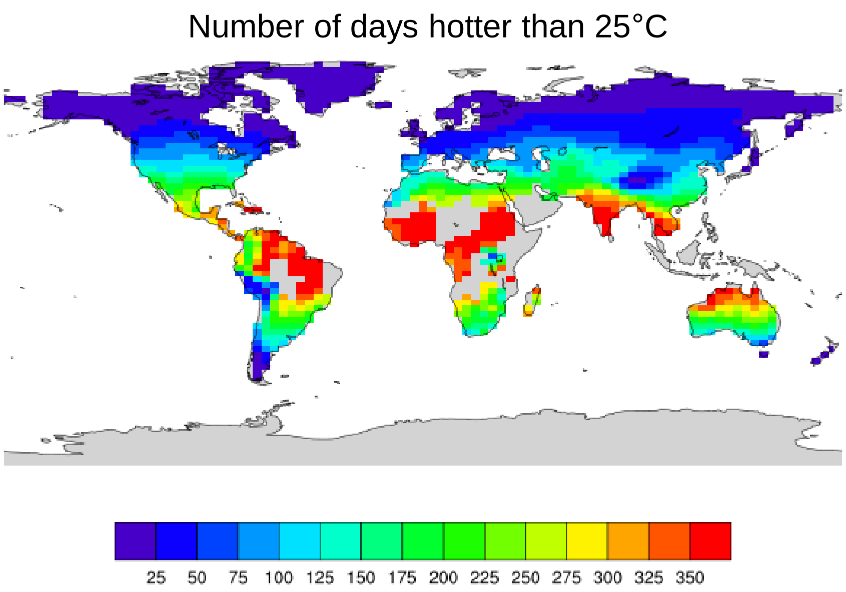
You can’t manage what you can’t measure.

The need for good data

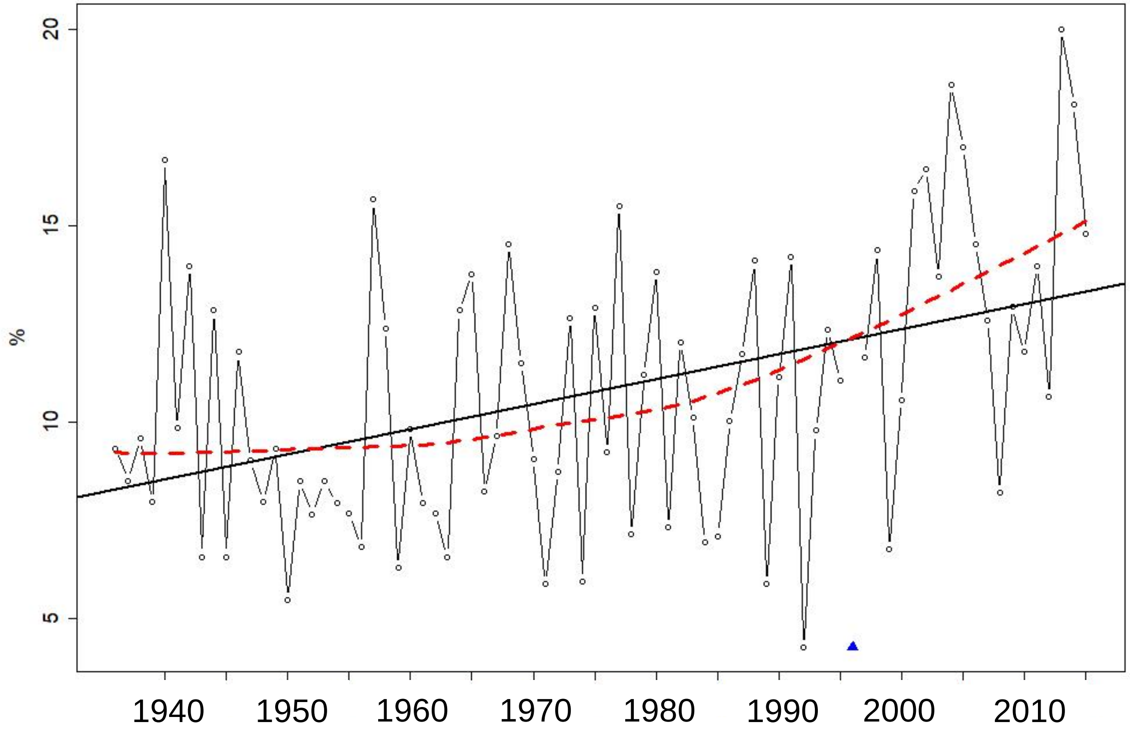
1. Importance of numerous, reliable and long observations.
2. Datasets for observations, model and reanalyses.

What makes a good climate index?

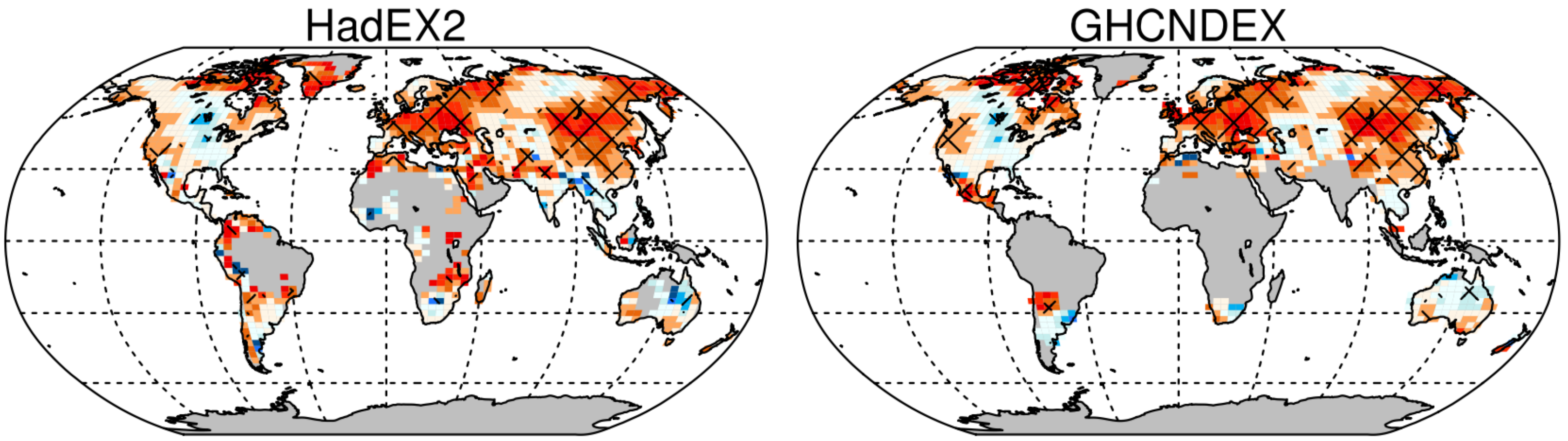
- Two ideal traits: Is *computable* and *comparable* across regions. Here's an example of a not-so-great index.



Long, reliable records are needed

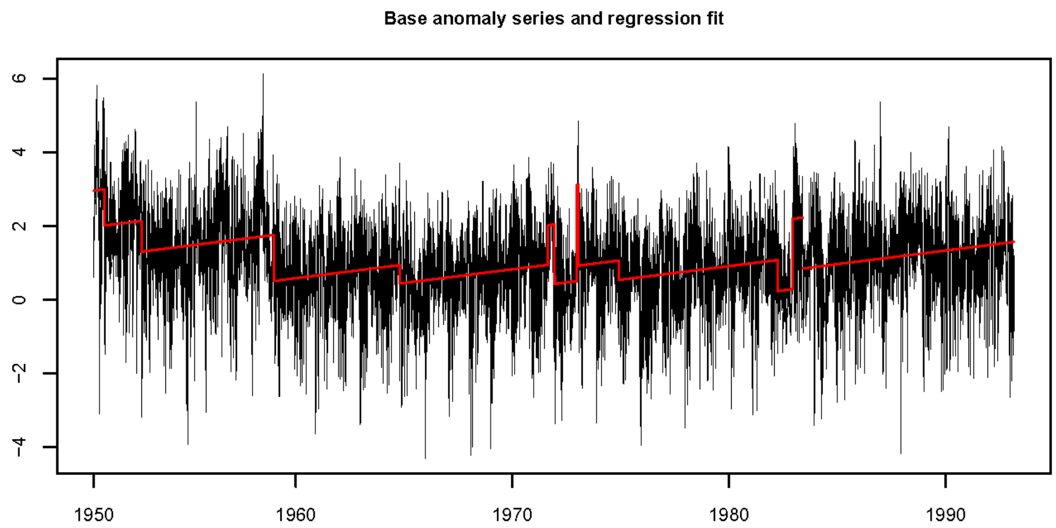


Good geographic coverage is needed



- Two widely used global datasets of climate extremes indices. Look at the gaps!!

Records must also be reliable



Open data is paramount but…

- Observational networks are expensive to maintain.
- Data rescue may be required to digitize records.
- Some governments prevent data sharing.

- WMO resolution in June 2015 “urges” countries to exchange GFCS relevant data on a free and unrestricted basis.

http://iedro.org/

https://public.wmo.int/en/resources/library/guidelines-best-practices-climate-data-rescue

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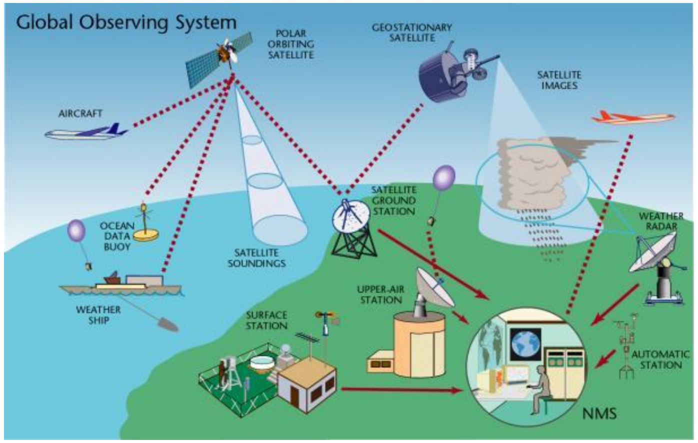
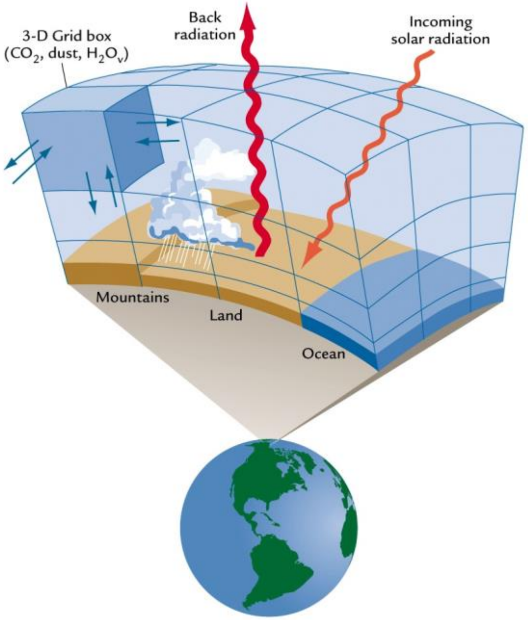
Observations, model and reanalysis datasets





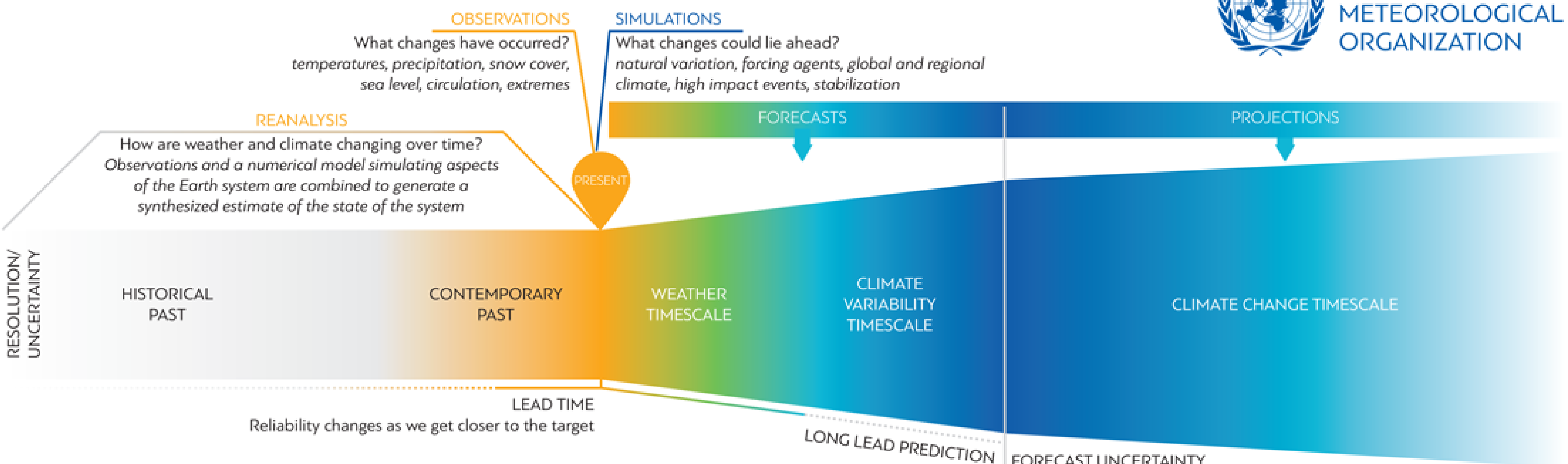
GREEN CLIMATE FUND

WORLD METEOROLOGICAL ORGANIZATION

UNSW THE UNIVERSITY OF NEW SOUTH WALES

CLIMATE SERVICES INFORMATION SYSTEM

WORLD METEOROLOGICAL ORGANIZATION



DATA

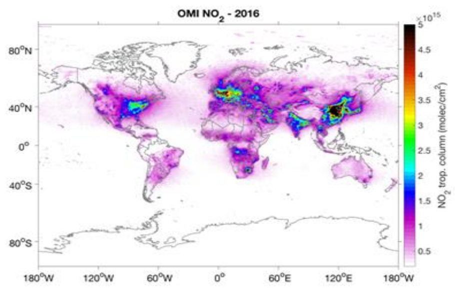
Historical **Instrumental data** - records of daily data, century-long measurements of surface temperature and precipitation **Paleoclimate and proxy data** - derived from natural sources (tree rings, ice cores, corals, and ocean and lake sediments)	**Monitoring** Uses data from the recent past and the present	**Sub-seasonal to Seasonal**	**Interannual** Boundary conditions, Anthropogenic forcing	**Multi-decadal**

PRODUCTS

Climate trends, Extreme climate indices, Sector-specific climate indices, Reanalyses, Return periods of extremes, Climate Normals, World Weather Records	Climate monitoring and watch	Flash flood guidance Severe weather forecasting Tropical cyclone forecasting	Climate change indices Information on extremes	Operational projections on climate change timescales

USER INTERFACE - identification and co-production of products; validation of end-use & outcomes

Scientific framework of the climate rationale



Global climate indicators

State of the climate system

Sector specific indexes

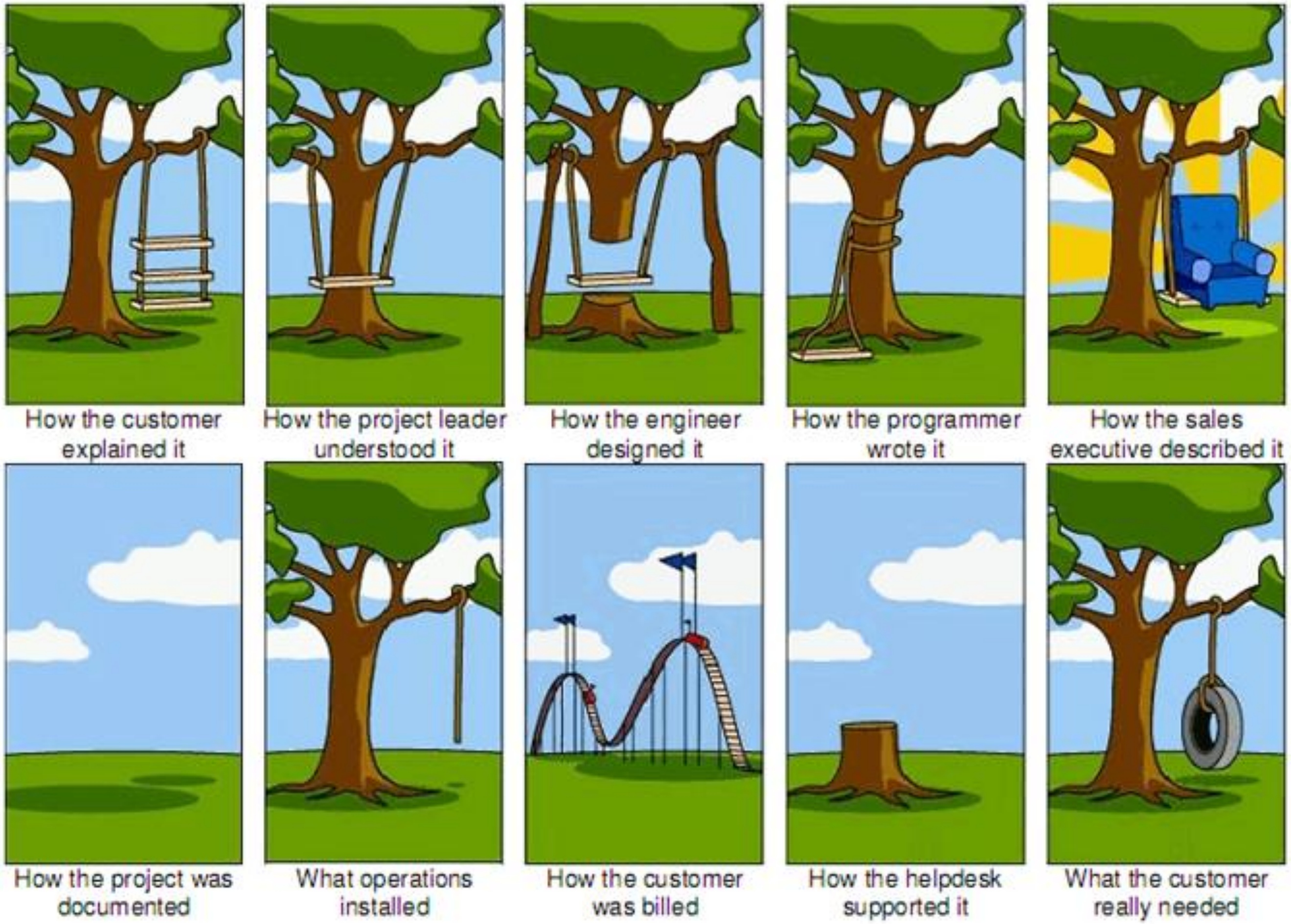
Socio-economically relevant sectors

High impact events

Widespread, multi-sectoral impacts

PRECIS regional climate model

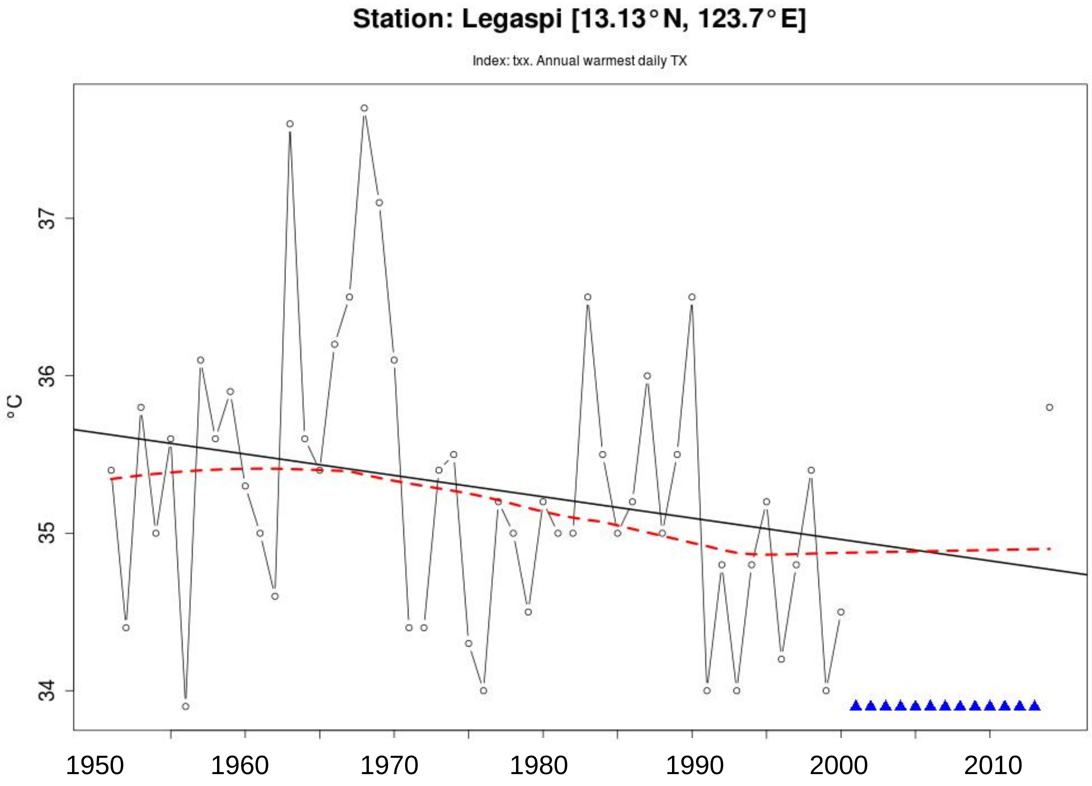
Lost in translation



Types of indices: Minimum/maximum values

- Indicate the minimum or maximum value of a variable.

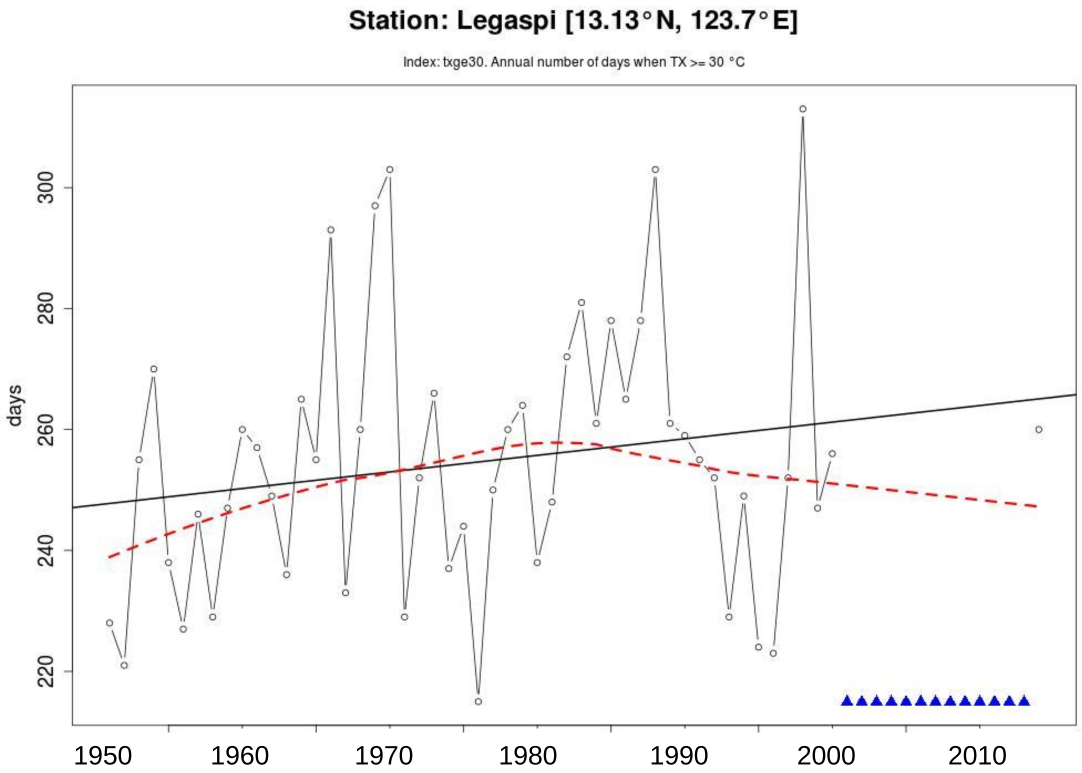
Maximum day time temperature each year



Types of indices: Threshold exceedance

- The number or proportion of days above or below a threshold.

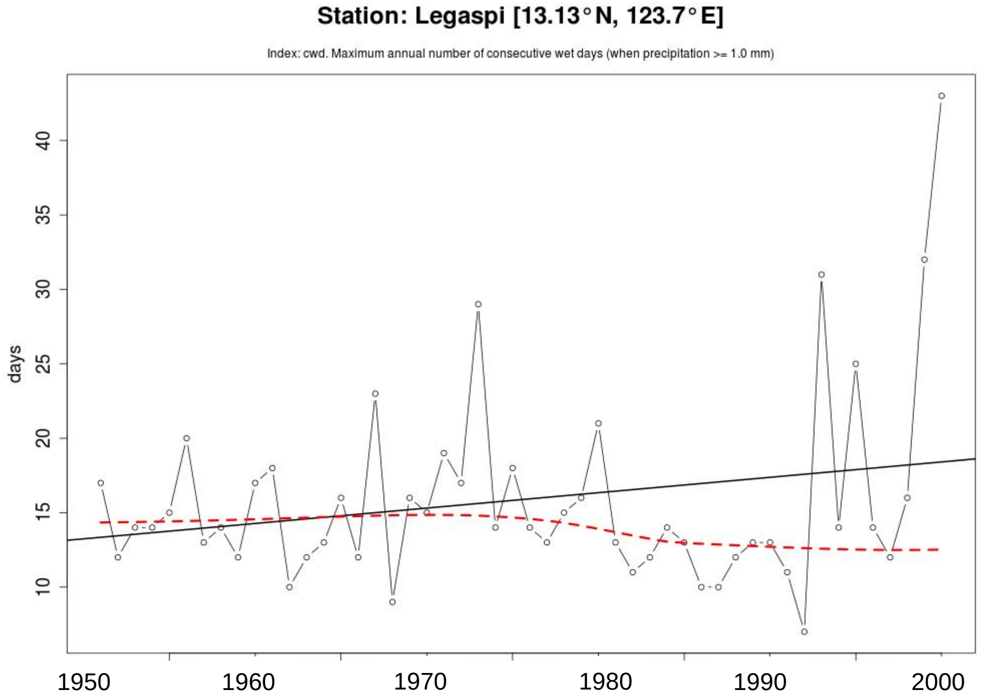
Number of days > 30°C each year



Types of indices: Duration indices

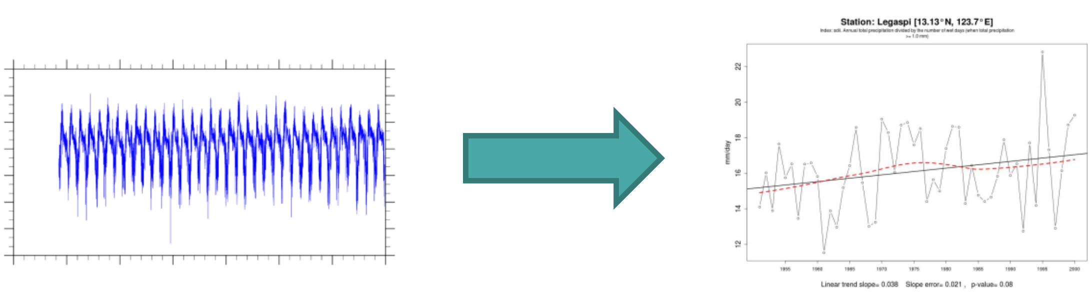
- Measure the length of time of or between certain events, or the aggregate number of days meeting a certain criteria

Maximum number of consecutive rainy days each year



Types of indices: Specialty indices

- More complex than the others and may represent a combination of types and/or multiple variables over different time scales.
- Examples: the **standardized precipitation index (SPI)** for drought, the **excess heat factor (EHF)** for heatwaves or the **Forest Fire Danger Index (FFDI)**.
- *Indices can get as complicated as you like, but they all extract useful information from your climate data -> they turn data into information.*



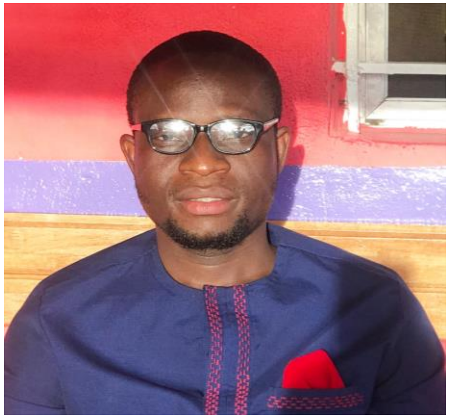
Panel Discussion

Session 2

Preparing adaptation project pipelines with strong climate rationale

Panel Discussion

Edna Juanillo
Weather Services Chief, PAGASA



Randall Dobayou
Deputy Executive Director, EPA, Liberia

Anne Hammil
Director, IISD

Manasa Katonivualiku
Project Development Specialist - Climate Resilience and Adaptation, SPREP

1. What in your opinion are the key barriers to i) uptake and 2) investments in climate information and early services in adaptation planning?
2. What can be done to drive uptake of climate information and early warning services for dynamic policy and decision-making in non-annex I countries (developing countries)? How can countries catalyze investments for climate information and early warning services?
3. Can you share some of the best practices, opportunities and challenges PAGASA has demonstrated/experienced in supporting disaster management in the Philippines?
4. What are the major challenges you have experienced in establishing a strong climate rationale for the NAP and other climate project design?
5. What are your expectations from this workshop?

Q&A

Send questions and vote at:

slido.com

Event code:

#GCFAdaptation

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Introduction to Technical Clinics

Establishing the climate case

Step 1. Climate driver
Understanding the earth climate system and its drivers.

Step 2. Hazard
Understanding how climate services are generated and applied for adaptation planning.

Step 3. Impacts, exposure, vulnerability and risks
Understanding/identifying climate impacts, exposure, vulnerability and risks. Understanding how risks are derived from hazard, exposure and vulnerability.

Leads to ***problem statement*** (further refined in **Step 4**)

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Project Development Process

Establishing the climate case

Step 1: Climate driver
Understanding the earth climate system and its drivers

Step 2: Hazard
Understanding how climate services are generated and applied for adaptation planning

Step 3: Impacts, exposure, vulnerability and risks
Understanding/identifying climate impacts, exposure, vulnerability and risks. Understanding how risks are derived from hazard, exposure and vulnerability

Developing interventions

Step 4: Problem identification and analysis
Defining core problem based on climate rationale as a starting point for project design

Step 5: Transformation of problem to project objectives
Reversing negative statements from the problem analysis into projects objectives and desired effects

Step 6: Creation of theory of change
Creating theory of change tree to lay out a detailed strategy to achieve expected results

Step 7: Development of Logical Framework from theory of change
Translating the theory of change tree into projects' goals, outcomes, outputs and activities

Step 8: Concept note development
Understanding how a proposed design fit into GCF Project idea/concept

Steps to enhance the climate rationale of GCF supported activities *(document GCF/B.21/Inf.08)*

1) Climate Science Basis
Scientific underpinning for evidence-based climate rationale and theory of change of all GCF funded projects and activities

Adaptation

2a) Climate impacts the project/programme aims to address

2b) Vulnerabilities and risks of these climate impacts to human wellbeing

Mitigation

2c) Emission trajectory for the relevant country and sector

2d) Potential pathways to shift projected emissions trajectory

3) Prioritized interventions for addressing barriers based on analysis of available options

4) Integration into broader domestic and international policy and decision-making processes

Session 2

Expected Outcomes

During the technical clinics:

1. Complete your own process map from Step 1 to 3
2. Identify problem statement

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Session 2

Technical clinics – rooms and location

Sector	Group facilitator	Room
Agriculture	Mr Michael Roy	San Cristobal, 2nd floor
CIS/EWS	Mr Joseph Intsiful	San Lucas, 2nd Floor
Ecosystems	Mr Jacinto Buenfil	Niña II, Ground Floor
Health & Well-being	Ms Johannah Yoyo Wegerdt	San Martin III, 2nd Floor
Infrastructure	Ms Katarzyna Rzucidlo	Santiago, 2nd Floor
Water	Ms Chibesa Pensulo	Niña I, Ground Floor

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Technical clinics

15:00-16:15

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Working Coffee Break

16:15-16:45

Report back and summary

16:45-17:45