



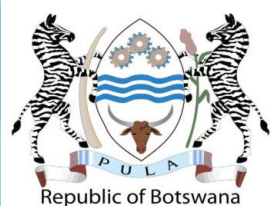
NAP EXPO  
2022

Transformations  
to adapt



Gaborone, Botswana

August 24, 2022



WORLD  
METEOROLOGICAL  
ORGANIZATION



GREEN  
CLIMATE  
FUND

Parallel sesión 3.2.1.

## ***Overview and application of the WMO-GCF toolkit 'Developing the Climate Science Basis for Climate Action'***

***Jorge Luis Vázquez-Aguirre***

- - *Member of WMO's Expert Team on Climate Information for Decision-Making (ET-CID)*
  - - *Universidad Veracruzana;*



**United Nations**  
Framework Convention on  
Climate Change



# CLIMPACT

<https://climpact-sci.org>

Developed and maintained by the University of New South Wales it has received support from the WMO-GCF partnership.

Societal and economic sectors (agriculture, health and water) require information about climate extremes. Changes in the climate extremes might be ‘masked’ in original weather time-series.

Therefore, a set of 60+ indices are possible to calculate (using CLIMPACT) to reveal trends and extreme behavior over time. These indices include the 27 ETCCDI core indices plus many newly designed indices.



# Indices

Climpact allows you to calculate indices that are annual or monthly statistics of modelled or observed climate data. Here you can find descriptions and formulae for each of the indices.

## What are extremes indices?

The indices calculated by Climpact are annual statistics of weather. They answer questions like:

- **TX<sub>x</sub>**: How hot was the hottest day each year?
- **TN10p**: What fraction of nights each year fell below the 10th percentile of minimum temperature?
- **Rx5day**: How much rain fell during the rainiest 5-day stretch of the year?

As well as being calculated over the full year, many indices are available for a given month—the hottest day each *January*, for example.





Water security relies on understanding changes in rainfall

WSDI

WSDId

CSDI

CSDId

TXgt50p

TXdTNd

CDD

R20mm

PRCPTOT

R95pTOT

R99pTOT

RXdday

SPI

SPEI

HWN

HWF

HWD

HWM

HWA

CWN\_ECF

CWF\_ECF

CWD\_ECF

CWM\_ECF

CWA\_ECF





# Agriculture

Many agricultural systems are dependent on changes in both  
temperature and rainfall

FD	TNlt2	TNltm2	TNltm20	ID	TR	GSL	TXx
WSDI	WSDId	CSDI	CSDId	TXgt50p	TX95t	TMge5	
TMlt5	TMge10	TMlt10	TXge30	TXge35	TXdTNd		
GDDgrown	CDD	R20mm	PRCPTOT	R95pTOT	R99pTOT		
RXdDay	SPI	SPEI	HWN	HWF	HWD	HWM	HWA
CWN_ECF	CWF_ECF	CWD_ECF	CWM_ECF	CWA_ECF			



# Health

Climpact indices describe changes in extreme heat and cold that can lead to impacts on human health

FD	TNI <sub>tm20</sub>	ID	SU	TR	WSDI	WSDI <sub>d</sub>	CSDI
CSDI <sub>d</sub>	TX <sub>gt50p</sub>	TX <sub>95t</sub>	TX <sub>gt50p</sub>	TX <sub>95t</sub>	TX <sub>ge30</sub>	TX <sub>ge35</sub>	
TX <sub>dTNd</sub>	CDD <sub>coldn</sub>	GDD <sub>grown</sub>	CDD	RX <sub>d</sub> day	SPI	SPEI	
HWN	HWF	HWD	HWM	HWA	CWN <sub>ECF</sub>	CWF <sub>ECF</sub>	
CWD <sub>ECF</sub>	CWM <sub>ECF</sub>	CWA <sub>ECF</sub>					







# NAP EXPO 2022

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Gaborone, Botswana

22 to 26 August 2022



Climpact



1933 05 11	2.3	16.6	7.0
1933 05 12	0.6	14.5	4.2
1933 05 13	0.8	14.5	0.7
1933 05 14	5.1	14.1	5.7
1933 05 15	0.8	12.9	4.9
1933 05 16	0.0	14.7	4.7
1933 05 17	0.0	14.0	6.2
1933 05 18	0.0	16.9	2.4
1933 05 19	0.0	18.7	6.3
1933 05 20	0.0	21.2	6.1
1933 05 21	0.0	24.6	9.4
1933 05 22	0.0	25.7	10.6
1933 05 23	0.0	24.4	9.7
1933 05 24	2.0	18.9	7.1
1933 05 25	16.6	15.2	9.6
1933 05 26	0.2	16.6	9.3
1933 05 27	0.0	17.5	7.9
1933 05 28	0.0	17.8	7.2
1933 05 29	0.0	18.9	7.7
1933 05 30	0.1	17.7	7.3
1933 05 31	0.0	18.8	5.0
1933 06 01	0.0	18.8	5.0
1933 06 02	0.0	23.8	5.1
1933 06 03	0.0	26.0	10.4
1933 06 04	0.0	27.2	12.1
1933 06 05	0.0	27.3	12.1
1933 06 06	0.0	28.5	9.8
1933 06 07	0.0	26.0	14.0
1933 06 08	1.0	22.9	7.2
1933 06 09	4.3	16.0	11.6
1933 06 10	0.0	16.0	10.8
1933 06 11	8.9	17.7	10.9
1933 06 12	0.0	21.6	11.0
1933 06 13	0.0	25.0	11.2
1933 06 14	0.0	25.1	12.4
1933 06 15	0.0	26.2	10.6

# Climpact

Quickly calculate climate indices using your own weather and climate data

WEATHER CLIMATE WATER  
TEMPS CLIMAT EAU

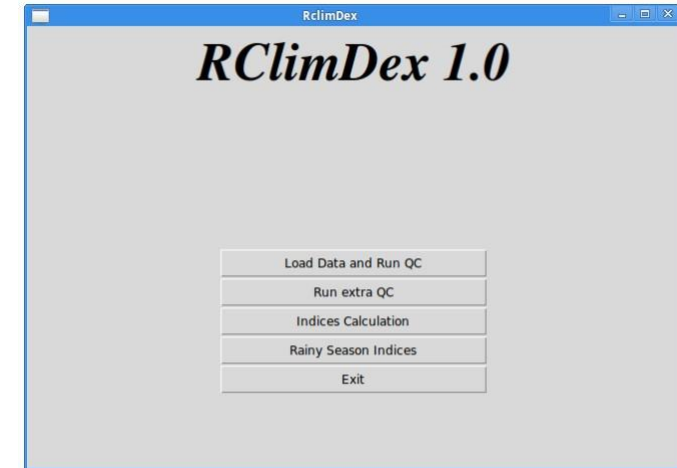
Use Climpact to quickly analyse climate extremes using your own weather or climate data.





# CLIMPACT Software predecessors

- RClimdex, developed around 2004 by the CCI Expert Team on Climate Change Detection and Indices (ETCCDI) was the initial Rpackage for the 27 core indices calculation.
- Extra-QC functionality was added to the original Rclimdex after 2009.
- Both, Rclimdex and Extra-QC capabilities have been included in the CLIMPACT software.
- In addition to the 27 core ETCCDI indices, CLIMPACT calculates the new ET-SCI indices accounting for over 60 climate extremes indices



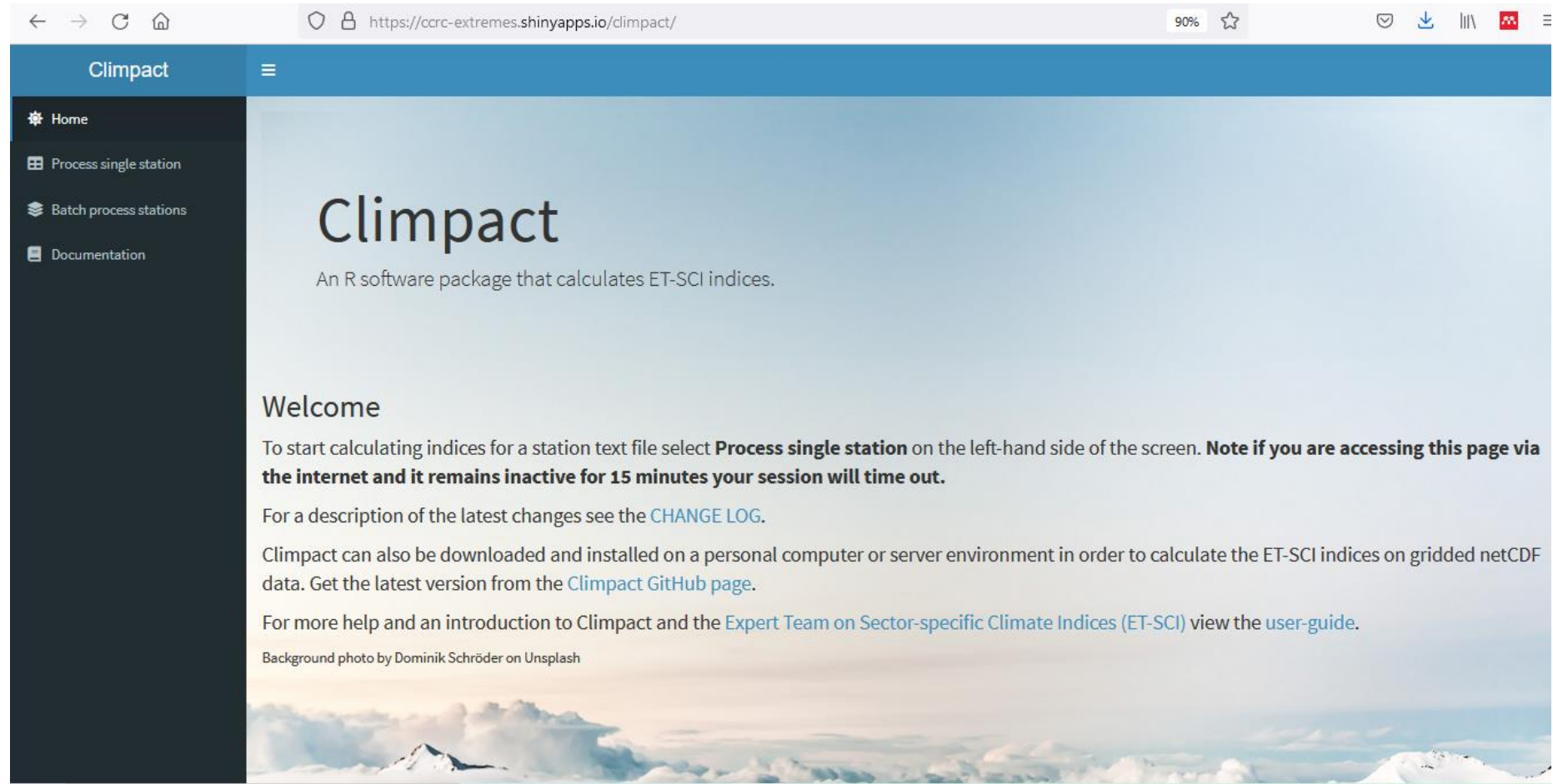




# CLIMPACT v. 3 (on-line)

Currently, CLIMPACT (v.3) has full on-functionality.

It only requires a web browser and an Internet connection



<https://climpact-sci.org>



If you have good quality daily climate data (precipitation, maximum & minimum temperature), you can calculate climate indices using Climpact.

The screenshot shows the Climpact web application interface. The main heading is "Process Single Station" with a progress bar indicating four steps: 1. Load, 2. Check, 3. Calculate, and 4. Compare. The current step is "1. Load station data and provide metadata".

**Station data**  
The dataset **must** use the format described in [Appendix B of the Climpact User Guide](#). For a sample dataset look at [sydney\\_observatory\\_hill\\_1936-2015.txt](#)

Browse... 3060848-Gaborone.txt  
Upload complete

**Metadata**  
**Station name (used in output file names):**  
3060848-Gaborone

**Latitude (decimal degrees e.g. -40.992):**  
-24.66

**Longitude (decimal degrees e.g. 148.346):**  
25.92

**Base period start year:**  
1971

**Instructions**  
**Station data**  
Select a station text file. Climpact will calculate indices for this data. The dataset **must** use the format described in [Appendix B of the Climpact User Guide](#). For a sample dataset look at [sydney\\_observatory\\_hill\\_1936.txt](#)

**Metadata**  
Specify the station name. Climpact will attempt to determine this automatically for you based on the uploaded station data file name. This must be some text.

Specify the station latitude and longitude in decimal degrees e.g. -40.992 or 148.346. Latitude must be between -90 and 90. Longitude must be between -180 and 180.

Specify valid values for the base period start year and end year. These values must be within the limits of the dates in the station data provided.

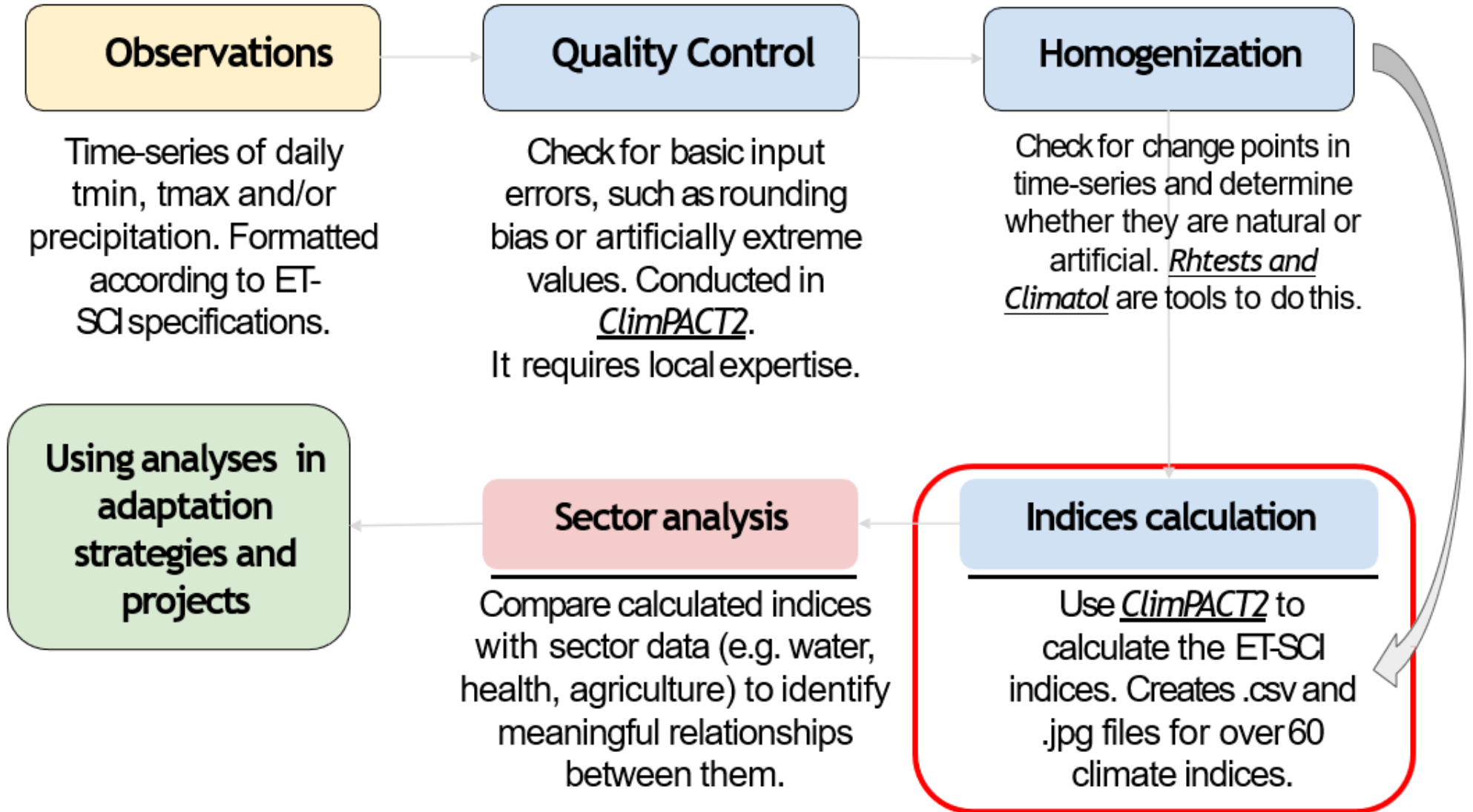
Sample data format

Yr	Mo	Dy	Pcp	MaxT	MinT
1901	1	1	-99.9	-3.1	-6.8
1901	1	2	-99.9	-1.3	-3.6
1901	1	3	-99.9	-0.5	-7.9
1901	1	4	-99.9	-1	-9.1
1901	1	5	-99.9	-1.8	-8.4





# Process for calculating/using the Indices





# Indices definitions

← → ↻ 🏠 <https://climpact-sci.org/indices/> 110% ☆ 📄 ⌵ 🗑️ ☰

Climpact Get started Indices About ▾ Contact us

Index ⓘ	Agriculture and food security		Water resources and food security		Disaster Risk		Fisheries	Forestry/GHGs	Cryosphere
	Health			Coasts	Reduction	Energy			
<b>FD</b> Frost days	✓	✓			✓			✓	✓
<b>TNlt2</b> TN below 2 °C		✓						✓	✓
<b>TNltm2</b> TN below -2 °C		✓						✓	✓
<b>TNltm20</b> TN below -20 °C		✓			✓			✓	✓
<b>ID</b> Ice Days		✓			✓			✓	✓
<b>SU</b> Summer days	✓				✓				
<b>TR</b> Tropical nights	✓	✓			✓			✓	

<https://climpact-sci.org/indices/>








# WMO Education and Training Program Course: Climpact

## Introduction to Climpact: Generating Climate Indices to Support Climate Services

[Home](#) / [Courses](#) / [Climpact Online](#)

Introduction to Climpact: Generating Climate Indices to Support Climate Services



Health    Agriculture    Water

Course Description    How to Take This Course

 Announcements

Module 1: Introduction (~13 min)

### COURSE MENU

- [HOME](#)
- [Module 1](#)
- [Module 2](#)
- [Module 3](#)
- [Module 4](#)
- [Module 5](#)
- [Module 6](#)
- [Module 7](#)
- [Module 8](#)
- [Course Glossary](#)
- [Resources and References](#)
- [Acknowledgements](#)

<https://etrp.wmo.int/course/view.php?id=221>





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**22 to 26 August 2022**







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22 to 26 August 2022



# Climate Information Platform (CIP)

<https://climateinformation.org>

Developed and hosted by the Swedish Meteorological and Hydrological Institute (SMHI) as part of the WMO-GCF partnership the CIP enable users to:

Get an instant climate change overview for any location world-wide.

Download pre-calculated climate indicators and explore interactive maps and graphs.



**NAP EXPO**  
**2022**  
Transformations  
to adapt



**Gaborone, Botswana**  
**22 to 26 August 2022**



<https://climateinformation.org>

The screenshot shows the homepage of climateinformation.org. At the top, there is a navigation bar with the site logo, 'Tools', 'Guidance', and 'Contact' links. The main heading reads 'Providing climate science basis for climate adaptation and mitigation activities', with a 'View a short intro film' button below it. Three featured services are highlighted in separate boxes: 'Site-specific report' (with a smartphone showing a map and indicators), 'Data Access Platform' (with a laptop showing a red globe), and 'Climpact' (with a person typing on a laptop). A cookie consent banner is visible at the bottom of the page.

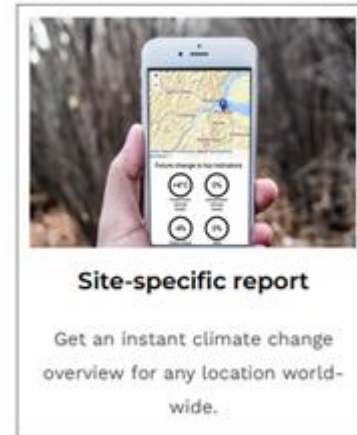
WEATHER CLIMATE WATER  
TEMPS CLIMAT EAU







# CIP - Site specific report



← → ↻ 🏠 <https://ssr.dimateinformation.org> ☆ 🛡️ ⬇️ 📄 📱 ☰

## Site-specific Report

### How will the climate change in your region

Select an area of interest by filling in a city, coordinate or click directly in the map. You can use the generated maps and graphs in your national climate science basis report.

*NOTE that the resolution of the climate indicator follow the resolution of the climate models. Data from a selected point always represents a mean value over a larger area (grid cell or catchment).*

#### Area of interest

City

Latitude and longitude

✔ Input format is valid

#### Scenario

Emission scenario

Time period

[Generate overview](#)



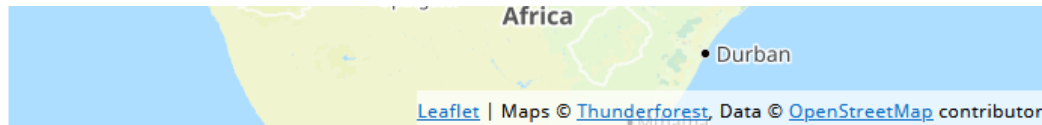
# CIP - Site specific report

Gaborone, BWA (-24.66 / 25.92)



## Site-specific report

Get an instant climate change overview for any location world-wide.



✓ Input format is valid

Generate overview

## Future change in top indicators

+4°C Temperature (annual mean)

-11% Precipitation (annual mean)

-11% Aridity actual (annual mean)

-15% Soils moisture (annual mean)

-8% Water discharge (annual mean)

-3% Water runoff (annual mean)





# CIP - Site specific report

## Indicator details

Gaborone, BWA (-24.66 / 25.92)

How to interpret change levels?

**Large**

Change is more than 2 °C

**Medium**

Change is 1.5-2 °C

**Small**

Change is less than 1.5 °C

Click on a row in the table below to view details about the specific indicator.

Change ↑	Indicator type ↑	Indicator	Ensemble agreement ↓
Large	Temperature	Temperature	MANY models agree on INCREASE
Large	Temperature	Max temperature	MANY models agree on INCREASE
Large	Temperature	Min temperature	MANY models agree on INCREASE
Small	Temperature	Frost days	MANY models agree NO CHANGE

## How to cite?

SMHI, Climate Information, <https://climateinformation.org/>, last accessed: (insert current DATE).



### Site-specific report

Get an instant climate change overview for any location world-wide.







# CIP - Site specific report

Indicator: Max temperature (annual mean), Time period: 2071-2100, Historical period: 1981-2010, Model: CORDEX Africa Ensemble Mean, Model results for an area covering the location: Gaborone (-24.66, 25.92)

Reference: <https://climateinformation.org> (date: 2022-08-24)



## Site-specific report

Get an instant climate change overview for any location world-wide.

[Download figure: Max temperature \(annual mean\) for Botswana](#)

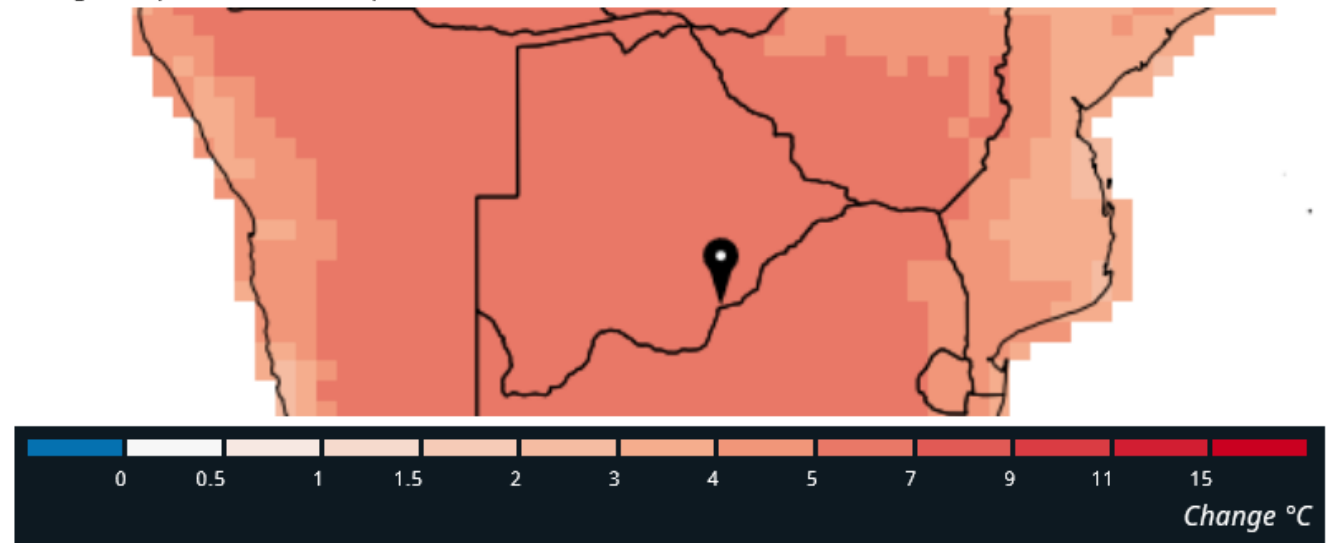
## Max temperature

### Indicator description Max temperature (annual mean)

Calculated as the maximum yearly values of daily maximum temperature averaged over a 30 year period. This index is given as an absolute change against the reference period of 1981-2010 (future period minus reference period). Here the medium ensemble value is given, calculated over the models listed in model attribute.

### Max temperature (annual mean) for Botswana

Change compared to historical period.

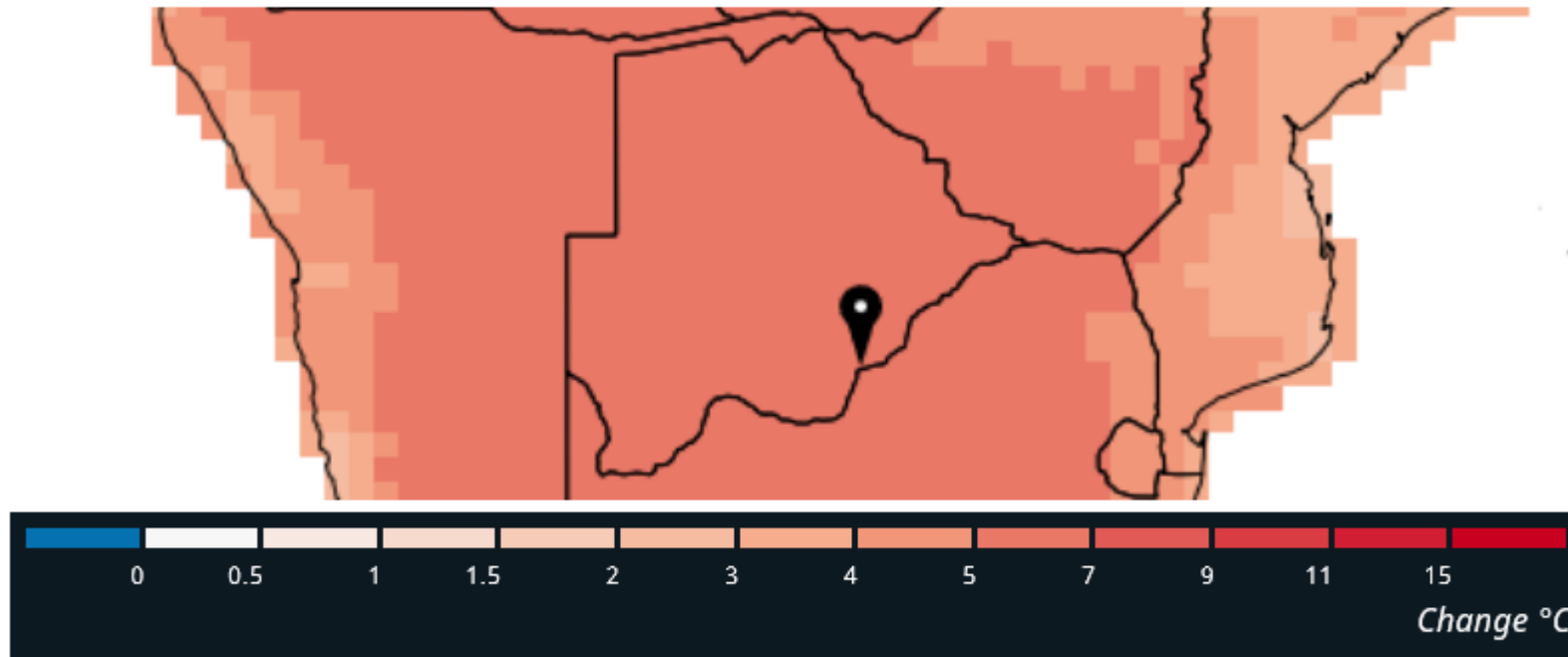




# CIP - Site specific report

## Max temperature (annual mean) for Botswana

Change compared to historical period.



Indicator: Max temperature (annual mean), Time period: 2071-2100, Historical period: 1981-2010, Model: CORDEX Africa Ensemble Mean, Model results for an area covering the location: Gaborone (-24.66, 25.92)

Reference: <https://climateinformation.org> (date: 2022-08-24)

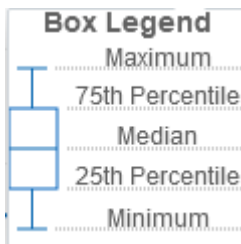


### Site-specific report

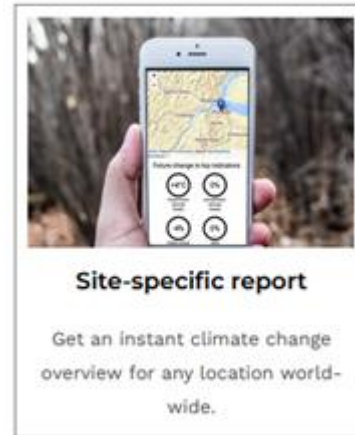
Get an instant climate change overview for any location world-wide.



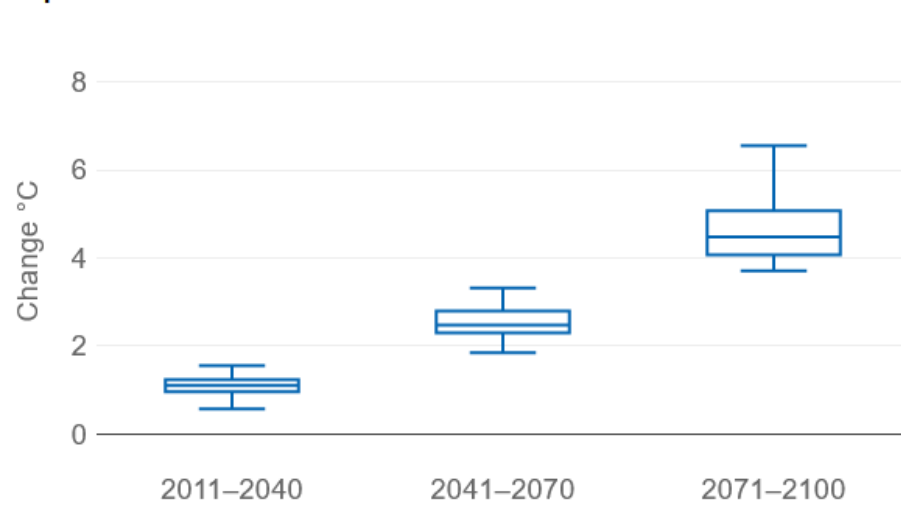
# CIP - Site specific report



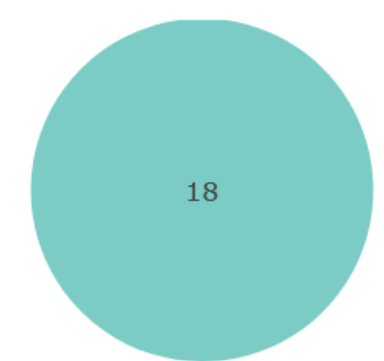
Gaborone, BWA (-24.66 / 25.92)



## Temperature



Indicator: Temperature (annual mean), Time period: 2071-2100, Historical period: 1981-2010, RCP 8.5, Model: CORDEX Africa Ensemble Mean, Model results for an area covering the location: Gaborone (-24.66, 25.92)  
 Reference: <https://climateinformation.org> (date: 2022-08-24)



■ Increase ■ No change ■ Decrease

Indicator: Temperature (annual mean), Time period: 2071-2100, Historical period: 1981-2010, RCP 8.5, Model: CORDEX Africa Ensemble Mean, Model results for an area covering the location: Gaborone (-24.66, 25.92)  
 Reference: <https://climateinformation.org> (date: 2022-08-23)







# CIP - Site specific report



## Site-specific report

Get an instant climate change overview for any location worldwide.

RCP 8.5, Model: CORDEX Africa Ensemble Mean, Model results for an area covering the location: Gaborone (-24.66, 25.92)

Reference: <https://climateinformation.org> (date: 2022-08-24)

[Download figure: Temperature \(annual mean\)](#)

Reference: <https://climateinformation.org> (date: 2022-08-23)

[Download figure: Ensemble Agreement of Temperature \(annual mean\)](#)

## Key message for Temperature (annual mean)

For the time period 2071–2100 compared to 1981–2010 (RCP 8.5)

- Median change is 4.5°C (ensemble mean)
- 50% of the ensemble members (interquartile range) agree that the change lies between 4.1°C and 5.1°C



# CIP - Site specific report

## Key message for Temperature (monthly mean)

For the time period 2071-2100 compared to 1981-2010 (RCP 8.5)

- Monthly mean change lies between 2.3°C and 8°C

Gaborone, BWA (-24.66 / 25.92)



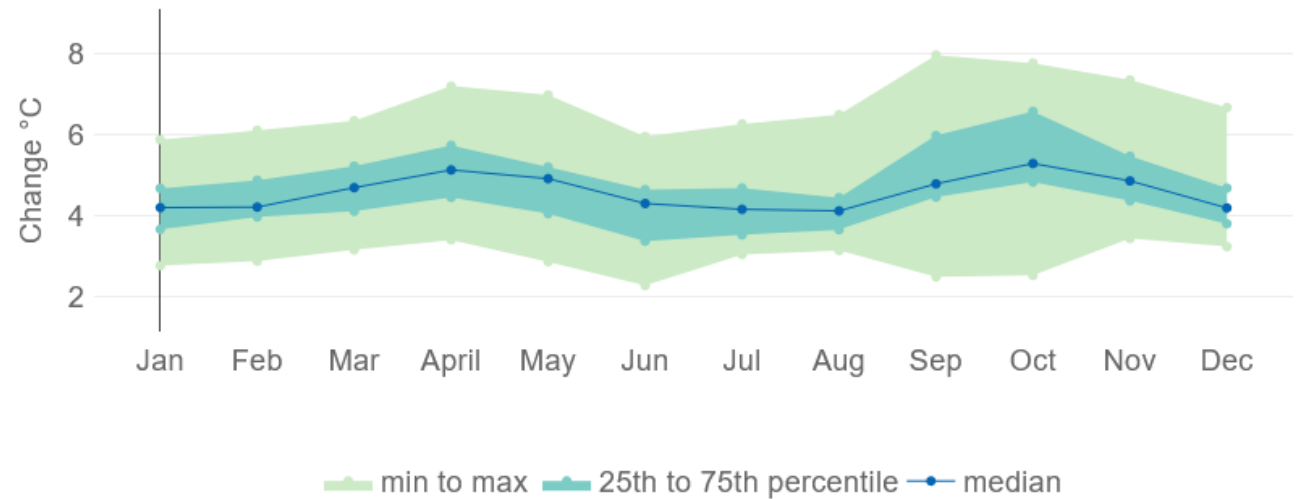
### Site-specific report

Get an instant climate change overview for any location world-wide.

## Temperature

Calculated as the mean monthly values of daily mean temperature averaged over all Januaries, Februaries, etc that are part of a 30 year period. This index is given as an absolute change against the reference period of 1981-2010 (future period minus reference period). Here the medium ensemble value is given, calculated over the models listed in model attribute.

Change compared to historical period.



Indicator: Temperature (annual mean), Time period: 2071-2100, Historical period: 1981-2010, RCP 8.5, Model: CORDEX Africa Ensemble Mean, Model results for an area covering the location: Gaborone (-24.66, 25.92)

Reference: <https://climateinformation.org> (date: 2022-08-23)





# NAP EXPO 2022

Transformations  
to adapt



Gaborone, Botswana  
22 to 26 August 2022



### Data Access Platform

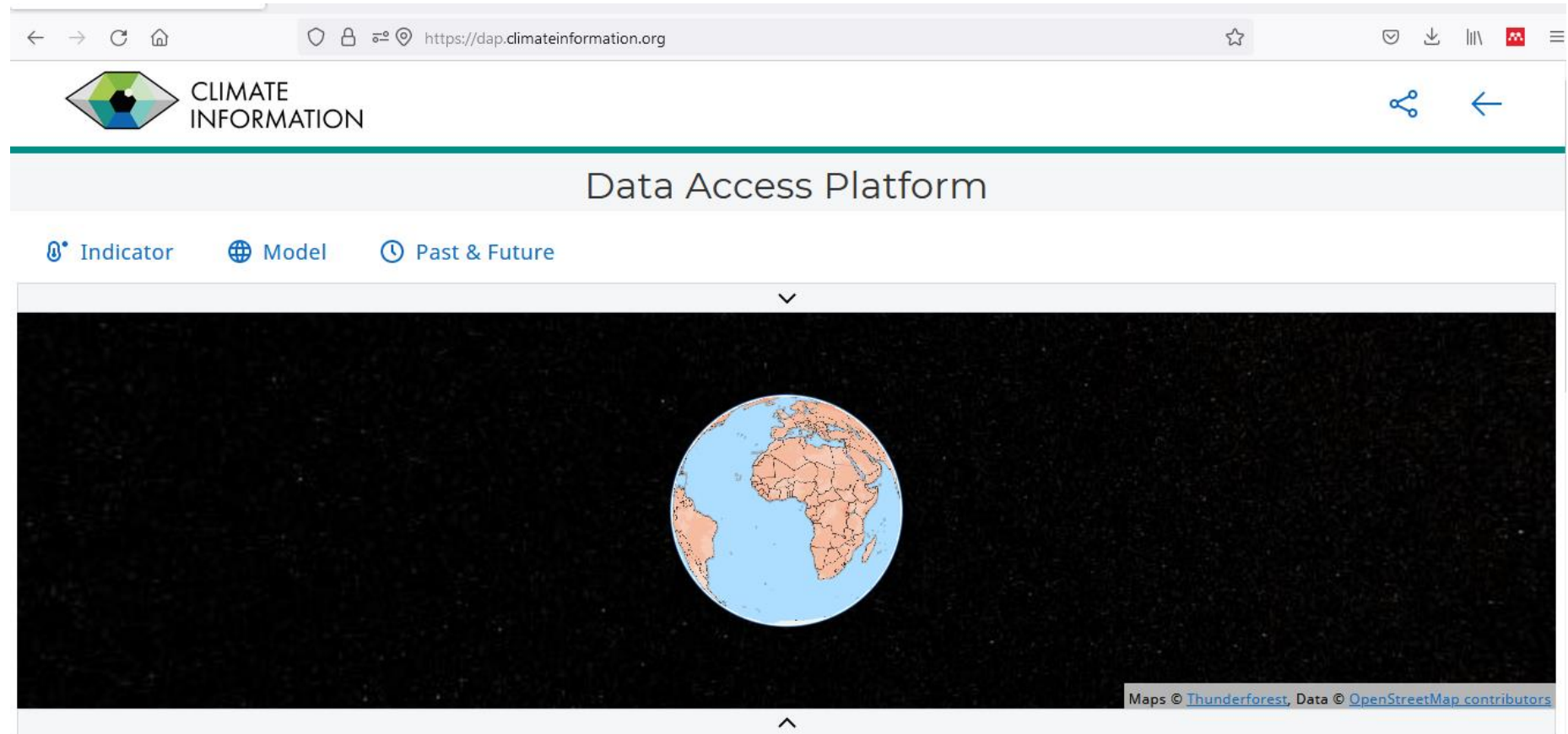
Download pre-calculated climate indicators and explore interactive maps and graphs.







# CIP – Data Access Platform



Indicator: Temperature, temperature (annual mean), Time Period: Future, 2071 - 2100, RCP: Moderate (RCP 4.5), Model: CMIP5 Global, Bias Adjusted: Yes



# CIP – Data Access Platform

 **Indicator**

 **Model**

 **Past & Future**

**Model ensemble**

CMIP5 Global ^

Cordex East Asia ^

Cordex Africa

Cordex Middle East  
North Africa

Cordex South  
America

Cordex South Asia v

**Bias adjusted**

Yes ^

Yes

No

**Ensemble member**

Ensemble median ^

Ensemble median

BNU-BNU-ESM

CNRM-CERFACS-  
CNRM-CM5

CSIRO-BOM-  
ACCESS1-0

CSIRO-BOM-



**Data Access Platform**

Download pre-calculated climate indicators and explore interactive maps and graphs.





# CIP – Data Access Platform

Type

Temperature ^

Temperature ^

Precipitation

Aridity

Soil moisture

Water discharge

Water runoff

Indicator

Temperature ^

Temperature ^

Max temperature

Min temperature

Frost days

Heating degree

Tropical nights

30 year averages

Annual ^

Annual ^

January

February

March

April

May



Data Access Platform

Download pre-calculated climate indicators and explore interactive maps and graphs.







# CIP – Data Access Platform

**Time period**

Future, 2071 - 2100 ^

Past, 1981 - 2010

Future, 2011 - 2040

Future, 2041 - 2070

Future, 2071 - 2100

**Emission scenario (RCP)**

High (RCP 8.5) ^

Low (RCP 2.6)

Moderate (RCP 4.5)

High (RCP 8.5)



## Data Access Platform

Download pre-calculated climate indicators and explore interactive maps and graphs.



# CIP – Data Access Platform

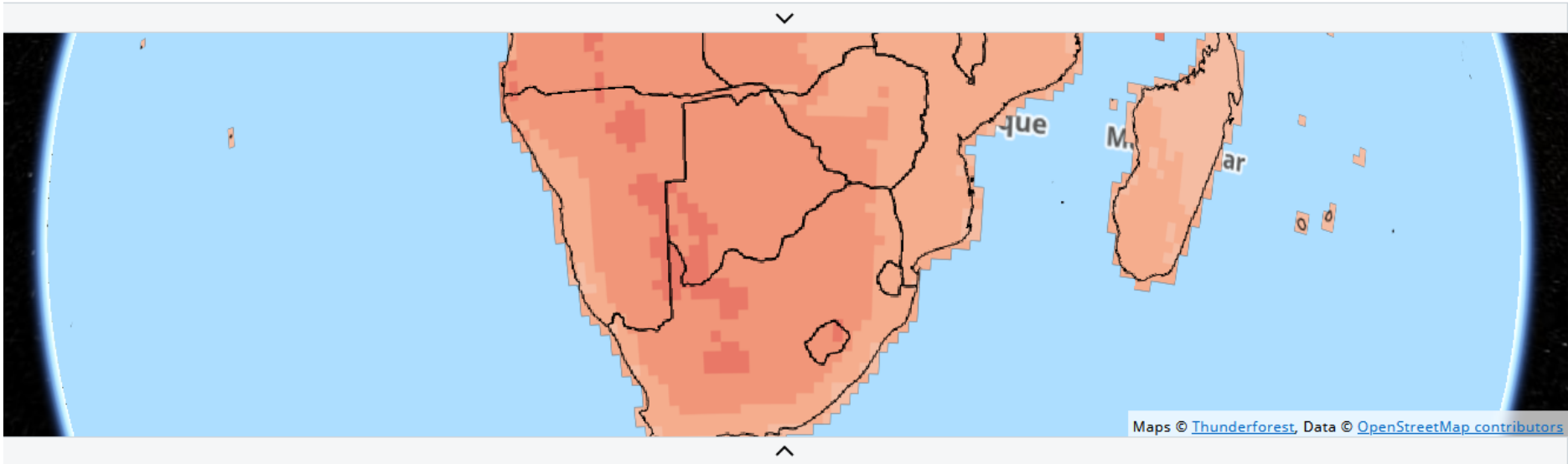


## Data Access Platform

Download pre-calculated climate indicators and explore interactive maps and graphs.

## Data Access Platform

Indicator Model Past & Future

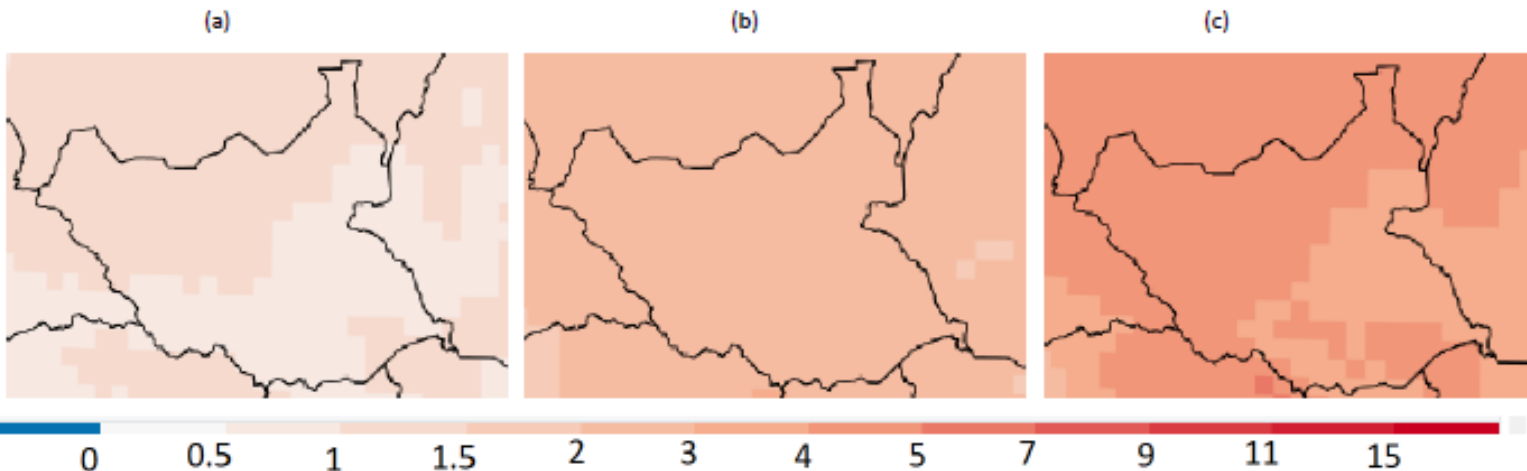


Indicator: Temperature, temperature (annual mean), Time Period: Future, 2071 - 2100, RCP: High (RCP 8.5), Model: Cordex Africa, Bias Adjusted: Yes

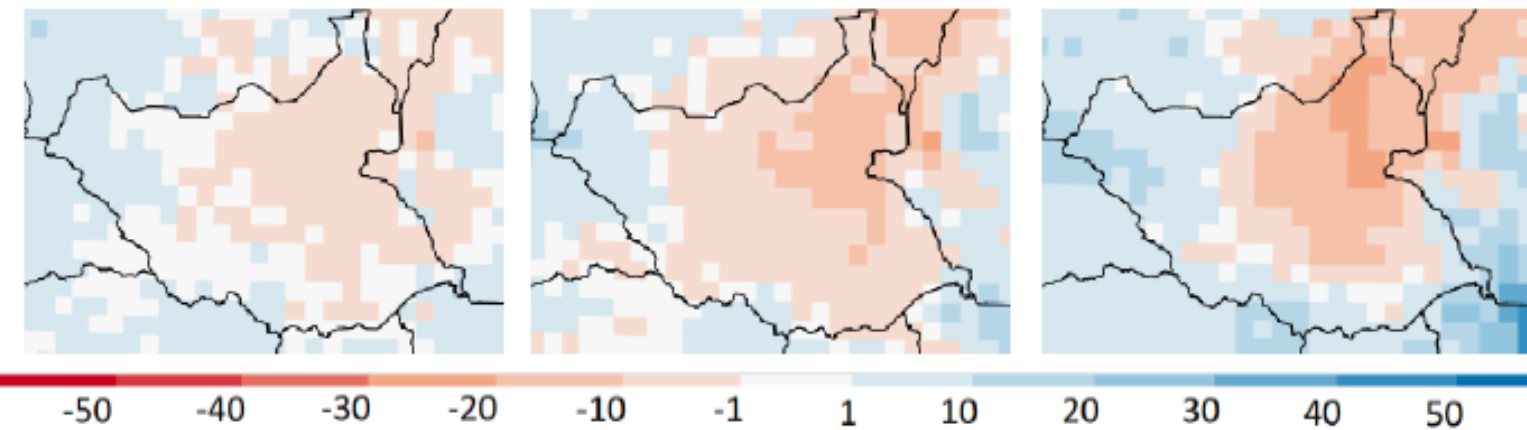
# CIP – Data Access Platform

Projected changes in annual mean temperature and annual total precipitation in South Sudan under a high emissions scenario (CORDEX Africa).

Source (<https://dap.climateinformation.org/>)



Indicator: Annual mean temperature. High emission scenarios (RCP 8.5) from biased adjusted models in CORDEX Africa. Future horizons for: (a) 2011-2040; (b) 2041-2070; (c) 2071-2100. °C change compared to reference period 1981-2010.



Indicator: Annual precipitation. High emission scenarios (RCP 8.5) from biased adjusted models in CORDEX Africa. Future horizons for: (a) 2011-2040; (b) 2041-2070; (c) 2071-2100. % change compared to reference period 1981-2010.



## Data Access Platform

Download pre-calculated climate indicators and explore interactive maps and graphs.

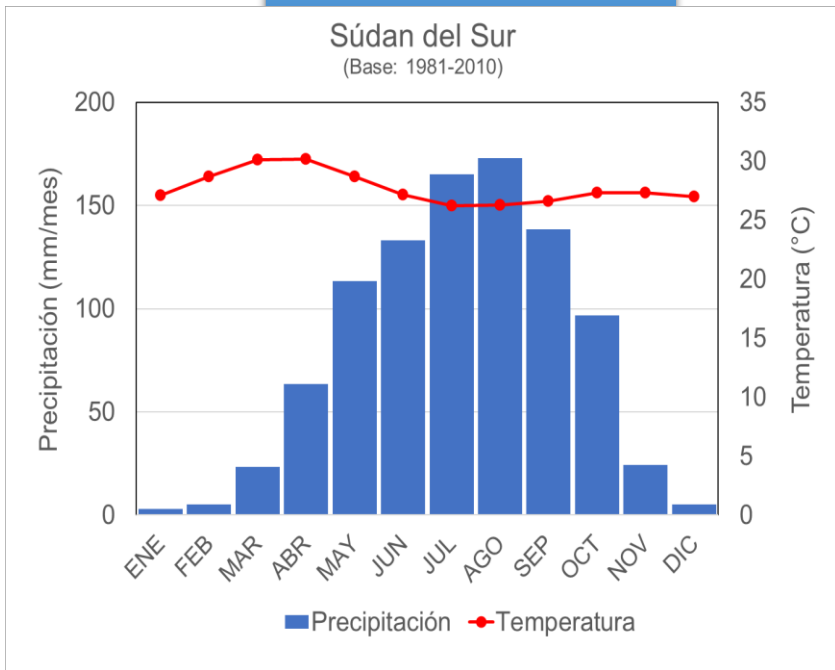




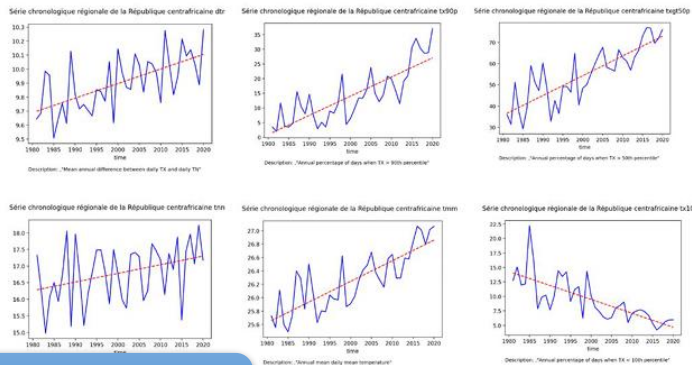


# Inputs for a NAP: South Sudan

## Present climate

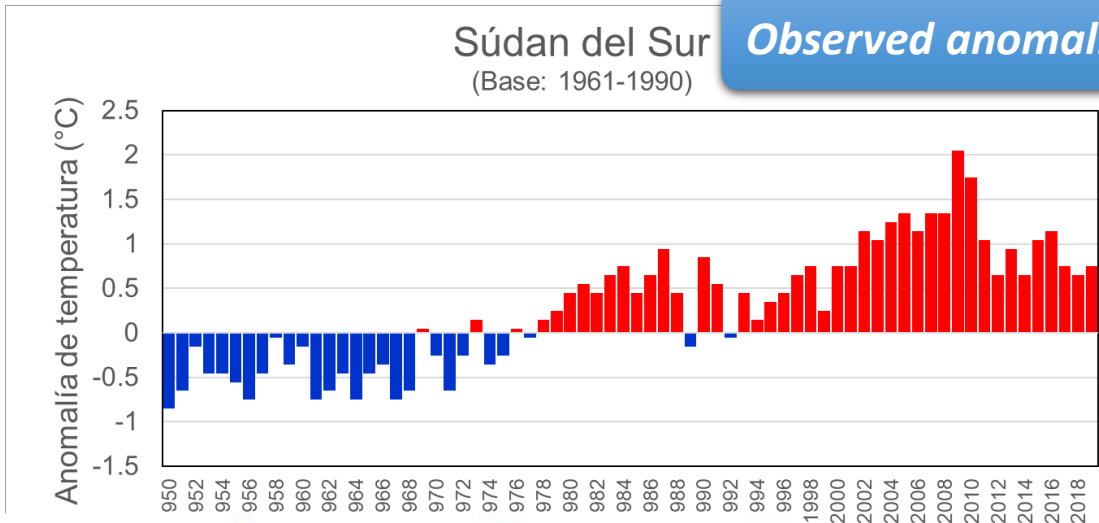


De gauche à droite: (a) DTR (+); (b) Tn10p (-); (c) Tx10p (-); (d) Txgt50p (+); (e) Tn90p (+); (f) Tx90p (+); (g) Tmm (+); (h) Tnn (+); (i) Txx (+); où (+/-) indiquent des tendances (positives/négatives).

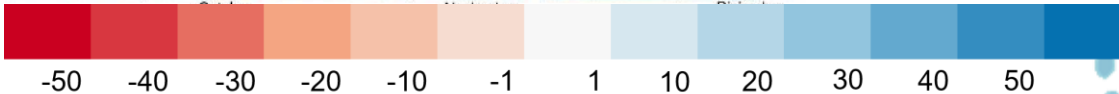
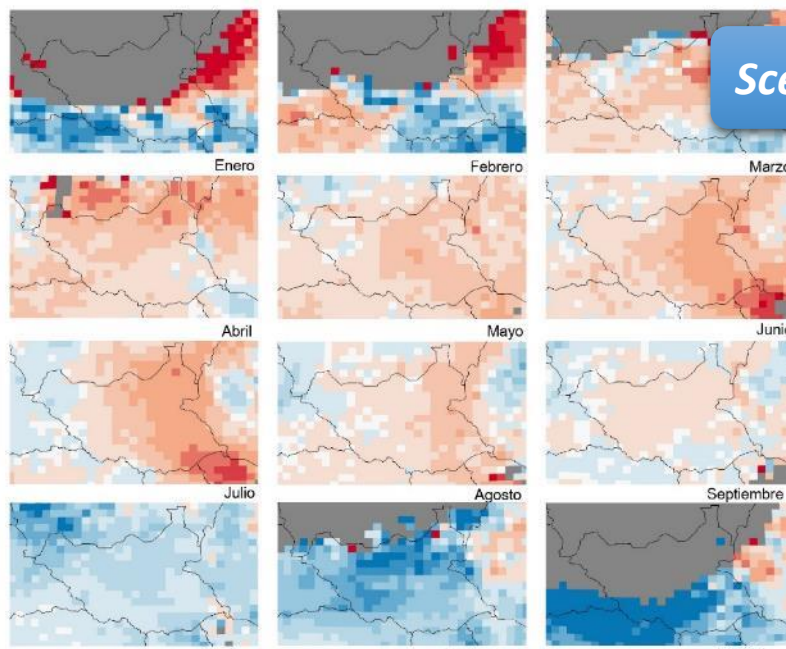


## Indices/trends

## Observed anomalies



## Scenarios/projections

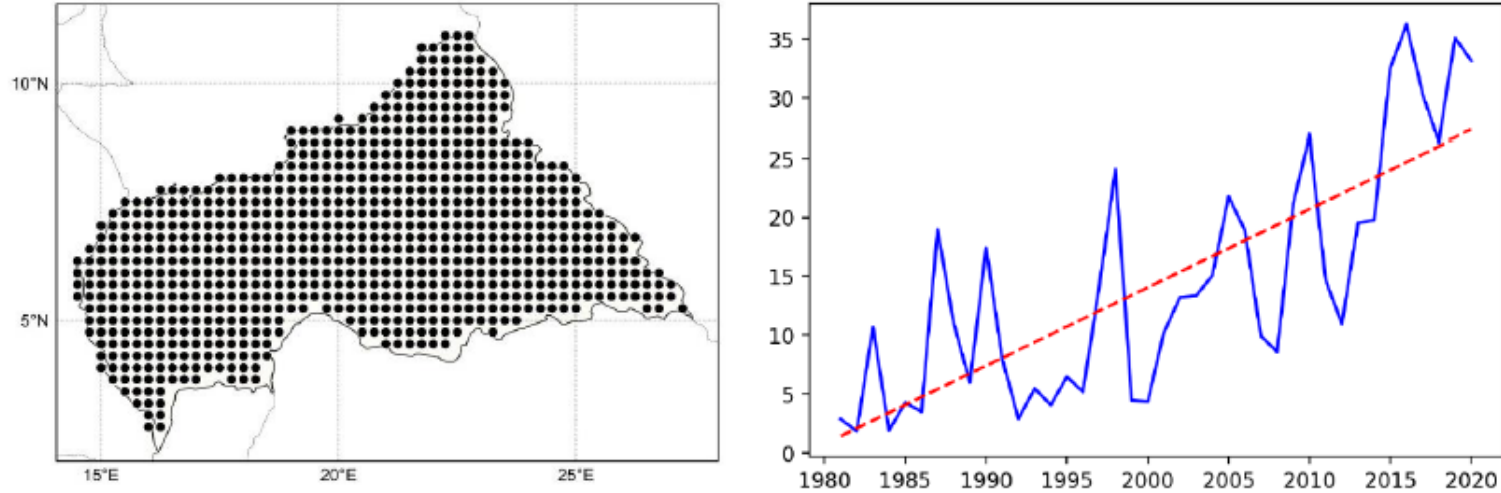




# Climate indices for CAR from ERA5

## *Central African Republic*

A regional time series covering all country



**Left:** Individual locations of 812 ERA5-reanalysis temperature timeseries withing the Central African Republic

**Right:** CAR regional timeseries of the (Tn90p) warm nights index (average of 812 individual timeseries): annual percentage of days when minimum temperature is greater than the 90<sup>th</sup> percentile



**NAP EXPO**  
**2022**  
Transformations  
to adapt



**Gaborone, Botswana**  
**22 to 26 August 2022**

