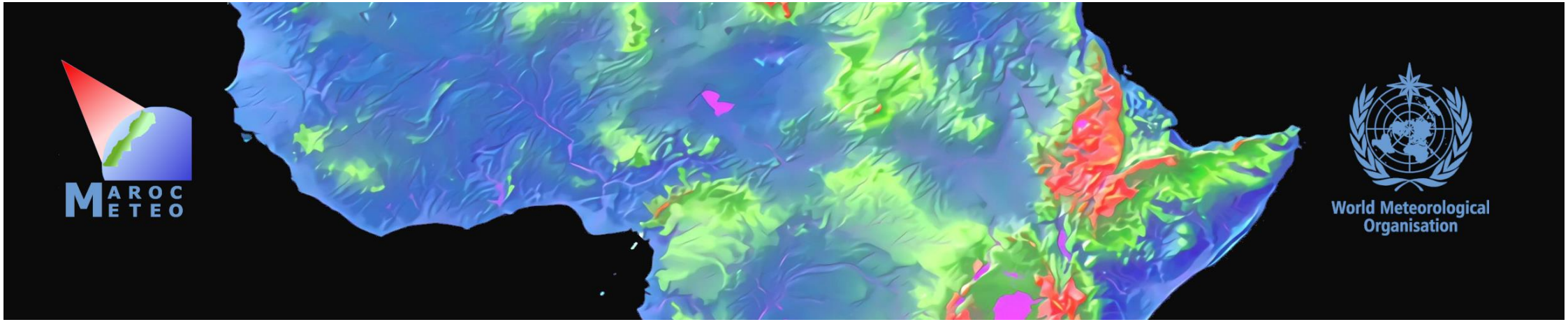

Concept of and introduction to computing National Climate Monitoring Products. (NCMPs)

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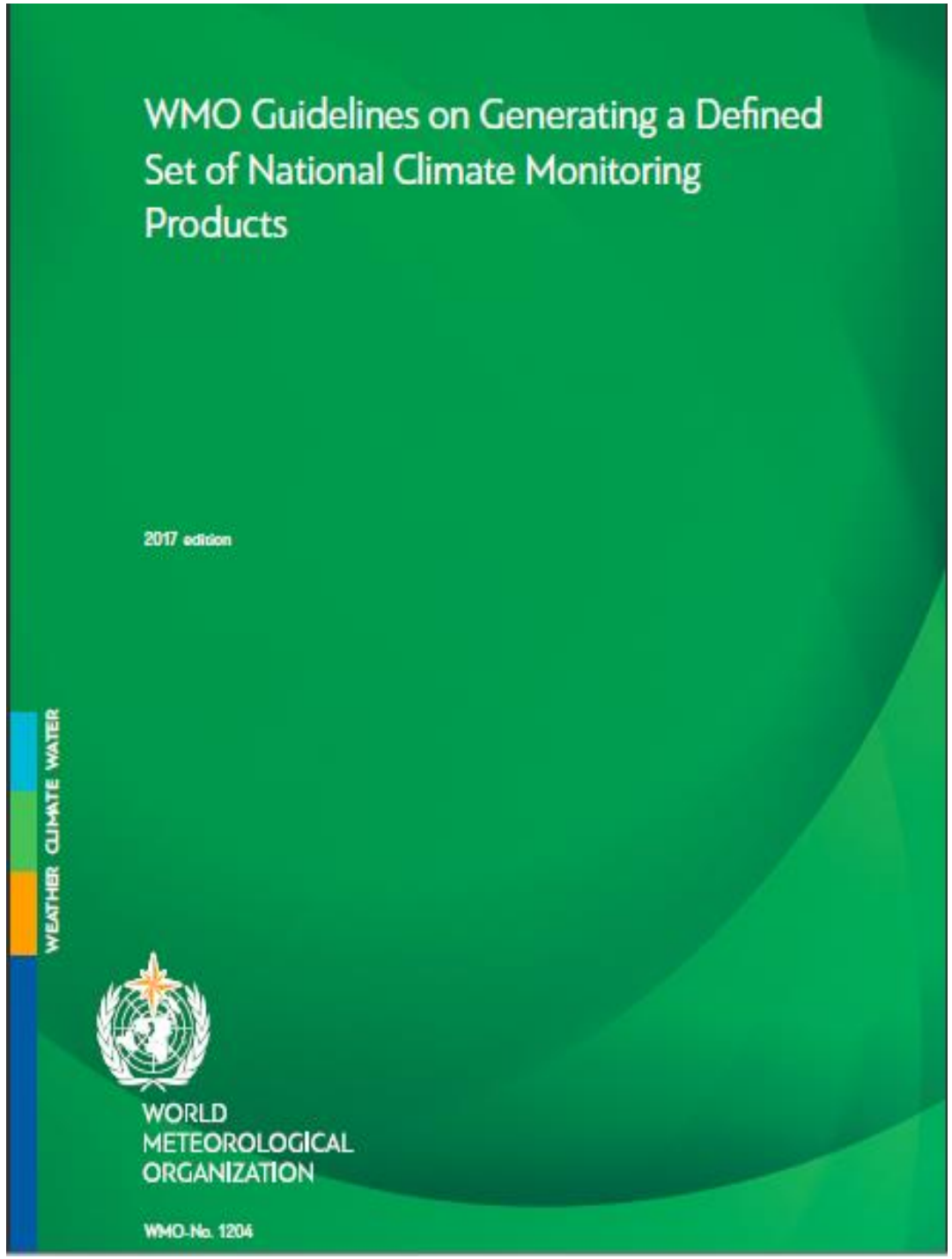
Workshop on climate data management, data sharing and exchange

DGM-WMO, 4-5 et 8 November 2021



National Climate Monitoring Products software :
https://github.com/ET-NCMP/NCMP

1. Introduction
2. National climate monitoring products
    a) NCMP1 : Mean temperature anomaly
    b) NCMP2 : Total rainfall anomaly
    c) NCMP3 : Standardized precipitation index
    d) NCMP4 : Warm days
    e) NCMP5 : Cold nights
    f) NCMP6 : Temperature and precipitation records
3. Strengths, caveats and limitations of national climate monitoring products
4. National focal points for national climate monitoring products
5. Generating national climate monitoring products

Introduction

Owing to the impact of varying and changing climatic conditions on society and ecosystems, countries around the world have created a variety of climate monitoring products at different spatial and temporal scales. National climate monitoring products (NCMPs) are products that specifically summarize climatic conditions at a national scale and show how current conditions compare with those in the past.

They are useful within a country because they raise awareness and understanding of the effects of climate variability and change, as well as demonstrate the importance of national monitoring networks and services.

At regional and international levels, NCMPs aid the synthesis of information from different countries to provide a broader, regional or global view of climate variability and change. Such summaries are routinely published in high-profile annual publications such as the WMO statement on the state of the global climate and others.

National climate monitoring products

Base period :

To ensure that national climate monitoring products (NCMPs) are comparable among countries, it is essential to have a consistent base period. A base period can also facilitate calculation of NCMPs and provide a fixed period against which changes in the climate can be assessed.

For operational climate monitoring, WMO guidance on the calculation of standard climatological normals recommends a rolling 30- year period, updated every 10 years (WMO, 2017). The most-recent period at the time of writing this publication is 1981–2010, which will be followed by 1991–2020 from 2021 and so on.

National climate monitoring products

Base period :

The table below indicates the number of heat waves according to different base period.

Tableau 2. Nombre de vagues de chaleur identifiées selon la période de référence utilisée pour la sélection des paramètres de la méthode (centiles).

Référence	1951-1980	1961-1990	1971-2000	1976-2005	1981-2010
Moyenne	11,98°C	11,83°C	12,16°C	12,37°C	12,55°C
Seuil Spic	24,06°C	24,39°C	24,76°C	24,98°C	25,28°C
Number of heat waves	56	50	41	24	18

Ref: Recensement des vagues de chaleur en France à différentes échelles spatiales et évolution en contexte de changement climatique

National climate monitoring products

Base period:

Year	Temp.Anomaly
2020	1,17
2017	1,15
2010	1,12
2016	0,92
2009	0,82
2015	0,81
2014	0,76
2001	0,67
2011	0,63
2019	0,54

Base period: **1981-2010**

Year	Temp.Anomaly
2020	0,87
2017	0,86
2010	0,80
2016	0,62
2009	0,51
2015	0,50
2014	0,45
2001	0,35
2011	0,32
2019	0,24

Base period**: 1991-2020**

Ranking of the hottest years over Morocco

Results derived from the National Climate Monitoring Products software

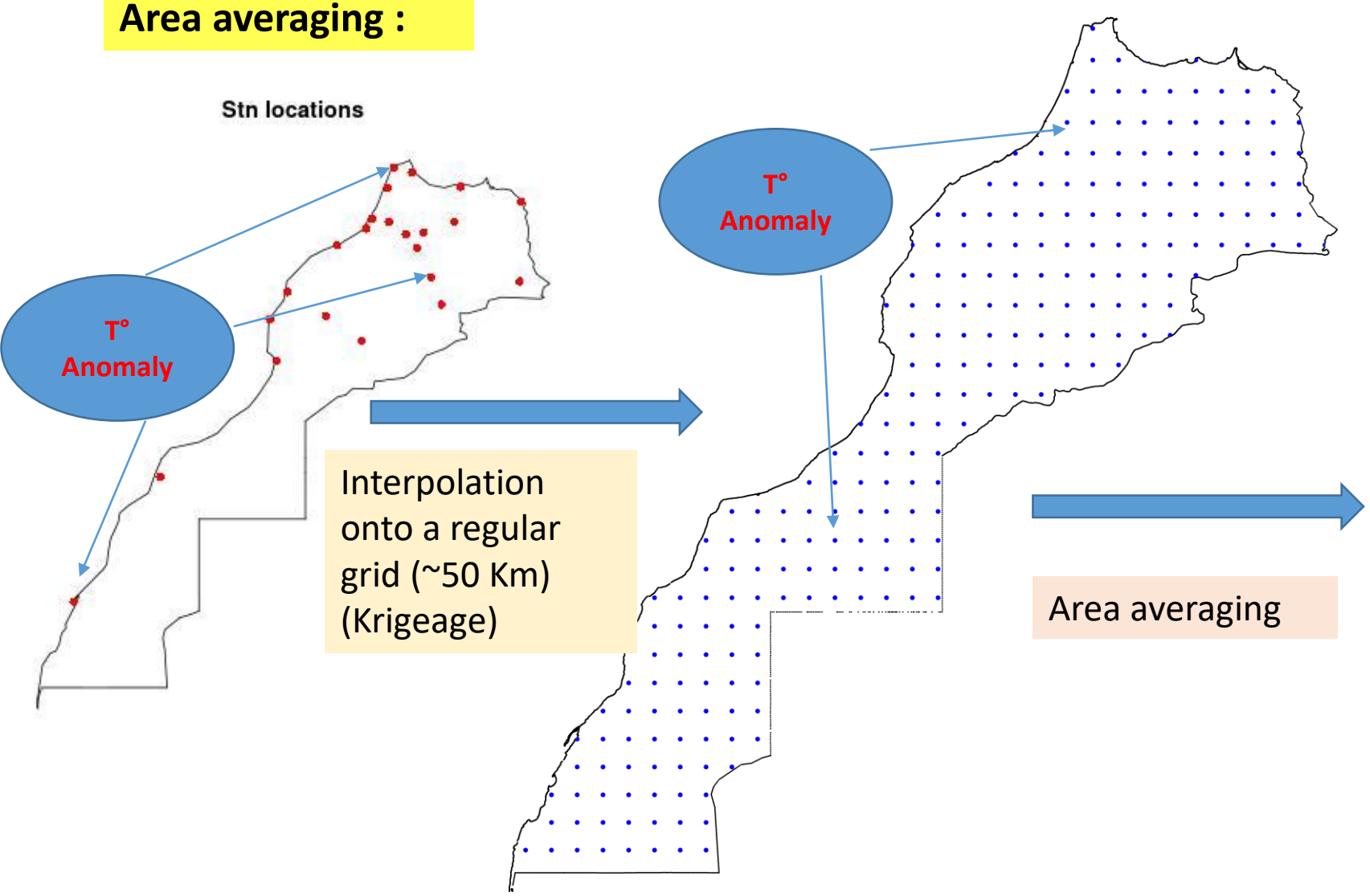
National climate monitoring products

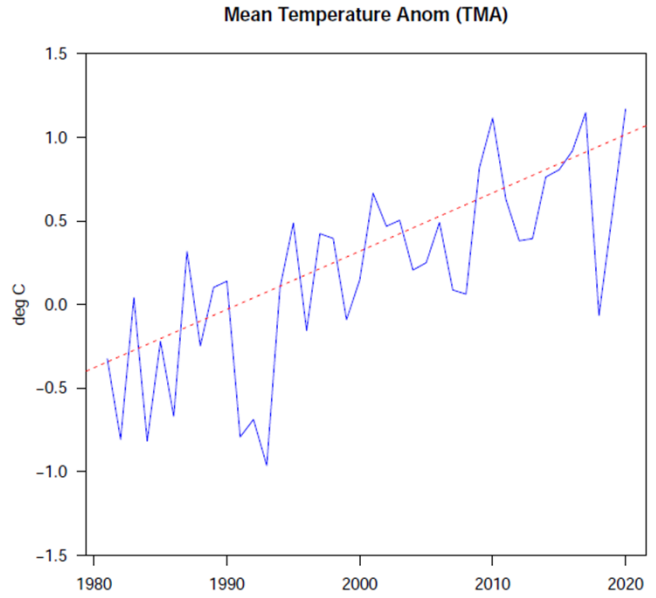
Area averaging :

In the following definitions, area averages are intended to be based on values that are comparable to indices calculated at a station level. Indices are calculated for each station, and the values of the indices are then interpolated onto a regular grid, which is then used to calculate the area average of that index for the country

National climate monitoring products

Area averaging :





Example of annual mean temperature anomaly area averaging over 1981-2020 period.

National climate monitoring products

NCMP 1: mean temperature anomaly

NCMP 1 is the mean temperature anomaly. It is the mean temperature anomaly for each month and year averaged across the country. Units are degrees Celsius

The mean temperature anomaly is a measure of overall warmth or cold relative to normal conditions. It is a standard metric used to monitor climate change and is widely used in monitoring reports .

Agadir_____TMA.csv - Bloc-notes

Fichier Edition Format Affichage Aide

```
"Year","January","February","March","April","May","June","July","August","September","October","November","December","Annual"
1960,-0.23,0.05,-0.2,-0.36,-0.53,-0.79,-1.52,-1.55,-1.69,-1.94,0.76,-3.28,-0.97
1961,-2.63,1.15,2.29,0.09,0.5,-0.07,1.6,0.48,0.92,-0.79,-1.6,1.34,0.27
1962,0.33,-2.88,-1.88,-0.89,1.29,-1.1,-1.14,2.77,1.2,1.12,-1.29,-0.74,-0.24
1963,0.94,-1.06,-2.11,-1.25,-1.36,-1.65,-1.59,-1.9,-1.78,0.13,0.05,-0.92,-1.04
1964,1.23,-1.37,-1.69,-2.41,0.39,-0.96,-1.19,-2.11,0.92,-1.31,-0.58,-3.12,-1.03
```

National climate monitoring products

NCMP 2: total rainfall anomaly

NCMP 2 is the rainfall anomaly for each month and year calculated in two ways:

- **As a simple difference from the base-period average averaged across the country ;**
  Anomaly = Total rainfall(a,m) - rainfall normal(a,m) ; unit = mm

- **As a simple difference from the base-period average expressed as a percentage of the base-period average averaged across the country;**
  Anomaly =100*(Total rainfall(a,m) - rainfall normal(a,m))/ rainfall normale(a,m) ; unit = %

a: annual time sacle
m: monthly time scale

National climate monitoring products

NCMP 3: standardized precipitation index

NCMP 3 is the standardized precipitation index SPI. It is a percentile-based measure of the standardized rainfall anomaly for each month and year averaged across the country. NCMP 3 is dimensionless, so it does not have units

This index is a standard metric used to monitor rainfall and drought. Extremes of precipitation can lead to drought or flooding

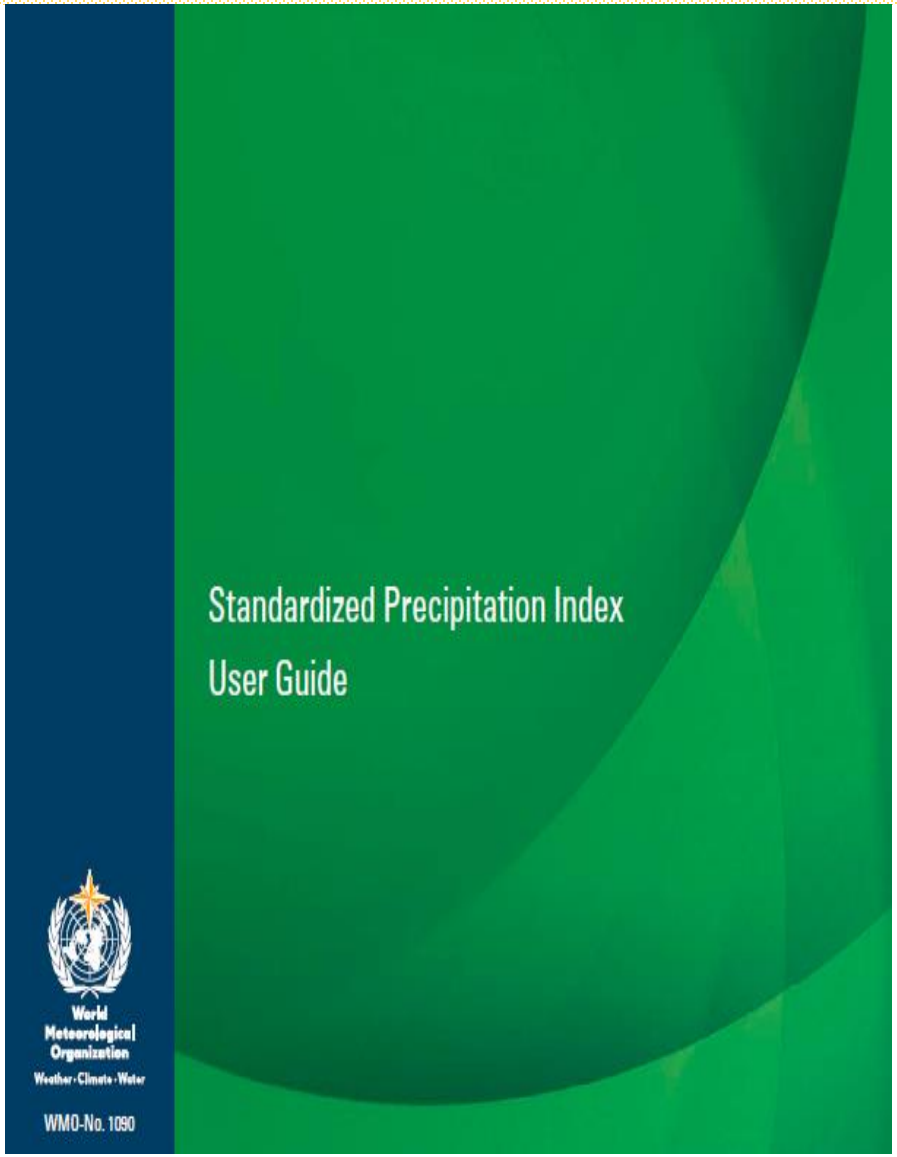
Marrakech_____SPI.csv - Bloc-notes

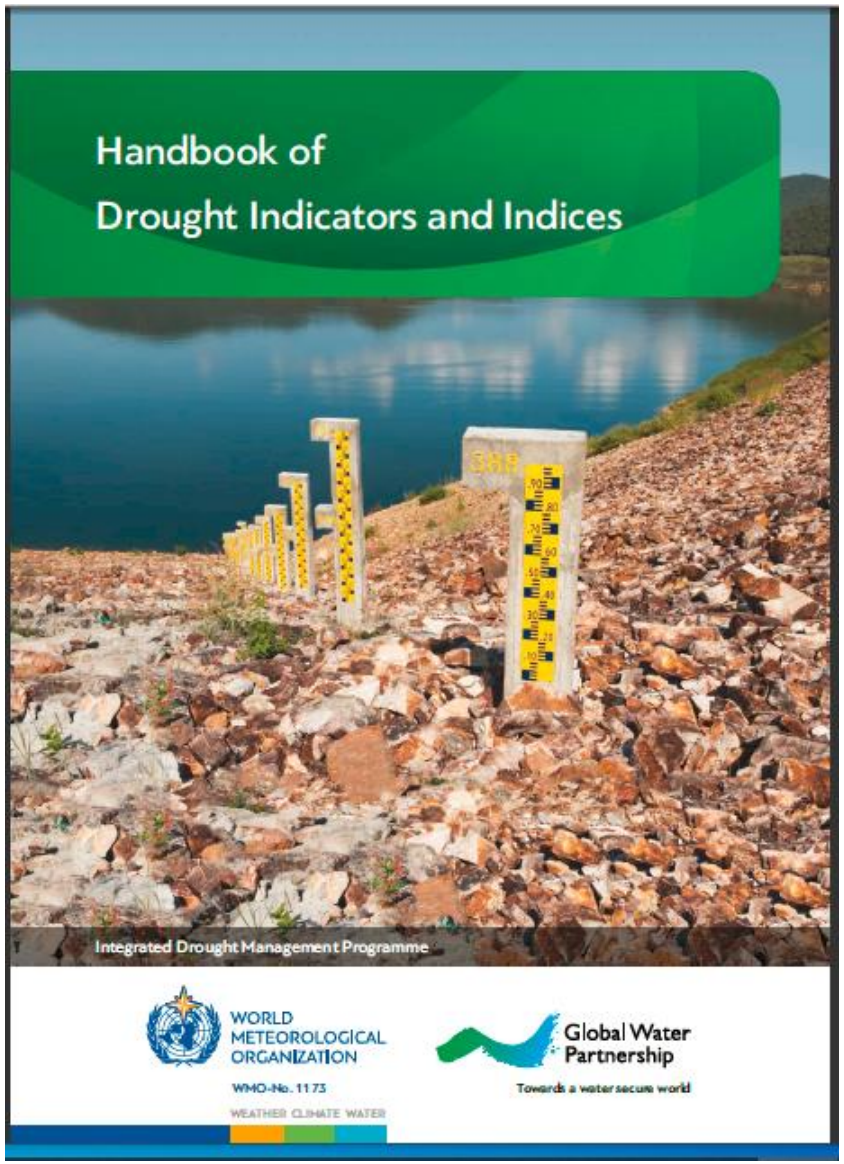
Fichier Edition Format Affichage Aide

```
"Year","January","February","March","April","May","June","July","August","September","October","November","December","Annual"
1961,-0.2,-0.2,0,0,0.1,0.9,0.5,0.1,0.2,0.3,0.2,-0.3,-1.5
1962,0.5,0.8,1.5,1,1.3,0.6,1.9,1.3,1.5,0.9,0.8,1.6,0.9
1963,1.3,1.1,0.5,0.9,1.6,0.4,0.3,-0.1,-0.2,0.7,0.8,0.7,1.1
```

National climate monitoring products

NCMP 3: standardized precipitation index

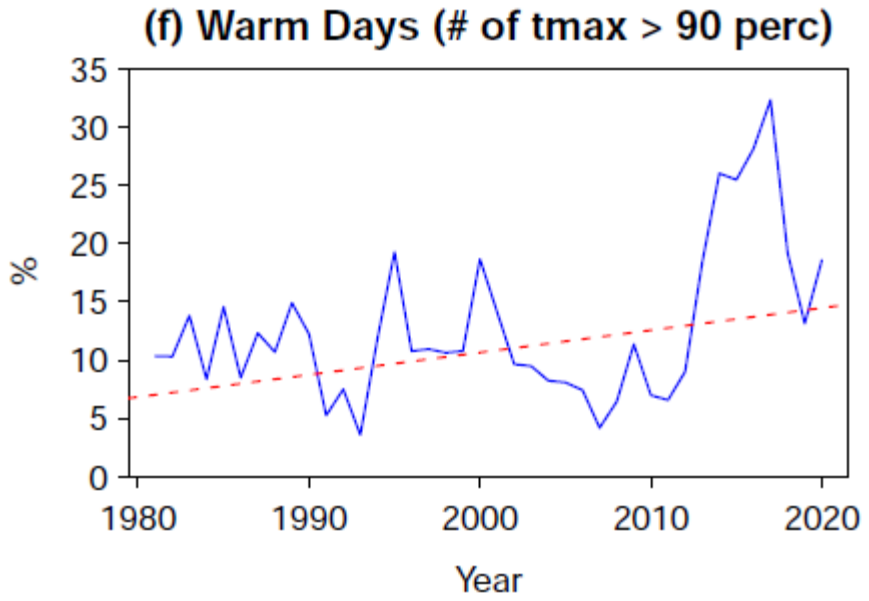




National climate monitoring products

NCMP 4: warm days

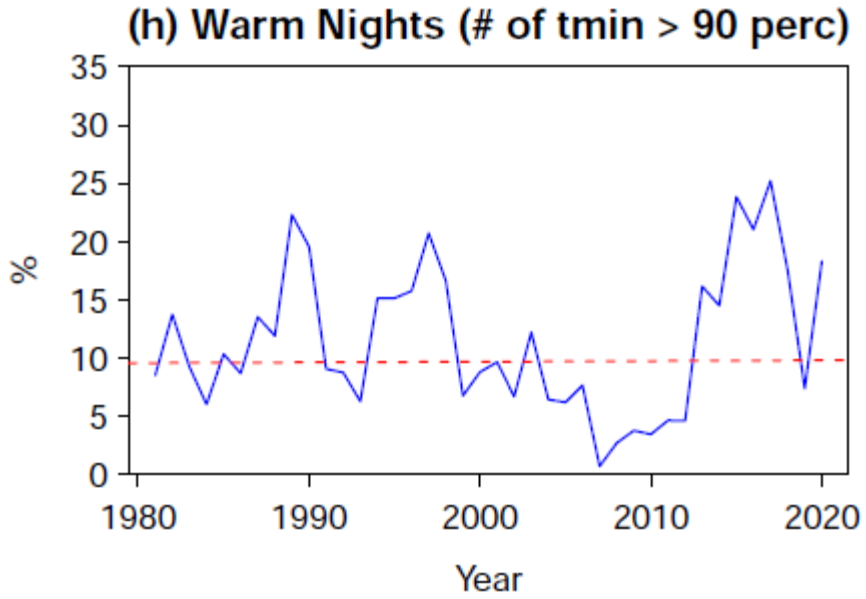
NCMP 4 is the warm days index. It is a measure of the percentage of days in each month and year that exceeded the 90th percentile of the base-period distribution for maximum temperatures for the day averaged across the country. Units are percentage of days.



National climate monitoring products

NCMP 5: cold nights

NCMP 5 is the cold nights index. It is a measure of the percentage of days in each month and year that fall below the 10th percentile of the base-period distribution of minimum temperatures for the day averaged across the country. Units are percentage of days .



National climate monitoring products

NCMP 6: temperature and precipitation records

NCMP 6 gives a simple count of the number of stations with records exceeding 30 years in length that report their highest recorded daily maximum temperature, lowest recorded daily minimum temperature and highest recorded daily precipitation total for each month and year. Records for each element are counted separately

The aim is to flag the exceptional events, that is, events that often have extreme impacts. Extremes of temperature – both hot and cold – can lead to a range of health problems and, in the most acute cases, death. High rainfall totals can lead to flooding and associated impacts including damage to crops, destruction of infrastructure, displacement of people and loss of life. Such extremes can be very localized, so this NCMP is based on records at stations, without aggregation

National climate monitoring products

a) NCMP1 : Mean temperature anomaly

b) NCMP2 : Total rainfall anomaly

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d) NCMP4 : Warm days

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f) NCMP6 : Temperature and precipitation records

Strengths, caveats and limitations of national climate monitoring products

Climates can vary within a country, sometimes to a great extent

region-specific information will be lost in calculating NCMPs, particularly when averaging rainfall over large areas

Balanced against this is the fact that NCMPs, by averaging out local variations in temperature and precipitation, will increase the signal-to-noise ratio for detecting changes in climate over time

National focal points for national climate monitoring products

National focal points for NCMPs are responsible for facilitating the calculation of NCMPs at a national level and for disseminating NCMPs. Members of WMO have been invited to nominate a focal point for NCMPs as per the following terms of reference:

- **To collaborate on identifying existing national sources for climate monitoring products and related capacities as well as related training and capacity-building needs**
- **To raise awareness of National Meteorological and Hydrological Service staff and other relevant stakeholders on the need for and the importance of NCMPs**
- **To facilitate calculation of NCMPs including dissemination via agreed protocols**
- **To prepare and submit feedback on the challenges and the need for improvement emanating from the preparation and dissemination of NCMPs**

Calculated NCMPs should be sent to WMO (wcdmp@wmo.int) as an email attachment in time for inclusion in the annual WMO statement on the state of the global climate. The deadline for submissions is usually late January each year. A coded message will be developed to make frequent dissemination more efficient

Generating national climate monitoring products

The basic steps for calculating NCMPs 1–5 are:

1. Conduct QC on the daily station data of temperature and precipitation;

2. Consider the homogeneity of the data at each station;

3. Generate the indices at each station for each month and year;

4. Interpolate the data for each index for each month and year;

5. Average each index across the country using the interpolated data;

6. Output the NCMP.

NCMP 6 simply reports daily temperature and precipitation records and is described separately

Many thanks for your attention