



# Climate parameter/data and its implication in sectors

**1**

Climate Monitoring

**2**

Climate Indices for Urban Sector

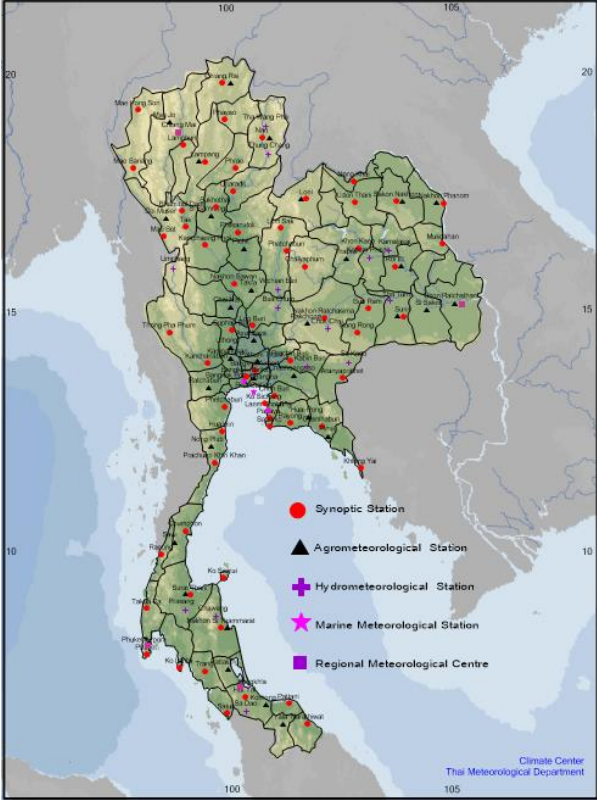
**3**

Climate Assessment & Climate Risk

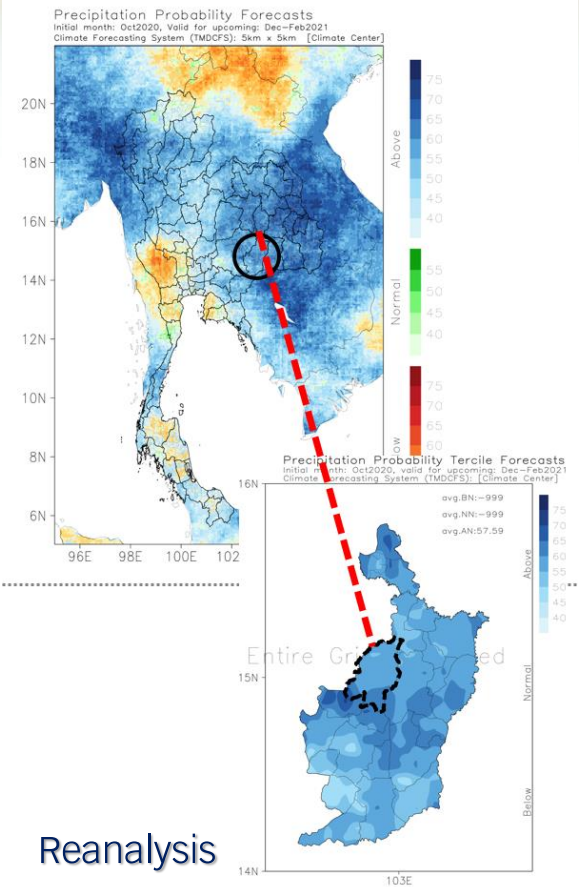


# Climate Monitoring

# Climate Data



Station Weather



Reanalysis

## Gridded Climate Data

Historical Spatial Maps and Gridded Climate Data for more precision of Climate Analysis and Climate Assessment

## Hi-Resolution Climate Dataset

Hi-Resolution Climate Data is beneficial to decision-making and stakeholder and utilizing on a sub-city level

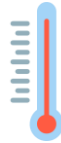
# Meteorological element

Every meteorological element that is observed may also be regarded as a climatic element. The most commonly used elements in climatology are



**Precipitation**

(rainfall, snowfall, hail, dew, rime, hoar frost)



**Temperature**

(maximum and minimum)



**Wind**

(speed and direction)



**Humidity**



**Sunshine**



**Evaporation**



**Pressure**



**Present Weather**

(fog, hail, thunder)



**Topography**

# Climate Monitoring Product

Climate summarizes the average, range and variability of weather elements, e.g. rain, temperature, wind direction and speed observed over many years at a location.

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- The Recent Climate
  - Map and Graph of Recently Rainfall, Temperature etc.
  - Climate summaries & diagnostic (weekly, monthly, annual)
  - Historical Tropical Cyclone Track
  - Technical Document (Seasonal summaries)
  - Weather and Climate Hot Issue
- Variability of Rainfall and Temperature
- Monitoring Climate Phenomena : ENSO, IOD, MJO

# Climate Monitoring Product

- Daily Temp & Rain Report
- Daily Temp & Rain Chart

- Weekly Summary Report
- Weekly Rainfall & Temp. Chart

- Monthly Weather Summary Report & Chart
- Monthly Current Data
- Monthly Weather Condition

- Weather Summary and Significant Events
- Winter
- Rainy
- Summer
- GMI (General Monsoon Index)

- Annual Weather Summary Report
- Annual Current Data
- Annual Weather Chart
- Rainfall Decile
- Annual Report of Tropical Cyclone

- Climate Variability
- Decadal climate and trend analysis

DAILY

WEEKLY

MONTHLY

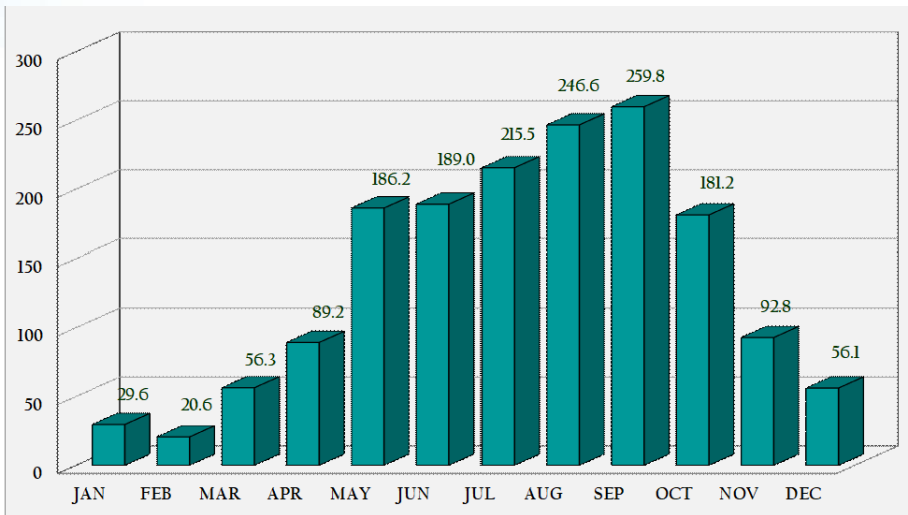
SEASONAL

ANNUAL

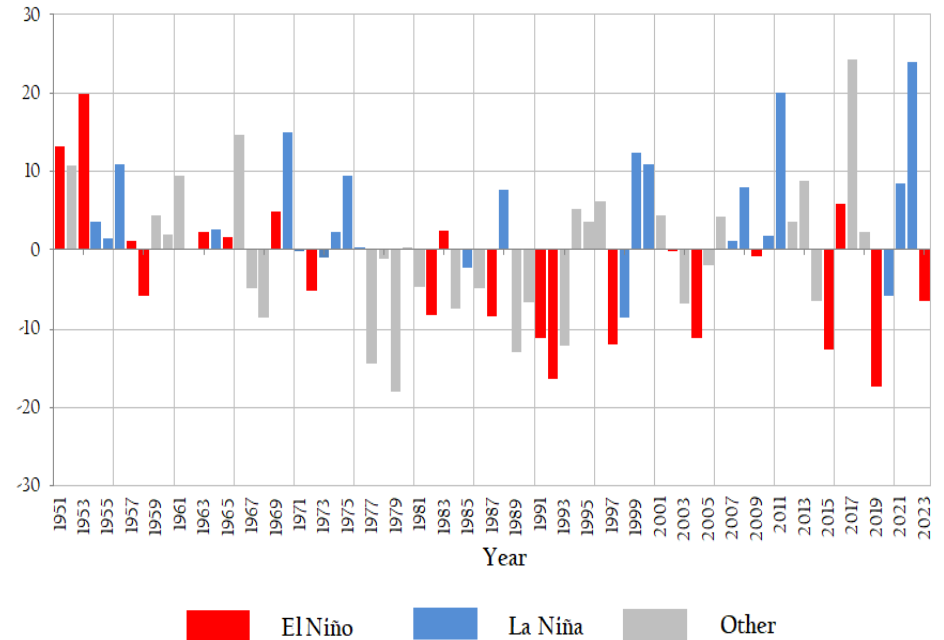
DECADAL

# Climate Monitoring Product

Mean Monthly Rainfall in Thailand (mm)  
(Normal : 1991-2020)

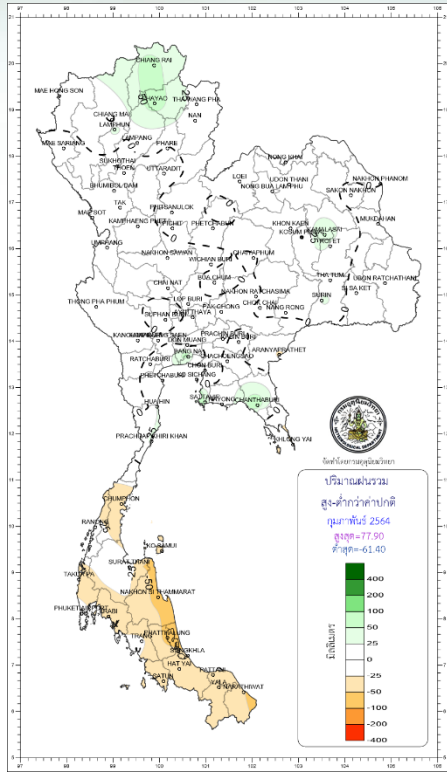


Mean Annual Rainfall in Thailand  
Above-below normal in percentage  
(Normal : 1991-2020)

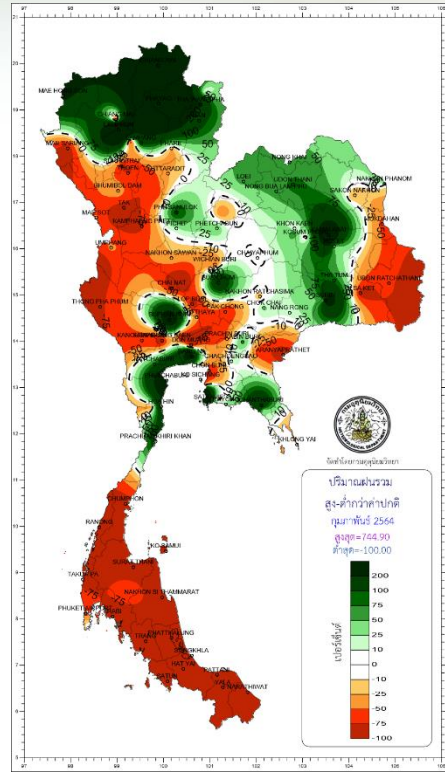




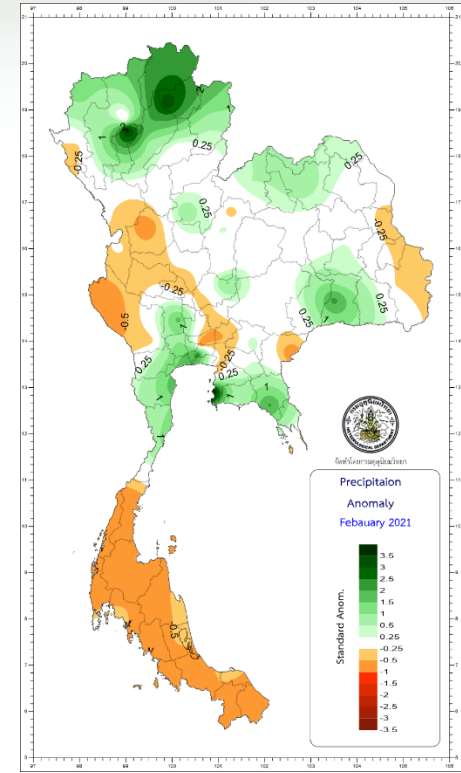
# Climate Monitoring Product



Anomaly (mm) , ( $^{\circ}$ C)



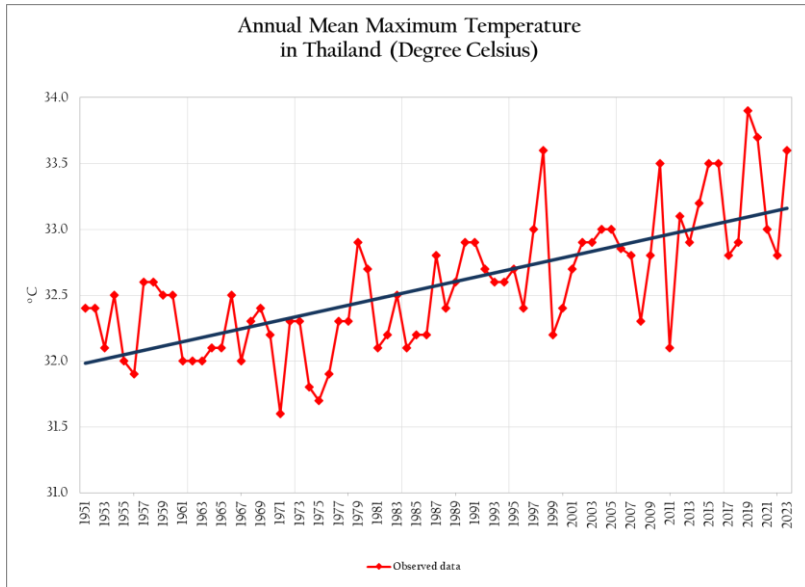
Percent Anomaly (%)



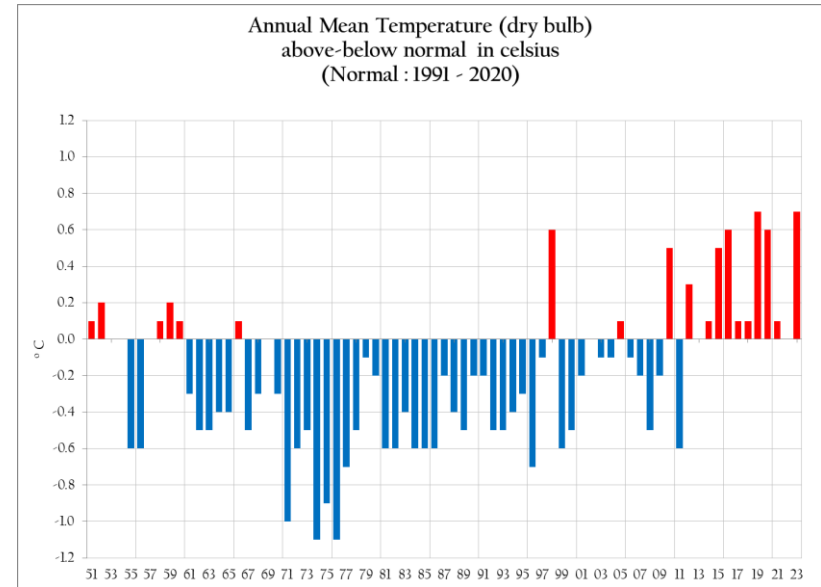
Standardize Anomaly

# Climate Monitoring Product

## Annual Mean Maximum Temperature in Thailand (Degree Celsius)

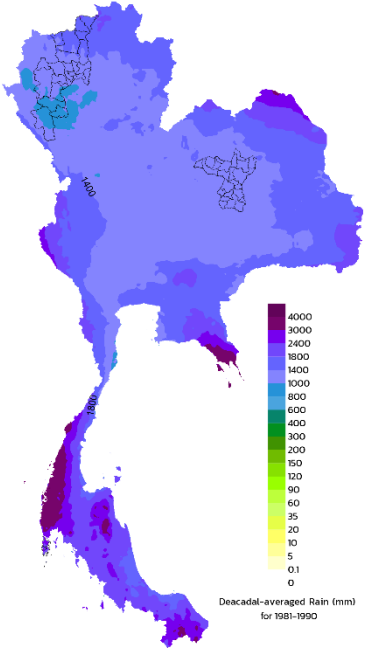


## Annual Mean Temperature (dry bulb) Above-below normal in Celsius (Normal : 1991-2020)

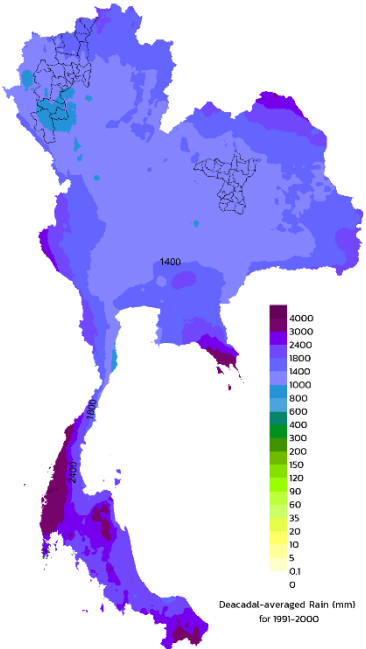


# Decadal Annual Precipitation

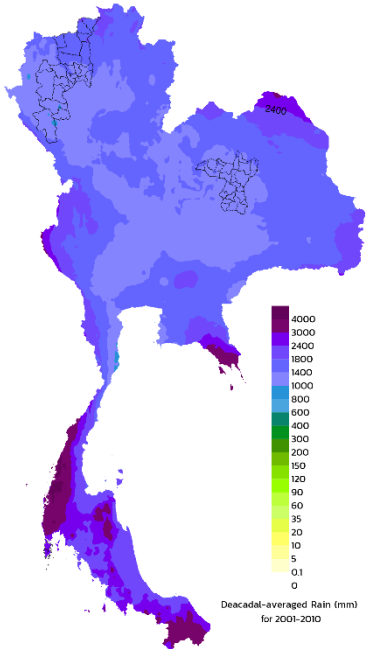
1981-1990



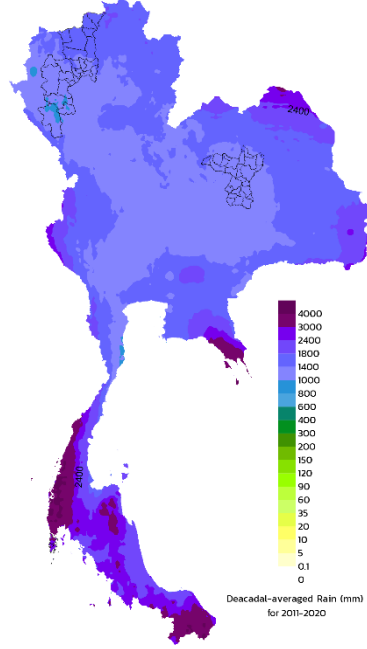
1991-2000



2001-2010

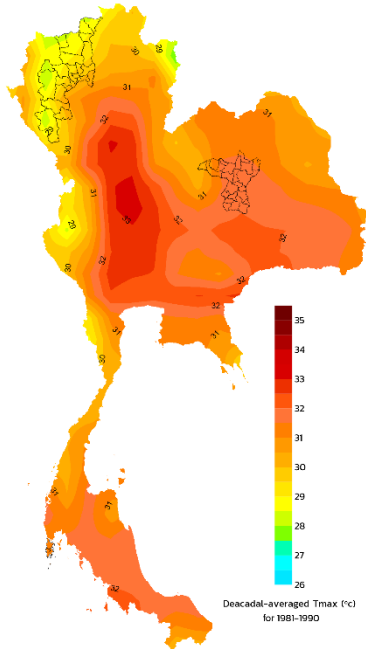


2011-2020

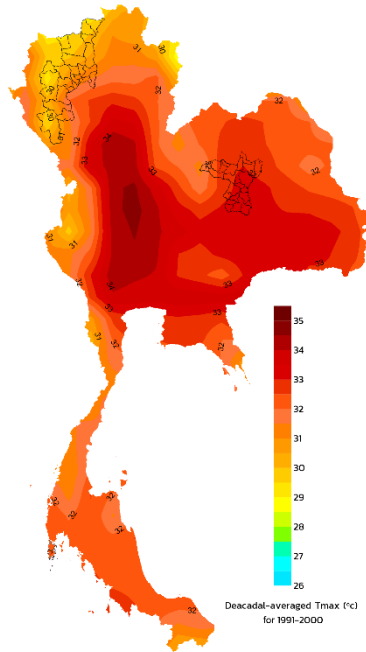


# Decadal Mean Maximum Temperature

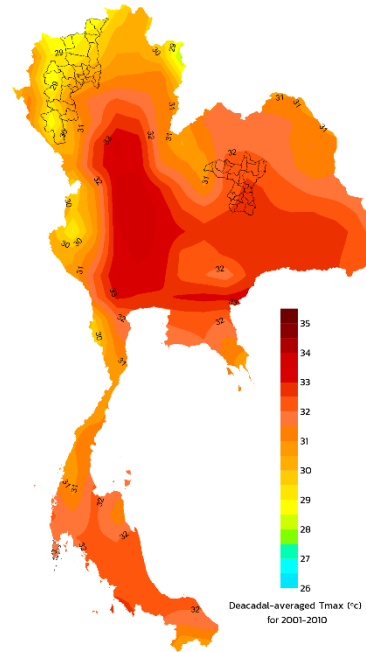
1981-1990



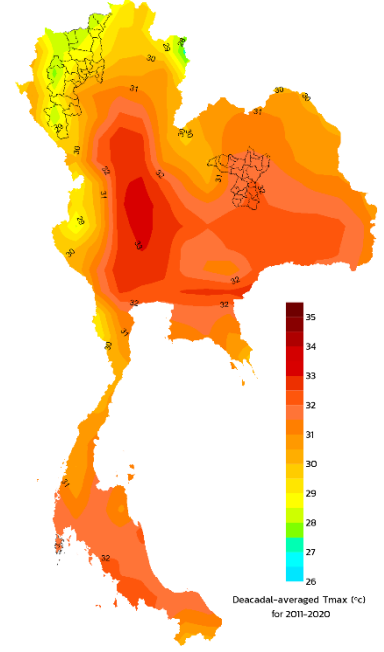
1991-2000



2001-2010

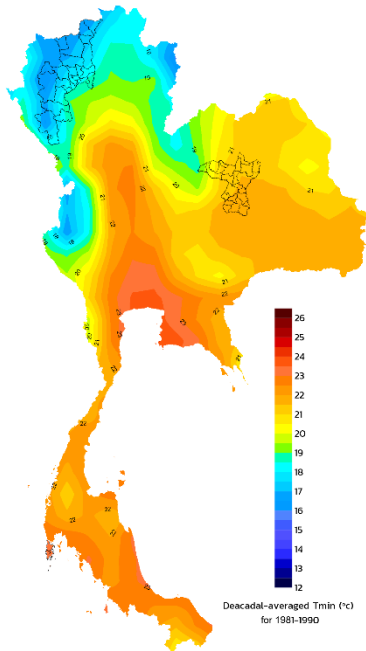


2011-2020

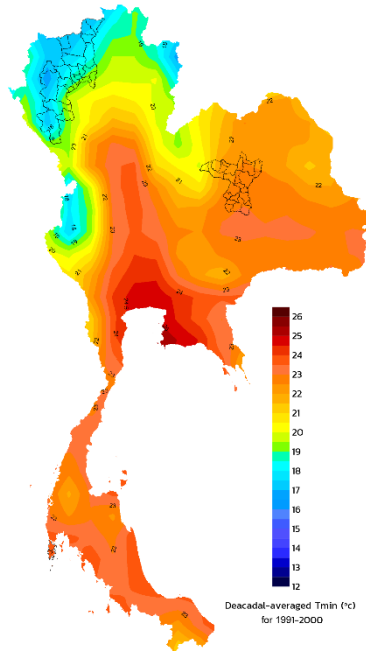


# Decadal Mean Minimum Temperature

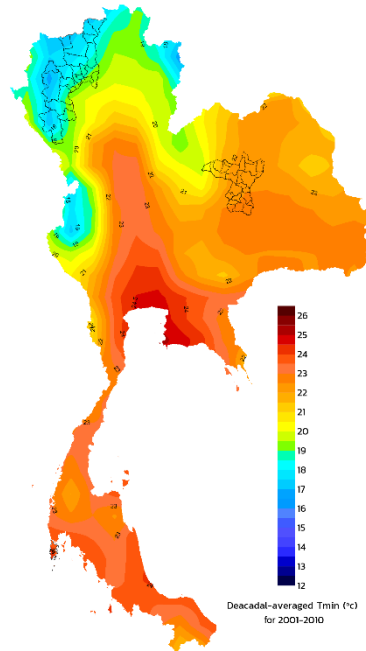
1981-1990



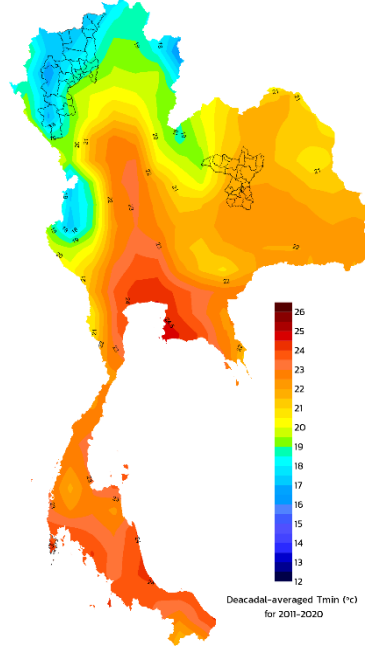
1991-2000



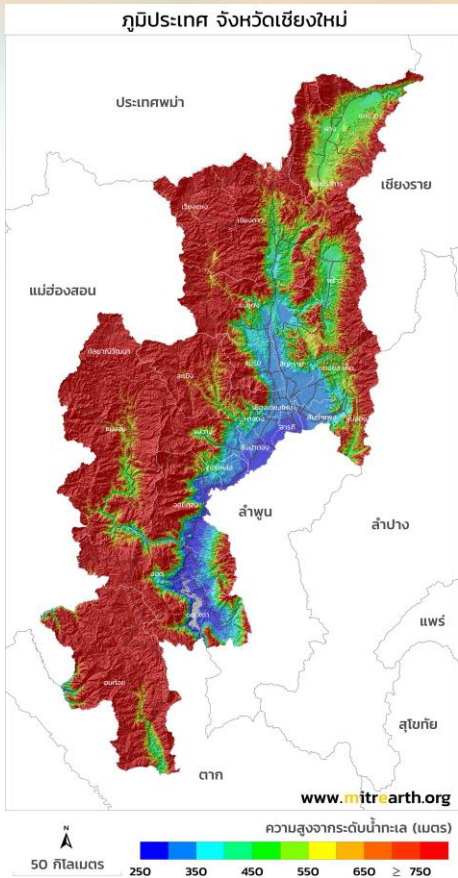
2001-2010



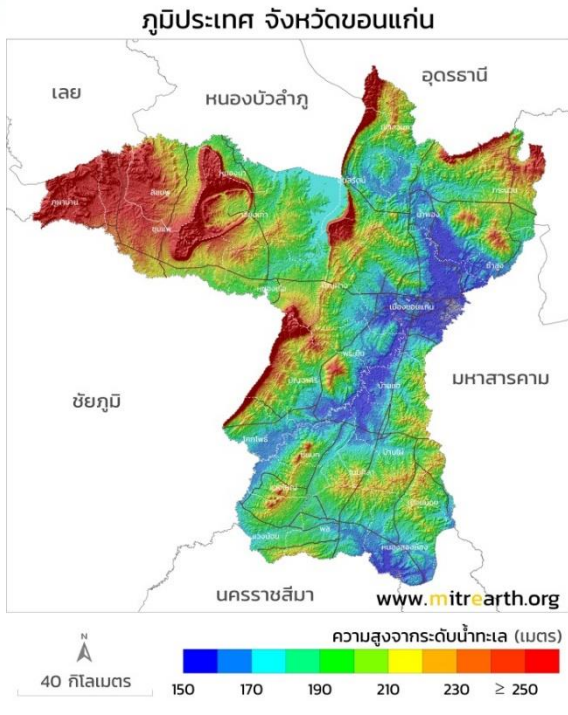
2011-2020



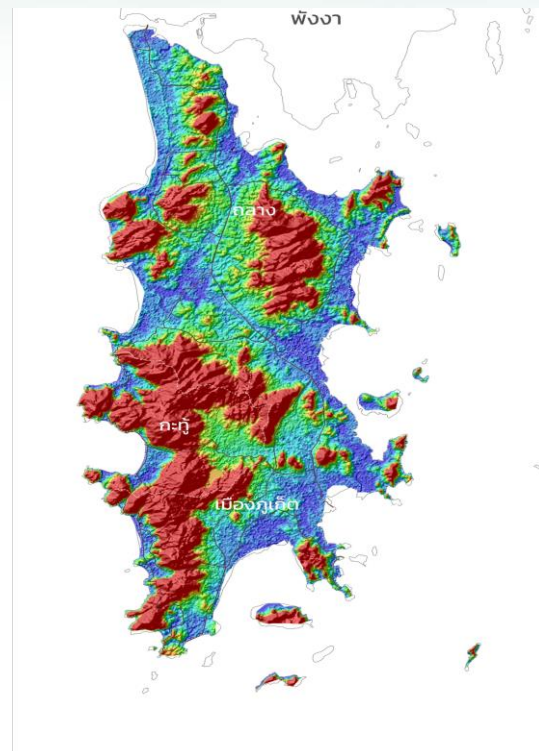
# Climate by province



Chiang Mai



Khon Kaen

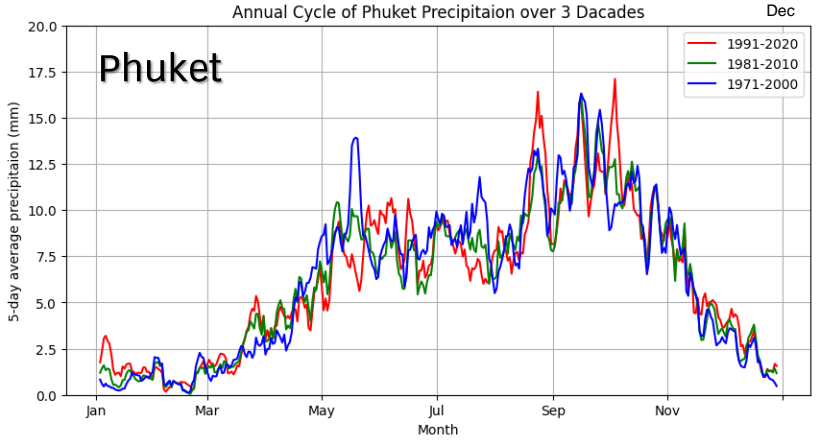
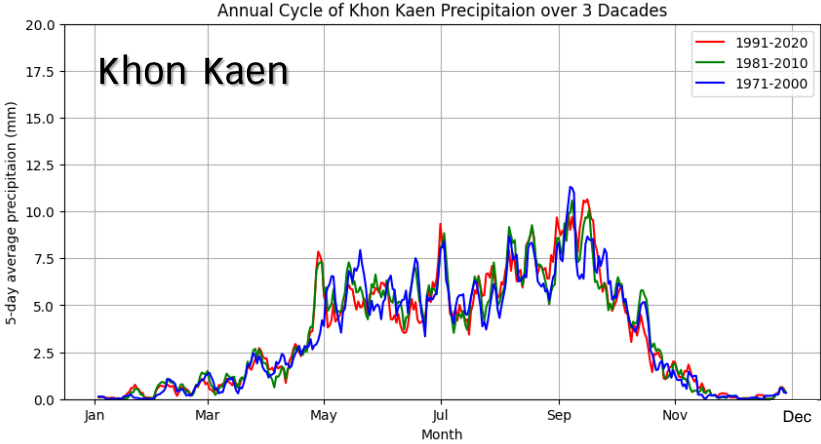
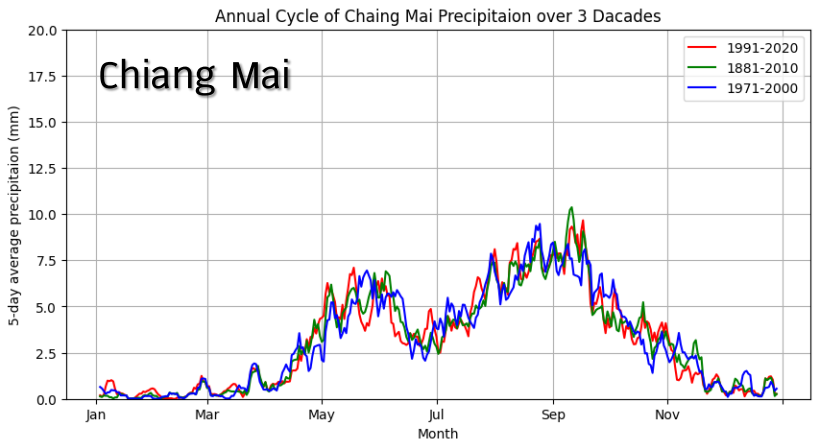


Phuket

# Climate Extremes

	Highest Daily Rainfall		Highest Temperature		Lowest Temperature	
	Millimeter	Date	Celsius	Date	Celsius	Date
Chiang Mai	166.5	14 Aug 1968	42.5	11 May 2016	3.7	2 Jan 1974
Khon Kaen	183.7	30 Aug 2019	42.8	6,25 Apr 1958 29 Apr 1960	5.1	24 Dec 1999
Phuket	245.7	1 Sep 2022	39.2	20 Apr 2019	13.9	4 Jan 1957

# Decadal Annual Precipitation

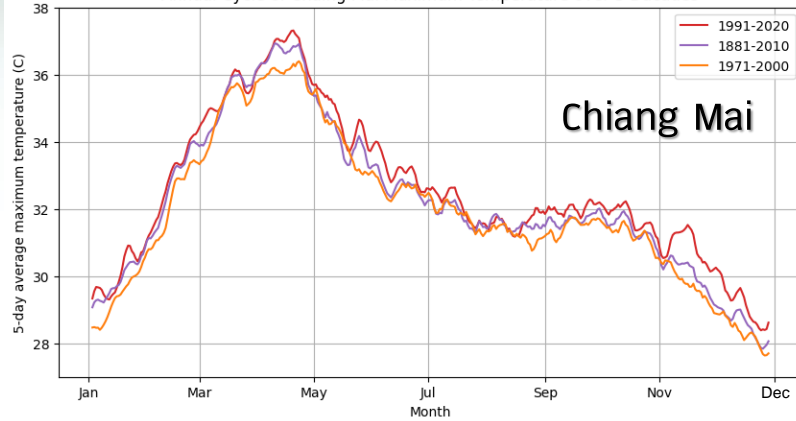


Dec

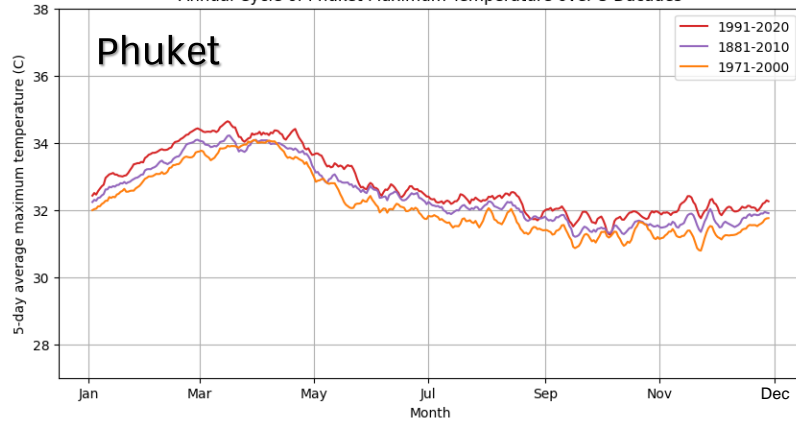


# Decadal Maximum Temperature

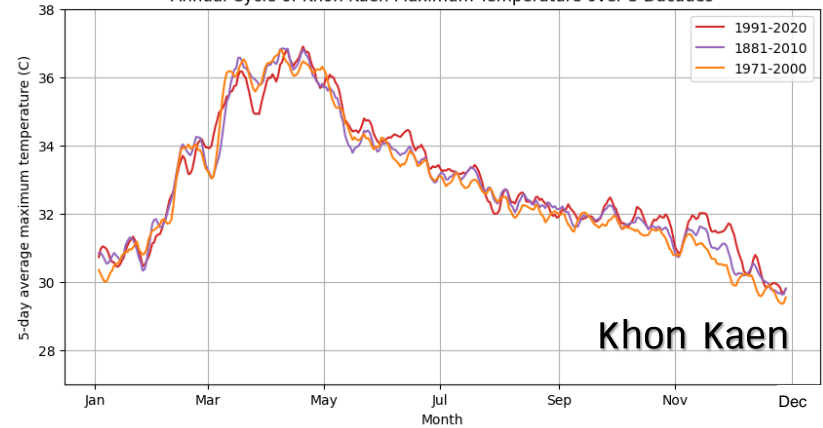
Annual Cycle of Chiang Mai Maximum Temperature over 3 Decades



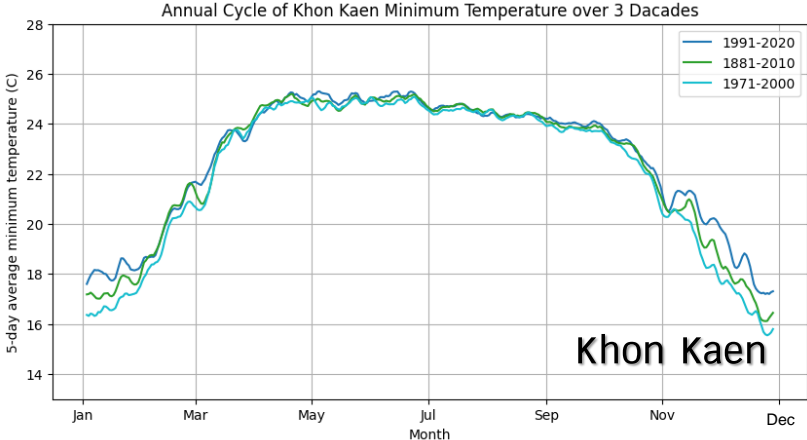
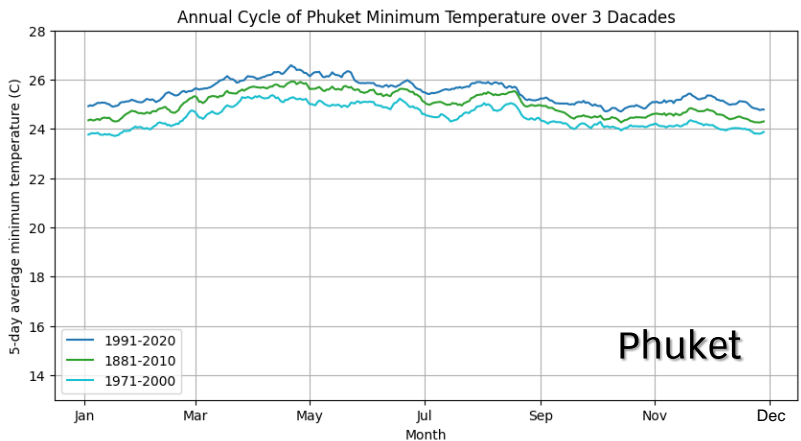
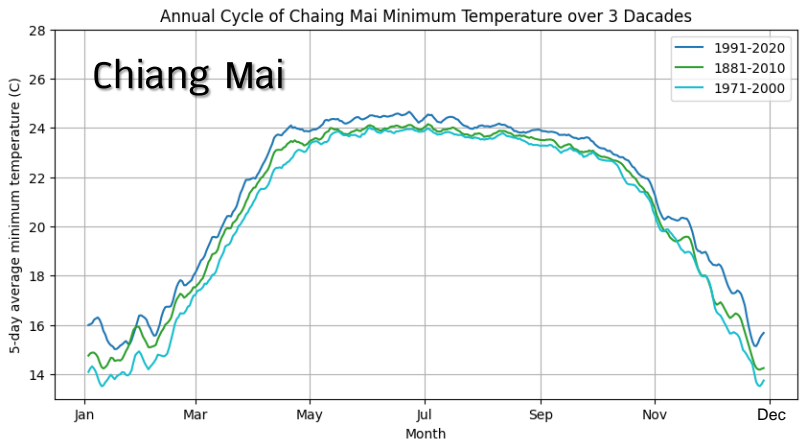
Annual Cycle of Phuket Maximum Temperature over 3 Decades



Annual Cycle of Khon Kaen Maximum Temperature over 3 Decades

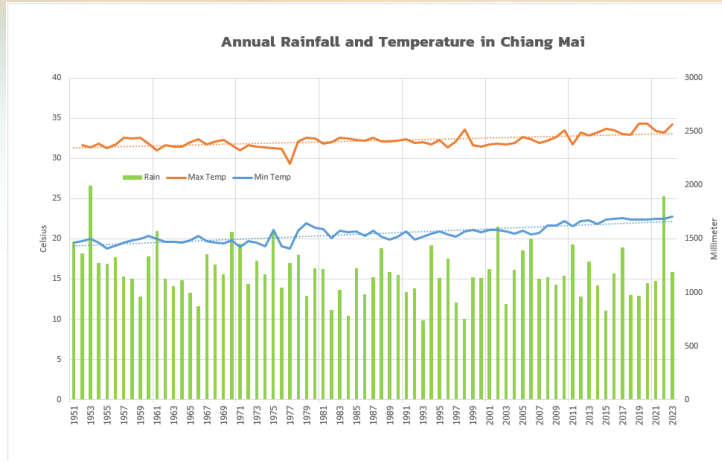


# Decadal Minimum Temperature

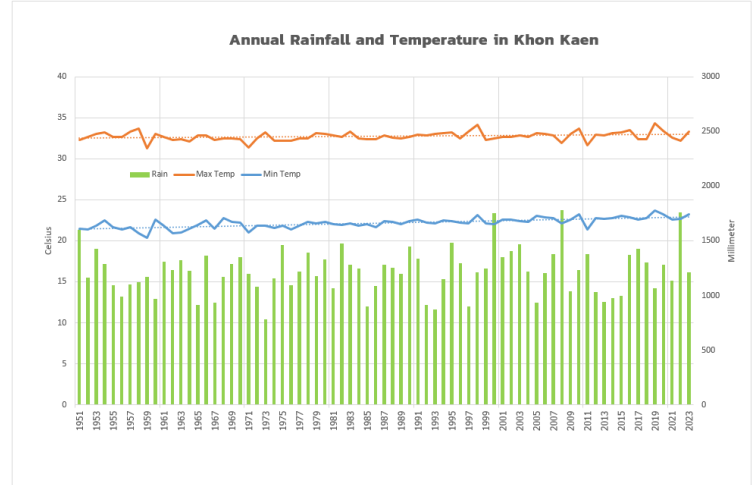
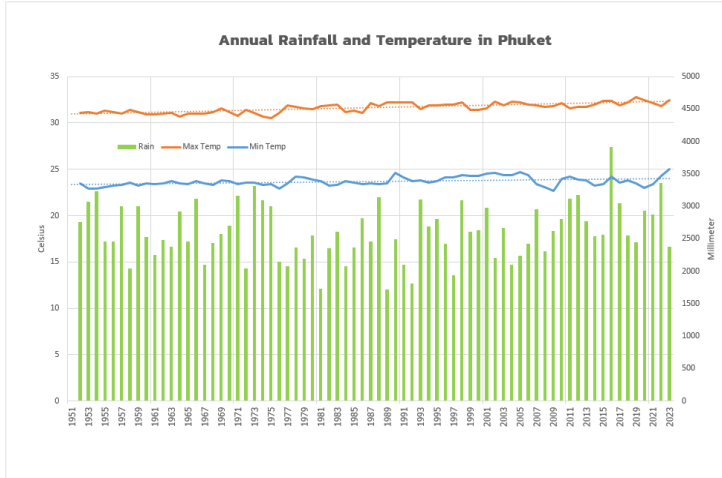


# Annual Rainfall and Temperature

Chiang Mai



Phuket



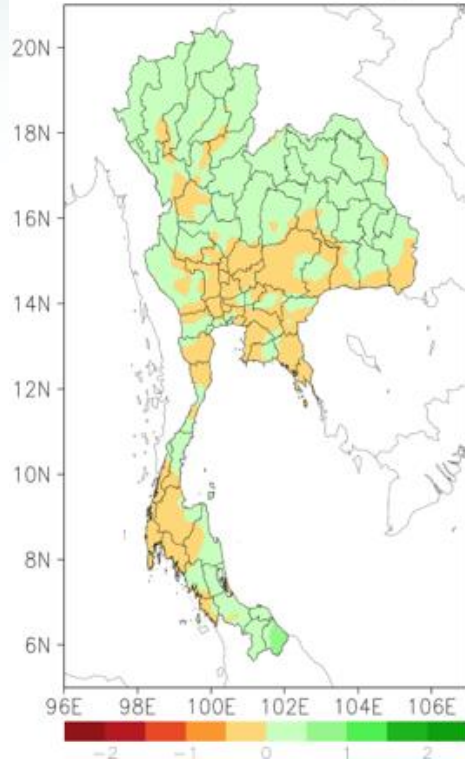
Khon Kaen



# Climate Indices

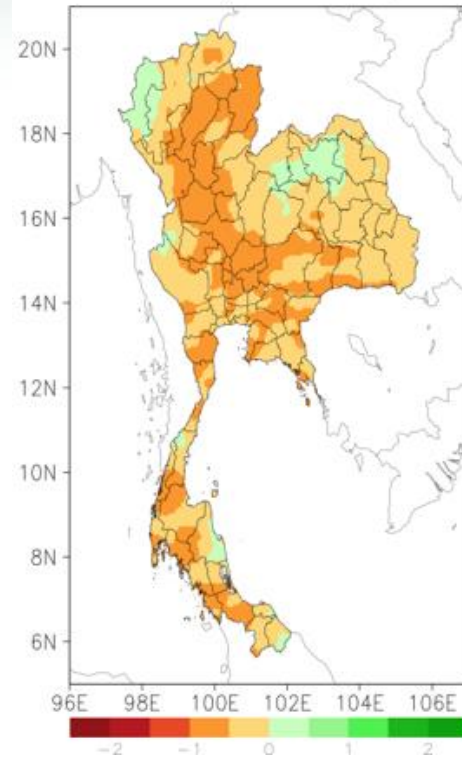
# SPI in Dry Season : period 1971-2005

SPI1: Dry Season [0.0687]



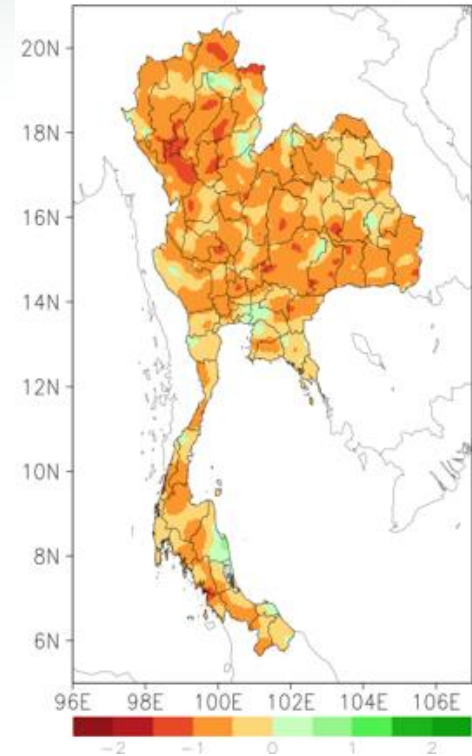
**SPI1**

SPI3: Dry Season [-0.382]



**SPI3**

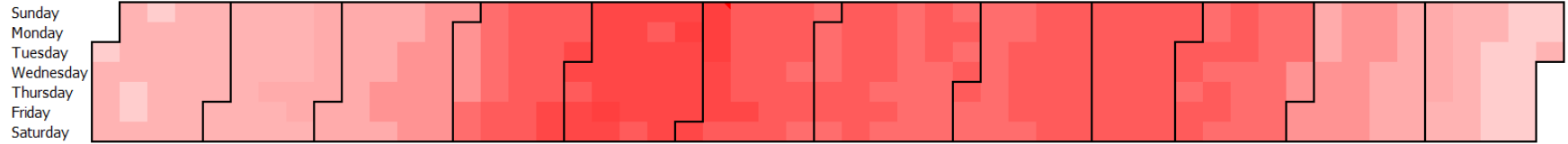
SPI6: Dry Season [-0.554]



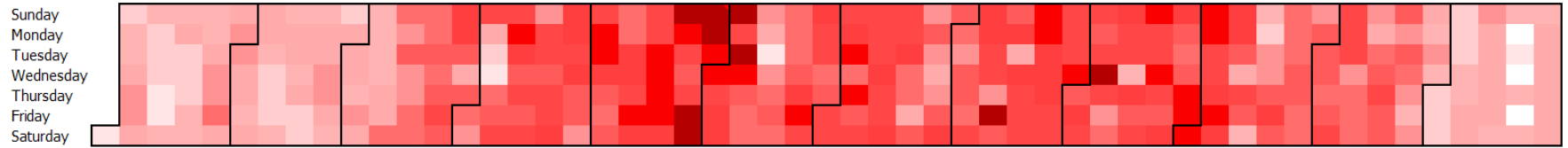
**SPI6**

# Heat Index - Chiang Mai

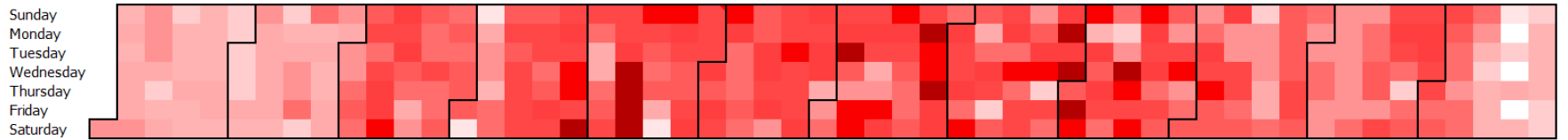
Chiang Mai 1991-2020



Chiang Mai 2021



Chiang Mai 2022



# Climate Data Service



# Useful indices by sector

Index <sup>1</sup>	Health	Agriculture and food security	Water resources and food security	Coasts	Disaster Risk Reduction	Energy	Fisheries	Forestry/GHGs	Cryosphere
<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	✓	✓			✓			✓	
<b>GSL</b> Growing season length		✓			✓			✓	
<b>TXc</b> Max TX		✓				✓		✓	✓
<b>TNn</b> Min TN		✓				✓		✓	✓
<b>WSDI</b> Warm spell duration indicator	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>WSDId</b> User-defined WSD	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>CSDI</b> Cold spell duration indicator	✓	✓		✓	✓	✓	✓	✓	✓
<b>CSDId</b> User-defined CSD	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>TXgt50p</b> Fraction of days with above-median temperature	✓	✓	✓					✓	
<b>TX95t</b> Very warm day threshold	✓	✓							



# Climate Indices

Parameter	Index	Impact	Sector
Rainfall	R95TOT, R99pTOT, RxTOT, R10mm, Rx1day, CDD, CWD, R35mm, R90mm	Flood, Drought	<b>Agriculture, Health, Urban</b>
Temperature	TN90p, TX90p, TXm, TNx, DTR, TXge35, TXx, SU, Heat index, TX95t	Heat	<b>Health, Urban, Agriculture</b>
Rainfall, Rh, Temperature	SPI, Heat Index	Heat	<b>Agriculture, Health</b>

# Disasters

	Chiang Mai	Khon Kaen	Phuket
Air pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extreme cold/heat wave	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tropical cyclones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flooding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storm surge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extreme rainfall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strong winds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sea level rise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate change :urban emissions of GHG	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy and water sustainability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Domino effect	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Decadal Flood Rating – Chiang Mai

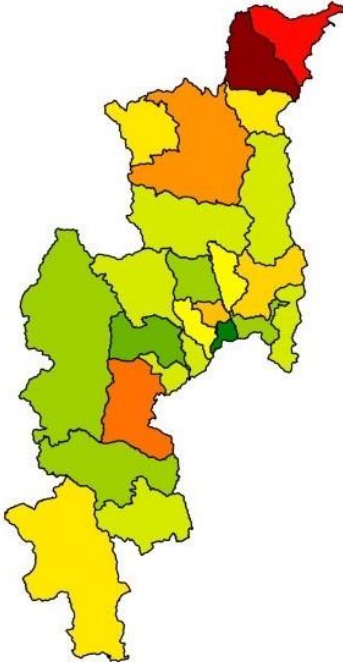
1991-2000



2001-2010

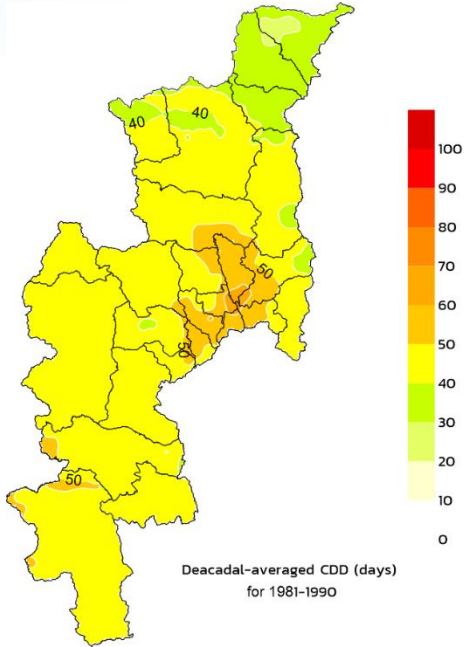


2011-2020

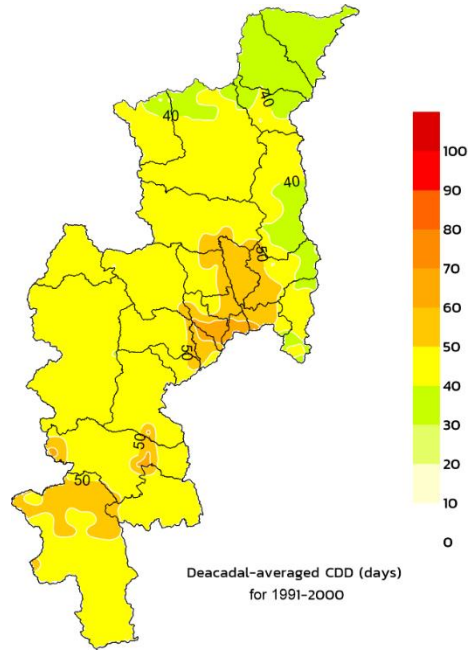


# Decadal Averaged CDD – Chaing Mai

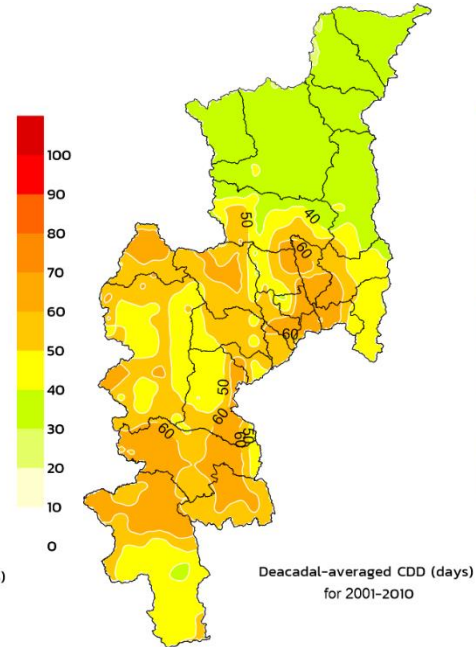
1981-1990



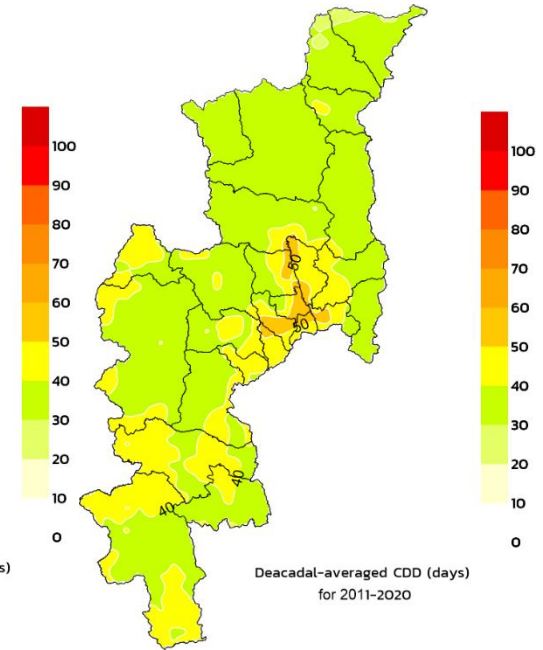
1991-2000



2001-2010



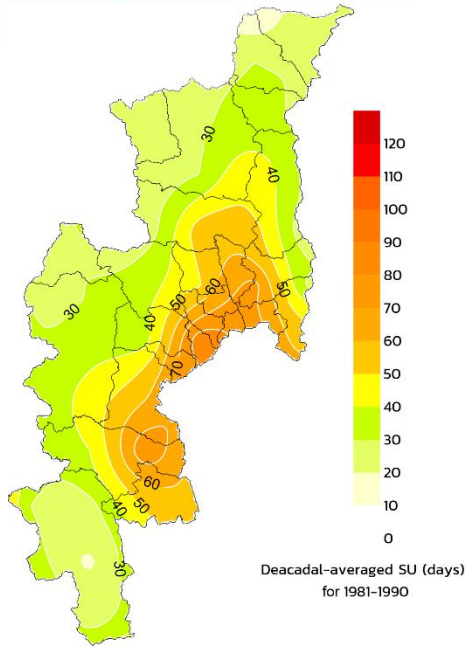
2011-2020



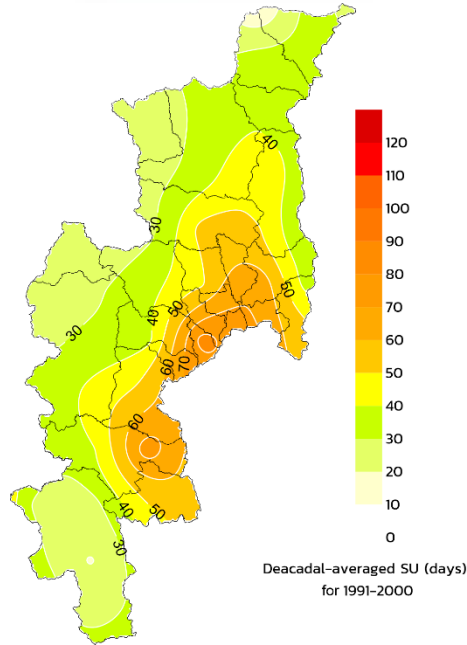
CDD : Consecutive Dry Day, Maximum length of dry spell: maximum number of consecutive days with rainfall < 1 mm

# Decadal Averaged SU(day) – Chaing Mai

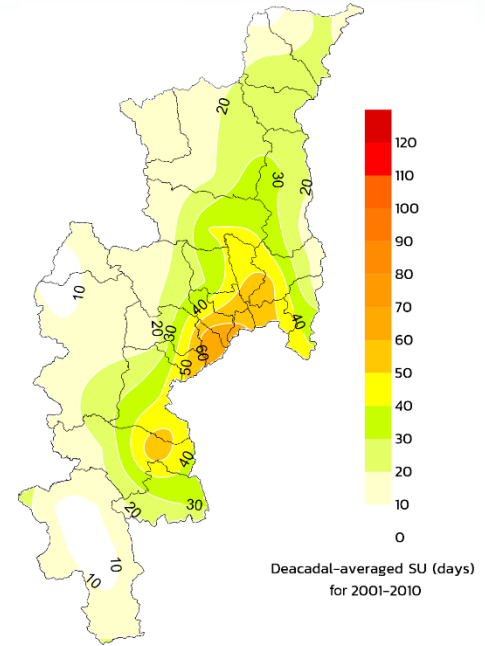
1981-1990



1991-2000



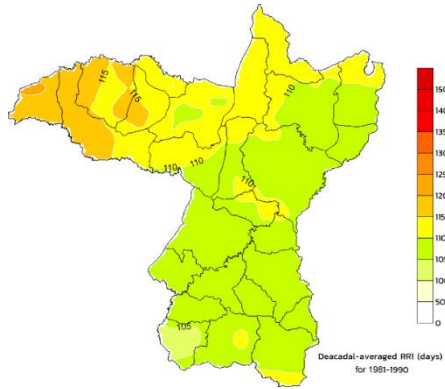
2001-2010



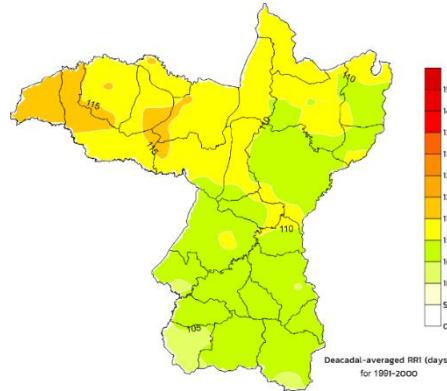
SU : Number of summer days, Annual count of days when TX (daily maximum temperature) > 35°C.

# Decadal Averaged Rx1day – Khon Kaen

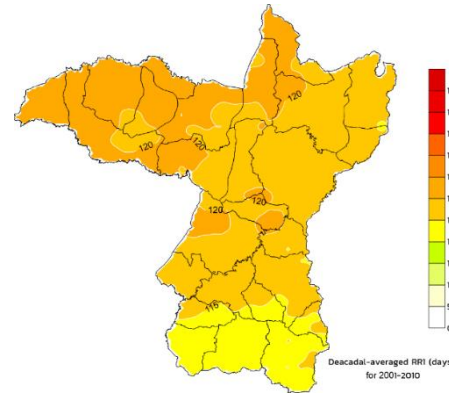
1981-1990



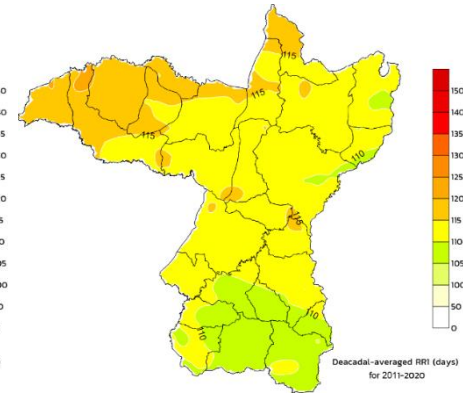
1991-2000



2001-2010



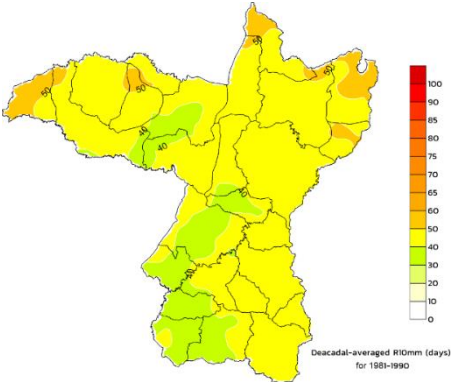
2011-2020



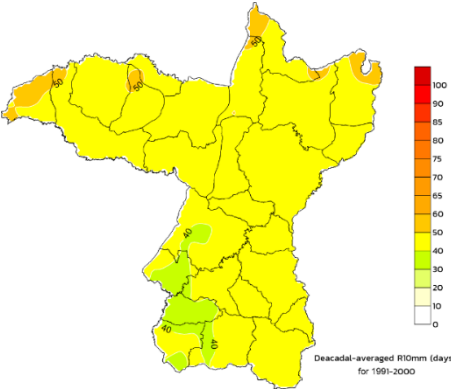
Rx1day : Maximum 1-day precipitation

# Decadal Averaged R10mm – Khon Kaen

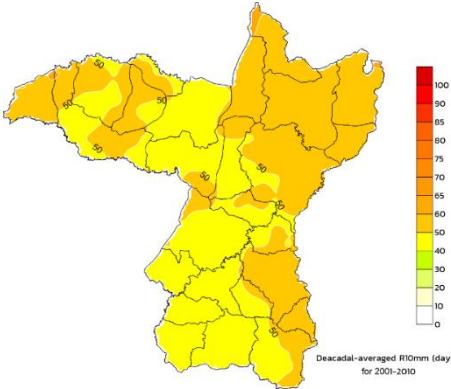
1981-1990



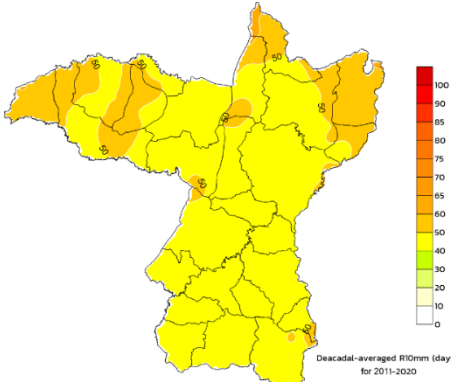
1991-2000



2001-2010



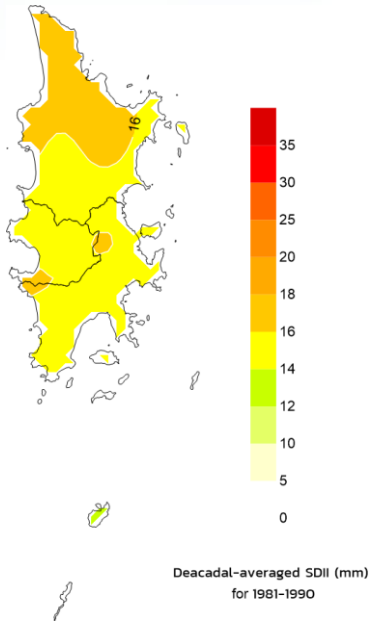
2011-2020



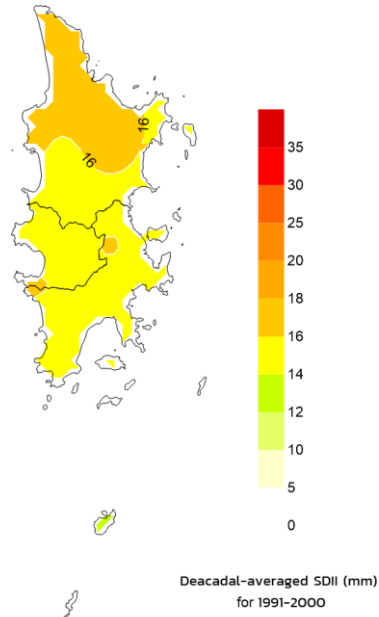
R10mm : Annual count of days when rainfall  $\geq 10$  mm

# Decadal Averaged SDII – Phuket

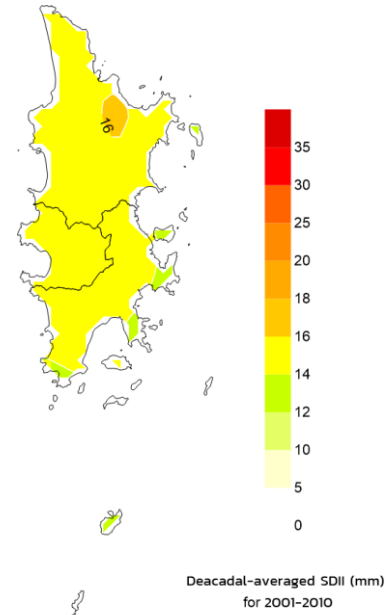
1981-1990



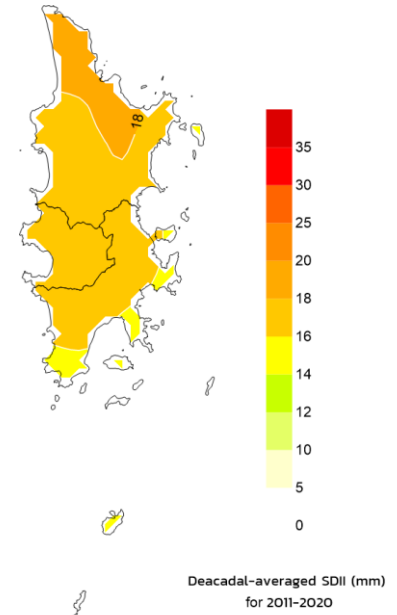
1991-2000



2001-2010



2011-2020

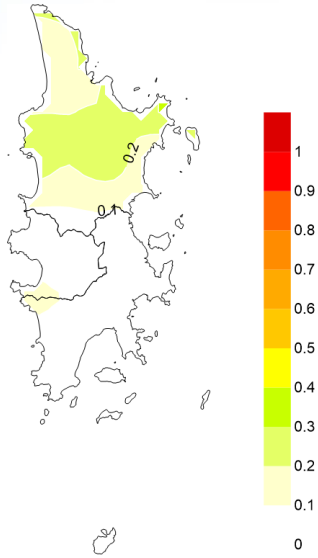


SDII : Daily rainfall intensity, Simple precipitation intensity index



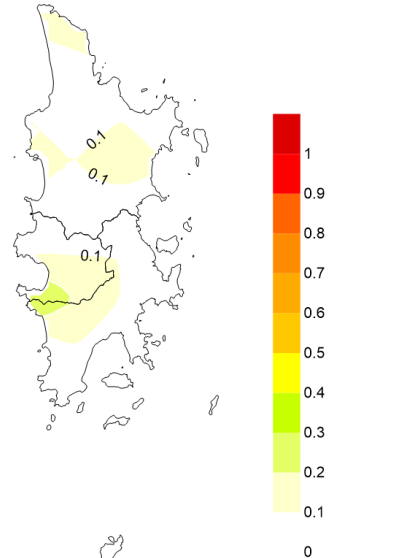
# Decadal Averaged R90mm – Phuket

1981-1990



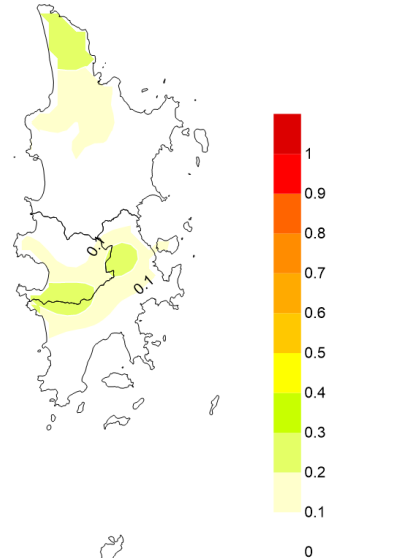
Decadal-averaged RR90 (days)  
for 1981-1990

1991-2000



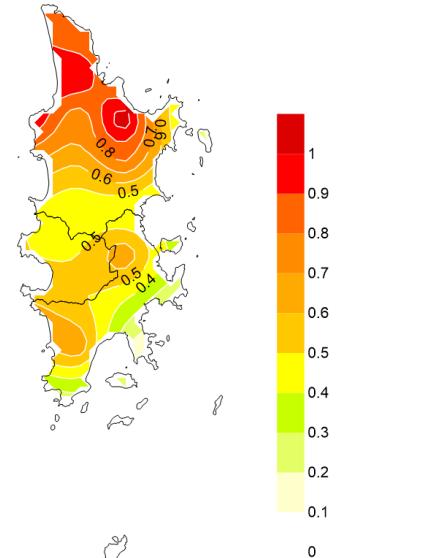
Decadal-averaged RR90 (days)  
for 1991-2000

2001-2010



Decadal-averaged RR90 (days)  
for 2001-2010

2011-2020



Decadal-averaged RR90 (days)  
for 2011-2020

R90mm : Annual count of days when rainfall  $\geq 90$  mm



**Climate  
Assessment &  
Climate Risk**

# Urban Action: Integrated Urban Climatic Maps

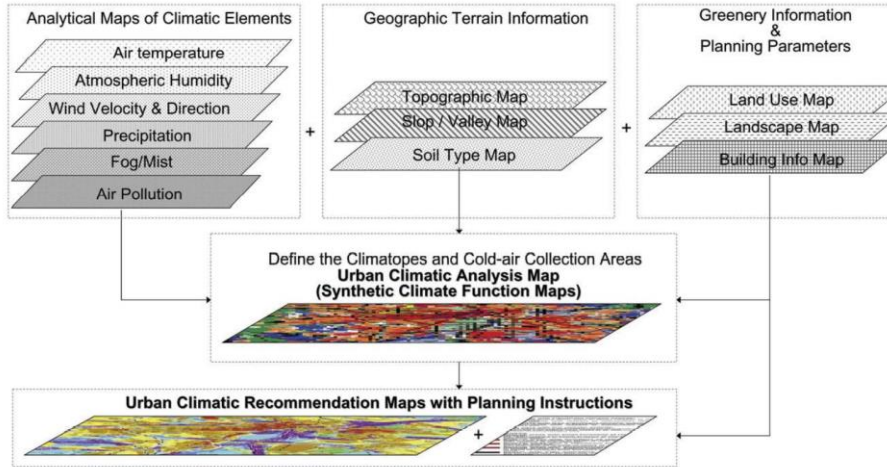


Fig. 2. The structure of UCMAP (Ren et al., 2010).

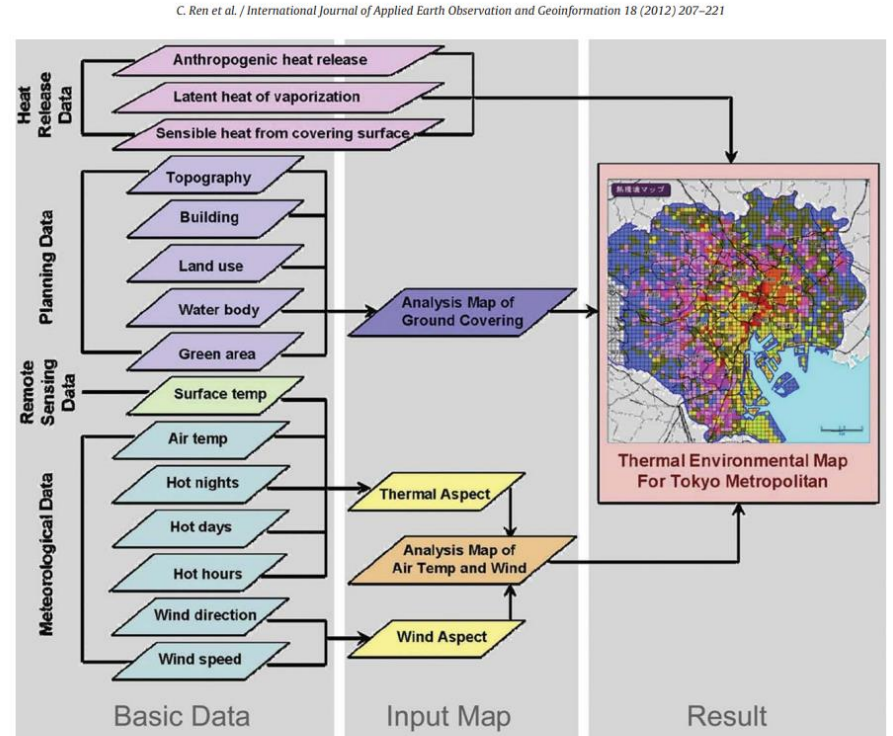


Fig. 6. Work flow of creating Tokyo Thermal Environment Map (after TMG, 2005).

A circular graphic with a gradient from orange at the top to teal at the bottom. The circle is outlined with two thin white lines. Ten short white lines radiate outwards from the circle's perimeter at various angles. The text "Thank you" is centered within the circle in a black, sans-serif font.

Thank you