WEIHENSTEPHAN · TRIESDORF
University of Applied Sciences

UNIVERSITÉ DE GABÈS
University of Gabes جامعة قابس

Climate change and forests – Perspectives from Bavaria and Tunisia

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Workshop on **22 June 2023** in frame of the African-Bavarian Academy on Climate Change Management

Freising, Germany

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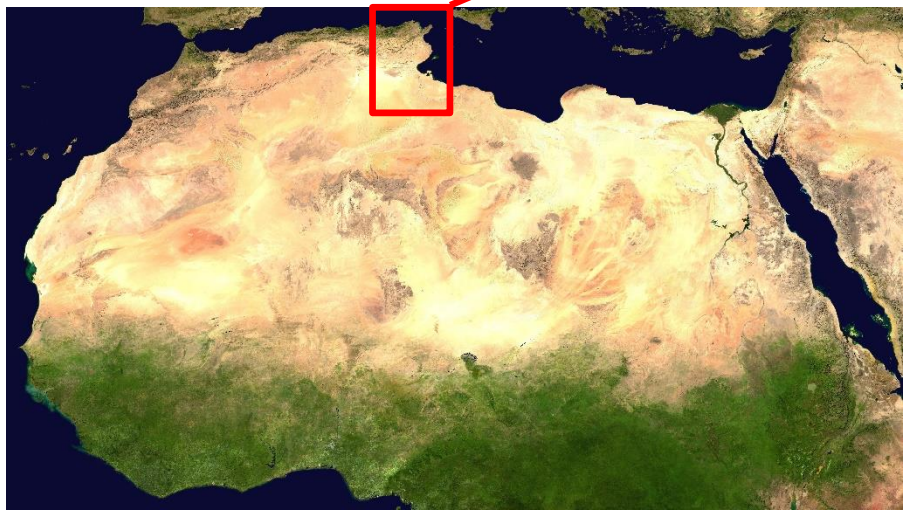
TUNISIA - Médenine

Area: 163,610 km²
Costline: 1,300 km

ZA = 7.5 TN
DZ = 14.5 TN



Sahara desert from space (Wikipedia)

Brief presentation

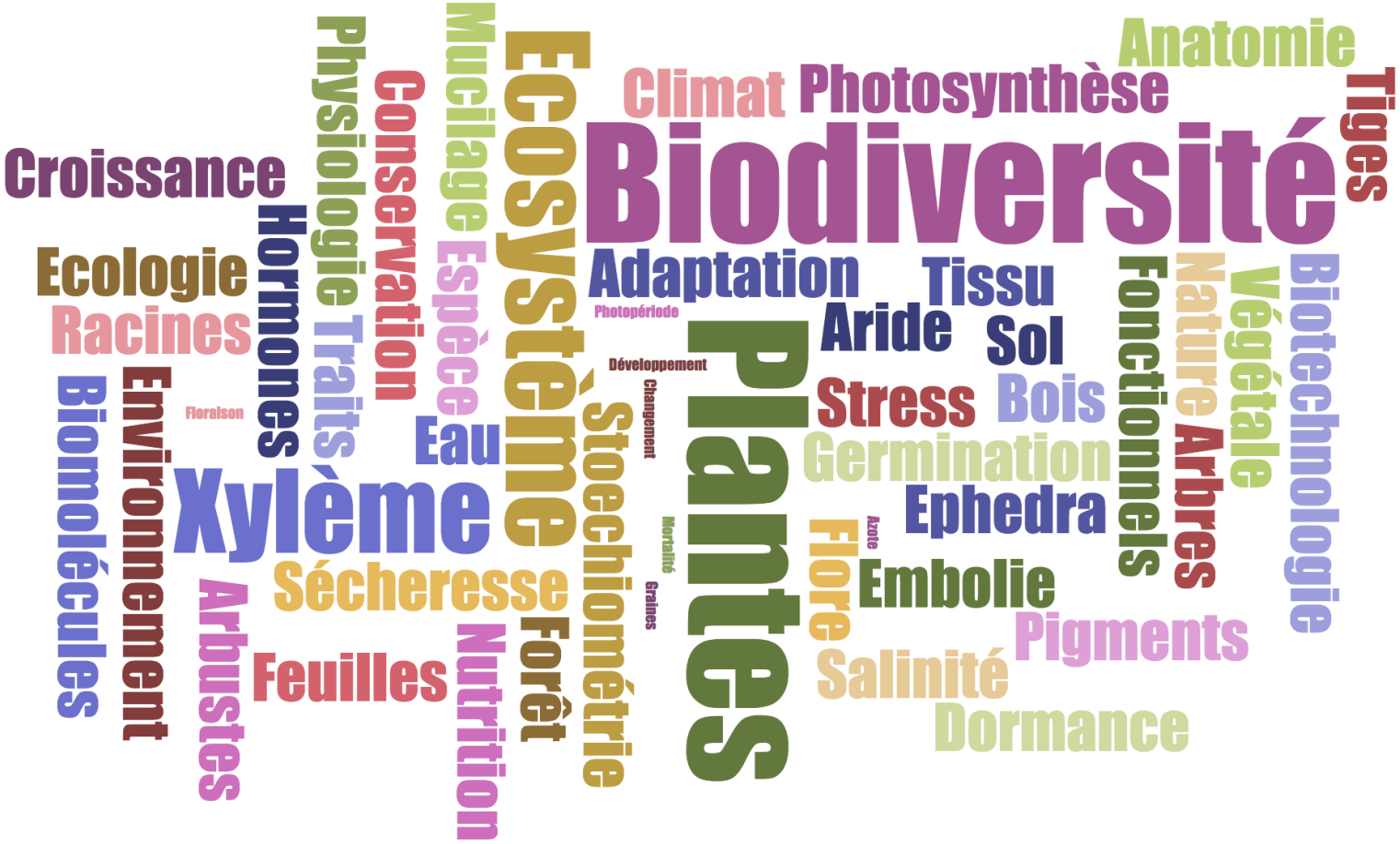
- Plant Ecophysiologist, UG-ISBAM
- Associate Director of Technology Tranfer & Licensing of the UG-TTO
- Coordinator of 02 MPRO: - *Valorisation of Plant Bioresources*
  - *Food Quality & Safety*
- Former Ambassador of the European Climate Pact, European Commission (May 2021-March 2023)

International experience, positions abroad

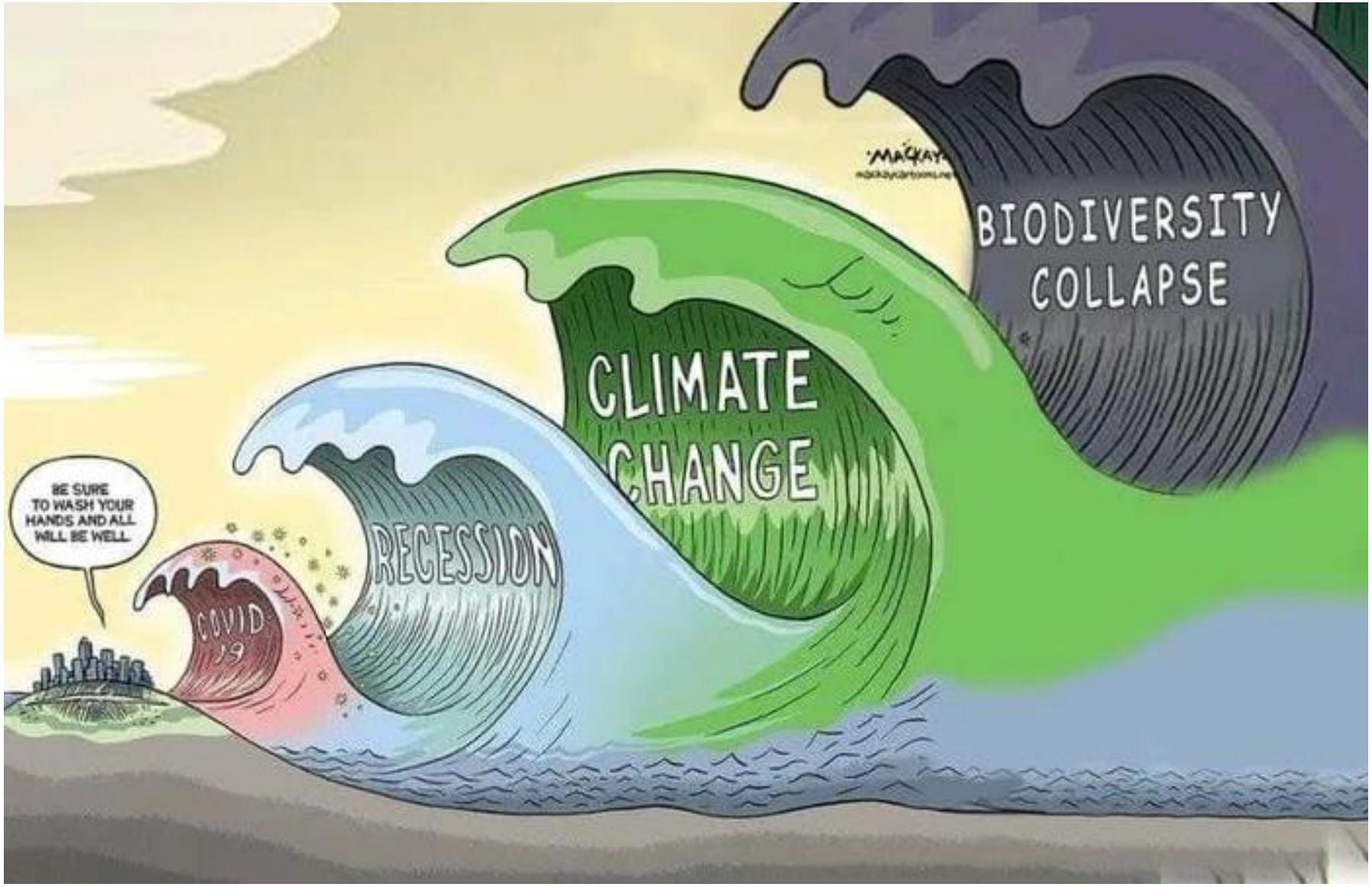
- *DAAD Fellow*, Institute of Systematic Botany and Ecology, University of Ulm, Germany; Sep-Dec, 2015
- *Erasmus Mundus Fellow*, University of the Balearic Islands, Spain; Dec 2014-May 2015
- *Fulbright Research Scholar*, University of California, Riverside, United States; Dec 2013-Sep 2014
- *AUF Fellow*, University of Blaise Pascal, Clermont-Ferrand, France; May 2013

Word cloud

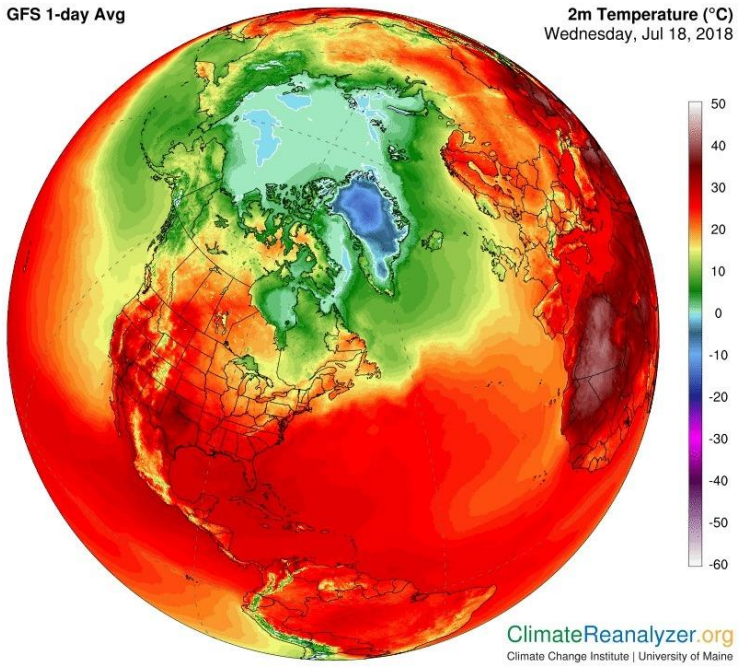
own research activities &
teaching



Are you ready to climate change?



Issues - Supporting data



Climate change, an indisputable reality, widely recognized around the world (IPCC, 2014)

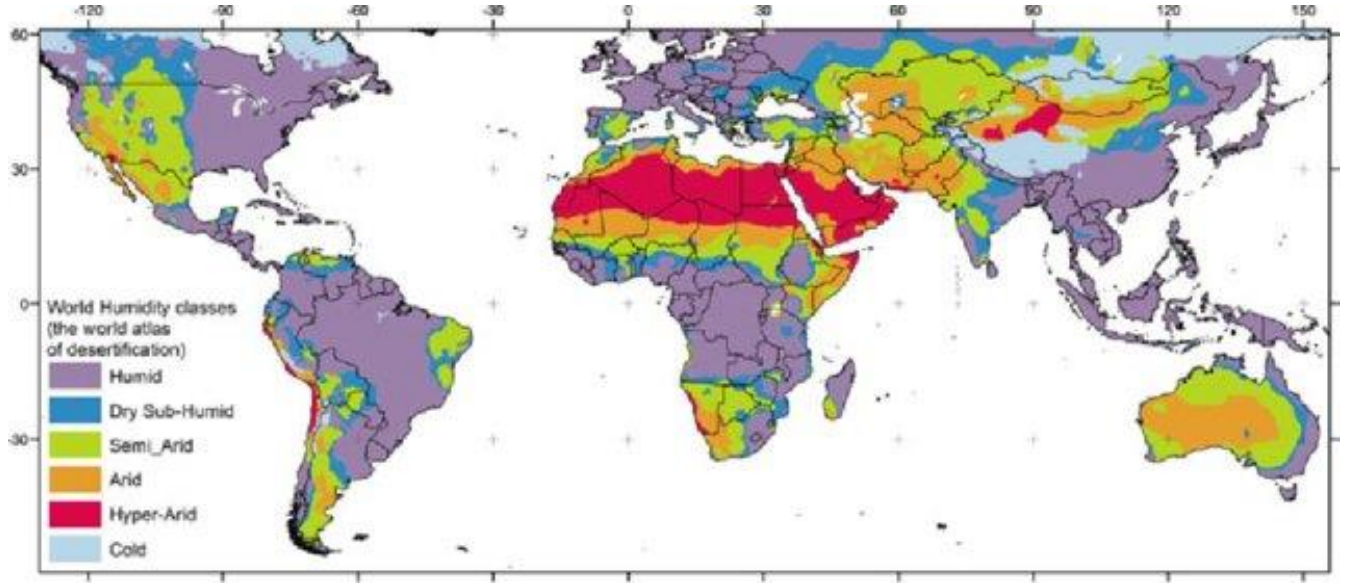
Global warming → **Precipitation decrease** → **Extremes droughts** → **Desertification** → **BIODIVERSITY ?!**

World's bioclimatic aridity zones

based on the P/PET ratio

Bioclimatic Zones	Area ($10^3 km^2$)		%	P/PET ratio
Hyperarid	9781		7·5	< P/PET < 0·05
Arid	15692	1/3	12·1	0·05 < P/PET < 0·20
Semi-arid	23053		17·7	0·20 < P/PET < 0·45
Dry sub-humid	+ 12947	> 47%	9·9	0·45 < P/PET < 0·65
Sub-humid	25843		19·9	0·65 < P/PET < 0·75
Humid and hyper-humid	42811		32·9	0·75 < P/PET

(after UNEP, 1992)



Source: UNEP-WCMC, 2007

Africa's arid lands

Size and distribution ($10^3 km^2$)

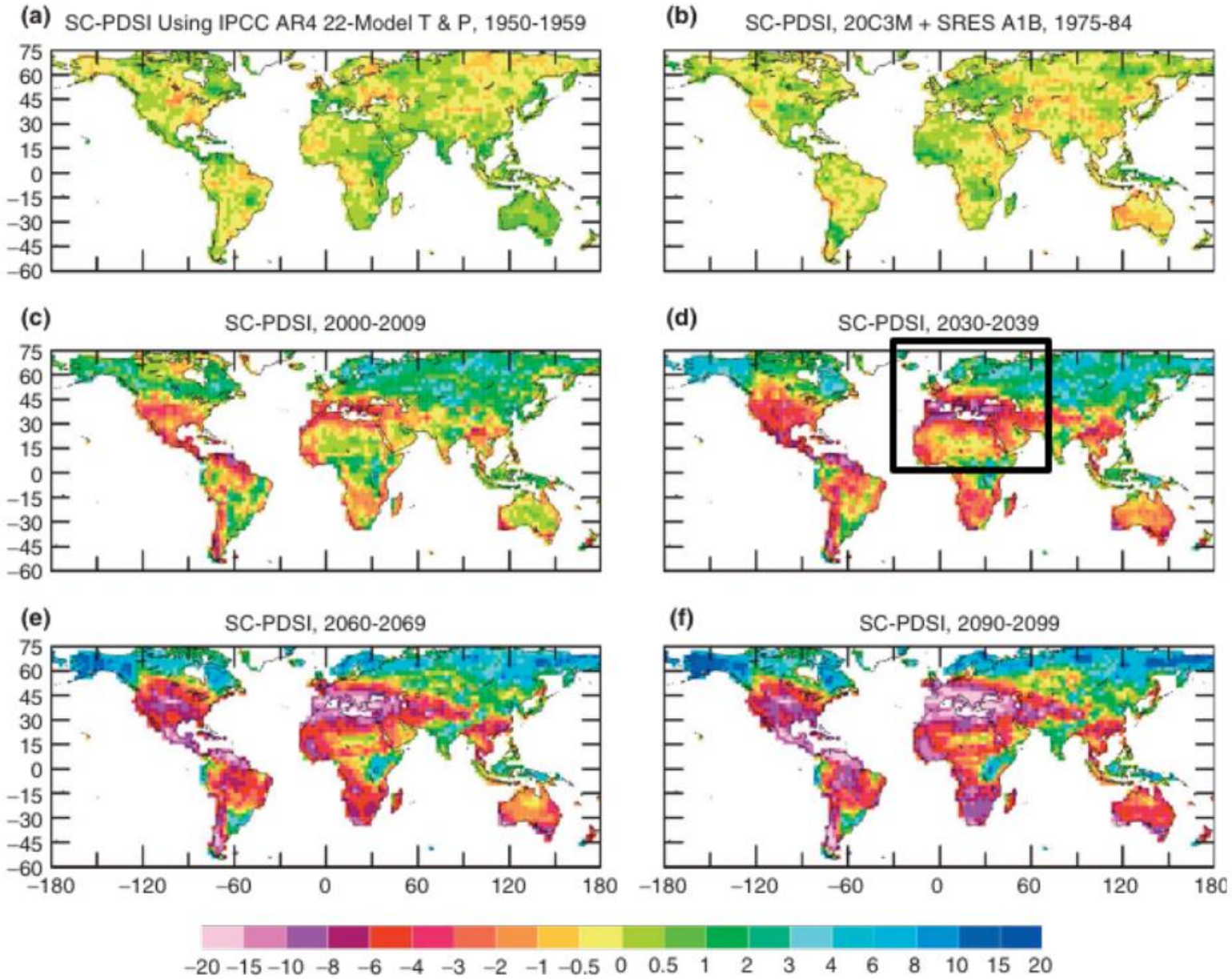
*(after **Le Houérou, 1992**)*

Regions and countries	Geographical surface area	Bioclimatic zone					
		Eremitic	Hyperarid	Arid	Semi-arid	Total	%
Aridity Index (I) (P/PET × 100)		I<3	3<I<6	6<I<30	30<I<50		
P (Approx. mm)		P<50	50–100	100–400	400–600		
Africa	30312	6232	3017	3570	2951	15770	52
North Africa	6019	3952	1137	505	248	5842	97
Algeria	2381	1562	438	210	90	2300	97
Egypt	1001	685	286	30	–	1001	100
Libya	1760	1435	230	90	2	1757	99
Morocco	713	240	150	120	130	640	90
Tunisia	164	30	33	55	26	144	88
World*	130737	7500	7059	14330	12651	41540	32

Forecasts of the evolution of drought in the world, 22 climate models

*The **Mediterranean region** is at risk of increasingly extreme droughts*

Dai (2011)



Red to pink areas are extremely dry (severe drought) conditions while blue colors indicate wet areas relative to the 1950–1979 mean.

The Mediterranean
a climate change hotspot where vulnerabilities are exacerbated

SoED 2020
State of the Environment and Development in the Mediterranean

Already
0.4°C
increase in seawater temperature
(up to +3.5°C by 2100)

+1.54°C
increase in air temperature: above the global average
(projection in 2040: +2.2°C versus +1.5°C global level)

Low-lying coastal cultural heritage sites are threatened by flooding and erosion

A decrease of
-0.1
in the pH of the ocean since the pre-industrial period, and a forecast of -0.4 by 2100

Warming
20%
faster than global average

-30%
of rainfall in spring/summer by 2080 and +10/20% of heavy rainfall events outside of summer

Sea level rise

between 0.43 and 2.5 m by 2100, depending on scenarios and projections. Increased risk for the 20 million people living below 5m of current sea level

Increased fire risk through a longer fire season, increasing heatwaves and drought

Consequences

- ⊕ heat waves
- ⊕ coastal erosion
- ⊕ fires
- ⊕ invasive species
- ⊕ acidification of the sea
- ⊕ floods
- ⊖ modification of migrations and risk of extinction of certain species
- ⊖ quality aquaculture fishing
- ⊖ agriculture production

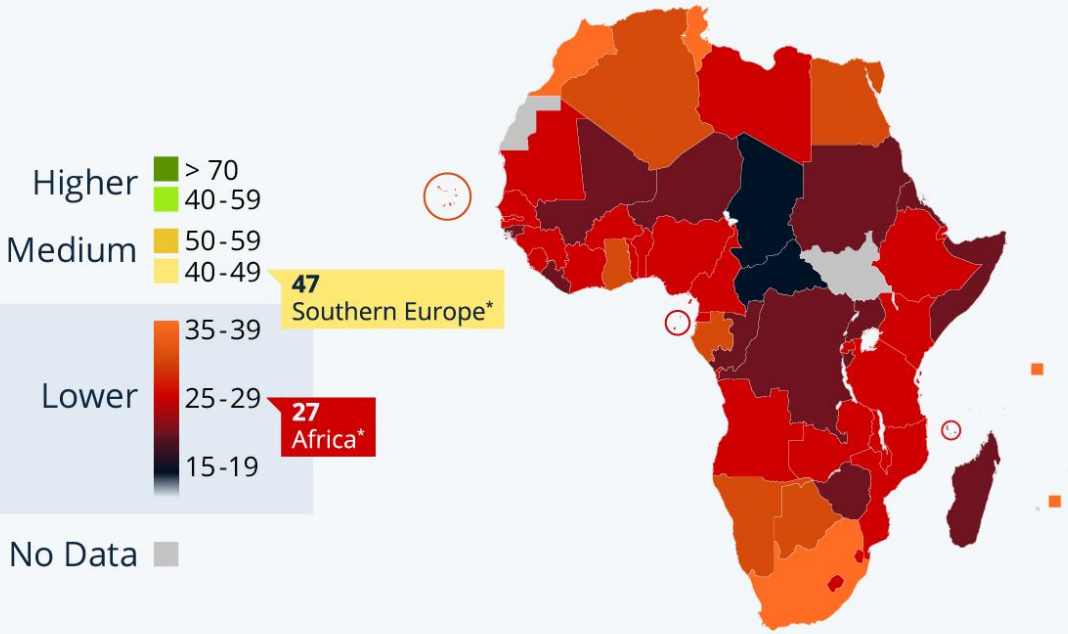
Plan Bleu

#SustainableMED

To consult the full report on the State of the Environment and Development in the Mediterranean and its information sources : www.planbleu.org/soed2020

Africa Is on the Frontline of Climate Change

Index scores for climate resilience of African countries in 2022

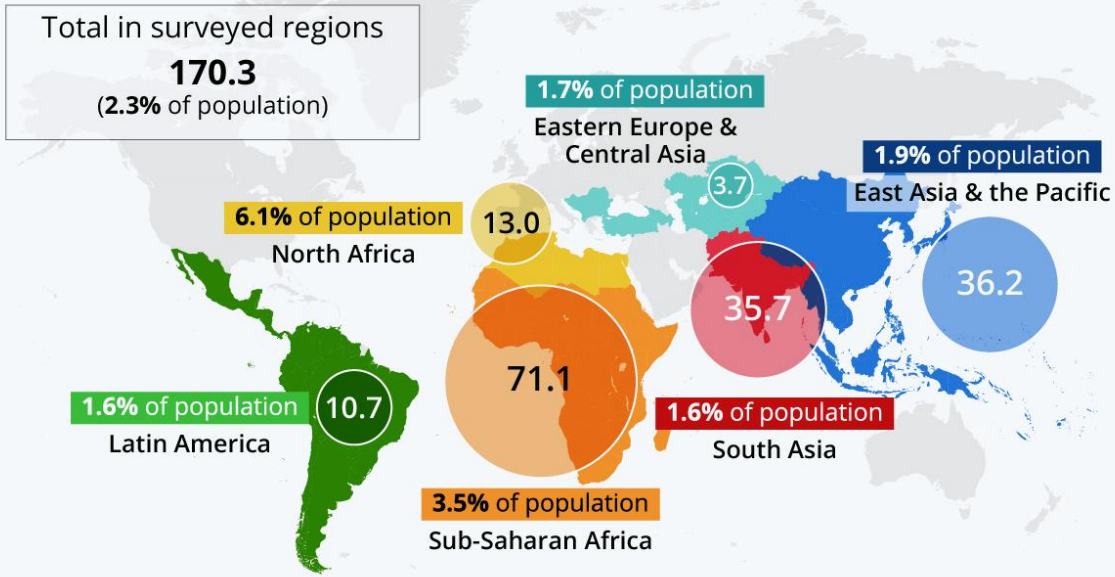


Based on assessment of 180 countries for readiness, vulnerability and GDP.
* Averages based on 10 countries in Southern Europe, 53 in Africa.
Sources: Henley & Partners, Statista calculations

statista

Climate Change, the Great Displacer

Average number of internal climate migrants by 2050 per region (in millions)*



* Modeled on pessimistic reference = High emission & unequal development scenarios concerning water availability, crop productivity and sea-level rise
Source: World Bank

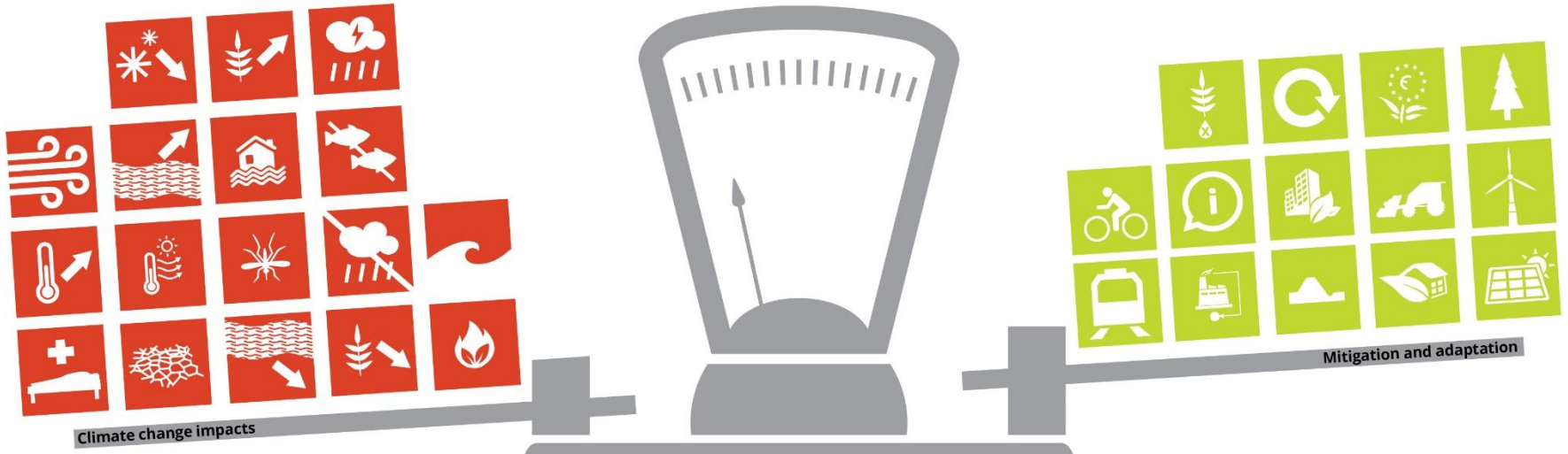
statista

UNDERSTANDING to better ACT

Understanding how **climate risks** interact with **development challenges** is becoming a **top priority** for all countries.

INNOVATE to better ADAPT

To meet these challenges, we must be **INNOVATIVE**, **bold** in order to **adapt our societies** and **TRANSFORM our economies** for a sustainable World

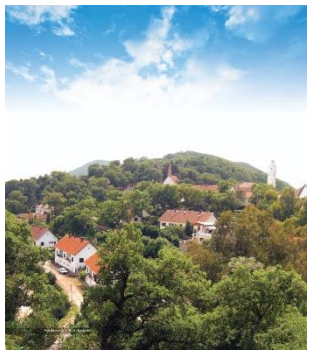


Climate Impacts

Climate Action

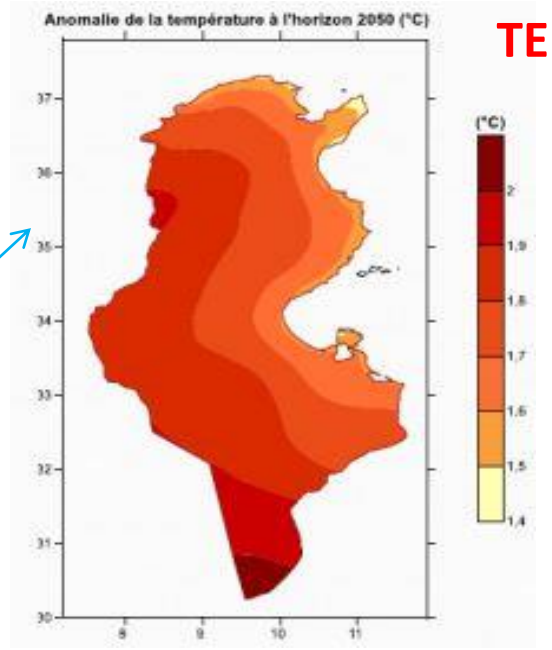
CLIMATE ACTION, an opportunity for boosting development

Tunisia's bioclimatic map

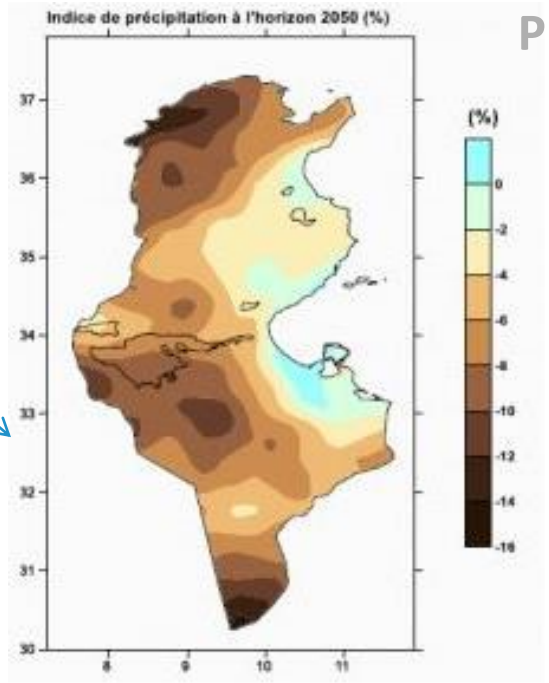


Natural aridity gradient North-South

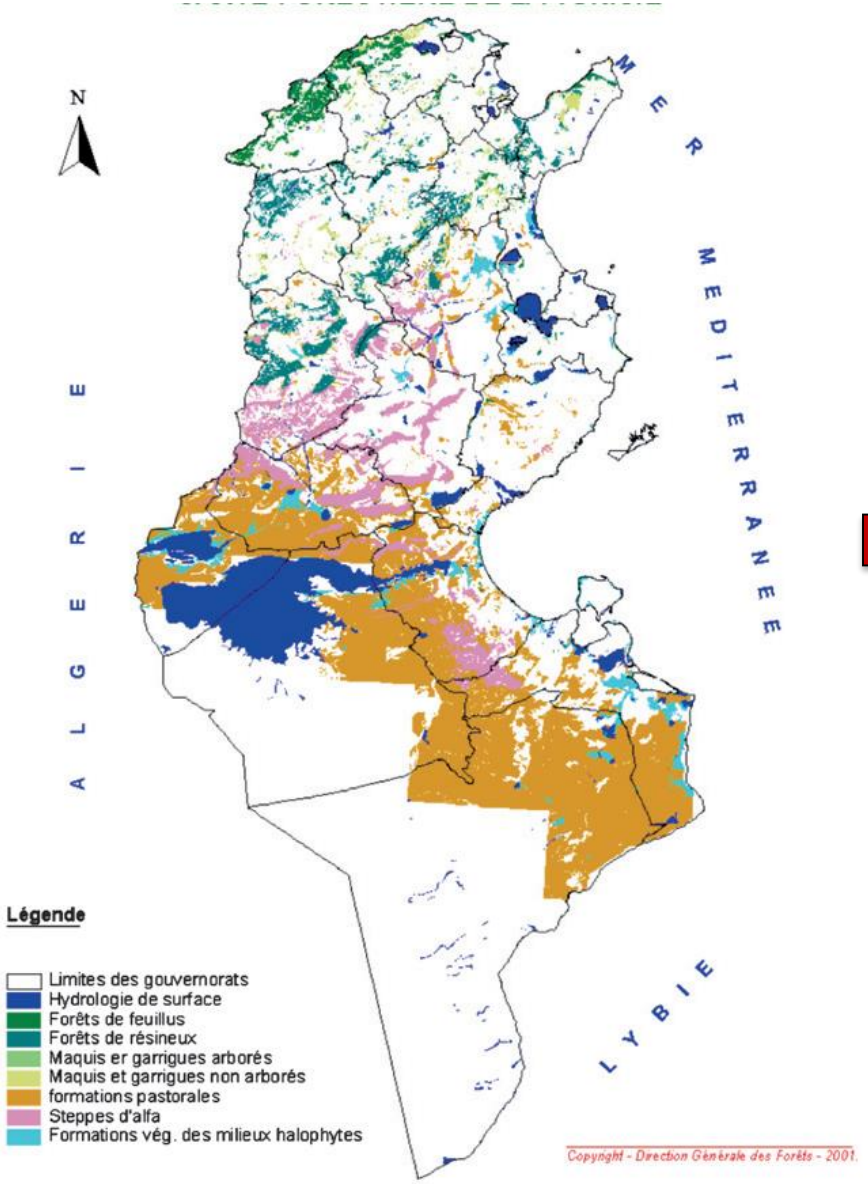
TEMPERATURE



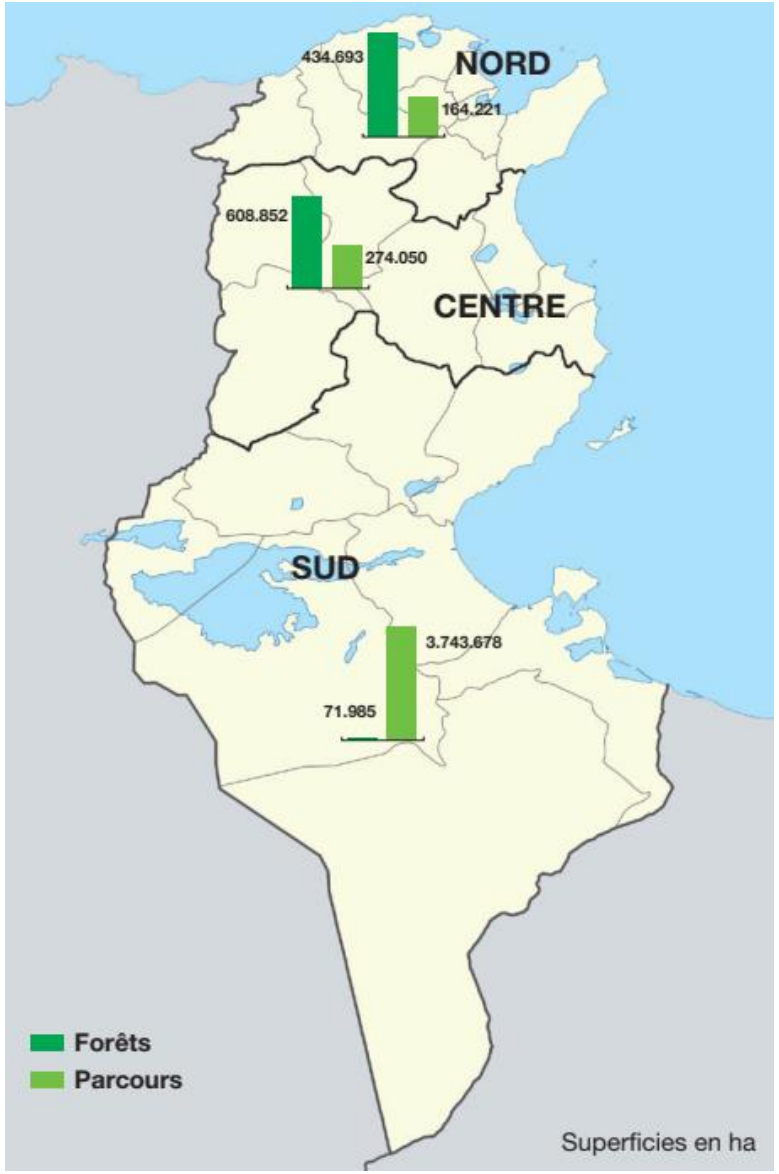
PRECIPITATION



Forests & Rangelands



Representative map of areas (ha) of forests and rangelands in the North, Center and South



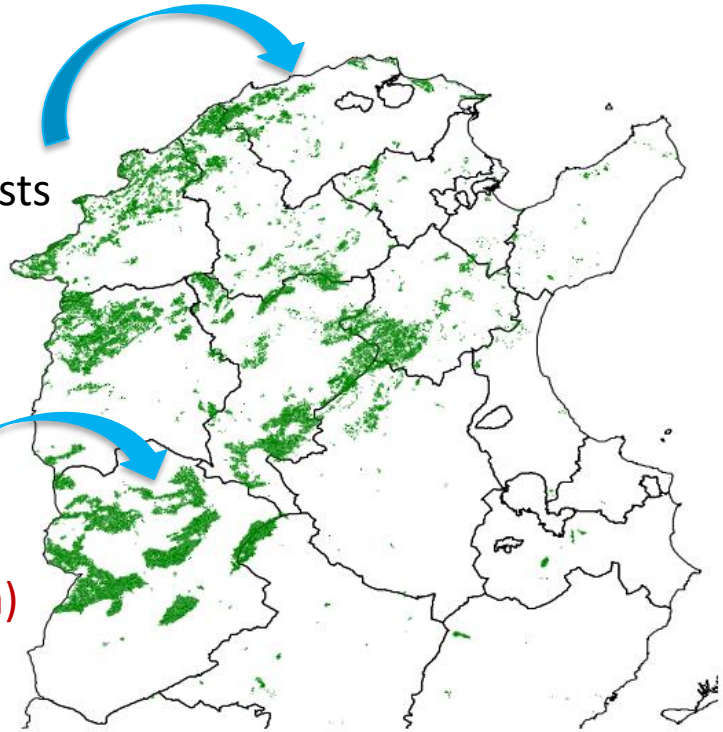
Tunisia's area: **16,361 millions ha**

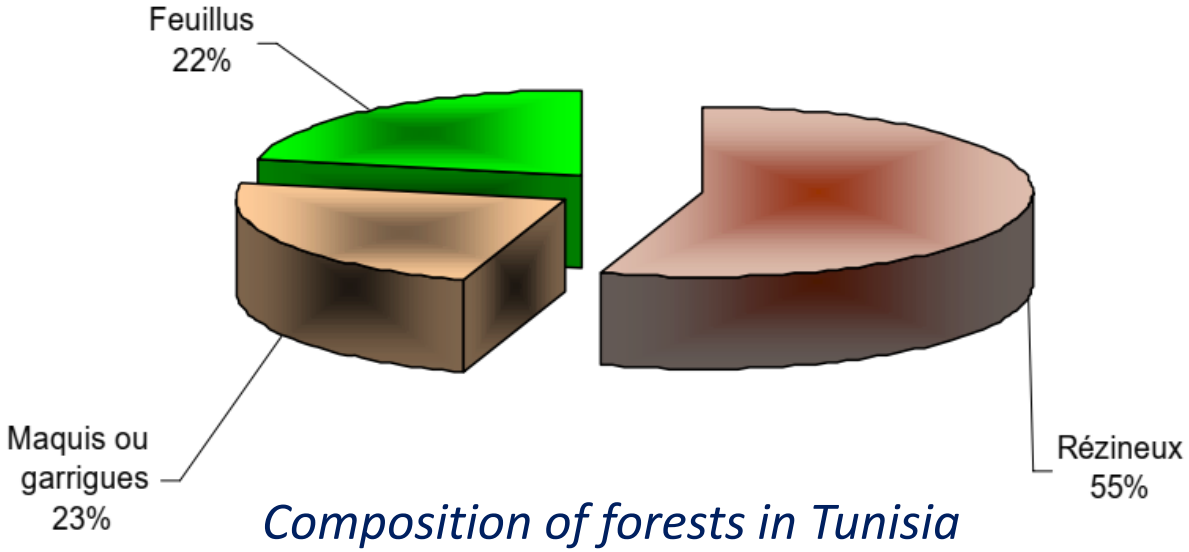
Composition of forests and main regions in Tunisia

Forests of cork oak (*Quercus suber)* in Tunisia. Source: Moez Touihri, 2008

Kroumirie-Mogods
Humid (P>800 mm)
Decidious & Evergreen forests

Dorsal
Semi-arid (400<P<600 mm)
Conifers, mainly *Pinus halepensis*





Composition of forests in Tunisia

Aleppo pine *(Pinus halepensis*). Source : Mohamed Hamdane

Tableau 3

Répartition de la superficie des espèces forestières dominantes

RESINEUX			
Espèce		Ha	%
Pin d'Alep	(= aleppo pine)	361 221	53,19
Thuya		30 438	4,48
Pin pignon	(= pine nuts)	20 922	3,08
Genévriers	(= junipers)	8 677	1,28
Pin maritime	(= maritime pine)	5 153	0,76
Cyprès	(= cypress)	4 010	0,59
Sous total		**430 421**	**63,38**
FEUILLUS			
Espèce		Ha	%
Chêne liège	(= cork oak)	70 113	10,32
Eucalyptus		41 397	6,1
Acacias		37 963	5,59
Oléastre		8 413	1,24
Chêne zeen	(= zeen oak)	8 33	1,23
Acacia tortillis		7 574	1,12
Sous total		**173 792**	**25,59**

National Forest Program (NFP)

2004: Public debate on the NFP which identified 4 challenges and 7 objectives:

1. Protection and conservation challenges

- Preservation of forest resources
- Conservation of biodiversity

2. Economic challenges

- Improved forest sector development
- Development of forest resources

3. Social challenges

- Accomplishment of the socio-economic progress of the populations forestry and pastoral

4. Institutional challenges

- Adaptation of the DGF to the requirements of the new forest policy
- Reinforcement of means

Forest Strategy

1990: Establishment of a first forestry strategy (duration 10 years)

2002 - 2011: Establishment of a 2nd strategy with 7 objectives:

1- Multiplication of actions aimed at increasing forest cover

2- Sustainable management of natural, forest and pastoral resources

3- Strengthening the participatory approach

4- Involvement of the private sector in the management of forest resources

5- Take into account the concerns of desertification, biodiversity and climate change

6- Decentralization of forestry activities

7- Search for alternatives for the financing of the sector

Forest Genetic Resources (FGR)

2010: Establishment of the 1st National Report on Forest Genetic Resources (FGR) which encompasses **9 aspects**:

1- the current state of FGR

2- their conservation *in-situ* and *ex-situ*

3- the level of their use

4- their management

5- the national programs that concern them

6- cooperation in this area

7- access to and sharing of benefits arising from their use

8- the fight against poverty

9- sustainable development

Benefits resulting from the use of FGRs

4 main advantages:

- Protection of agricultural land and water infrastructure
- Food production and security of the forest population
- Enrichment of plant material from recreational forests
- Diversification of ornamental species and urban green spaces

Beneficiaries of the benefits resulting from the use of FGR

6 main beneficiaries of FGR:

1. The forest population (10% of the Tunisian population, i.e. 1 million of people).
2. Potential consumers (medicinal and cosmetic uses, recreation, hunting, …)
3. The private sector (particularly loggers)
4. Forest researchers
5. Universities and their research laboratories.
6. Foreign applicants who are researchers and visitors.

Pressure, threats and conservation challenges

THREATS

Espèce	Déboisement	Changement d'utilisation des terres	Surexploitation
Quercus suber	*		*
Chêne afarès			*
Pinus halepensis	*		*
Tetraclinis articulata	*		*
Juniperus phoenicea			*
Juniperus oxycedrus	*	*	*
Myrtus communis	*		*
Thymus capitatus			*
Thymus algeriensis			*
Origanum glandulosum			*
Pistacia atlantica			*
Pistacia terebinthus			*
Pistacia lentiscus	*		*
Mentha pulegium	*		*
Magydaris pastinacea			*

25

Increase of social pressure

Increasingly visible dieback of cork oak stands

Conservation efforts: protected areas, a sufficient tool ?

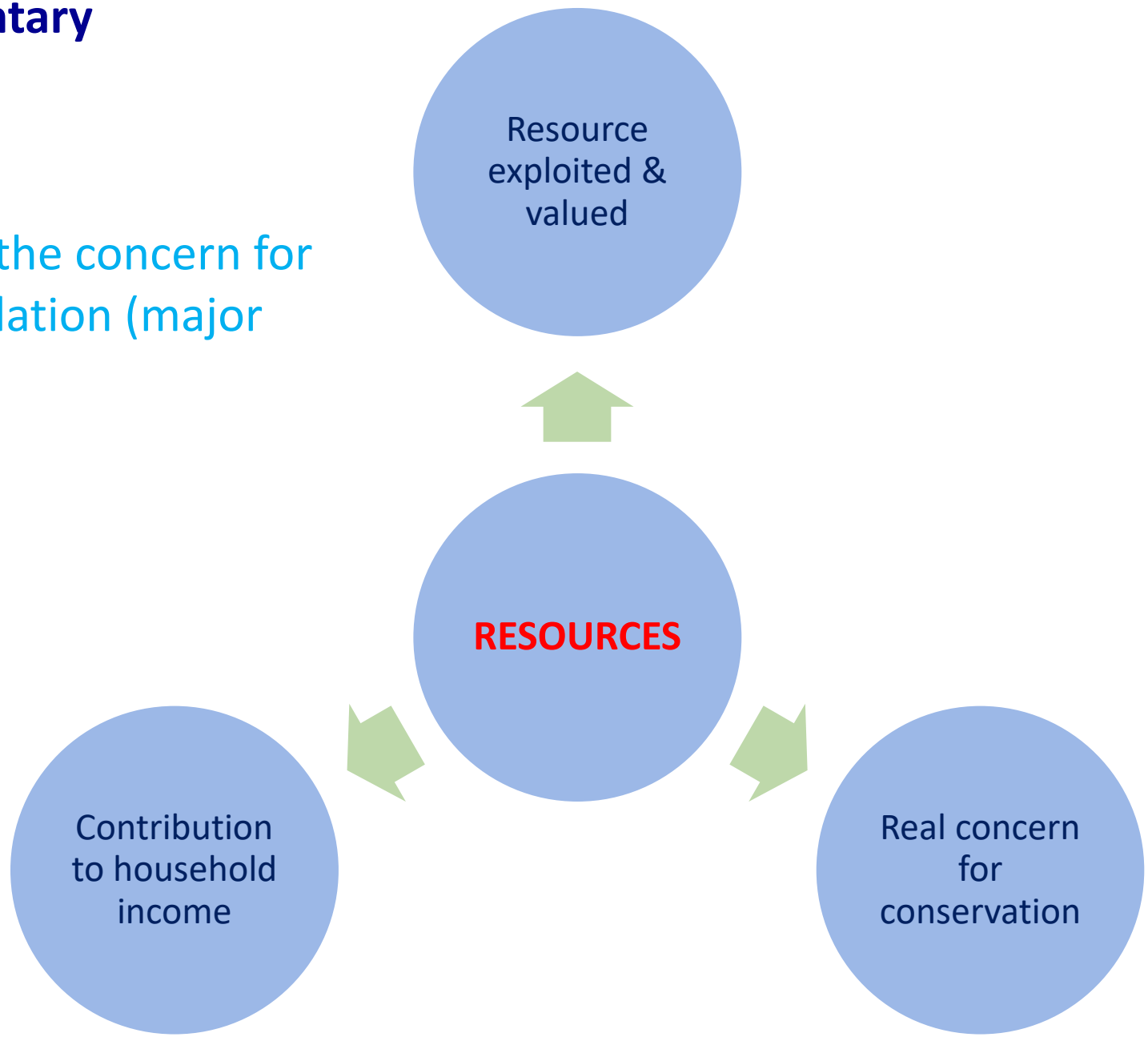
- **Protected areas** cover all forest, steppe and Saharan ecosystems,
- extend over approximately **582,900 hectares**,
- **17 National Parks** and **27 Nature Reserves**.

35 wetlands of international importance appearing on the RAMSAR list.

Protected areas in Tunisia

Finding alternative and/or complementary solutions

- Valuing to better preserve
- The development of FGR increases the concern for conservation among the local population (major player)



EXAMPLES OF USING INDIGENOUS SPECIES FOR REHABILITATION

Cork oak

SEEDS – *Quercus suber*

Experimental plantation in the forest of Jouza – Amdoun (Photo Khaldi 2005)

Jebel Dinar: an example of successful reforestation with cork oak (Photo Khaldi 2012)

Development of caper cultivation

Carob tree

Valorization of carob seeds: **GUM**

- Manufacturing technology
- Characterization
- Uses (pod meal and gum)

Mainly medicinal and food use (thickening additive)

Carob tree

Experimental carob plantations

Grafting and selection

Thank you

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