DROUGHT SITUATION AND MANAGEMENT STRATEGIES IN MOROCCO

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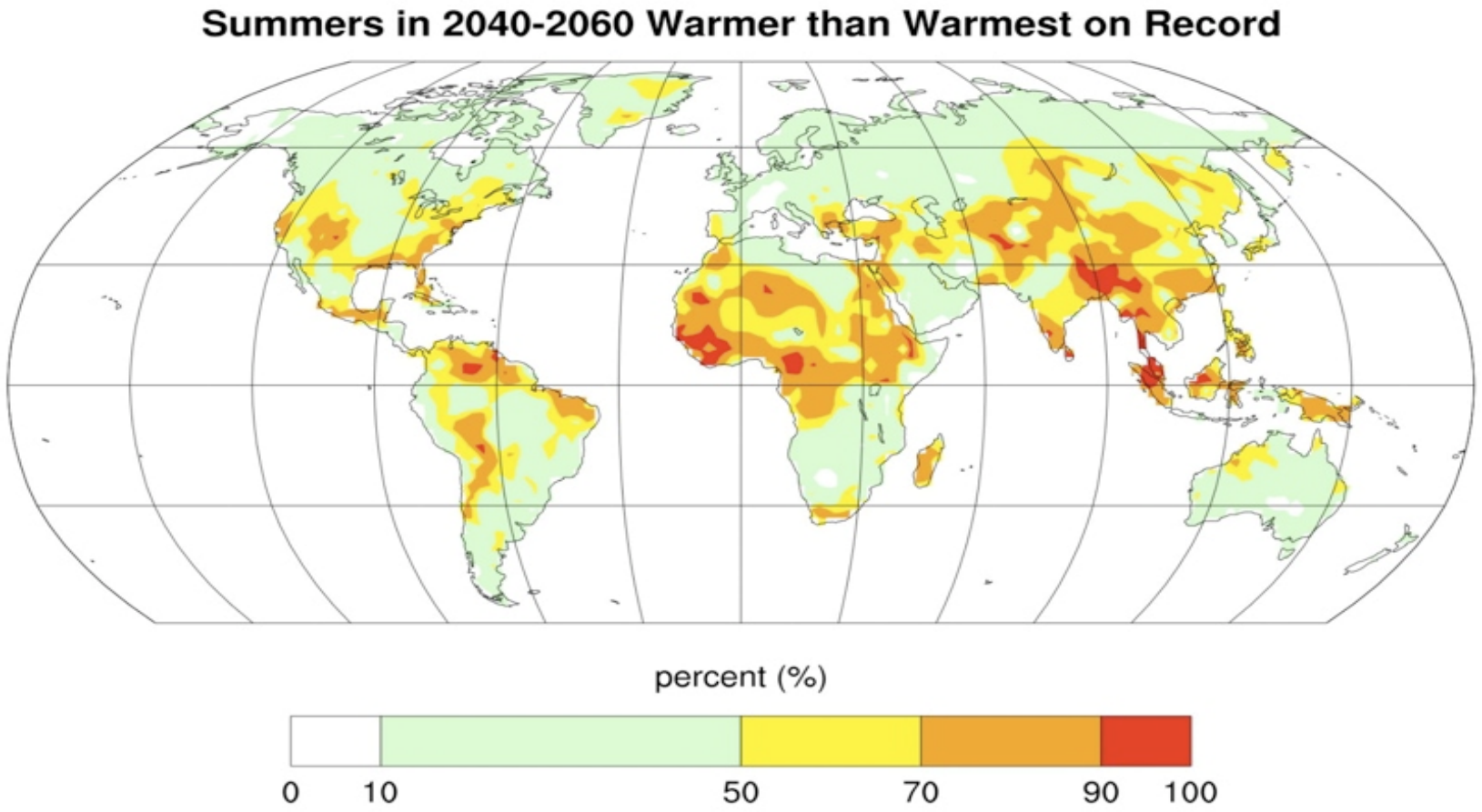
Change in Temperature

Likelihood (in percent) that the summer average temperature in 2050 will exceed the highest summer temperature ever observed (1900-2006).

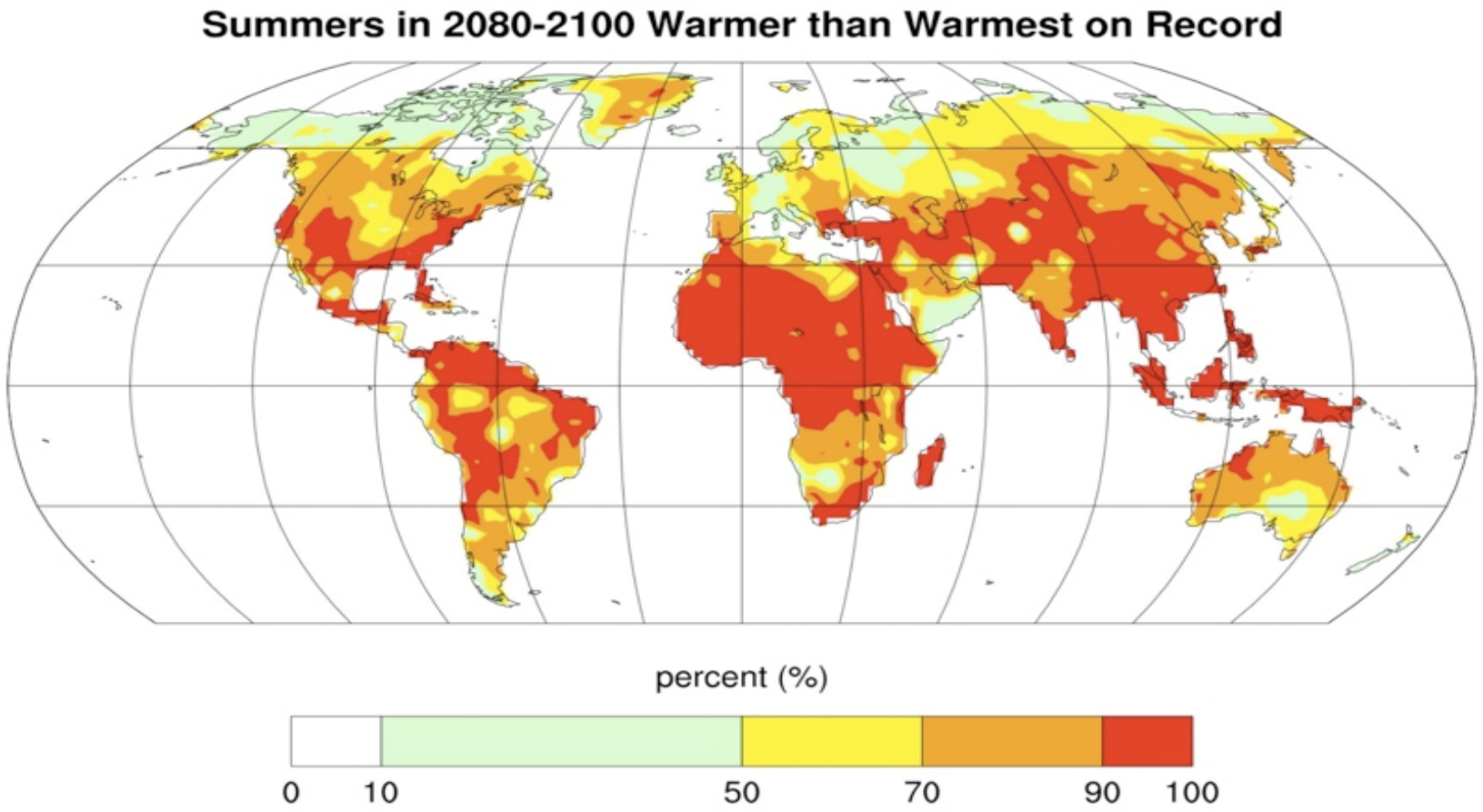


Source: Battisti and Naylor, 2009. *Science*: 323, 240-244.

Change in Temperature

Likelihood (in percent) that the summer average temperature in 2090 will exceed the highest summer temperature ever observed (1900-2006).

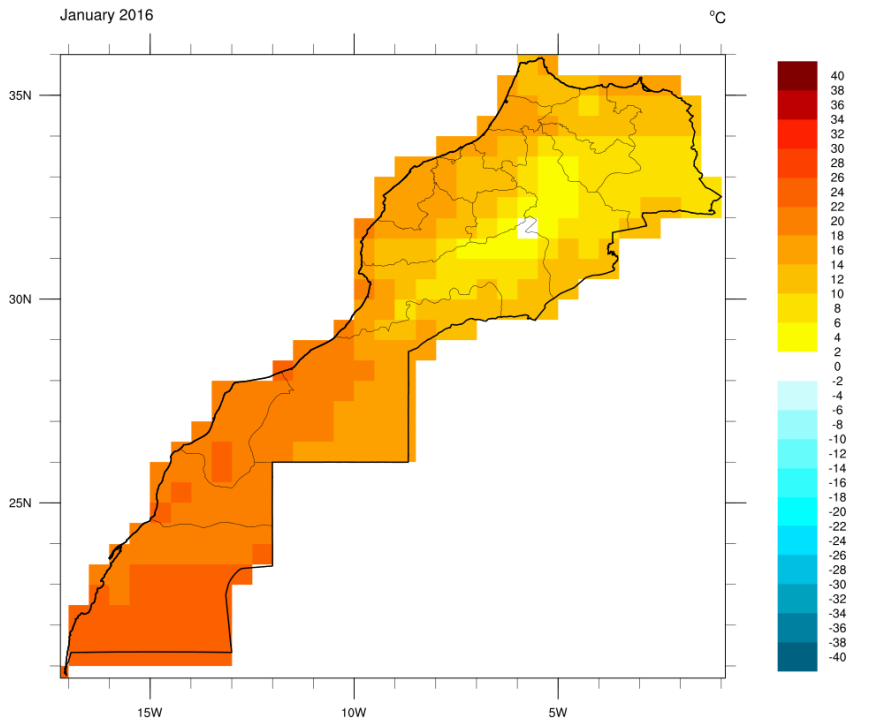
- **Heat**
- **Drought**
- **Salinity**

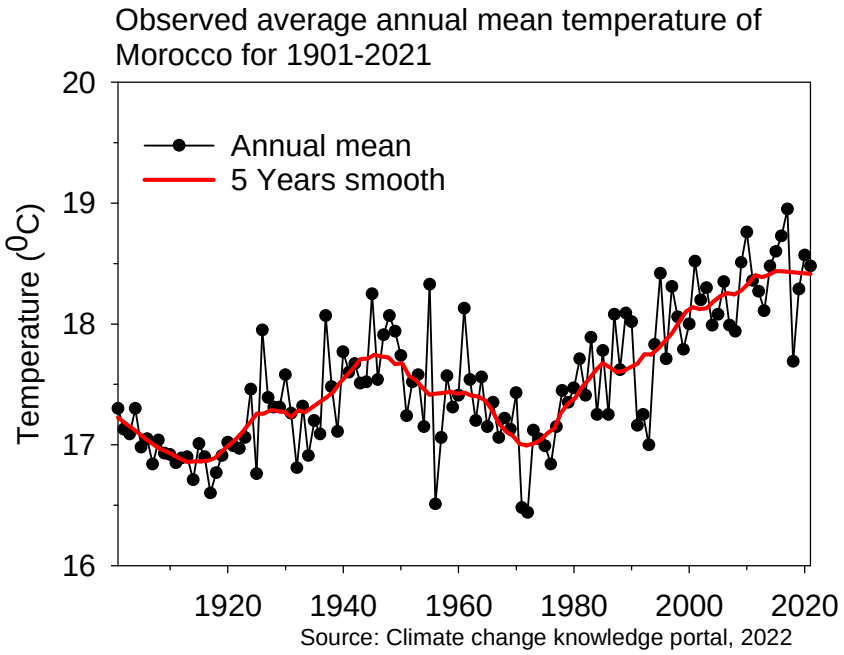


Source: Battisti and Naylor, 2009. *Science*: 323, 240-244.

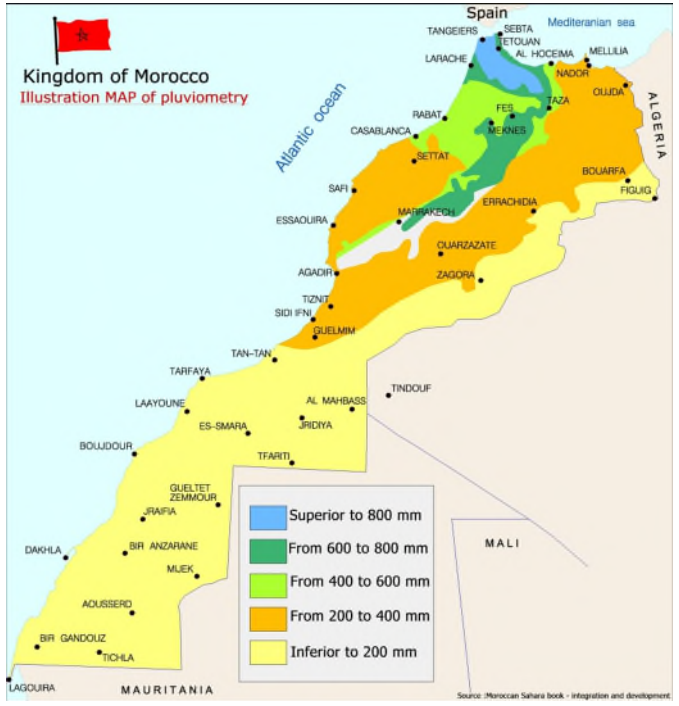
Drought in Morocco

- Temperature increase from 2 to 4 °C.
- Decrease in rainfall: between 5% and 20%.
- Increasing frequency of extreme weather events such as long and frequent periods of drought, sudden and violent floods.





http://www.marocmeteo.ma/

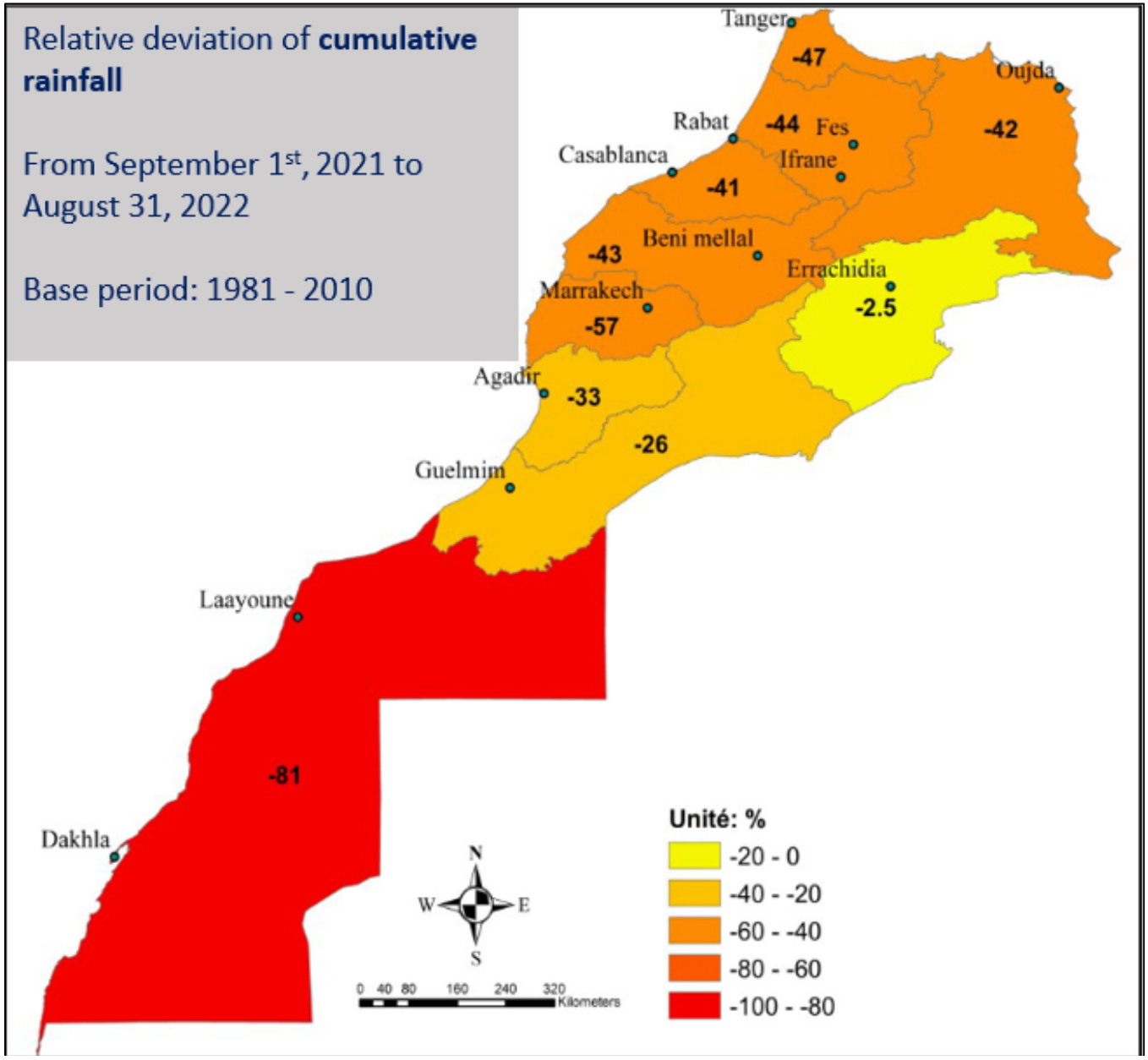


Drought in Morocco

The frequency analysis of drought episodes reveals that drought tends to become chronic in Morocco ant that its frequency, severity and duration increase:

- **1940-1979: 5 dry years over 40 years (1/10)**
- **1980-1995: 6 dry years over 16 years (3/10)**
- **1996-2006: 4 dry years over 10 years (4/10)**

ICARDA, 2021



Socio-economic impacts

Drought monitoring and early warning systems

The seasonal forecasting system of DMN (Direction de la Météorologie Nationale) :

- Operational since 1994
- Exploring both statistical and dynamical approaches to providing seasonal predictions of precipitation in Morocco (**October-November-December** to make prediction of precipitations for **February-March-April** over Morocco).
- The products are disseminated to many users especially high authorities, agricultural and hydrological services.

Water law:

- Established in 1995
- **Integrated water resources management** through better water use efficiency, resource allocation practices, and protection of water quality

Management Strategies of Drought in Morocco

National Drought Observatory (NDO):

- Established in **2001**
- Development of an early warning system to trigger an emergency program to mitigate the effects of drought in the short term
- Providing decision support tools through the integration of drought risks in economic planning.

Drought early warning systems (SMAS; Système Maghrébin d'Alerte Précoce à la Sécheresse):

- Established **in 2006** between Morocco, Algeria and Tunisia and it is coordinated by the OSS (Observatory of Sahara and Sahel)
- Establishing a Maghreb-wide system for early warning to drought.

The Moroccan National System for crop monitoring and cereal yield prediction (CGMS-MAROC):

- Initiated by the National Institute of Agronomic Research (INRA) **in 2011**
- Instantly predicting grain yields two to three months before harvest
- Allowing decision makers to be prepared in advance for eventual consequences of abnormal deviations of the climate.

Emergency relief programs:

These programs are based on interventions aimed at:

- **Securing safe drinking water** for rural populations in particular
- Reserving **livestock** through feed distribution
- Implementing **income and job-creating activities** (maintenance of rural roads and **irrigation infrastructures**)
- Conserving **forests** and natural **resources**.

Programmes and policies to mitigate drought:

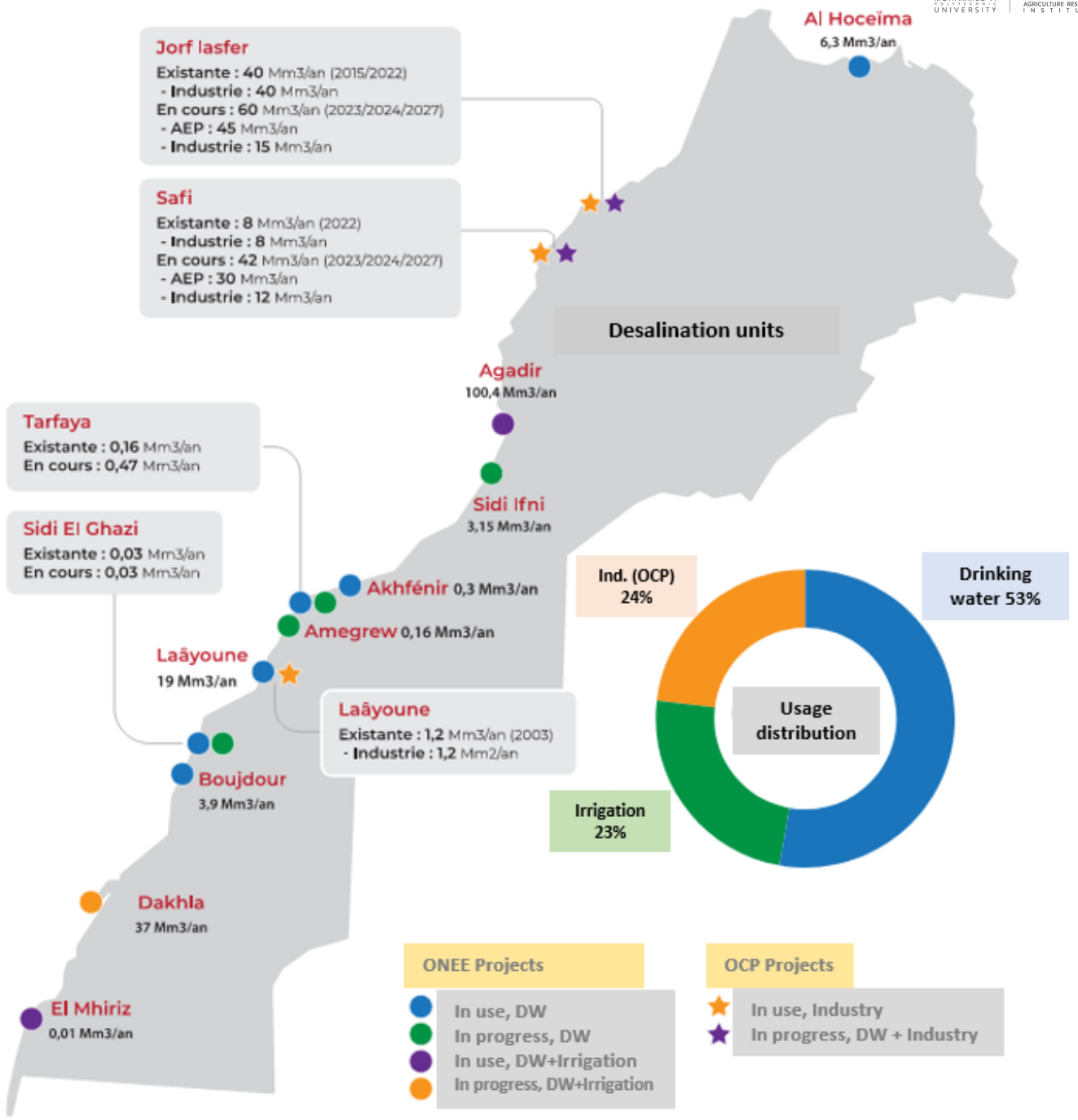
Four main programmes implemented:

- **Morocco Green Plan** (2008 to 2020): Improving crop production and water productivity, etc.
- **Green Generation** (2020-2030) – sustainable management, preservation of agricultural water, etc.
- **Increase of drip irrigation technique** – from the current 37% to 70% of agricultural land.
- Introduce a new model of public-private partnership (PPP) to boost investment in order to improve **water efficiency** for resilience and sustainability to droughts: Implementing policies relating to developing **effective water supply systems** and **improving governance of water usage**.

Management measures to mitigate agricultural drought:

- Construct **new dams** in North Morocco to have more storage and discharge capacity;
- Implementing **deficit irrigation** technique, **nano irrigation** systems, and **waste water reuse**;
- **Incentives**: 80% to 100% subsidy for farmers who use drip irrigation technique;
- Adopting **precision agriculture techniques**, using digital tools for climate smart agriculture;
- **Breeding Programme**: improving productivity and resilience to drought;
- **Water saving** and **awareness campaigns** to minimize drought impacts;
- **Capacity building** programmes to increase capability of the community to use and conserve the available resources;
- **Allocating financial resources** and increasing the budget for research and extension programs;
- Setup of **desalination units**.

18 Desalination stations in total



Source: Ministry of Equipment & Water, Morocco

Take-home messages:

- Droughts compounded by climate change, are likely to be **more frequent** in the future impacting agriculture & agrobiodiversity;
- A wide range of mitigation and adaptation options exist including **water desalination**, better management of land and **water resources**, development and promotion of new **crop varieties**, etc;
- Importance of **coordination** between various ministries and organizations for efficient **water management** and adequate **sharing of drought information**;
- Need for **comprehensive early warning system** and regular update of **mitigation plans**.

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Thank you !

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