Geospatial Big Data Challenges to Achieve the UN Sustainable Development Goals (SDGs): The Southern Tunisia Context

Bouajila Essifi
Institut des Regions Arides (IRA), TUNISIA

CONTENT

- Southern Tunisia Context
- Sustainable development and the UN SDGs
- Data Application Ecosystems
- Challenges and Recommendations

TUNISIA

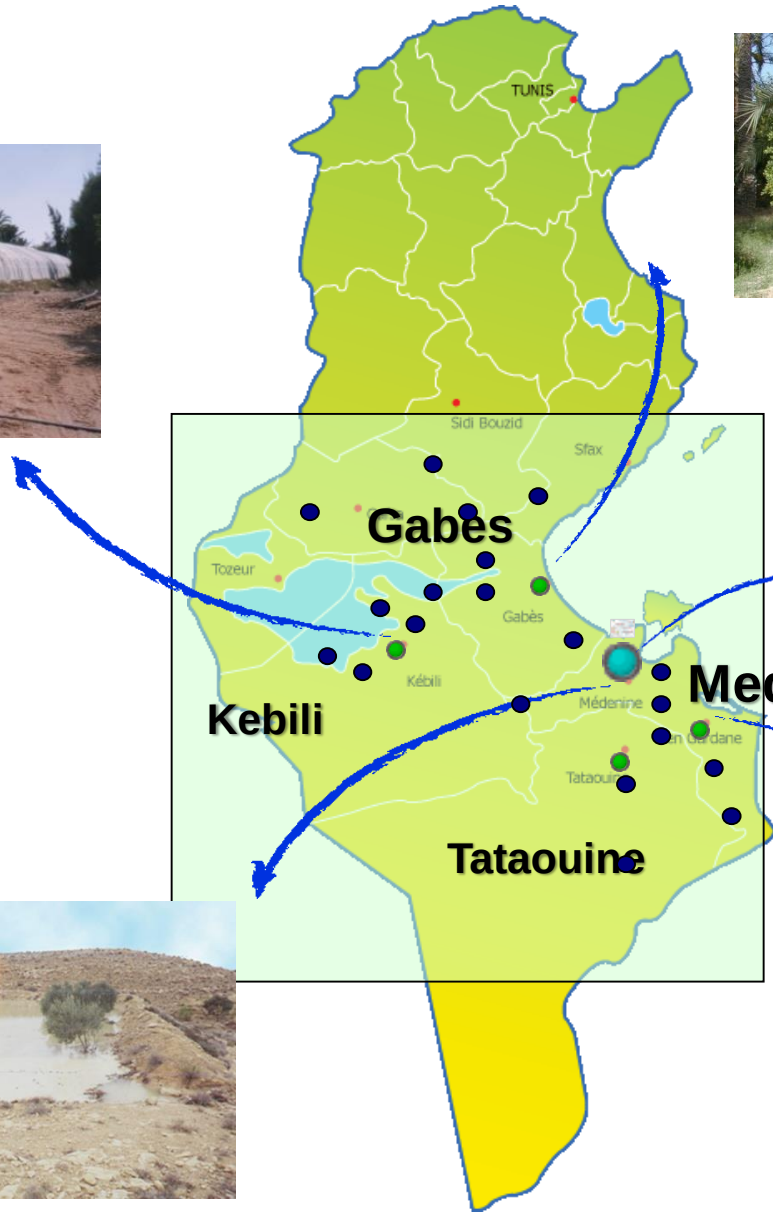
Long.: 7° - 12°E,
Lat.: 32° - 38°N
Area: 165 000 km²
Population: 12 Millions

Climate variability

- ✓ Mediterranean Sea
- ✓ Sahara
- ✓ Coastline spans: 1300 km
- ✓ Annual rainfall: (150-1500 mm)

THE INSTITUT DES REGIONS ARIDES (IRA)

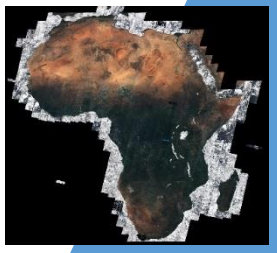
http://www.ira.agrinet.tn/



- Headquarters
- Regional Stations
- Experimental Stations

THE INSTITUT DES REGIONS ARIDES (IRA)

http://www.ira.agrinet.tn/



Socio-economic interactions between local population and their environmental landscapes

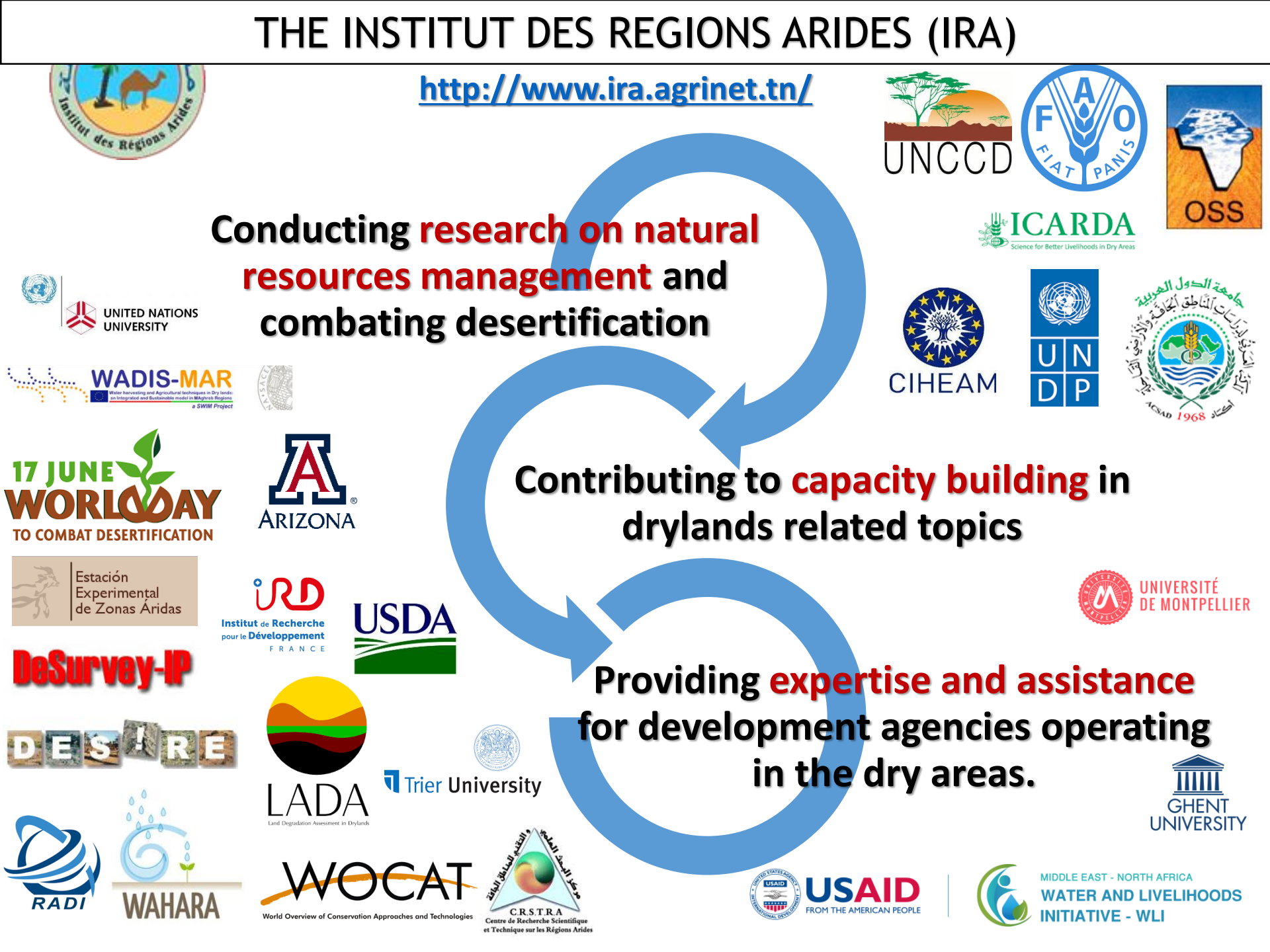
Monitoring of wildlife and endangered animal species

Natural resources and **desertification surveillance** at different spatial and resolution scales

Geomatic-based **tools for decision making** in drylands assessment and development

THE INSTITUT DES REGIONS ARIDES (IRA)

http://www.ira.agrinet.tn/



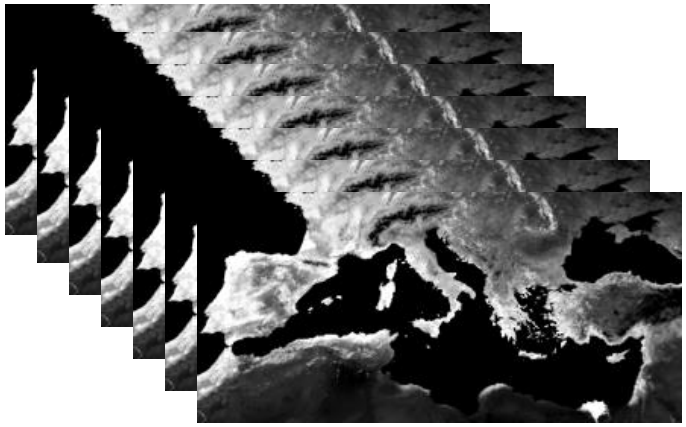
SOUTHERN TUNISIA CONTEXT

- **Monitor and diagnose desertification, vulnerability of eco-agricultural systems.**

- **Establish the relationships between degradation processes, natural ecosystem dynamics, and human activities.**

CONTINUOUS GLOBAL AND REGIONAL MONITORING

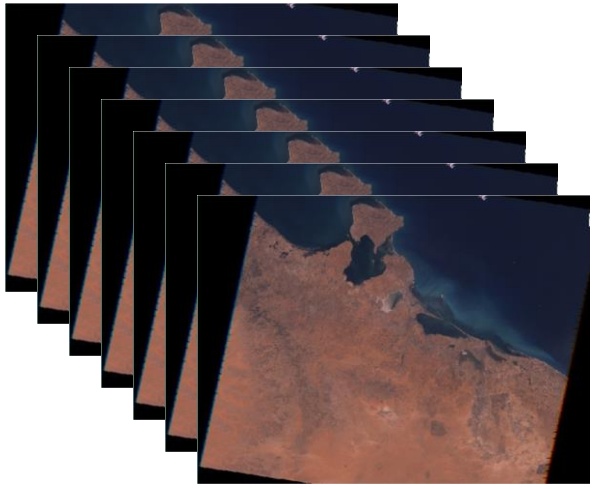
300 m – 1 km



Continuous global indicator monitoring

Selected regional land quality assessment & monitoring

10 – 30 m



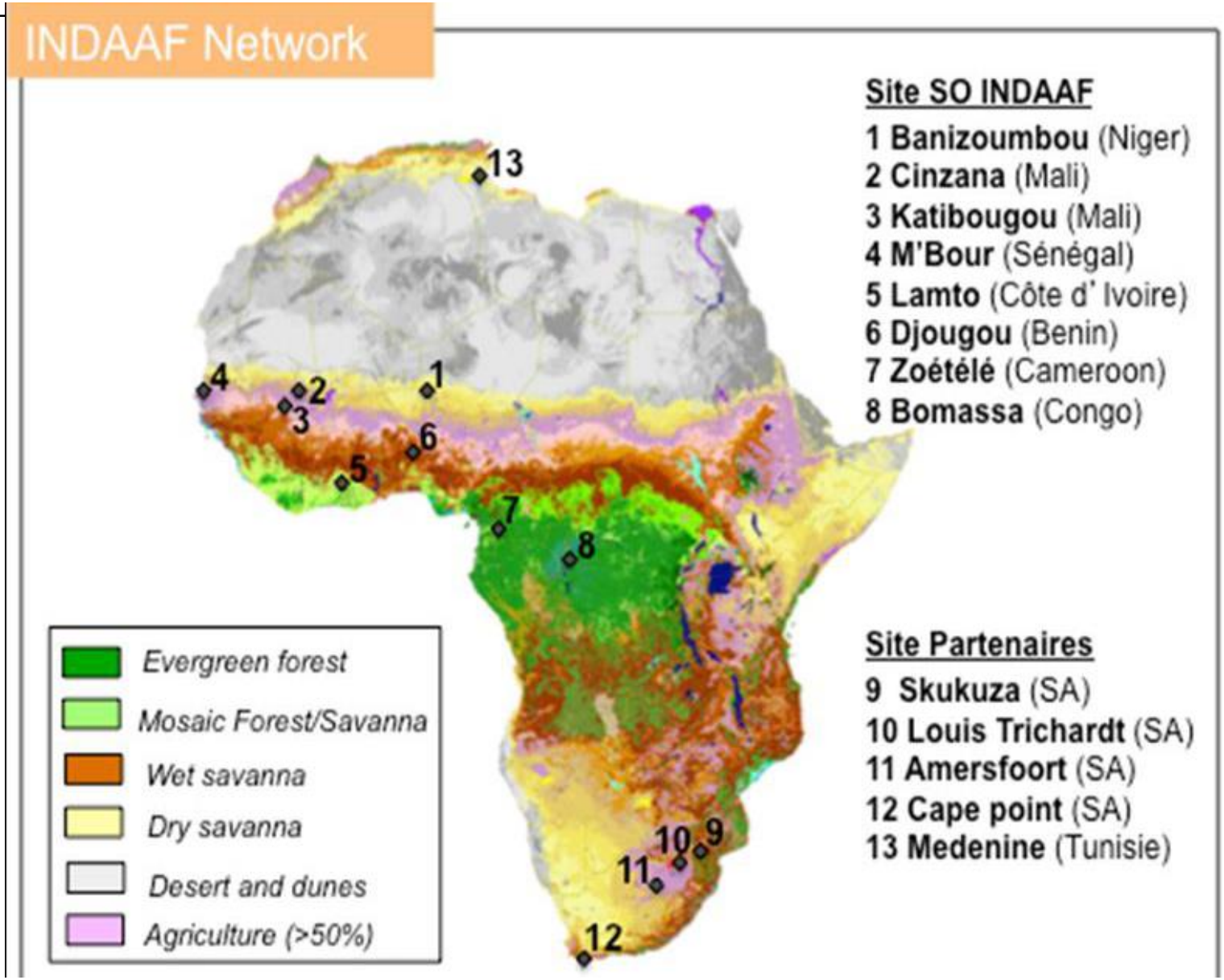
Land use change assessment

Local land surface properties

0.5-1 m

1980 1990 2000 2010 2020

CONTINUOUS GLOBAL AND REGIONAL MONITORING



International Network to study Deposition and Atmospheric composition in Africa (INDAAF)

TECNOPOLE DU SUD (TPS)

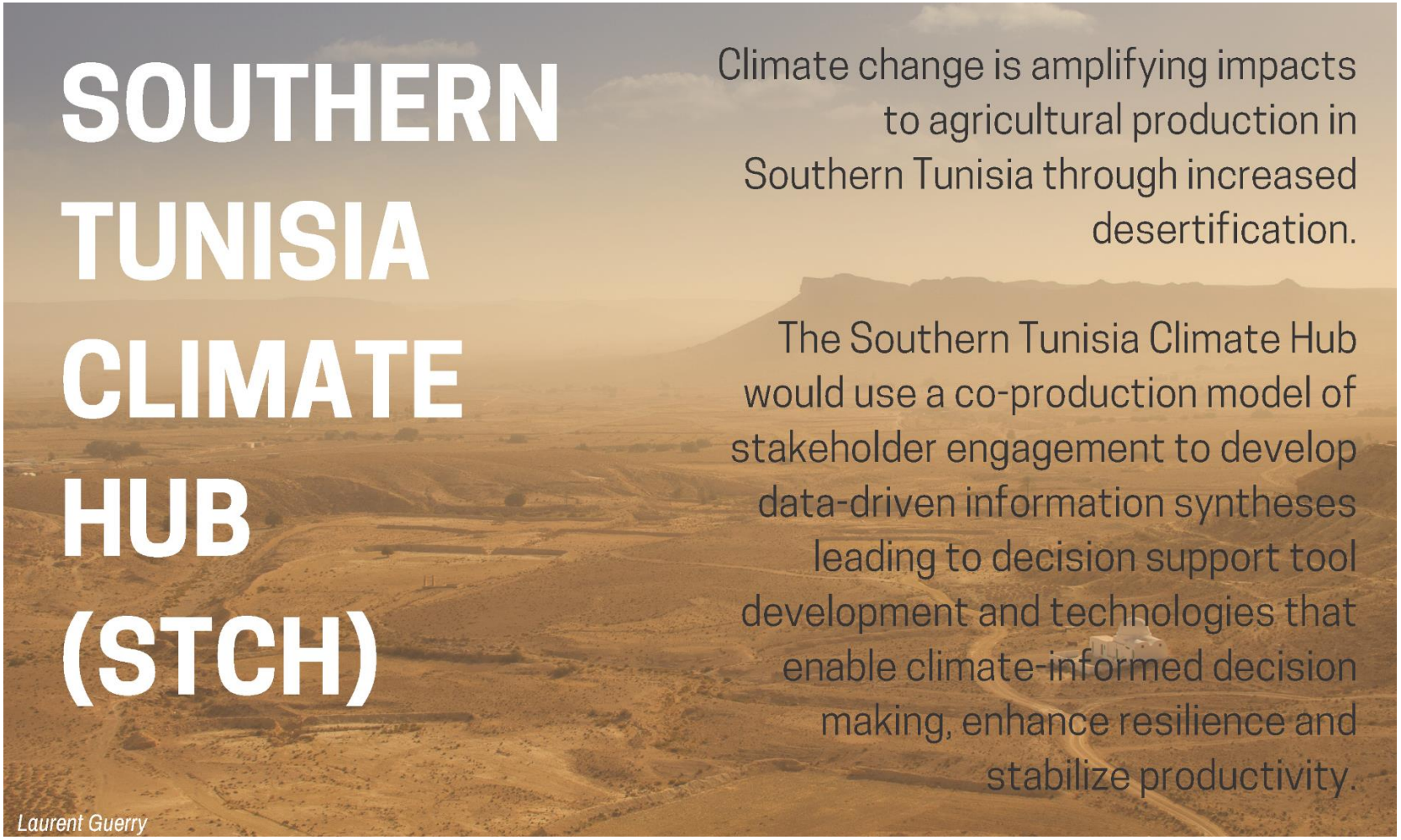
http://www.technopolesud.tn/

- Since 2013.
- 4 governorates in southern Tunisia.
- Higher education and research center.
- Area: 40 ha.

Main Goals

- Encourage innovative high-added value companies,
- Support a dynamic socio-economic development in southern Tunisia.

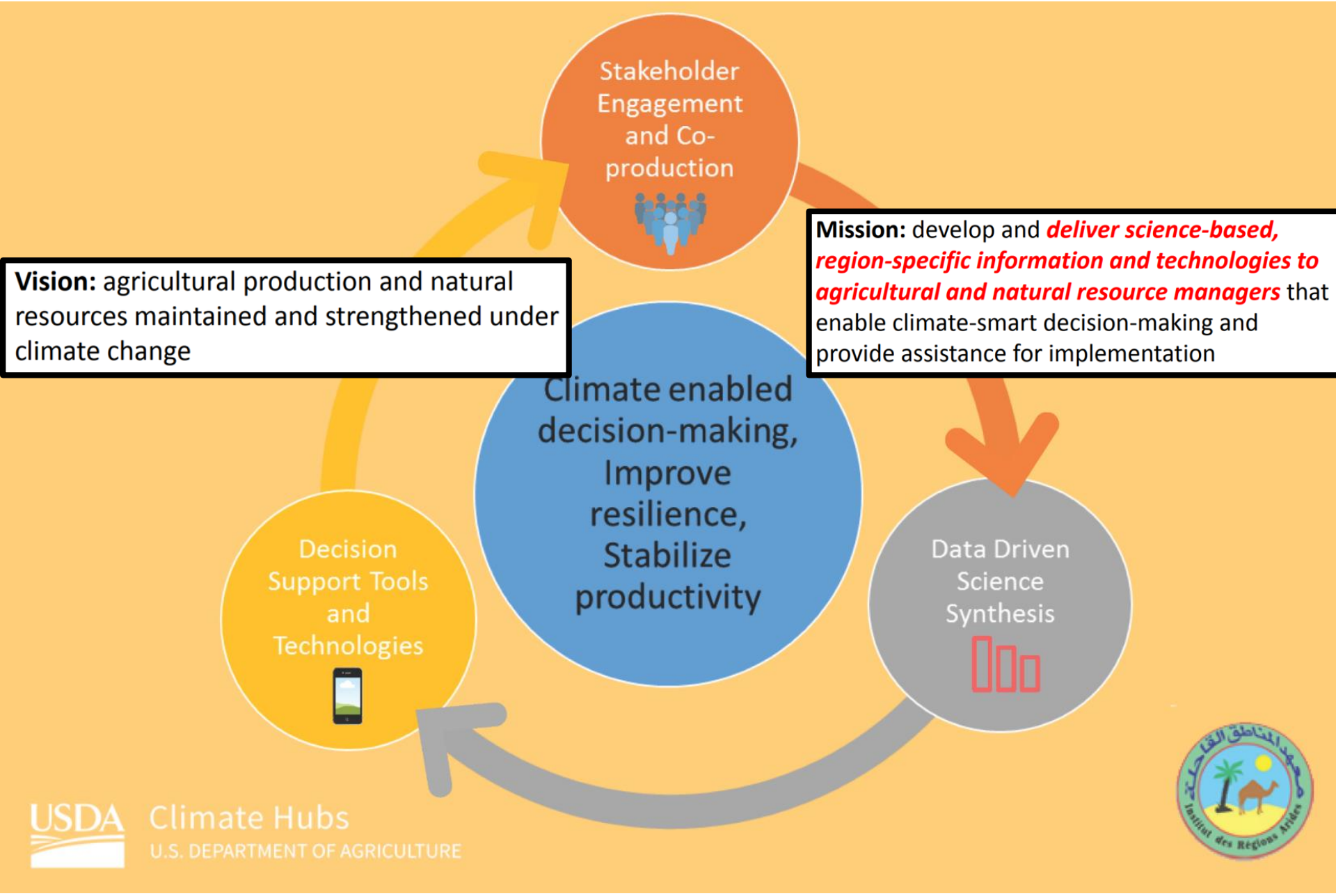
Southern Tunisia Climate Hub (STCH):
Towards an Actionable Climate Information



USAID FROM THE AMERICAN PEOPLE

USDA

UC DAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

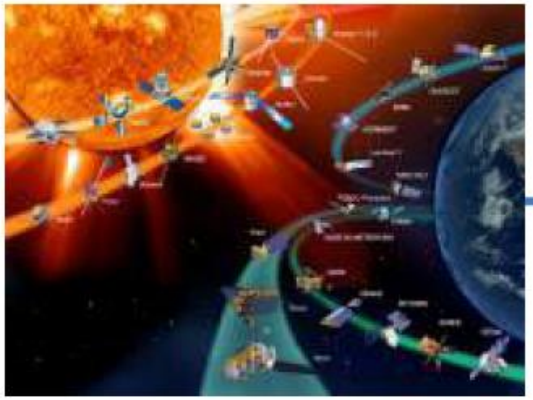

Stakeholder Engagement and Co-production
Mission: develop and deliver science-based, region-specific information and technologies to agricultural and natural resource managers that enable climate-smart decision-making and provide assistance for implementation
Vision: agricultural production and natural resources maintained and strengthened under climate change
Climate enabled decision-making, Improve resilience, Stabilize productivity
Data Driven Science Synthesis
Decision Support Tools and Technologies
USDA Climate Hubs
U.S. DEPARTMENT OF AGRICULTURE

Sustainable Development & SDGs

"Development that meets the needs of the present without compromising the ability of future generations."

2030 Agenda for Sustainable Development

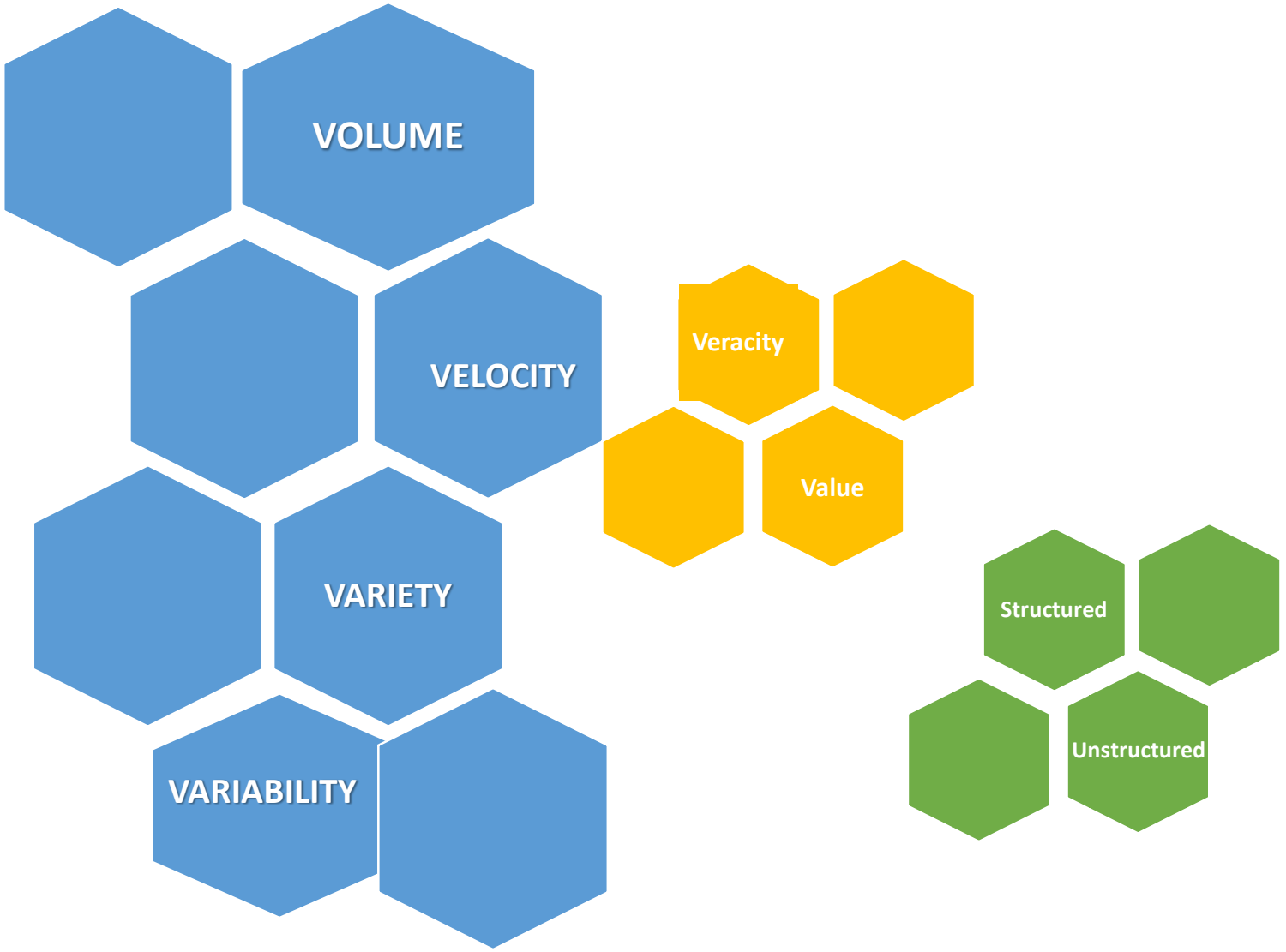
17 Sustainable Development Goals



SUSTAINABLE DEVELOPMENT GOALS

Space technology supports our common goals to address **global challenges of the 2030 Agenda for Sustainable Development.**

BIG DATA CHARACTERISTICS



DATA ANALYTICS ECOSYSTEMS

Ecosystems

Stakeholders /
Communities of practice

Applications

Algorithms & Tools

Data Integration > Feature Extraction > Model Training > Evaluation

Information Extraction > Analysis > Visualization

Data Management and Processing Infrastructure

Highly scalable and performant
(On Premise, in Cloud, spatially distributed)

Data

Structured
Unstructured

EO

Sensor Networks
Social Media, etc.

Data (EO Data and the SDGs)

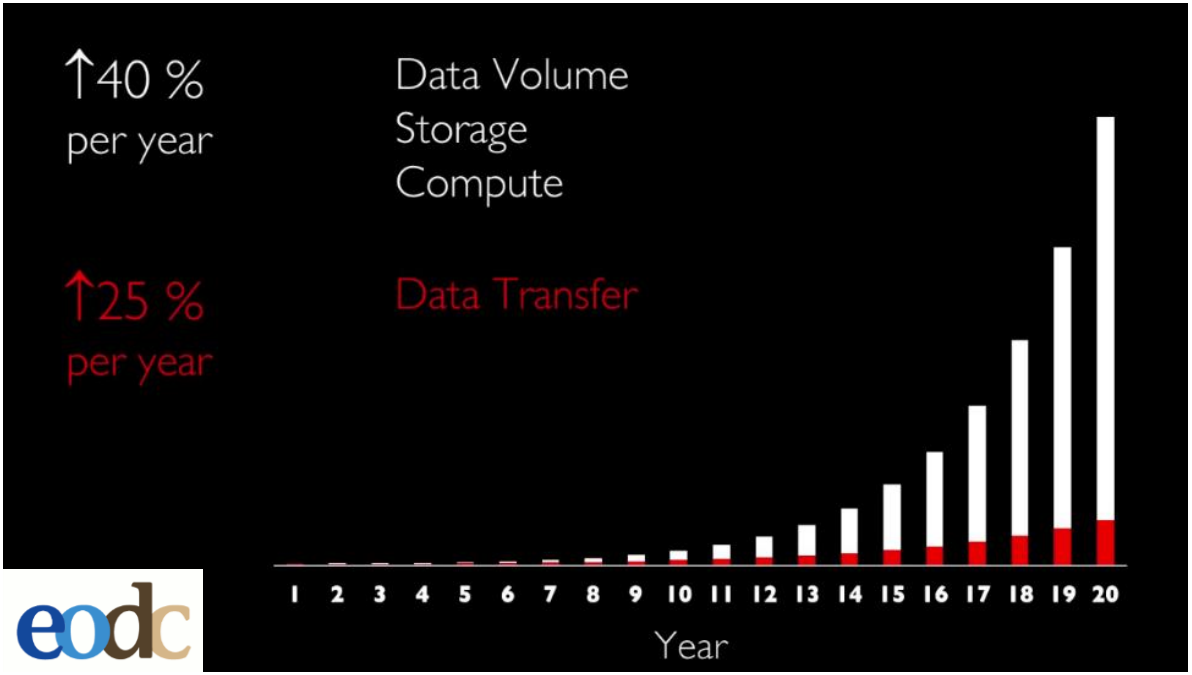
Satellite data availability:

- **Since 1960ies / Open Domain: Sentinel, MODIS, Landsat**

Custodian Agencies for the SDGs

- **Member States, UNOOSA**

Data (Volume and Transfer)



- Where and how to access data
- Trend in moving algorithms to the data (cloud computing)

Challenges & Recommendations

Challenges

- How to choose the right tools?
- Values and Norms (e.g. privacy)
- Many EO machine learning models need to be trained and validated with in-situ measurements
- Digital Divide (esp. considering infrastructure moving to the cloud)
- Human Capacity
- Many initiatives, many projects, overlaps and gaps!

Recommendations

- Communication – find a common language and mutual understanding
- Foster exchange and integration of in-situ and satellite imagery. How remains an open question.
- Data Science at the intersection of Computer Science, Statistics and the respective fields of application
- Collaborate and address the gaps!

Strategic Recommendations

- A ***multi-stakeholder platform*** for ***interdisciplinary knowledge exchange;***
- Making ***information*** on space solutions and technologies for land and water-related topics ***discoverable and filterable;***
- A ***capacity-building platform;***
- A portal for ***expert communities, including those from developing countries.***

Institut des Régions Arides (IRA)
Laboratory of Eremology and Combating Desertification
El Fje 4119 Medenine - TUNISIA
Tel: (+216) 75633005 | Fax: (+216) 75633006
E-mail: essifib@gmail.com, bouajila.essifi@ira.agrinet.tn

Thanks!

شكرا