The alliance Water-Energy-Food Security
In North Africa:
Morocco as an exemple

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Reflection on the alliance Water-Energy-Food Security:

• What is the alliance «Water-Energy-Food Security»?

• Why only these 3 elements?

• How EO will respond to these goals and what is the role of the different actors to promote this alliance?
Importance of Earth Observations for Africa

- World’s second largest continent (30.2 m km²) including islands

- Second most populous continent (about 15% of the world’s population)

- Has a vast land area with difficult terrain *deserts, rainforest, inland water bodies, complex and inhomogeneous topography, the Great Rift Valley*

Satellite observations are critical to support environment and natural resources management for protection of life and property and sustainable socio-economic development of Africa.
North Africa: a harsh climatic context

- 6 countries: Algeria, Egypt, Libya, Mauritania, Morocco and Tunisia.
- The area is approximately 7 049 591 km² mostly covered by the Sahara desert (75%).
- The population is around 190 million of inhabitants.
- extreme climatic conditions (arid and semi-arid),

**Problematics**
- Conflicts of interest
- Resource degradation
- Climate Variability and Change
- Migration
The natural water resources in Morocco are among the lowest in the world.

- Potential is estimated at 21 billion m$^3$ per year, equivalent to 730 m$^3$ / capita / year.
- More than half of these resources are concentrated in the north over an area covering 7% of the national territory.

The potential available is below the threshold of water stress (1000 m$^3$ / capita / year).
Water and food are linked by irrigation (45% of agricultural GDP and may reach 70% in dry years).

Great Hydraulics: 682,600 superficies percentage.
Small and Medium Hydraulics: 334,100 superficies percentage.
Irrigation Private: 441,450 superficies percentage.
Total: 1,458,150 superficies percentage.

Alliance Water-Food Security

The irrigated area of Doukkala is among the largest and earliest developed areas in Morocco, remarkable for its strategic importance for national production, specially sugar beet (38%) and commercialized milk (20%).

The region's climate is typically semi-arid with a large variability rainfall averaging 316 mm / year.

The resources mobilized for irrigation of Doukkala area come mainly from the dam Al Massira, a major water storage structure in the basin of Oum Rbia.
Aims of the project

MOSES aims at putting in place and demonstrate at the real scale of application an information platform devoted to planning of irrigation water resources, to support water procurement & management agencies (e.g. reclamation consortia, irrigation districts, etc.). Its main goals are:

- saving water
- improving services to farmers
- reducing monetary and energy costs
Spatial distribution of IP2

Irrigation Adequacy

Spatial distribution of IP3

Irrigation Efficiency

For Alfalfa Crops Map

irrigation water management
MOSES Alpha version on the Italian Demonstration area:
Seasonal irrigation forecast (mm)
Emission of 1st June 2016
current consumption about 1,450 GWh >>>>> 6,150 GWh in 2030 (about 0.7 to 0.8 kWh/m³):

- The use of energy-intensive solutions (desalination of seawater and the water transfer project)
- Exploitation of conventional resources with high energy consumption in order to satisfy water demand. This is the case of drinking water supplies for water to Some big cities.
- Development of sanitation and wastewater treatment activities.

<table>
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<th>sector</th>
<th>2010 Water (Mm³)</th>
<th>2010 Energy (GWh)</th>
<th>2030 Water (Mm³)</th>
<th>2030 Energy (GWh)</th>
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<td>550</td>
<td>1 550</td>
<td>2 350</td>
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<td>Irrigation</td>
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<td>900</td>
<td>6 500</td>
<td>3 880</td>
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<td>Reuse of wastewater</td>
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<td>300</td>
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<td><strong>Total</strong></td>
<td><strong>5 250</strong></td>
<td><strong>1 450</strong></td>
<td><strong>9 000</strong></td>
<td><strong>6 145</strong></td>
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Evolution of energy consumption in the water sector:

- 71.5% increase
- 320% increase
By 2020-2030, all possible wind potential, estimated at 7,000 MW, could be exploited.

By 2020, solar development, increasing photovoltaic to 1,080 MW and solar concentrator production to 400 MW.

The hydroelectric capacity will be increased from 1,730 MW currently to 2,700 MW by the construction of new dams and pumping power stations.

Target:

52% Morocco's energy production will be renewable by 2030.
OCP Experience

Development strategy without impact on water resources:

- Water withdrawals in rivers would remain constant in volume.
- The current withdrawals in the groundwater would be abandoned in run-
  phosphate fertilizer.

Type of project

- Desalination of sea water
- Wastewater treatment at mining sites
- Water supply from dams
- Transport Slurry pipe
21 Billion dollars of investment
More than 60% of industrial water needs will eventually be met from unconventional waters