Food and Agriculture Organization of the United Nations

Regional Initiative on Water Scarcity

The Potential of Geospatial Technology for Applications in Water and Agriculture

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FAO-RNE

Food and Agriculture Organization of the United Nations

Presentation Outline

Regional Initiative on Water Scarcity

- **Geospatial Technology**
  - Remote Sensing (RS)
  - Geographic Information Systems (GIS)

- **Applications**
  - Irrigation Areas Water Consumption
  - Agricultural Production Change
  - Surface Water Change
  - Drought Monitoring
  - Vegetation Monitoring

  → **Live Demo – Using Cloud Computing / Big Data for Vegetation Monitoring in Egypt**

- **Earth Observation and Geospatial Information for SDGs**

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Geospatial Technology (GT)

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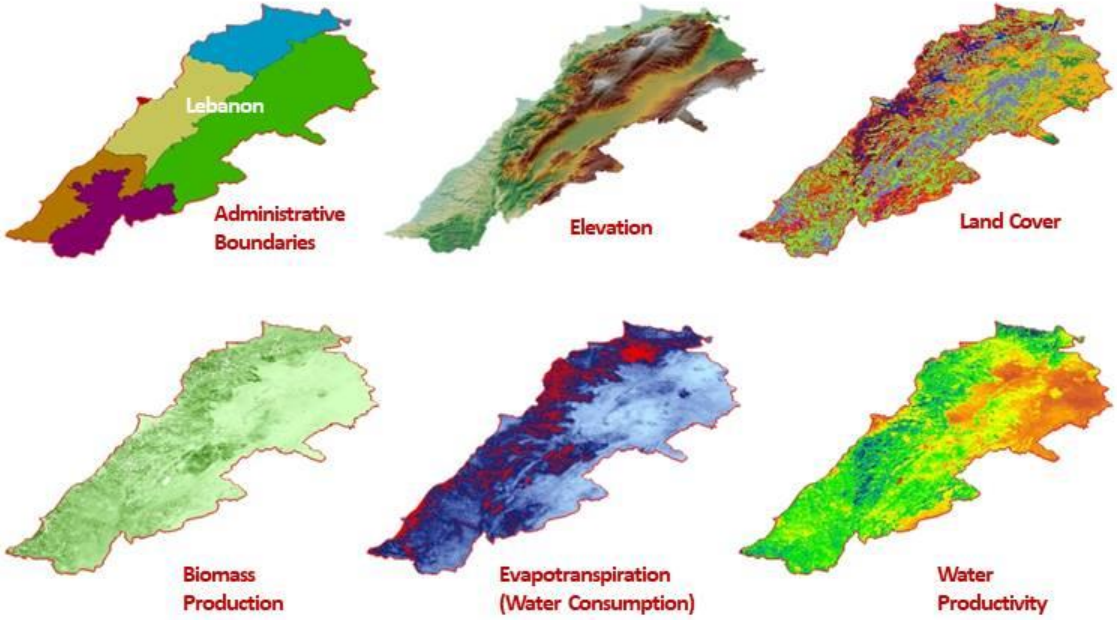
- **Geospatial Technologies** is a term used to describe tools contributing to the **collection, processing, visualization and analysis** of **data associated with location (Geospatial Data)**

.....virtually most aspects of human life involve location



Agricultural Water Management Geospatial Data

Geospatial Technology

- Remote Sensing (RS)
- Geographic Information Systems (GIS)

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Remote Sensing (RS)

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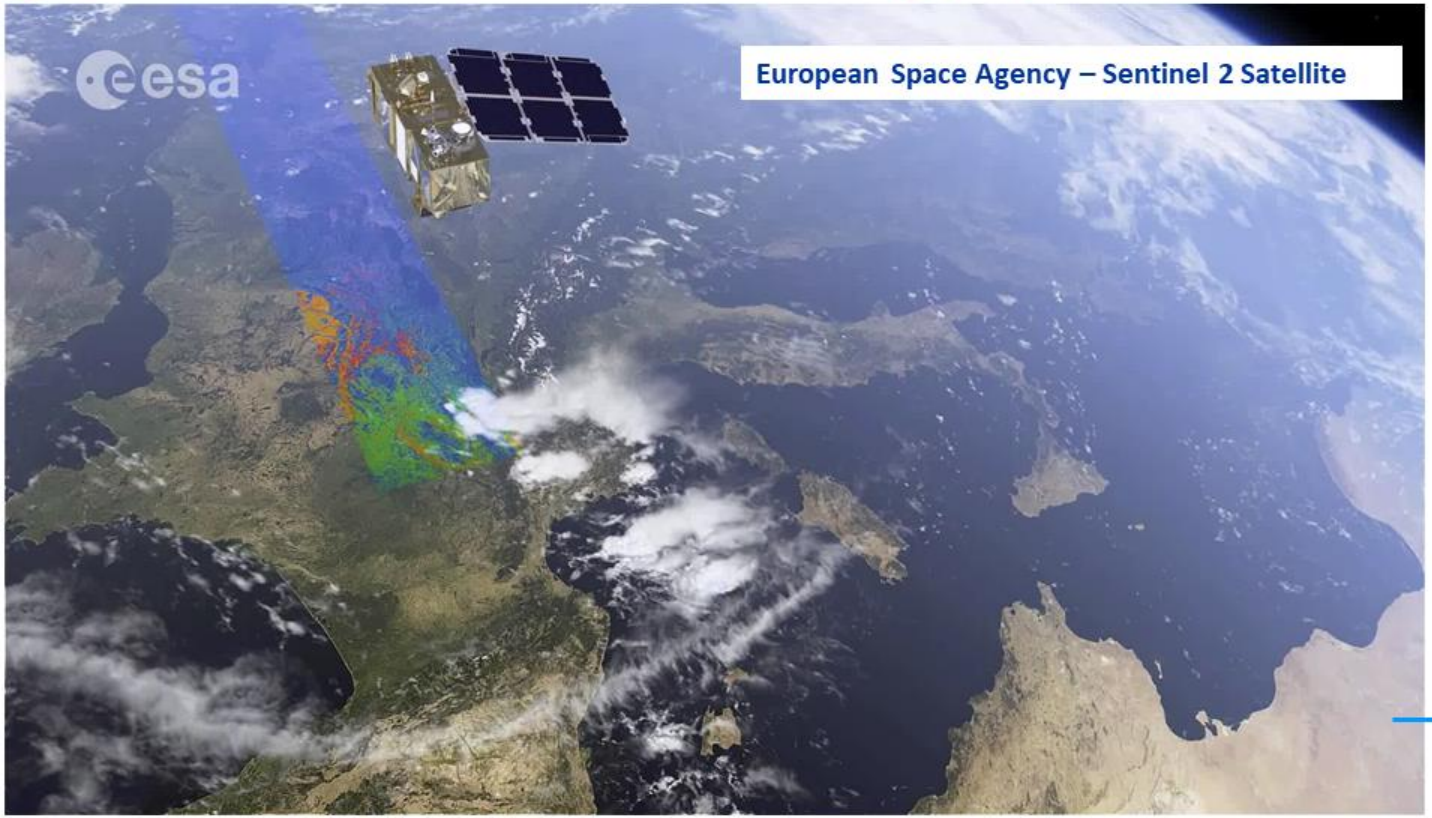

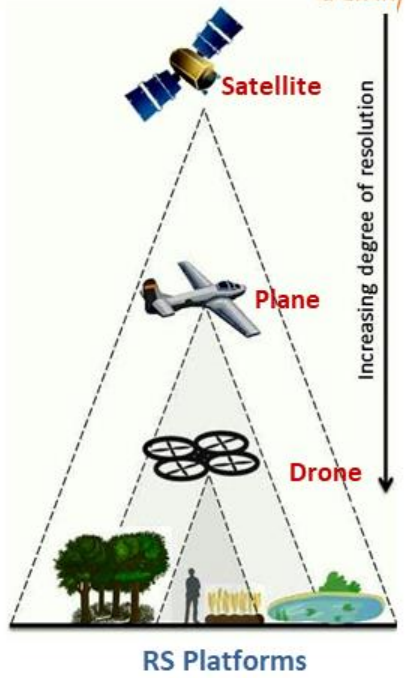

Images (bands) of recorded measurements

Sensors are mounted on different platforms to **capture radiation reflected** or emitted from **objects on Earth**, that include **visible, ultraviolet** and **infrared radiation.** These RS **measurements** are recorded as **images (bands).**

> > > > > **Sensors capture** what **humans** can **see and more.**

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Seeing beyond the Visible

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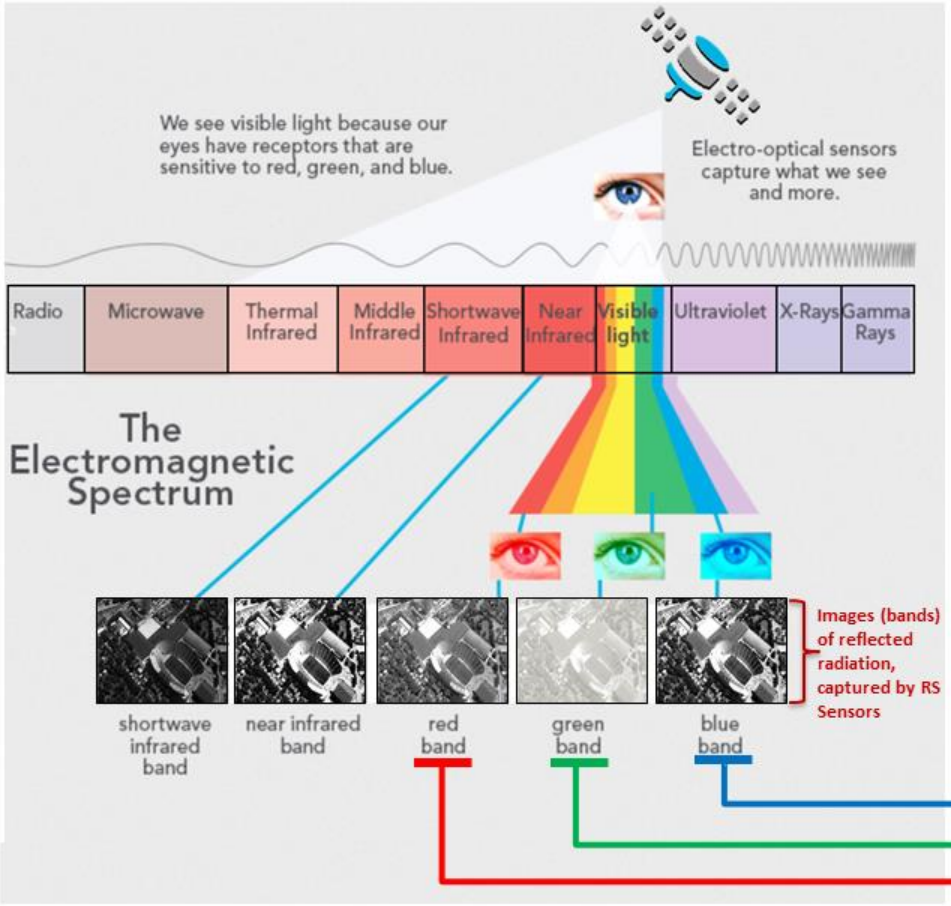

Image credit: University of Wisconsin-Madison - esri

A True Color Image generated using the bands in the visible part (Red, Green, Blue) of the electromagnetic spectrum

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Seeing beyond the Visible

Regional Initiative on Water Scarcity

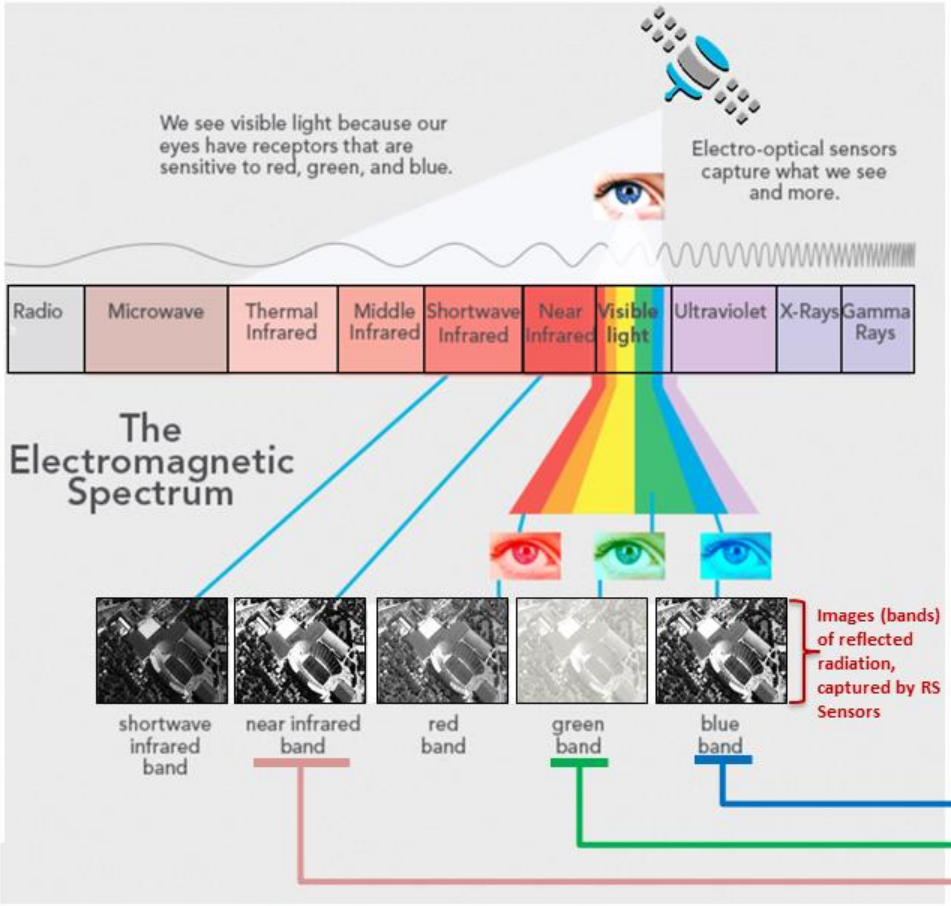
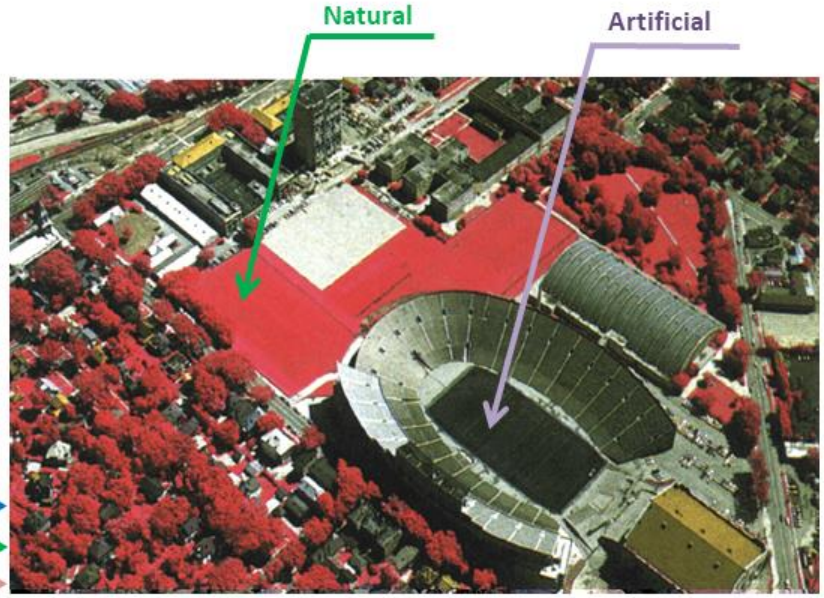


Image credit: University of Wisconsin-Madison - esri

A False Color Image generated using the (Near-Infra-Red, Green, Blue) bands to display healthy Vegetation in red



What we see is not always what exists

Geospatial Technology

- Remote Sensing (RS)
- Geographic Information Systems (GIS)

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Geographic Information Systems - (GIS)

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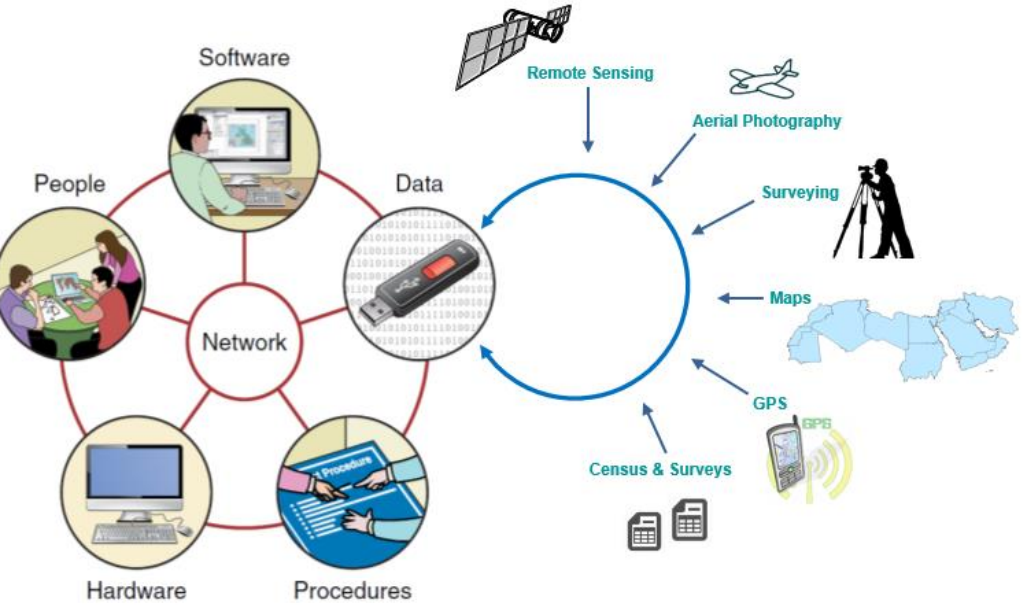
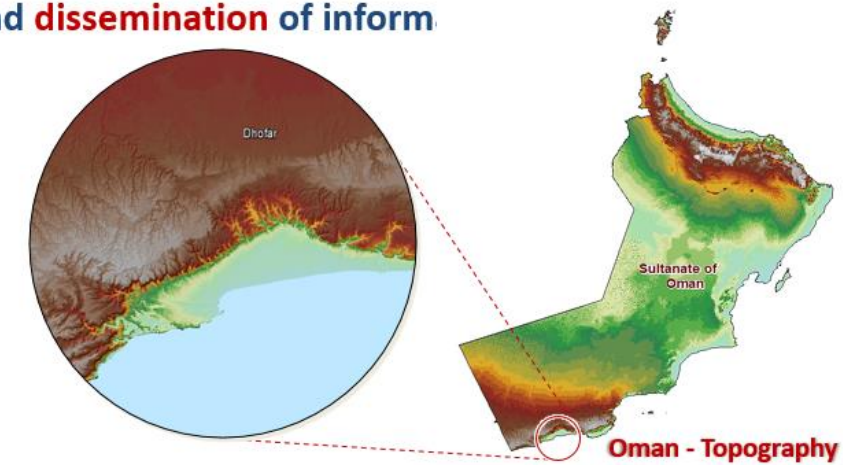
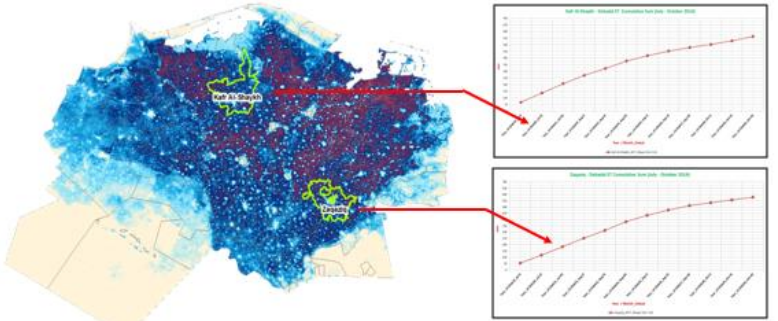
A **Geographic Information System** (GIS) is an **interactive mapping technology** which provides users with the necessary **abilities** for **data creation, storage, retrieval, analysis, display, and dissemination of inform**



GIS Components (Pillars)



Oman - Topography



Nile Delta - Water Consumption

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Integrating Statistical and Geospatial Data

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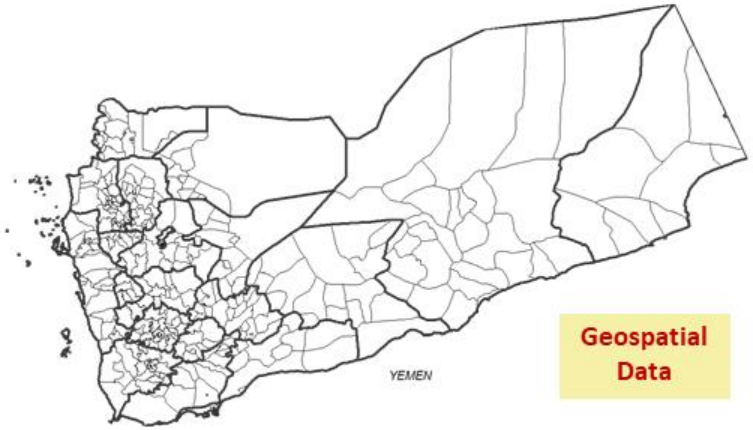
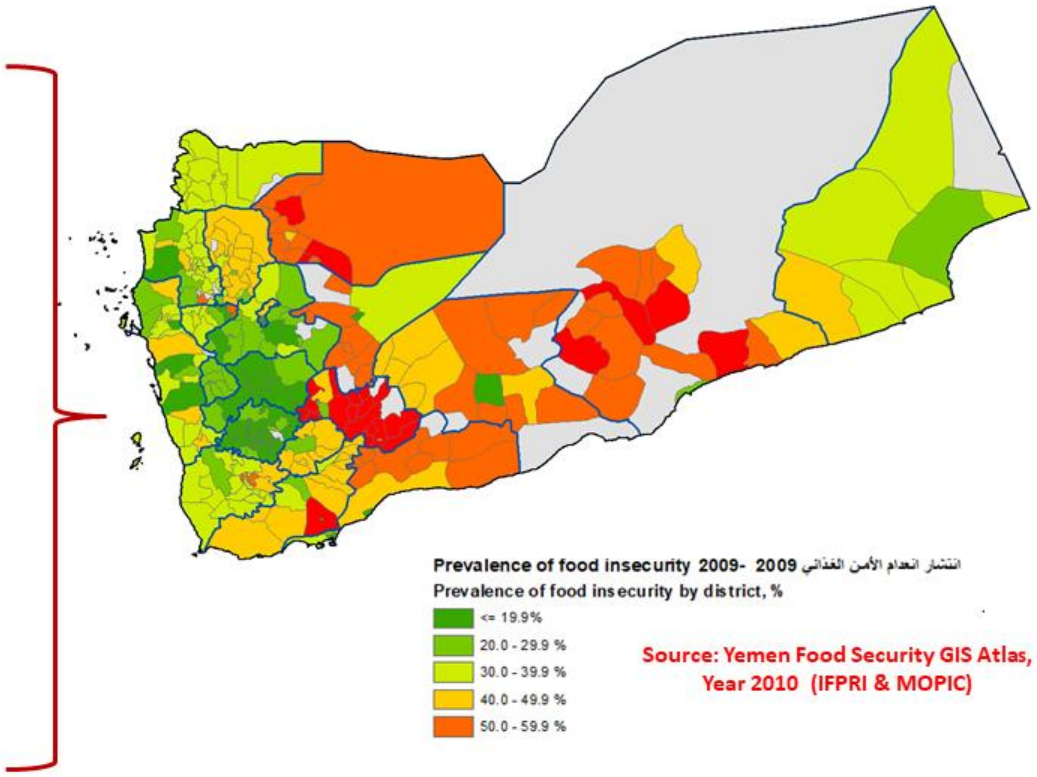


Geospatial Data

Population density (district) - الكثافة السكانية (المقاطعة)

District name	Area (ha)	Area (km2)	Agroecological zone	Total population 2004	Male population 2004	Female population 2004	Urban population	Rural population
Al Qafr	68353.9	683.54	Highlands	103182	51785	51397	5067	98115
Yarim	55603.23	556.03	Temperate highlands	175035	88018	87017	52278	122757
Ar Radmah	29654.46	296.54	Temperate highlands	76568	38418	38150	4480	72088
An Nadirah	28898.54	288.99	Temperate highlands	73753	36312	37441	6478	67275
Ash Sha'ir	13801.26	138.01	Temperate highlands	39774	19301	20473	1937	37837
As Saddah	26707.77	267.08	Temperate highlands	82493	39690	42803	5099	77394
Al Makhadir	21570.83	215.71	Highlands	113779	57120	56659	2469	111310
Hubaysh	23275.26	232.75	Highlands	105944	48888	57056	6137	99807
Hazm Al Udeyn	49074.63	490.75	Highlands	79370	36886	42484	0	79370
Far Al Udeyn	36913.67	369.14	Highlands	88964	41619	47345	0	88964
Al Udayn	37449.52	374.5	Highlands	143505	68693	74812	7717	135788
Jiblah	12406.3	124.06	Temperate highlands	112504	54712	57792	13328	99176
Ba'dan	24336.23	243.36	Temperate highlands	115950	54926	61024	3804	112146
As Sabrah	34364.89	343.65	Highlands	69852	34056	35796	2983	66869
As Sayyani	23786.71	237.87	Temperate highlands	110488	54202	56286	2261	108227
Dhi As Sufal	19236.49	192.36	Temperate highlands	162965	80242	82723	46495	116470
Mudhaykhirah	11892.1	118.92	Highlands	77830	36901	40929	1264	76566
Al Mashannah	2694.29	26.94	Highlands	101129				14933
Al Dhihar	3161.87	31.62	Temperate highlands	154380				27619
Ibb	18955.51	189.56	Temperate highlands	143625				143625
Al Mahfad	277336.46	2773.36	Internal Plateau	26859				23686
Mudiyah	110782.45	1107.82	Internal Plateau	34882				26551
Jaryhan	76537.1	765.37	Internal Plateau	14769				14769
Lawdar	212921.31	2129.21	Internal Plateau	88146				74610
Sibah	32976.46	329.76	Highlands	15940				15940
Rasad	20537.38	205.37	Highlands	54816	27338	27478	940	53876
Sarar	80043.93	800.44	Highlands	15106	7369	7737	0	15106
Al Wade'a	64752.72	647.53	Internal Plateau	23422	11943	11479	0	23422
Aheer	370868.13	3708.68	Arabian Sea	25243	12919	12324	6460	18783
Zingibar	9585	95.85	Arabian Sea	25530	13118	12412	20007	5523
Khanfir	398688.76	3986.89	Arabian Sea	109022	55882	53130	59026	49996
Old City	181.98	1.82	Temperate highlands	63386	34340	29046	63386	0
Shu'aub	1510.6	15.11	Temperate highlands	213936	115779	98157	213936	0
Az'zal	922.76	9.23	Temperate highlands	115033	61178	53855	115033	0
Assafi'yah	745.47	7.45	Temperate highlands	109106	63340	45766	109106	0
As Sabeen	3082.68	30.83	Temperate highlands	311213	172941	138272	311213	<null>

Descriptive & Statistical Data



Source: Yemen Food Security GIS Atlas, Year 2010 (IFPRI & MOPIC)

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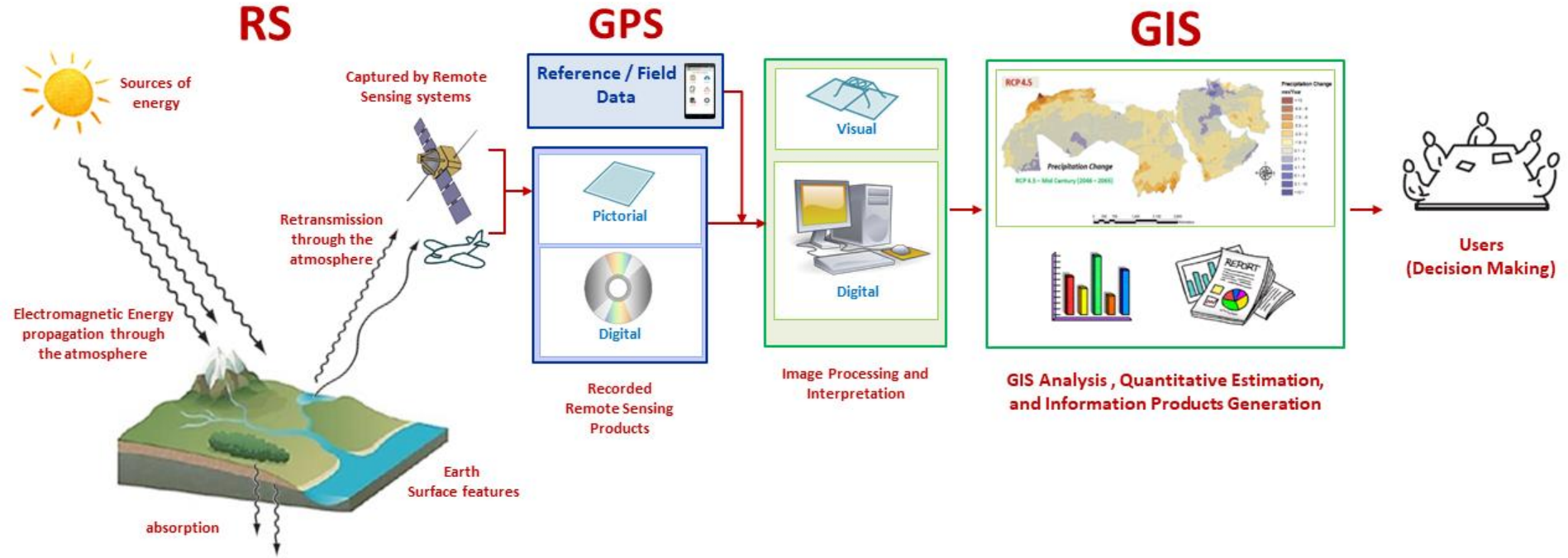
THE BIG PICTURE ... INTEGRATION OF GEOSPATIAL TECHNOLOGIES

DATA ACQUISITION | PROCESSING | INTERPRETATION | ANALYSIS | DISSEMINATION



Where can we find Geospatial Data?

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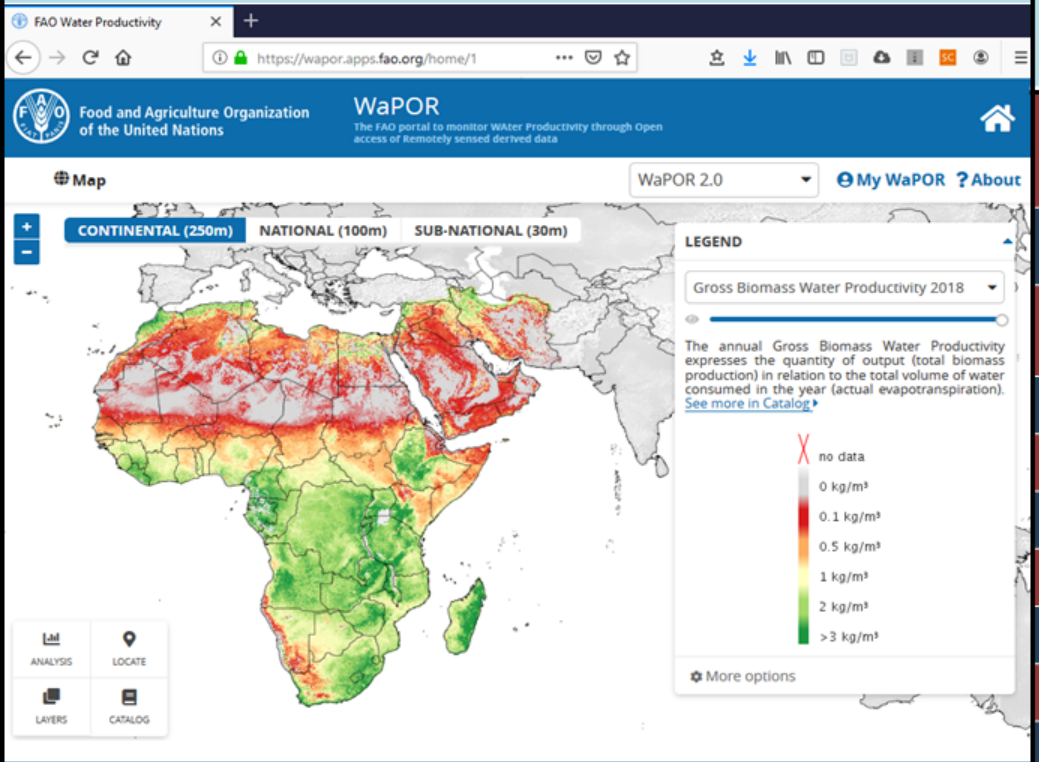
Ready-to-use-Datasets

With the support of Ministry of Foreign Affairs of the Netherlands

FRAME Consortium: eleaf, vito, University of Twente, Water Watch Foundation

Partners: IHE Delft, IWMI

FAO - Water Productivity Open Access Data Portal (WaPOR)



Countries (Level II): Egypt | Jordan | Lebanon | Morocco | Palestine | Syrian Arab Republic | Tunisia | Yemen
River Basins (Level II): Jordan | Litani | Nile

Data component	Spatial and Temporal Resolution		
	Continental Level I (250 m) Africa and Near East	**National** Level II (100 m) Countries and River basins	**Sub-National** Level III (30 m) Pilot areas of 100,000 ha
Actual Evapotranspiration (Water Consumption)	Dekadal* /Monthly/ Annual	Dekadal/Monthly/ Annual	Dekadal/Monthly/ Annual
Net Primary Production	Dekadal	Dekadal	Dekadal
Above Ground Biomass Production	Annual	Seasonal	Seasonal
Harvest Index (HI)			Seasonal
Water Productivity	Annual	Dekadal / Seasonal	Dekadal / Seasonal
Evaporation (E)	Dekadal /Annual	Dekadal/Annual	Dekadal/Annual
Transpiration (T)	Dekadal/Annual	Dekadal/Annual	Dekadal/Annual
Interception (I)	Dekadal/Annual	Dekadal/Annual	Dekadal/Annual
Phenology		Seasonal	Seasonal
Precipitation	Daily (5km)	Dekadal / Seasonal	Dekadal / Seasonal
Land Cover	Annual	Annual	Dekadal

* Dekad = (~ 10 days) – one Month = 3 Dekads

Temporal Coverage: Year 2009 to Present

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Ready-to-use Datasets

Regional Initiative on Water Scarcity

FAO - Water Productivity Open Access Data (WaPOR)

FAO Water Productivity

https://wapor.apps.fao.org/catalog/1

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WaPOR

The FAO portal to monitor WAter Productivity through Open access of Remotely sensed derived data

Back to map > Catalog

WaPOR 2.0

My WaPOR ? About

CONTINENTAL (250m) | NATIONAL (100m) | SUB-NATIONAL (30m)

Water Productivity | Water | Land | Climate | Ancillary

Gross Biomass Water Productivity

The annual Gross Biomass Water Productivity expresses the quantity of output (total biomass production) in relation to the total volume of water consumed in the year (actual evapotranspiration).

WATER PRODUCTIVITY

Net Biomass Water Productivity

The annual Net Biomass Water Productivity expresses the quantity of output (total biomass production) in relation to the volume of water beneficially consumed (by canopy transpiration) in the year, and thus net of soil evaporation.

WATER PRODUCTIVITY

Actual EvapoTranspiration and Interception (Annual)

The actual EvapoTranspiration and Interception (ETIa) is the sum of the soil evaporation (E), canopy transpiration (T), and evaporation from rainfall intercepted by leaves (I).

WATER

Evaporation (Dekadal)

The Evaporation (E) data component (dekadal, in mm/day) is the actual evaporation of the soil surface.

WATER

Interception (Dekadal)

The Interception (I) data component (dekadal, in mm/day) represents the evaporation of intercepted rainfall from the vegetation canopy.

WATER

Net Primary Production

Net Primary Production (NPP) is a fundamental characteristic of an ecosystem, expressing the conversion of carbon dioxide into biomass driven by photosynthesis.

LAND

Actual EvapoTranspiration and Interception (Monthly)

The actual EvapoTranspiration and Interception (ETIa) is the sum of the soil evaporation (E), canopy transpiration (T), and evaporation from rainfall intercepted by leaves (I).

WATER

Actual EvapoTranspiration and Interception (Dekadal)

The actual EvapoTranspiration and Interception (ETIa) (dekadal, in mm/day) is the sum of the soil evaporation (E), canopy transpiration (T), and evaporation from rainfall intercepted by leaves (I).

WATER

Transpiration (Annual)

The Transpiration (T) data component is the actual transpiration of the vegetation canopy.

WATER

Total Biomass Production (Annual)

The annual Total Biomass Production expresses the total amount of dry matter produced over the year.

LAND

Land Cover Classification

This land cover dataset at continental scale is based on the Copernicus Global Land cover map.

LAND

Reference EvapoTranspiration (Annual)

Reference EvapoTranspiration (RET) is defined as the evapotranspiration from a hypothetical reference crop and it simulates the behaviour of a well-watered grass surface.

CLIMATE

Evaporation (Annual)

The Evaporation (E) data component is the actual evaporation of the soil surface.

WATER

Interception (Annual)

Interception is the process where rainfall is captured by the leaves.

WATER

Transpiration (Dekadal)

The transpiration (T) data component (dekadal, in mm/day) is the actual transpiration of the vegetation canopy.

WATER

Precipitation (Annual)

Precipitation data is delivered on a daily basis. The source of this dataset is CHIRPS (Climate Hazards Group InfraRed Precipitation with Station) quasi-global rainfall dataset, starting from 1981 up to near present.

CLIMATE

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CLIMATE

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Ready-to-use Datasets

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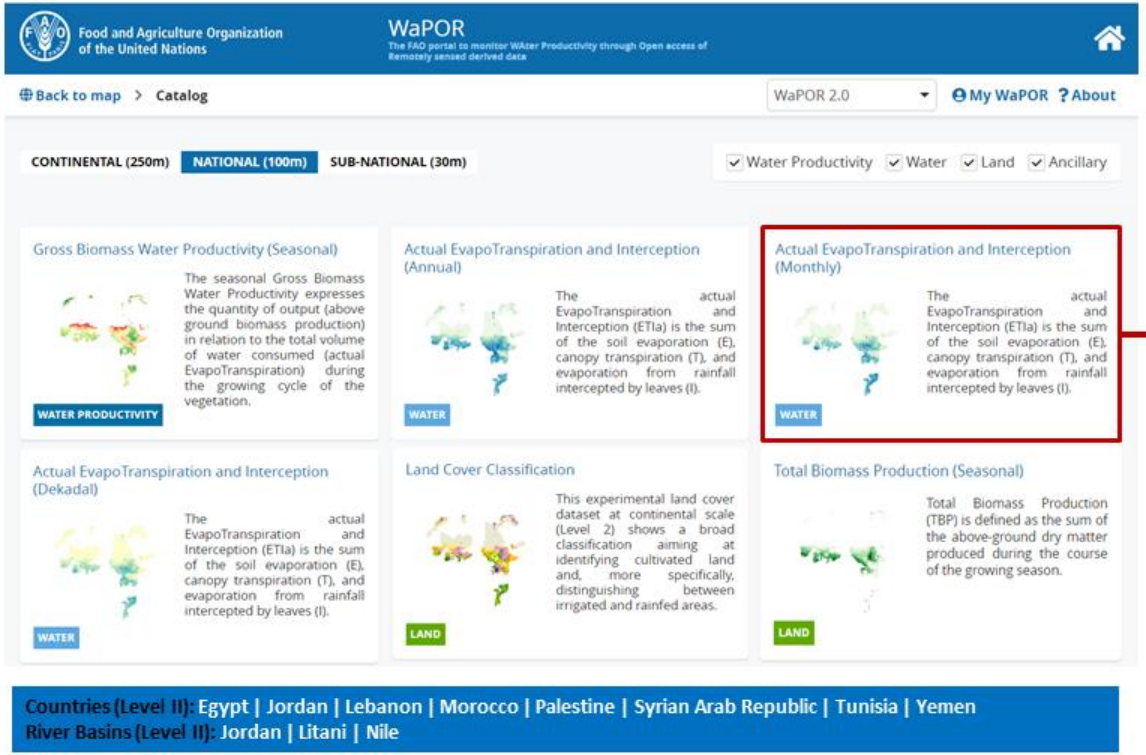
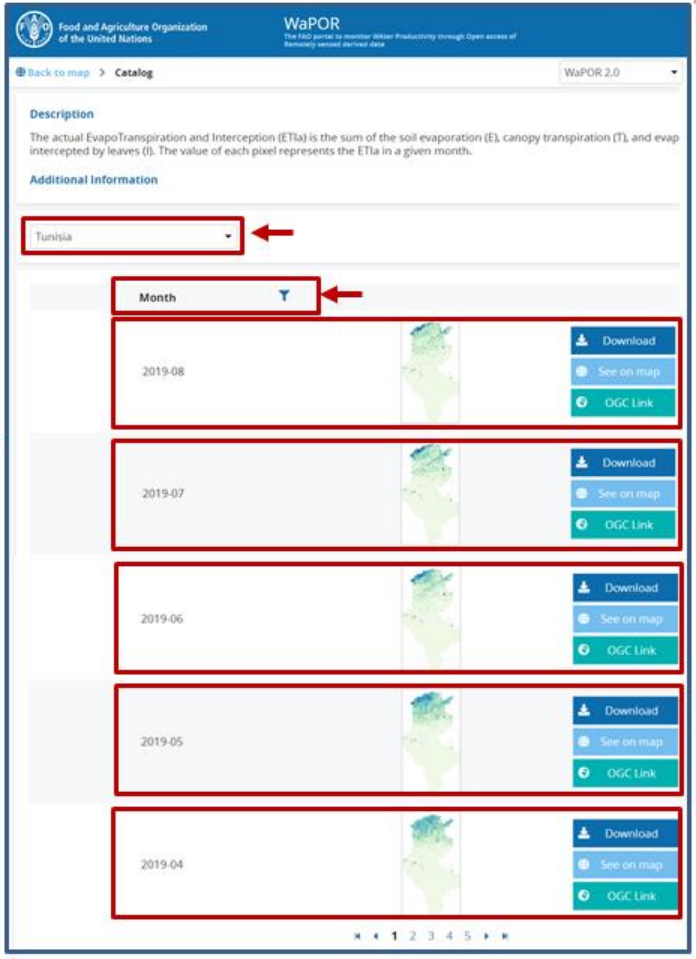
FAO - Water Productivity Open Access Data (WaPOR)





Countries (Level II): Egypt | Jordan | Lebanon | Morocco | Palestine | Syrian Arab Republic | Tunisia | Yemen
River Basins (Level II): Jordan | Litani | Nile

Applications

- Irrigation Areas Water Consumption
- Agricultural Production Change
- Surface Water Change
- Vegetation Monitoring

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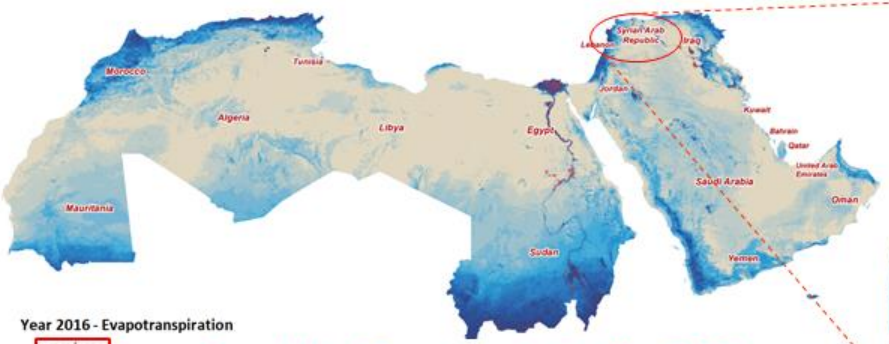
Monitoring Irrigation Areas Water Consumption

Regional Initiative on Water Scarcity

Actual Evapotranspiration (ET) is the amount of water released into the air through **Soil Evaporation (E)** and **Plant Transpiration (T)**



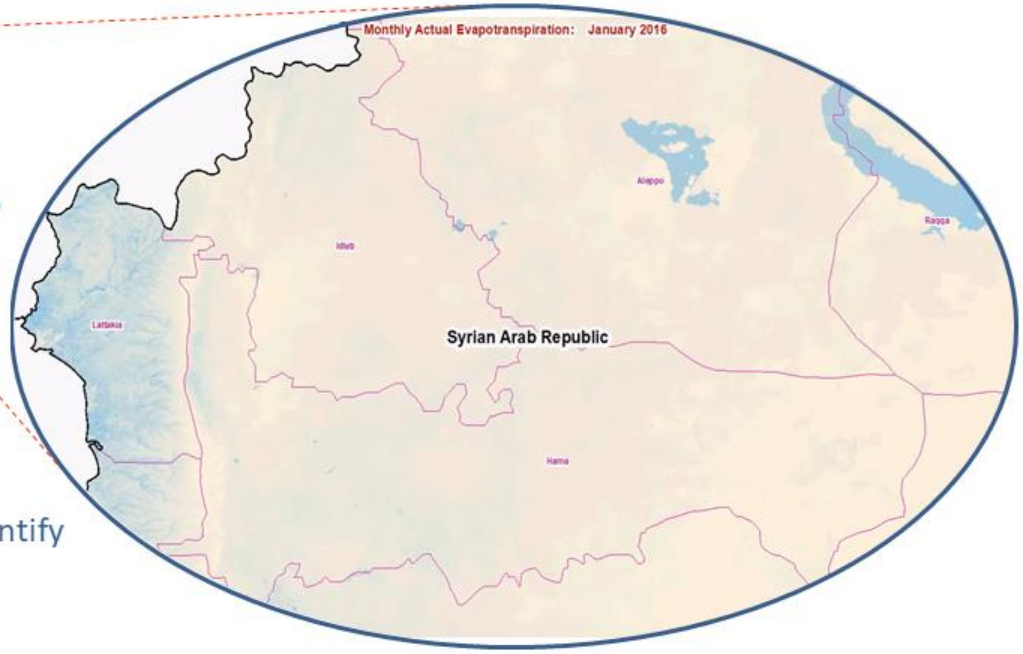
Year 2016 - Evapotranspiration

mm/year

- 0 - 22
- 23 - 52
- 53 - 88
- 89 - 134
- 135 - 194
- 195 - 265
- 266 - 341
- 342 - 423
- 424 - 517
- 518 - 621
- 622 - 734
- 735 - 859
- 860 - 999
- 1,000 - 1,166
- 1,167 - 1,357
- 1,358 - 1,576
- 1,577 - 1,909
- 1,910 - 3,219

Annual Actual Evapotranspiration (Year 2016)

Spatial Resolution: **250m** - Temporal Resolution: **Annual**



Actual Evapotranspiration (ET) can be used to quantify the **agricultural water consumption**

- Daily
- Dekadal (~10 Days)
- Monthly
- Annual

Amount of **Water Consumed** (mm) through **Evapotranspiration** over a year

Low: 0 mm — High: 220 mm

Monthly Actual Evapotranspiration (Year 2016)

Spatial Resolution: **100m** - Temporal Resolution: **Monthly**

Datasets Source: FAO Water Productivity Open Access Portal (WAPOR)

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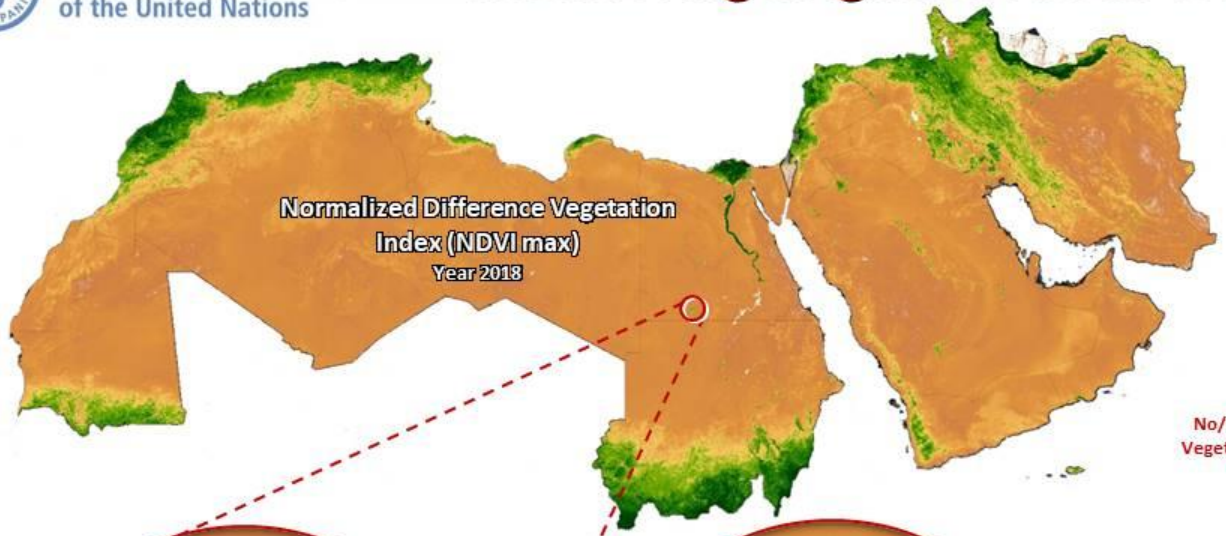
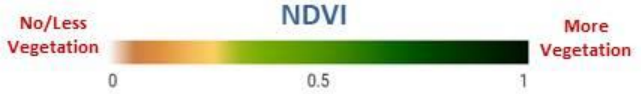
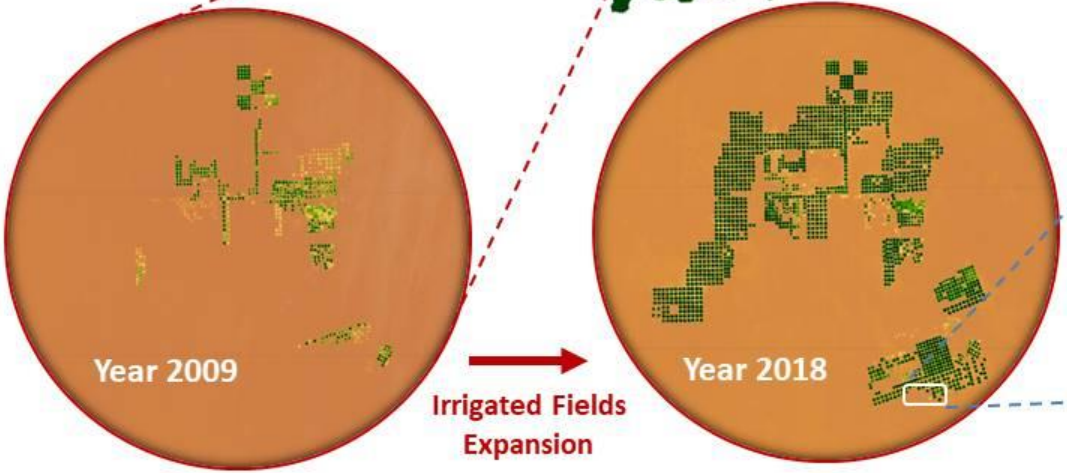
Monitoring Irrigation Areas Water Consumption

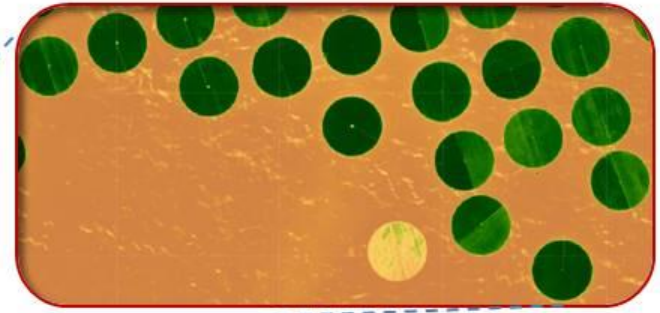
Regional Initiative on Water Scarcity



This area of interest at southern Egypt is irrigated with sprinklers rotating around a central pivot.







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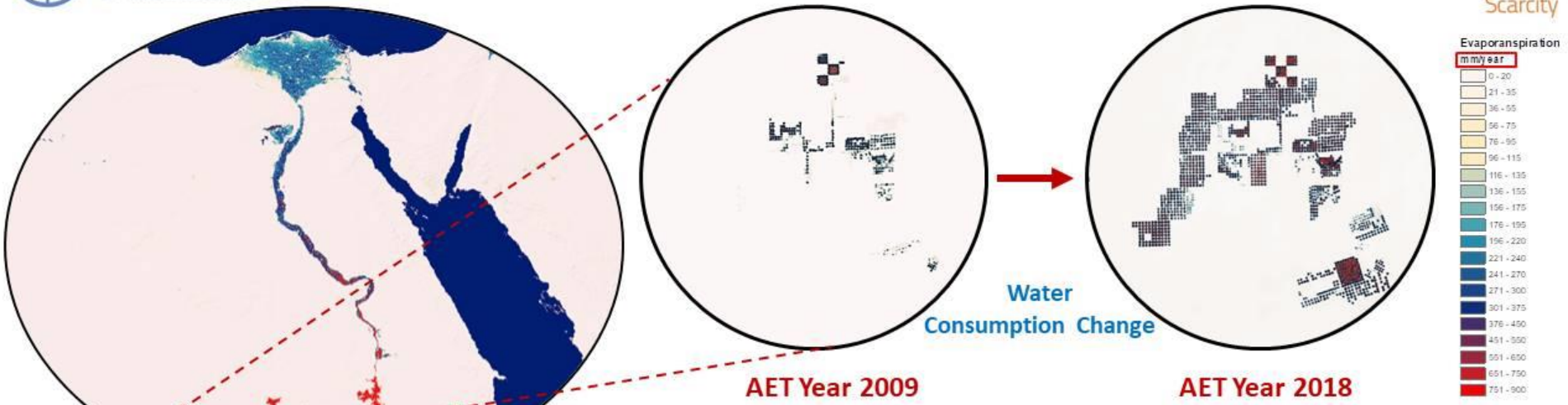
Monitoring Irrigation Areas Water Consumption

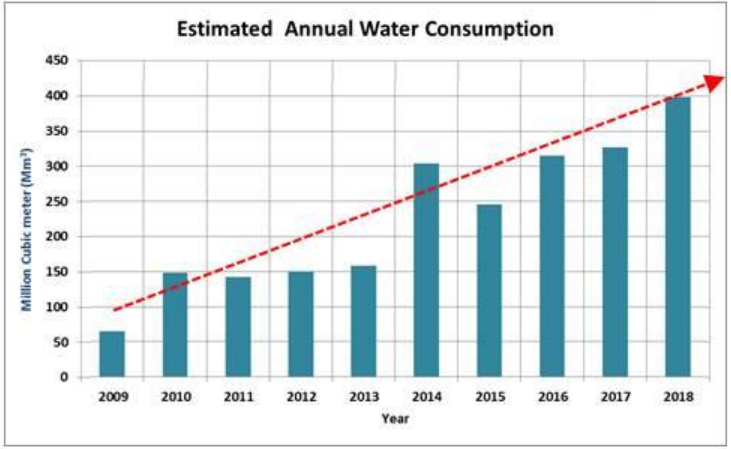
Regional Initiative on Water Scarcity



Actual Evapotranspiration (AET) Year 2009

Amount of **Water Consumed** through **Evapotranspiration** over a year (mm/year)

- Using **AET** the amount of **water withdrawn** from the **Nubian Sandstone Aquifer** could be assessed.
- In **Year 2018**, the estimated **annual water consumption** was about.... **400 million cubic meters.**



Datasets Source: FAO Water Productivity Open Access Portal (WAPOR)

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Applications

- Irrigation Areas Water Consumption
- **Agricultural Production Change**
- Surface Water Change
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Monitoring Agricultural Production Change

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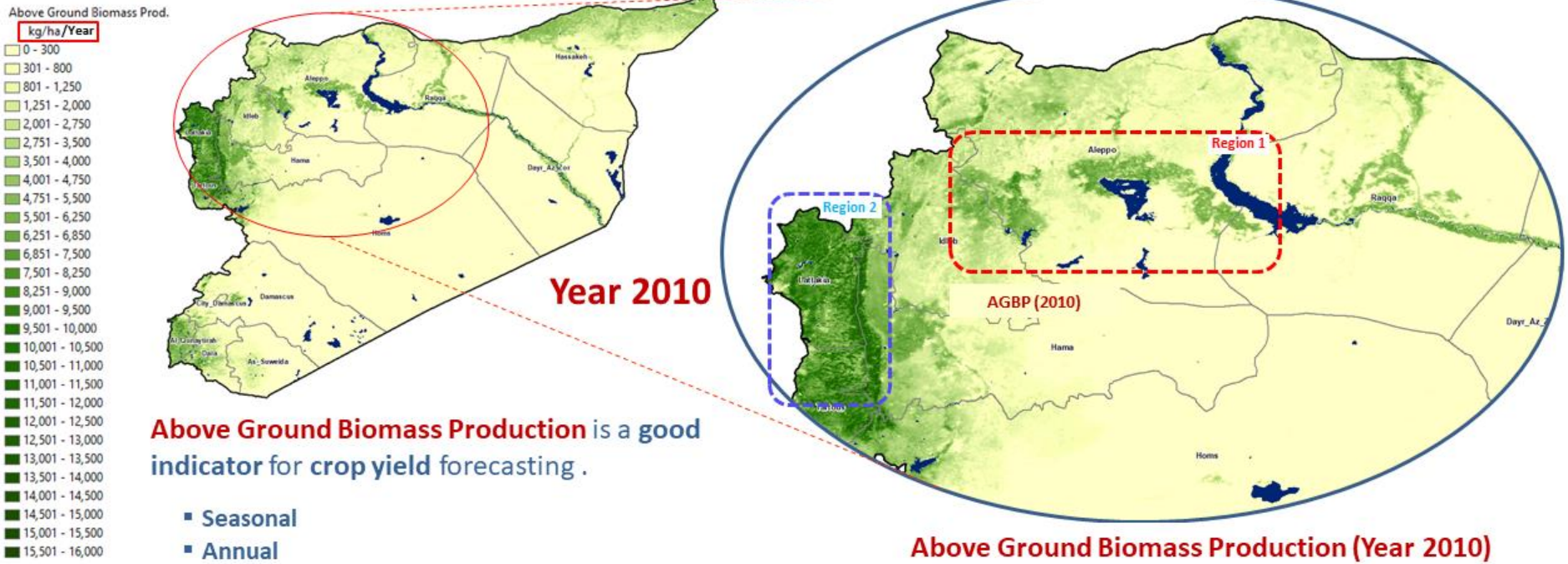
Above Ground Biomass Production (AGBP) is the **biomass accumulated** over a period of time (**crop growing season** or **year**)



Above Ground Biomass Production is a **good indicator** for **crop yield** forecasting .

- **Seasonal**
- **Annual**

Above Ground Biomass Production (Year 2010)

Spatial Resolution: **250m** - Temporal Resolution: **Annual**

The **green areas** of the map are areas where **agricultural productivity** or in **general biomass production** per hectare is **high**

Datasets Source: FAO Water Productivity Open Access Portal (WAPOR)

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Monitoring Agricultural Production Change

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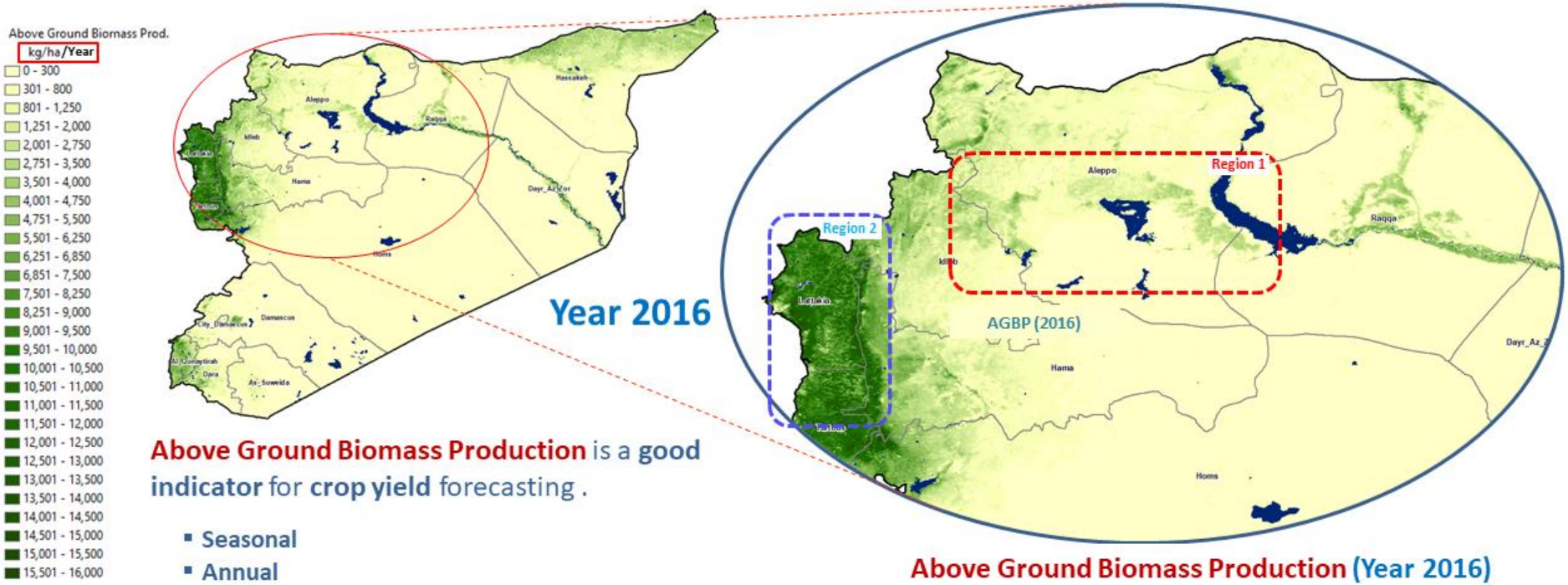

Year 2016

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Monitoring Agricultural Production Change

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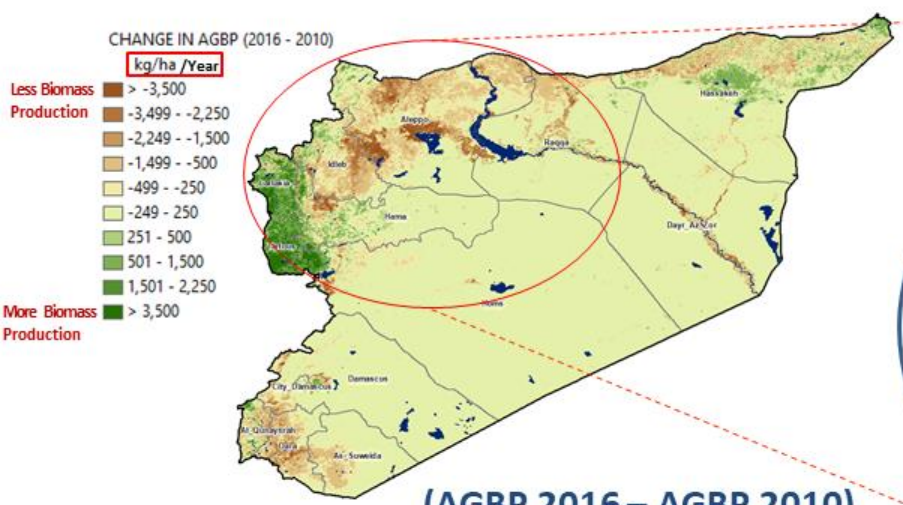
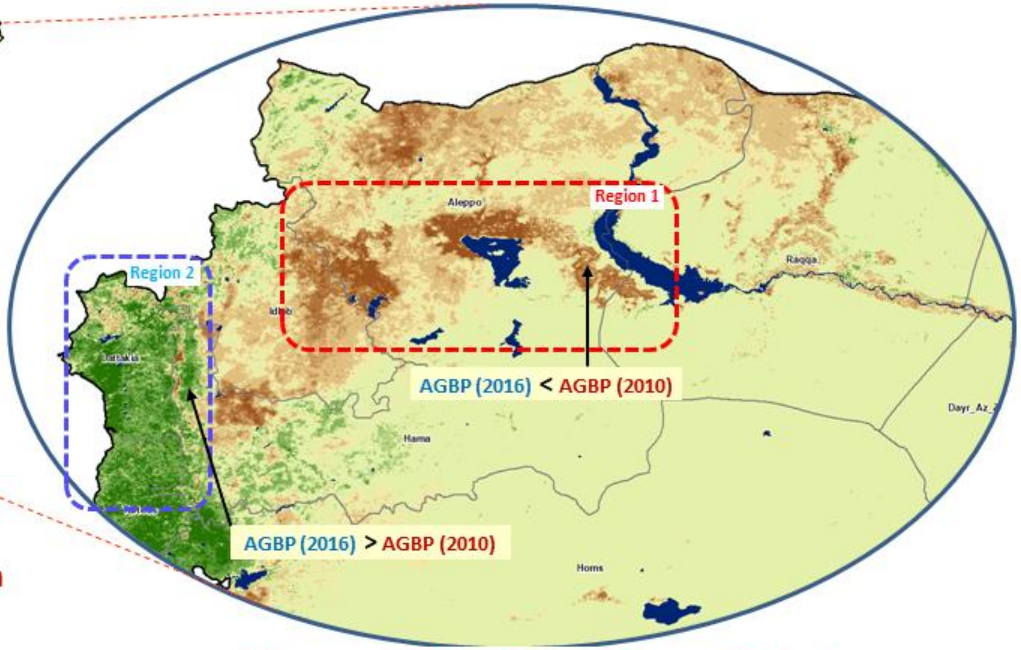


(AGBP 2016 – AGBP 2010)

Difference in Above Ground Biomass Production (Year 2016 – Year 2010)



Difference in Above Ground Biomass Production (Year 2016 – Year 2010)

This map of **Syria** shows the **difference** in ***Biomass Production*** (natural vegetation / cropland) in **Year 2016** compared to **Year 2010**

Spatial Resolution: **250m** - Temporal Resolution: **Annual**

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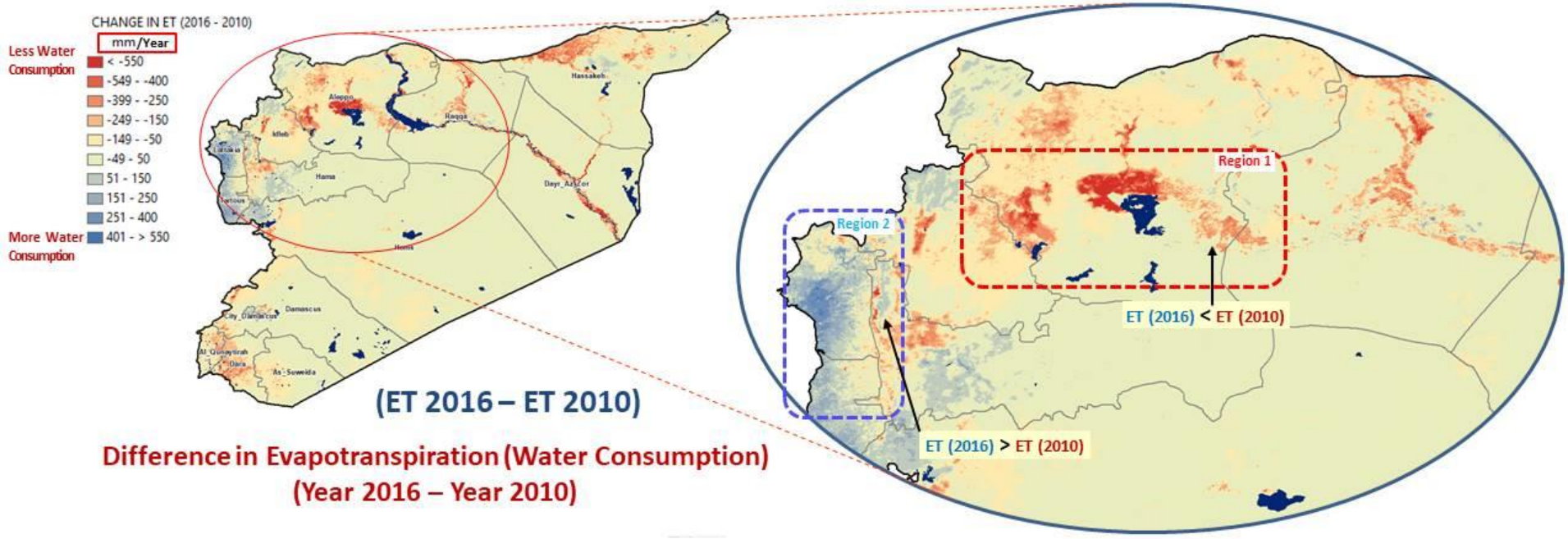
Monitoring Change in Water Consumption

Regional Initiative on Water Scarcity

Actual Evapotranspiration (ET) is the amount of water released into the air through **Soil Evaporation (E)** and **Plant Transpiration (T)**



(ET 2016 – ET 2010)

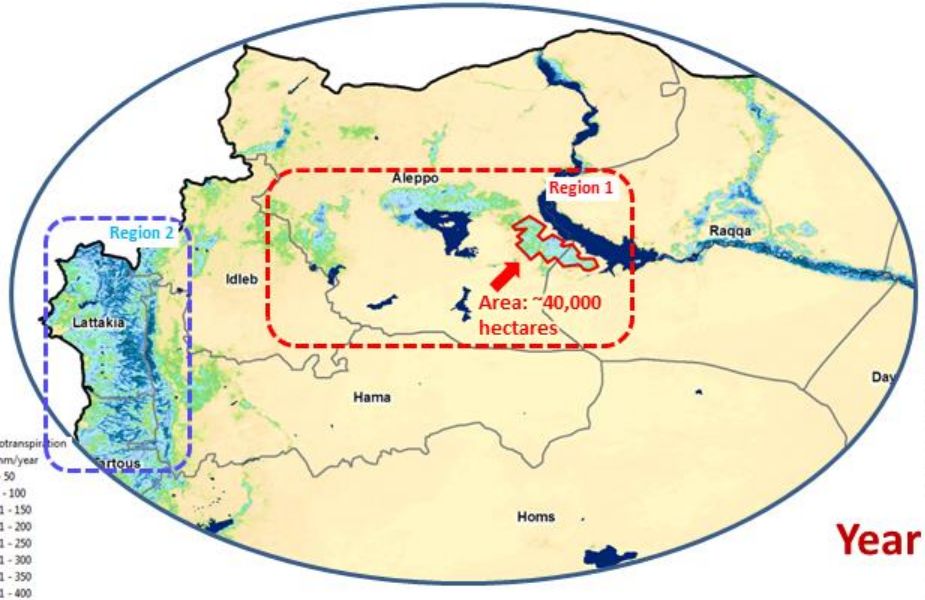
Difference in Evapotranspiration (Water Consumption)
(Year 2016 – Year 2010)

Difference in Evapotranspiration (Water Consumption)
(Year 2016 – Year 2010)

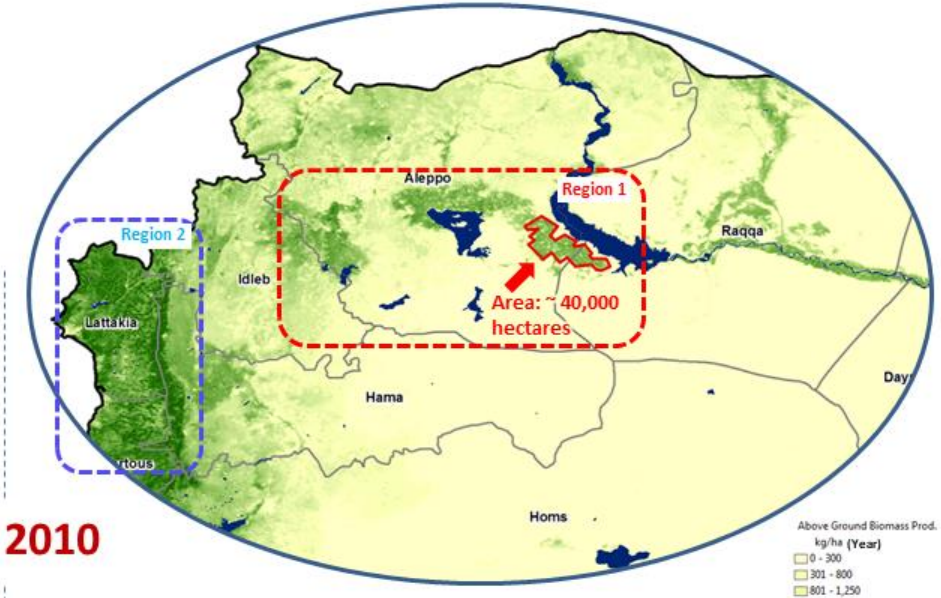
This map of **Syria** shows the difference in ***Water Consumption*** in **Year 2016** compared to **Year 2010**

Spatial Resolution: **250m** - Temporal Resolution: **Annual**

Evapotranspiration (Water Consumption)



Above Ground Biomass Production (AGBP)



Evapotranspiration mm/year
0 - 50
51 - 100
101 - 150
151 - 200
201 - 250
251 - 300
301 - 350
351 - 400
401 - 450
451 - 500
501 - 550
551 - 600
601 - 650
651 - 700
701 - 750
751 - 800
801 - 850
851 - 900
901 - 950
951 - 1,000
1,001 - 1,050
1,051 - 1,100
1,101 - 1,150
1,151 - 1,200
1,201 - 1,250
1,251 - 1,300
1,301 - 1,350
1,351 - 1,450
1,451 - 1,550
1,551 - 1,650
1,651 - 1,750
1,751 - 1,850
1,851 - 1,950

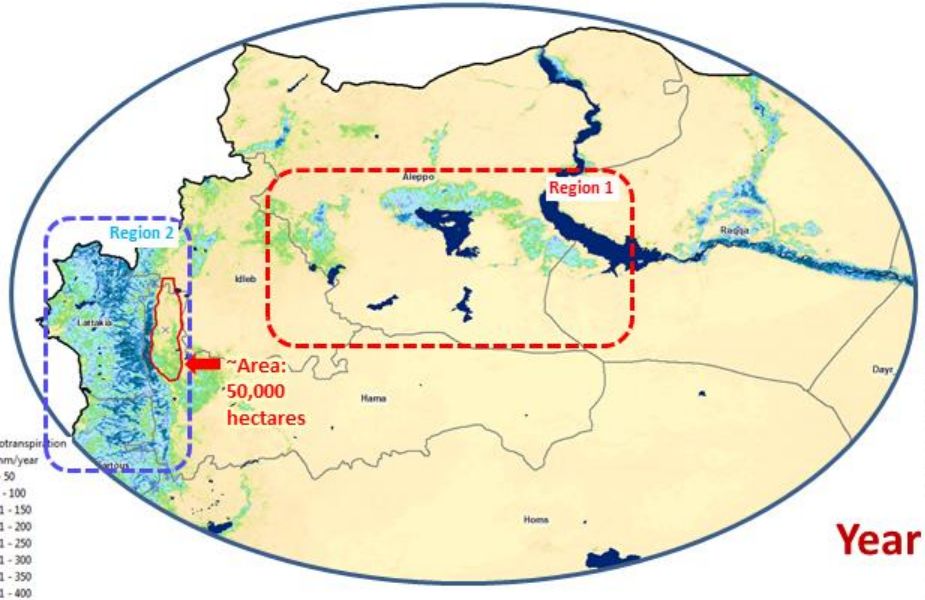
Year 2010

Above Ground Biomass Prod. kg/ha (Year)
0 - 300
301 - 800
801 - 1,250
1,251 - 2,000
2,001 - 2,750
2,751 - 3,500
3,501 - 4,000
4,001 - 4,750
4,751 - 5,500
5,501 - 6,250
6,251 - 6,850
6,851 - 7,500
7,501 - 8,250
8,251 - 9,000
9,001 - 9,500
9,501 - 10,000
10,001 - 10,500
10,501 - 11,000
11,001 - 11,500
11,501 - 12,000
12,001 - 12,500
12,501 - 13,000
13,001 - 13,500
13,501 - 14,000
14,001 - 14,500
14,501 - 15,000
15,001 - 15,500
15,501 - 16,000
16,001 - 17,000

Actual Evapotranspiration – Water Consumption (Annual)

Above Ground Biomass Production (Annual)

Evapotranspiration (Water Consumption)



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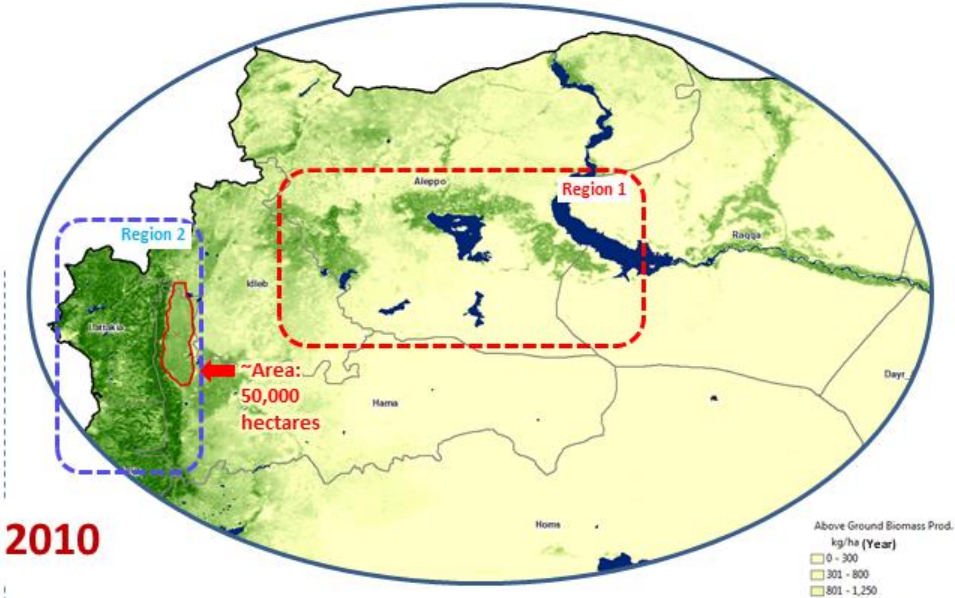
Above Ground Biomass Production (AGBP)



Above Ground Biomass Prod. kg/ha (Year)
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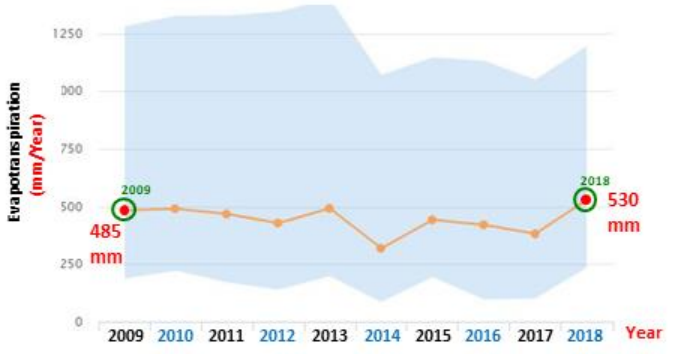
Year 2010

Actual Evapotranspiration – Water Consumption (Annual)



Above Ground Biomass Production (Annual)

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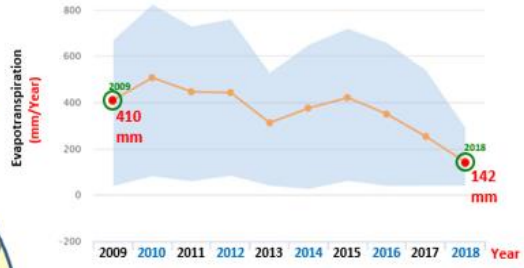
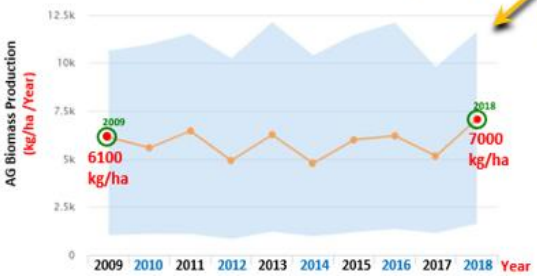
Regional Initiative on Water Scarcity

Actual Evapotranspiration – Water Consumption (Annual)

Actual Evapotranspiration – Water Consumption (Annual)



Above Ground Biomass Production (Annual)



Above Ground Biomass Production (Annual)

Quick First Assessment

Applications

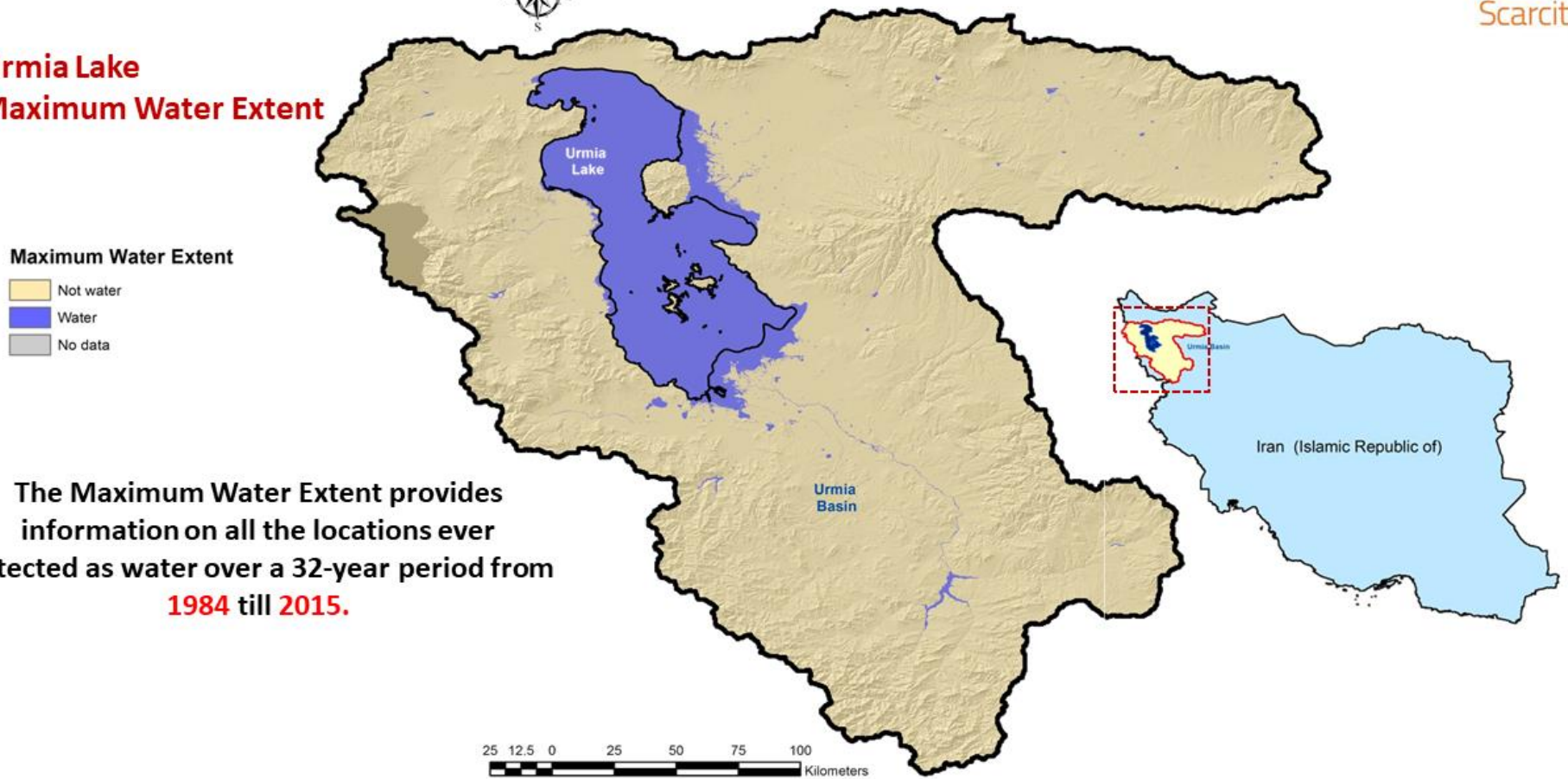
- Irrigation Areas Water Consumption
- Agricultural Production Change
- **Surface Water Change**
- Vegetation Monitoring

Food and Agriculture Organization of the United Nations

Surface Water Change Monitoring

Regional Initiative on Water Scarcity

Urmia Lake
Maximum Water Extent



The Maximum Water Extent provides information on all the locations ever detected as water over a 32-year period from 1984 till 2015.

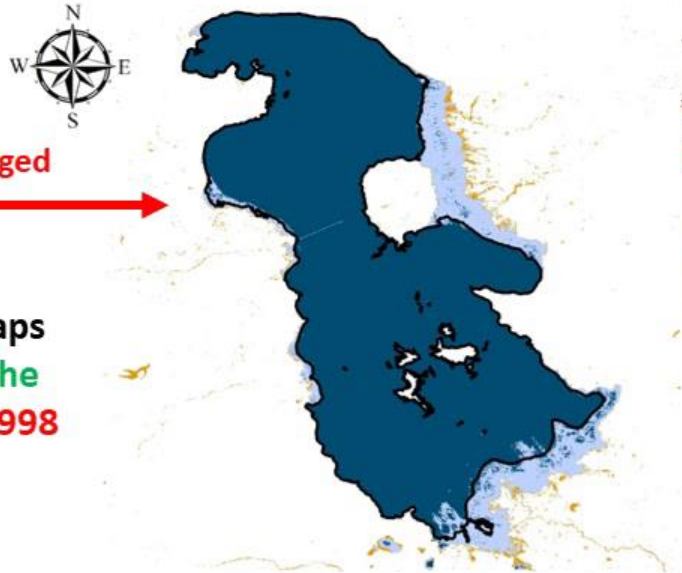
Water Data Source : EC JRC/Google | Administrative Boundaries Source: FAO GAUL Global Administrative Unit Layers (GAUL) 2014 | Lake and Basin Boundaries Source: HydroSHEDS Database

Food and Agriculture Organization of the United Nations

Urmia Lake Yearly History : 1998

Regional Initiative on Water Scarcity

This is how Urmia Lake has changed over the past years

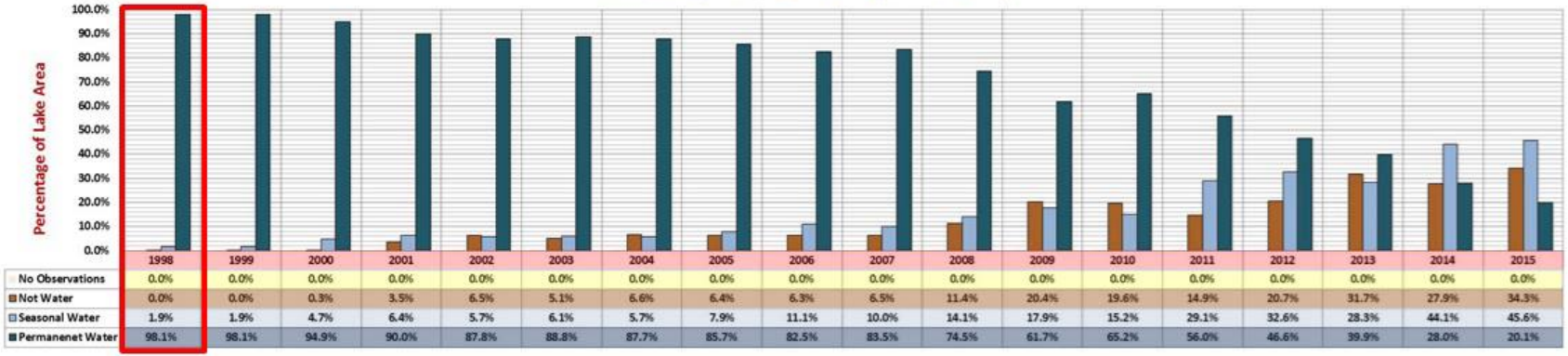


Yearly History (Seasonality of Water)

- No Observations
- Not Water
- Seasonal Water
- Permanent Water

25 12.5 0 25 50
Kilometers

Yearly History RS-derived maps showing the seasonality of the water over the period from 1998 till 2015



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
No Observations	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Not Water	0.0%	0.0%	0.3%	3.5%	6.5%	5.1%	6.6%	6.4%	6.3%	6.5%	11.4%	20.4%	19.6%	14.9%	20.7%	31.7%	27.9%	34.3%
Seasonal Water	1.9%	1.9%	4.7%	6.4%	5.7%	6.1%	5.7%	7.9%	11.1%	10.0%	14.1%	17.9%	15.2%	29.1%	32.6%	28.3%	44.1%	45.6%
Permanenet Water	98.1%	98.1%	94.9%	90.0%	87.8%	88.8%	87.7%	85.7%	82.5%	83.5%	74.5%	61.7%	65.2%	56.0%	46.6%	39.9%	28.0%	20.1%

Water Data Source : EC JRC/Google | Administrative Boundaries Source: FAO GAUL Global Administrative Unit Layers (GAUL) 2014 | Lake and Basin Boundaries Source: HydroSHEDS Database

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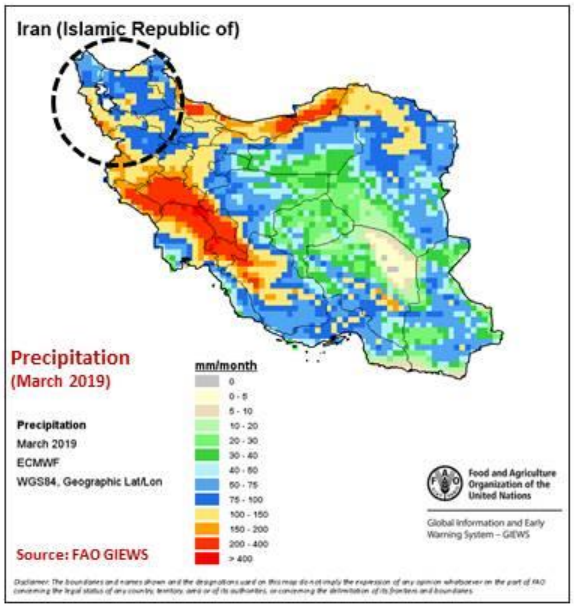
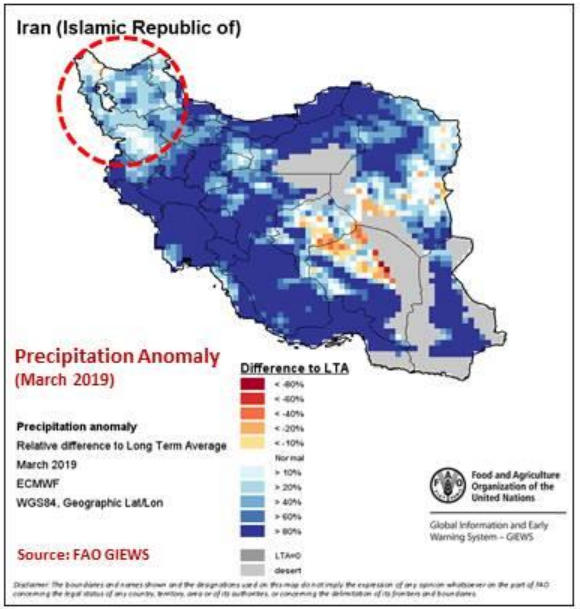
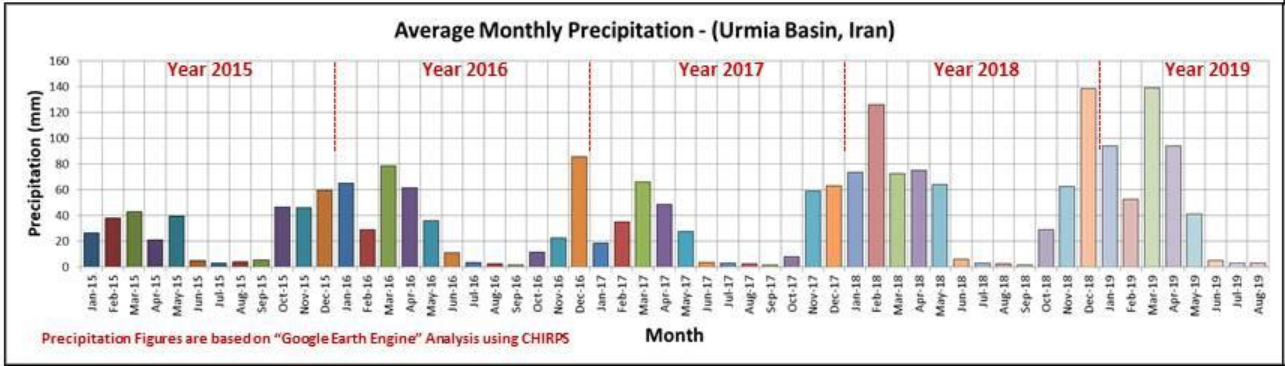
Surface Water Change Monitoring

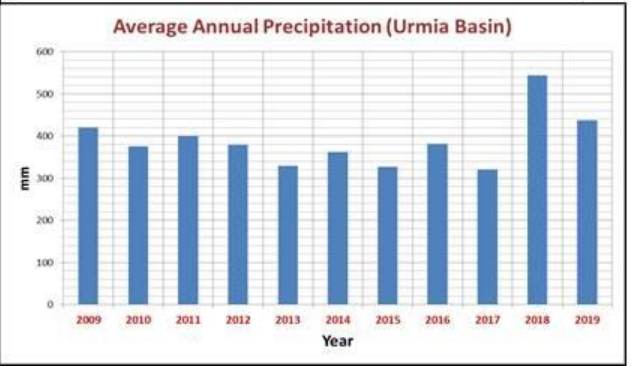
Precipitation Estimation

Satellite-based methods to estimate precipitation can fill the gaps of the ground-based gauge networks, particularly in areas where such network is sparse or non-existent.









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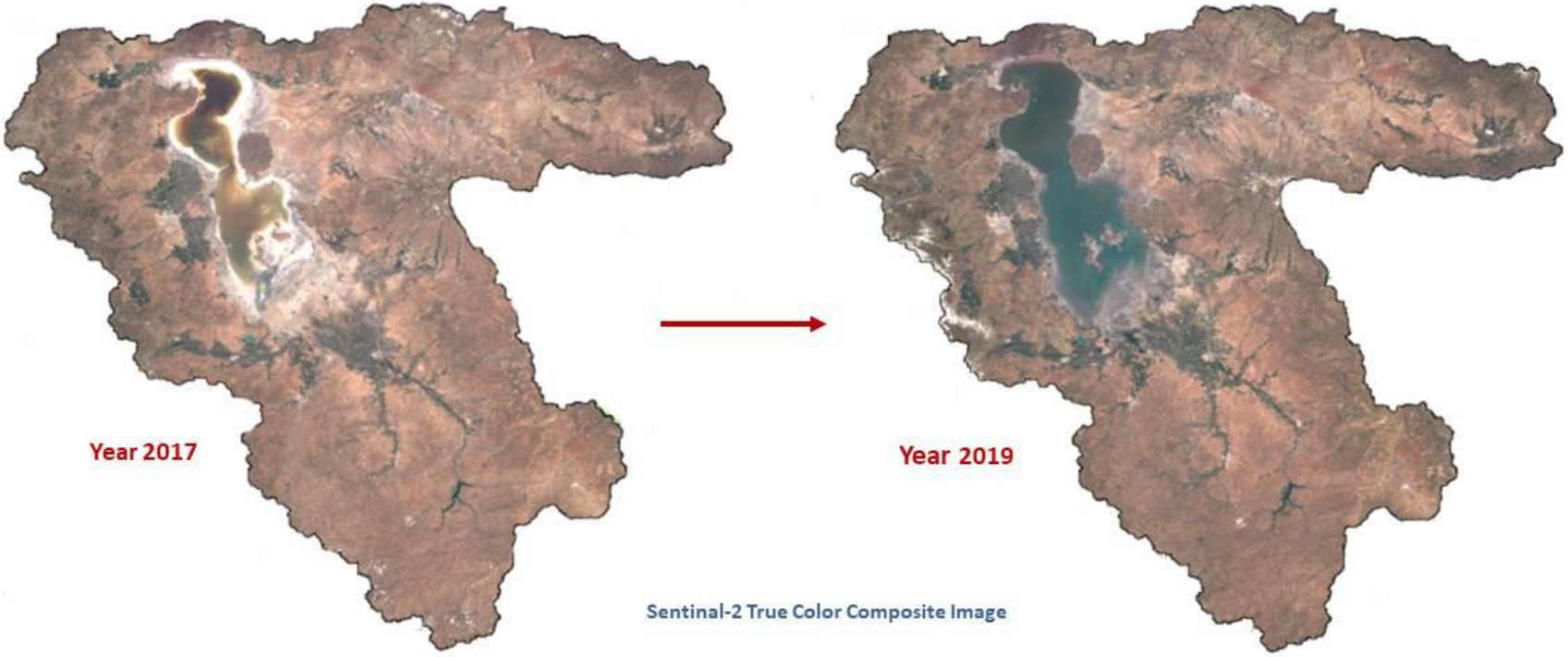
Surface Water Change Monitoring

Regional Initiative on Water Scarcity



Sentinal-2 True Color Composite Image

Applications

- Irrigation Areas Water Consumption
- Agricultural Production Change
- Surface Water Change
- **Vegetation Monitoring**

Food and Agriculture Organization of the United Nations

Vegetation Monitoring

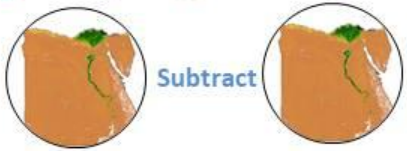
Regional Initiative on Water Scarcity

Live Demonstration: Using Cloud Computing and Big Data

Monitor Change in Vegetation

① *Visual Observation*

② *Image Differencing*

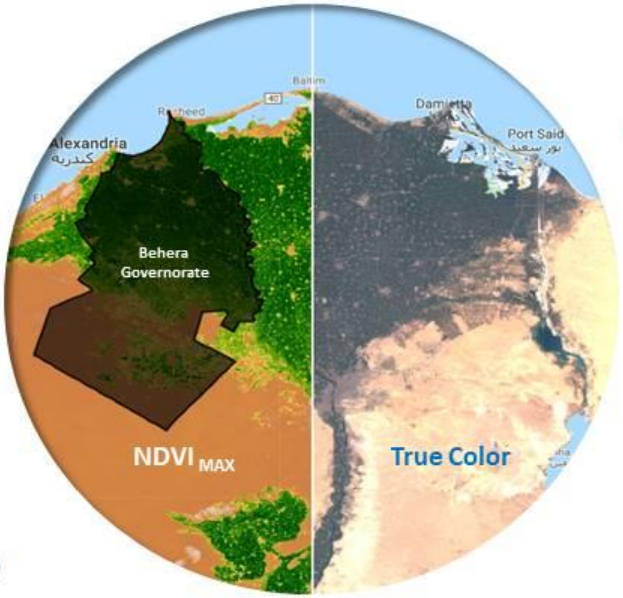


Subtract

Year 2018 - Year 2016

NDVI MAX NDVI MAX

Change



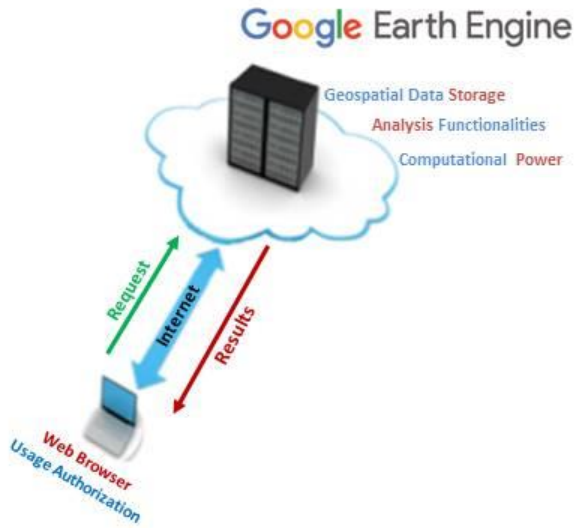
Vegetation Increase

Vegetation Decrease

AREA CALCULATION

Behera Governorate

Access to freely available Satellite Images



The Potential of Earth observation

Main Benefits

Quality improvement

- Improved visualization of phenomena / better insight in actual situation
- **Integration of different layers** of information / Increased amount of data **for analysis**
- Better **insight into cause-effect relations** (add spatial dimension)
- Better informed decision-making and planning
- **Cross checking with ground measurements**
- **Cross country comparisons**

Saving of costs and time

- Cost saving by **limiting need for field inspections** / in-situ observations
- Base layer for field inspections
- Quick first analysis
- **Near-real time information** / Year-round data collection.

Improved process control

- Improved vulnerability assessment / Earlier identification of threats and potential risks
- Improved **preparedness**
- Coverage of unsafe and/or inaccessible areas;
- Increased **detection** rate (of illegal activities)

Source: Earth Observation and Sustainable Development Goals in the Netherlands
Towards more synergetic use of Earth Observation: An exploratory study

The Potential of Earth observation

Main Challenges

Data-related

- High or sufficient resolution imagery (spatial resolution)
- High frequency imagery (temporal resolution)
- Affordable data and data processing
- **In-situ validation**
- **Additional in-situ data**
- Time series (Continuity)

Knowledge and skills-related

- Further development
- **Expert knowledge.**

Marketing-related

- **Buy-in of stakeholders** and Advocacy.
- Scaling up

Infrastructure

- **Internet connectivity**

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The Regional Initiative on Water Scarcity (WSI)

Regional Initiative on Water Scarcity

- **The WSI:** FAO and partners launched in 2013 the WSI to **support the NENA region countries** to strategically plan their water resource management and allocation, review their water, food security and energy policies, formulate effective investment plans, modernize governance and institutions, account for transboundary surface and ground water and adopt good agricultural practices.

- **Regional Project: Implementing the 2030 Agenda for water efficiency/productivity and water sustainability in NENA countries** – in cooperation with the SIDA

  - **Countries:** Algeria, Egypt, Iran, Jordan, Lebanon, Morocco, Palestine and Tunisia.

  - **Aim:** establishing a water accounting system, implementing a series of interventions to increase water efficiency and productivity in selected farming systems , and ensuring sustainable, socially equitable based development.

- **NENA-ETNet: Regional Network for Field Measurement of Actual Crop Water Consumption (Evapotranspiration)**

  - **Countries:** Egypt, Jordan, Lebanon, Morocco, and Tunisia.

  - **Aim:** to establish and operate a NENA Regional Network of specialized Institutions, to conduct field measurements of actual ET, over selected crops, in order to evaluate the accuracy of existing RS based ET estimates.

Other Geospatial Data Sources

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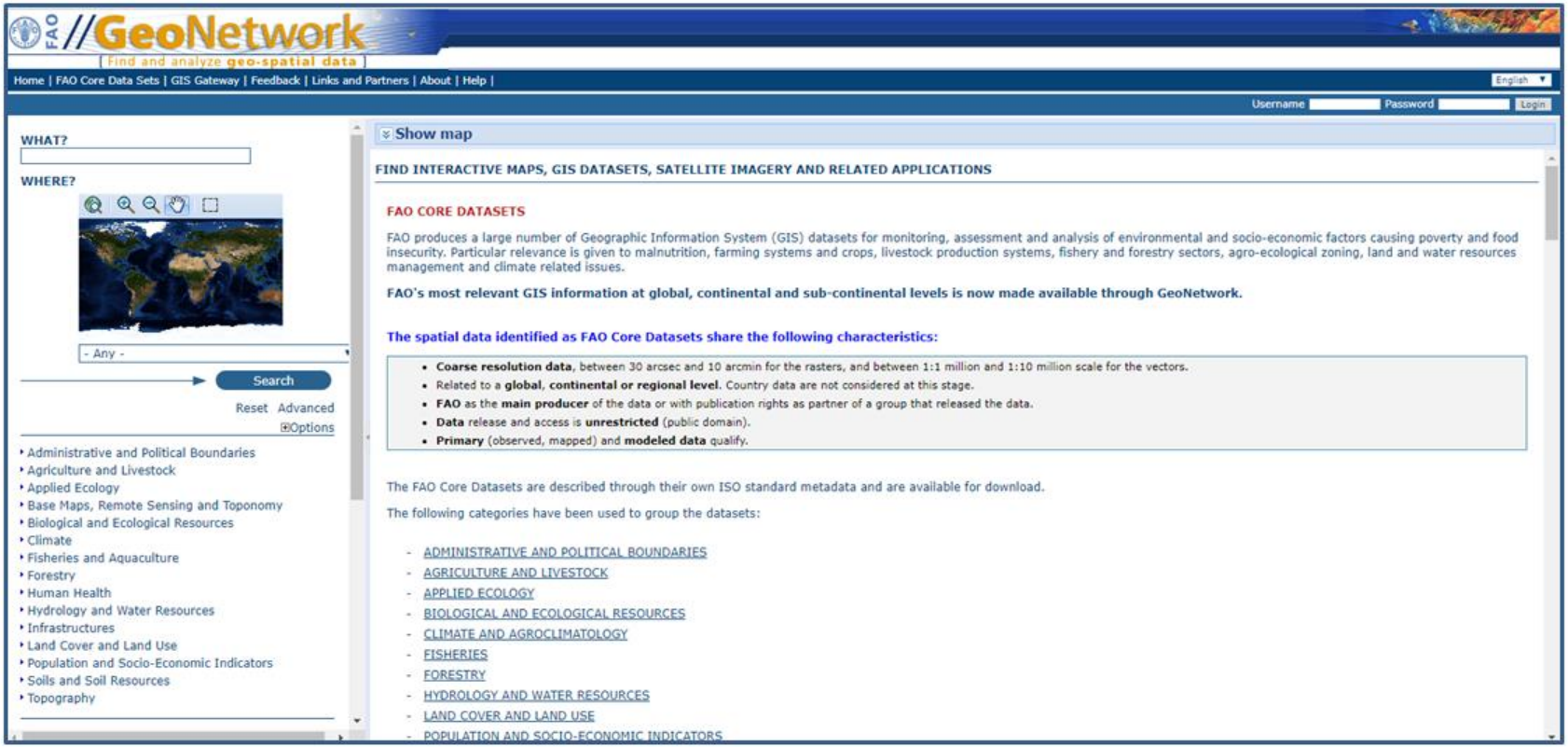
Ready-to-use-Datasets

Regional Initiative on Water Scarcity

- **FAO - Geonetwork**



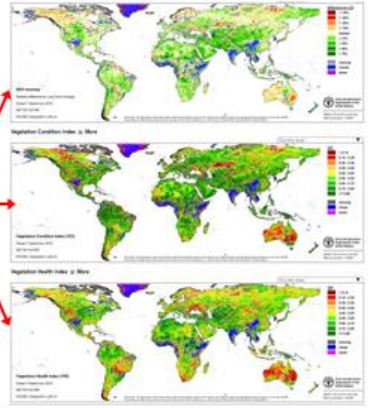
Food and Agriculture Organization of the United Nations

Ready-to-use-Datasets

Regional Initiative on Water Scarcity

- **FAO - Global Information and Early Warning System on Food and Agriculture (GIEWS)**

GIEWS monitors the condition of major food crops across the globe to assess production prospects. To support the analysis and supplement ground-based information, GIEWS utilizes remote sensing data that can provide a valuable insight on water availability and vegetation health during the cropping seasons.



Food and Agriculture Organization of the United Nations

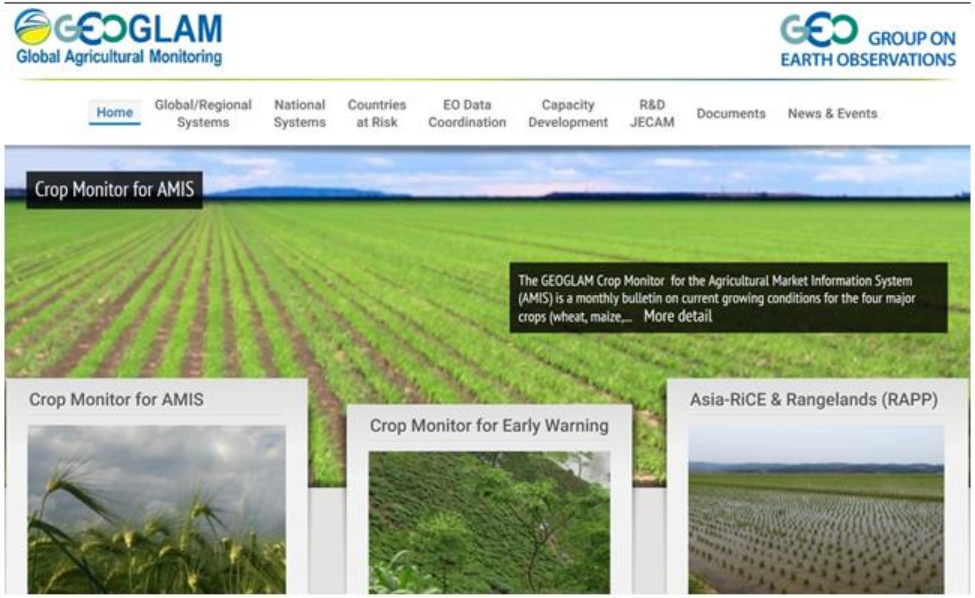
Ready-to-use-Datasets

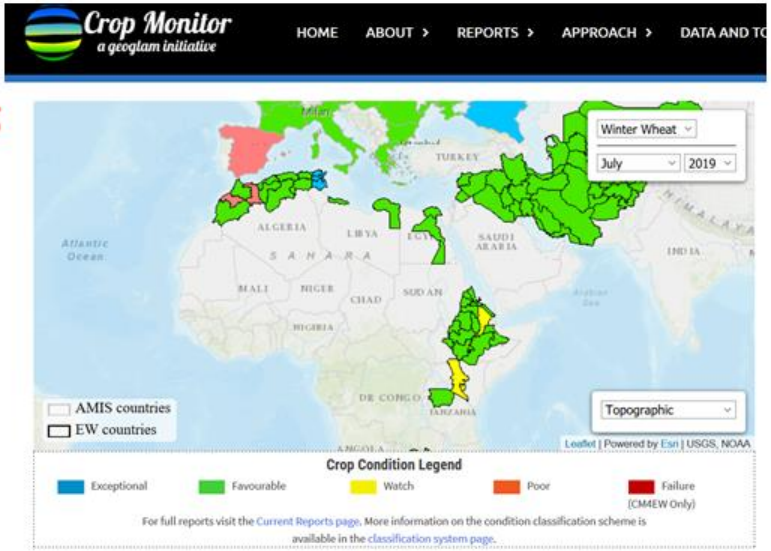
Regional Initiative on Water Scarcity

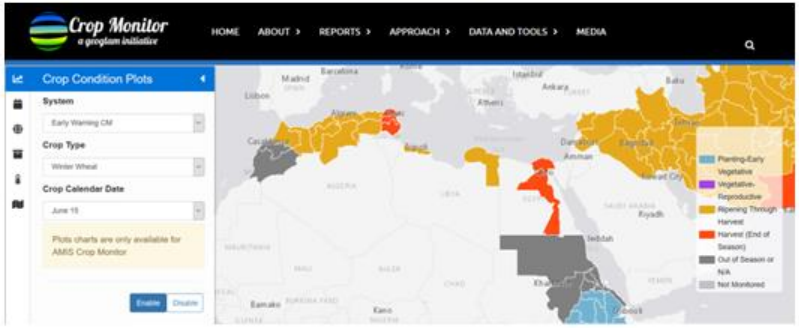
GEOGLAM

Group on Earth Observations Global Agricultural Monitoring

http://www.geoglam.org







https://cropmonitor.org/

Food and Agriculture Organization of the United Nations

Ready-to-use-Datasets

Regional Initiative on Water Scarcity

FEWS NET

The USGS - Famine Early Warning Systems Network

http://www.fews.net

FEWS NET FAMINE EARLY WARNING SYSTEMS NETWORK

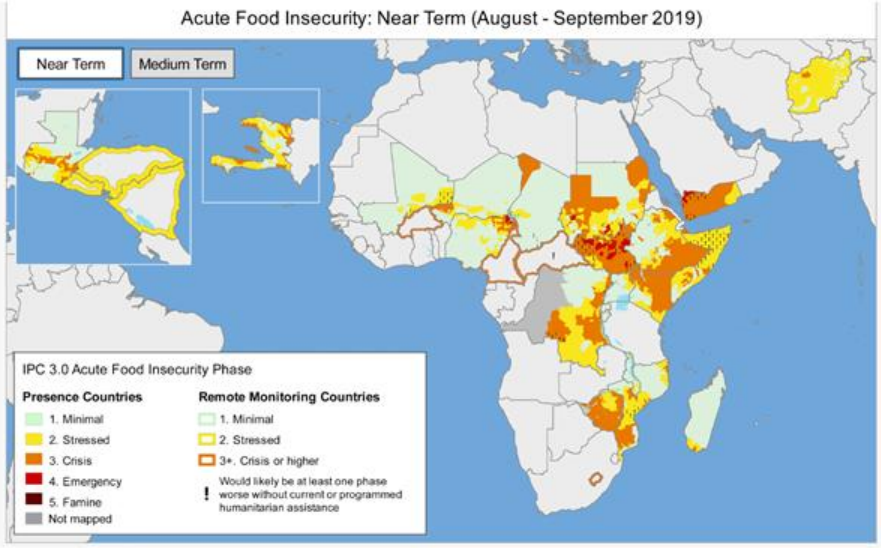
COUNTRIES & REGIONS | SECTORS & TOPICS | DATA & MONITORING | ABOUT US

FEWS NET Data Center

- Food Security Classification
- Administrative Boundaries
- Livelihood Zones
- Remote Sensing Imagery
- Price & Cross-Border Trade

Agroclimatic Monitoring

- From NOAA
- From USGS



The USGS FEWS NET Data Portal provides access to geo-spatial data, satellite image products, and derived data products in support of FEWS NET drought monitoring efforts throughout the world. This portal is provided by the USGS FEWS NET Project, part of the Early Warning Focus Area at the USGS Earth Resources Observation and Science (EROS) Center.

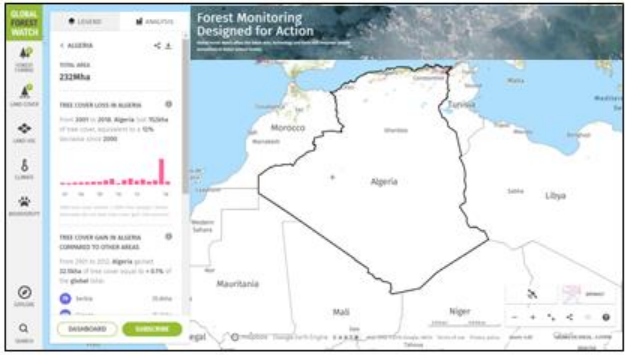
Food and Agriculture Organization of the United Nations

Ready-to-use-Datasets

Regional Initiative on Water Scarcity

The Global Food Security Analysis-Support Data at 30 meters (GFSAD30) project, led by USGS - https://croplands.org

Global Forest Watch (GFW) …. near real-time forest monitoring
https://www.globalforestwatch.org



The largest data archives and global coverage missions can be found online at:

Landsat:
earthexplorer.usgs.gov

Copernicus Sentinels Open Access Hub:
scihub.copernicus.eu

Copernicus services:
copernicus.eu/main/services

NASA missions:
earthdata.nasa.gov/earth-observation-data

NOAA Satellite and Information Service:
www.nesdis.noaa.gov/content/imagery-and-data

EUMETSAT mission data:
www.eumetsat.int/website/home/Data/DataDelivery/OnlineDataAccess/index.html

JAXA mission data:
www.eorc.jaxa.jp/en

Thank You

Questions?