APCTT
Asian and Pacific Centre
for Transfer of Technology
ESCAP

University of Tehran

Ministry of Science, Research & Technology
Iranian Research Organization
for Science and Technology

# Climate Change Risk Management for Sustainability in Iran

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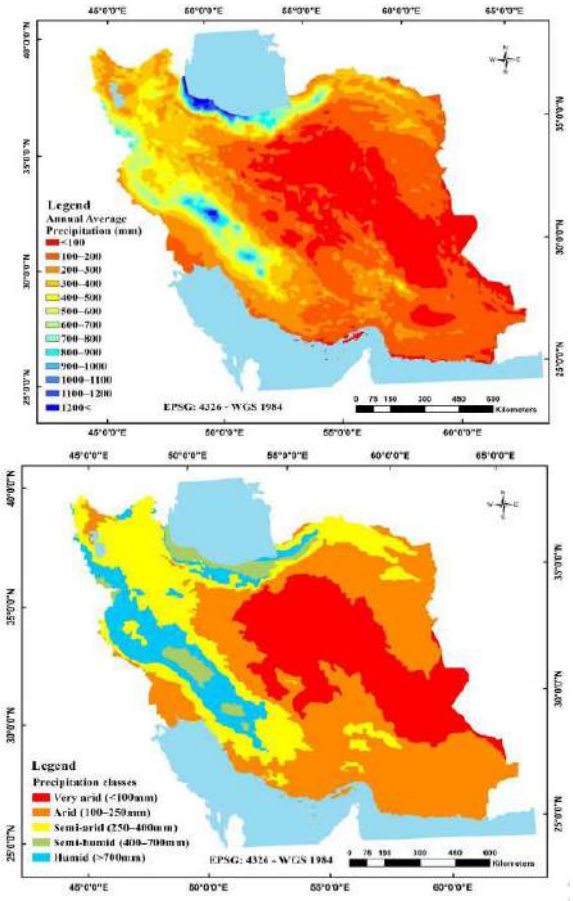
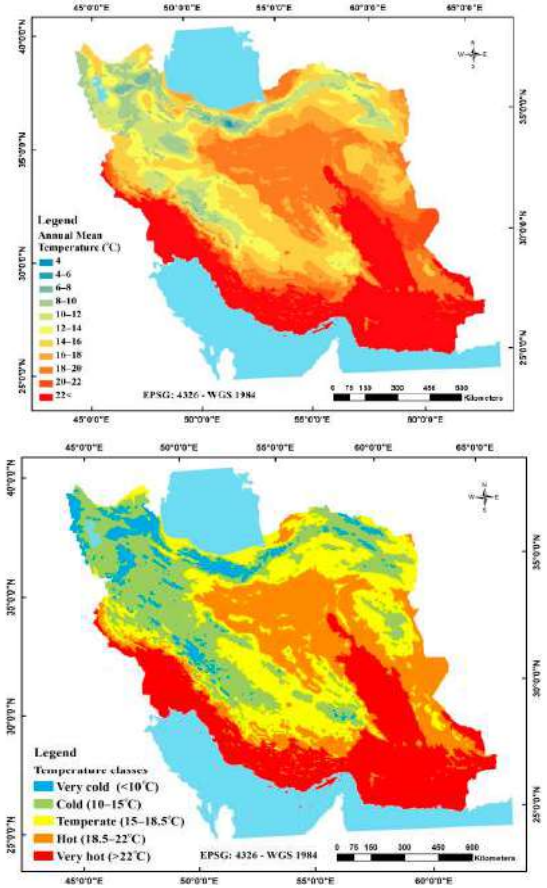
# Iran's climate




**Spatial variability of the annual average precipitation and its qualitative classes**

(Asadi Oskouei et al., 2022)




**Spatial variability of the annual mean temperature and its qualitative classes**

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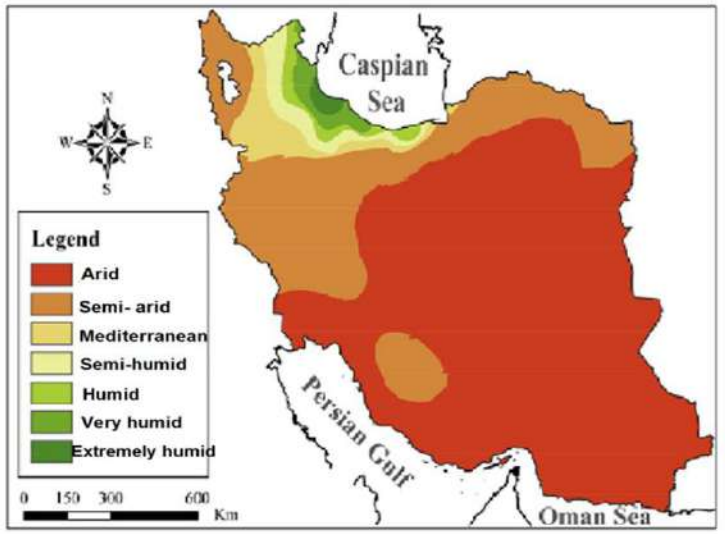
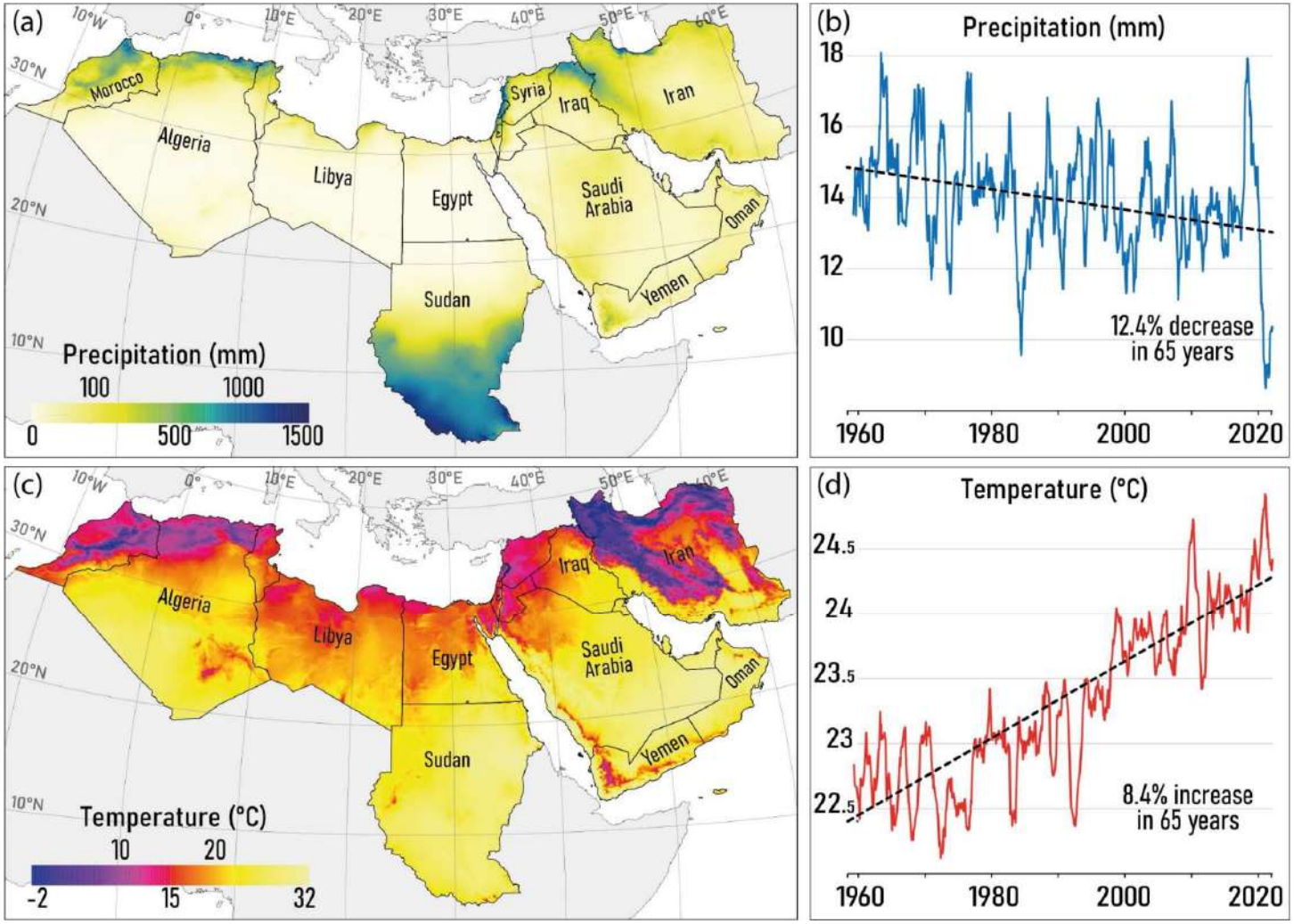



the climate classification of Iran based on De Martonne climate type (1966- 2005) (Tabari *et al*., 2014)

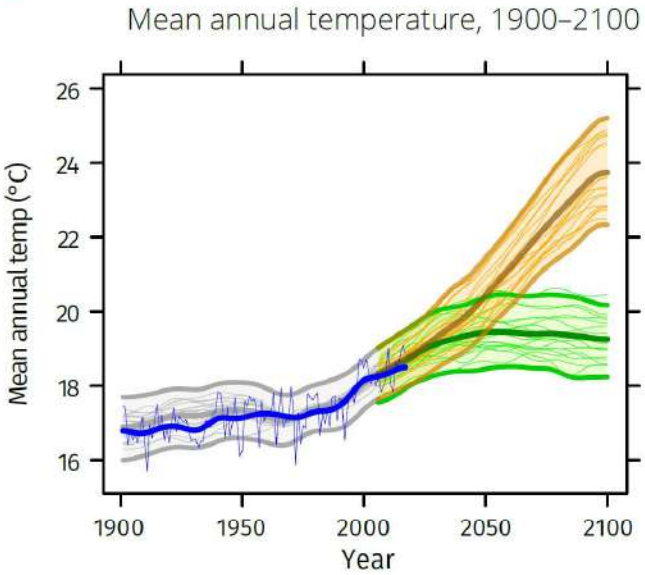
- Iran has 7 climatic zones varying from Arid to Extremely humid.
- Most part of Iran is classified among the arid and semi-arid region.

# Climate Change in MENA and IRAN



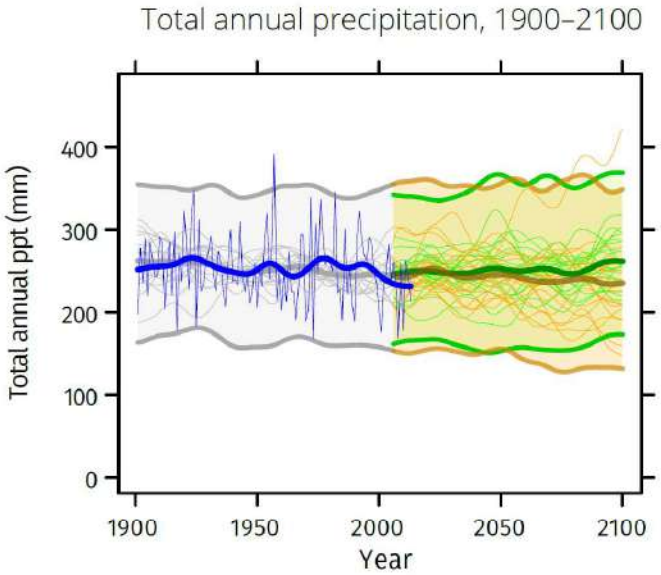
# Projections of Climate Changes in the mid- and end-of-century horizon (future conditions)

## Rising temperature




Under a high emissions scenario, the mean annual temperature is projected to rise by about 5.2°C on average by the end-of-century (i.e. 2071–2100 compared with 1981–2010). If emissions decrease rapidly, the temperature rise is limited to about 1.5°C.

## Little change in total precipitation

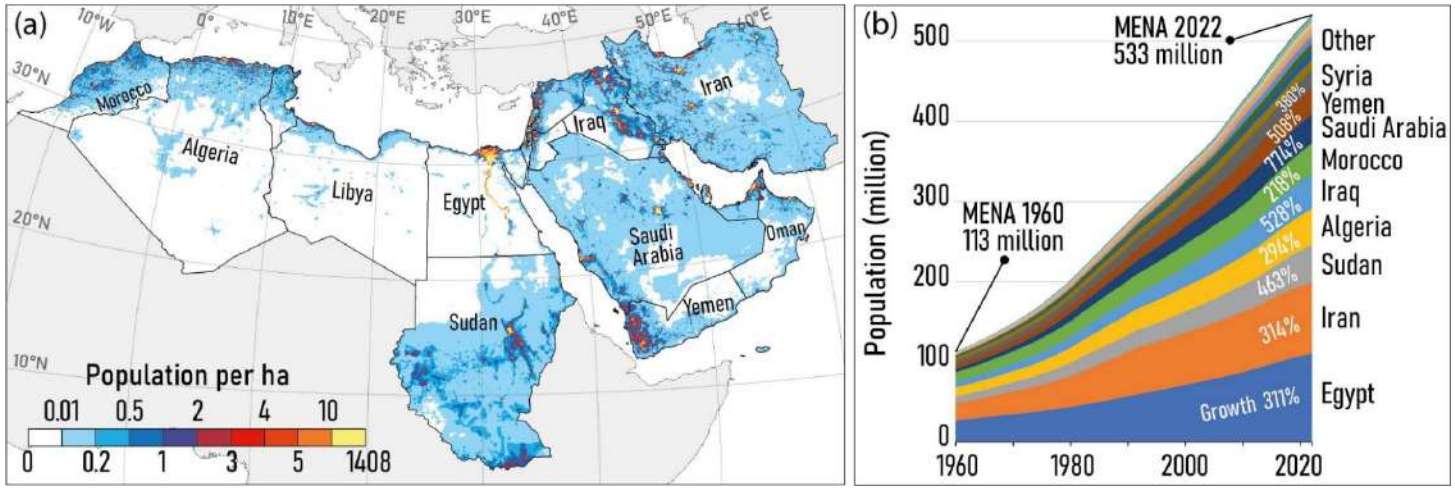


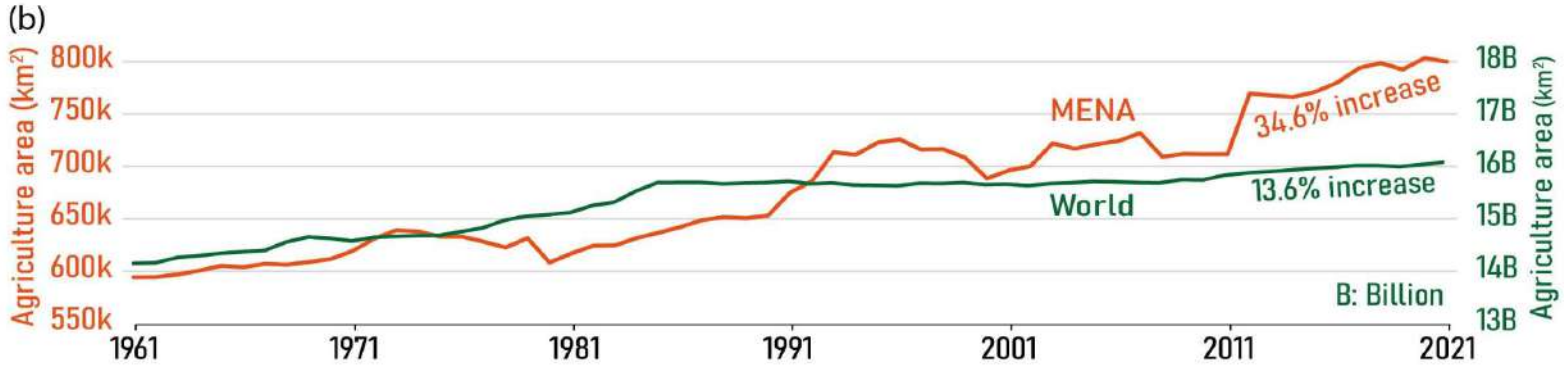

Total annual precipitation is projected to remain almost unchanged on average under a high emissions scenario, although the uncertainty range is large (-24% to +21%). If emissions decrease rapidly, there is a projected change of -5% to +15%.

World Health Organization

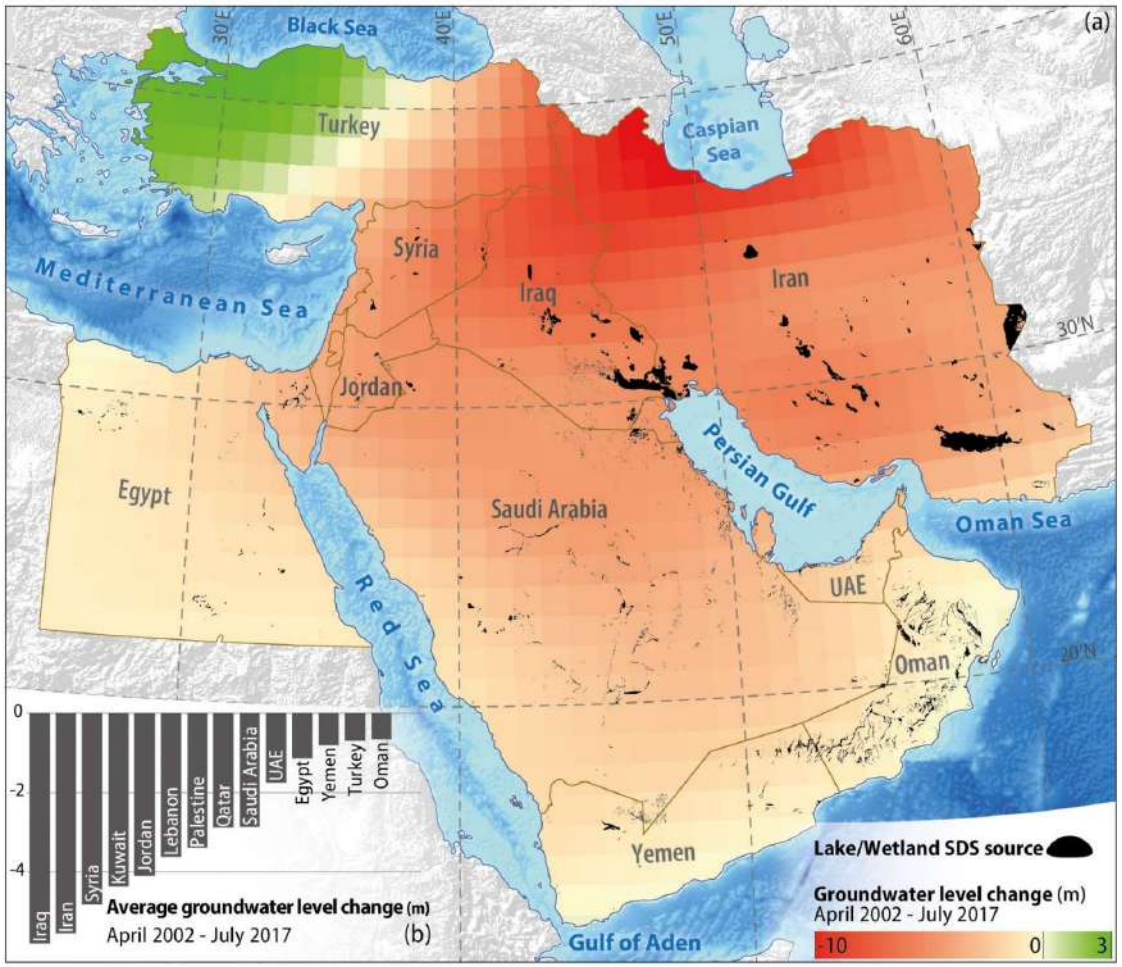
United Nations Framework Convention on Climate Change

# Population growth despite the decrease in rainfall and increase in agricultural area

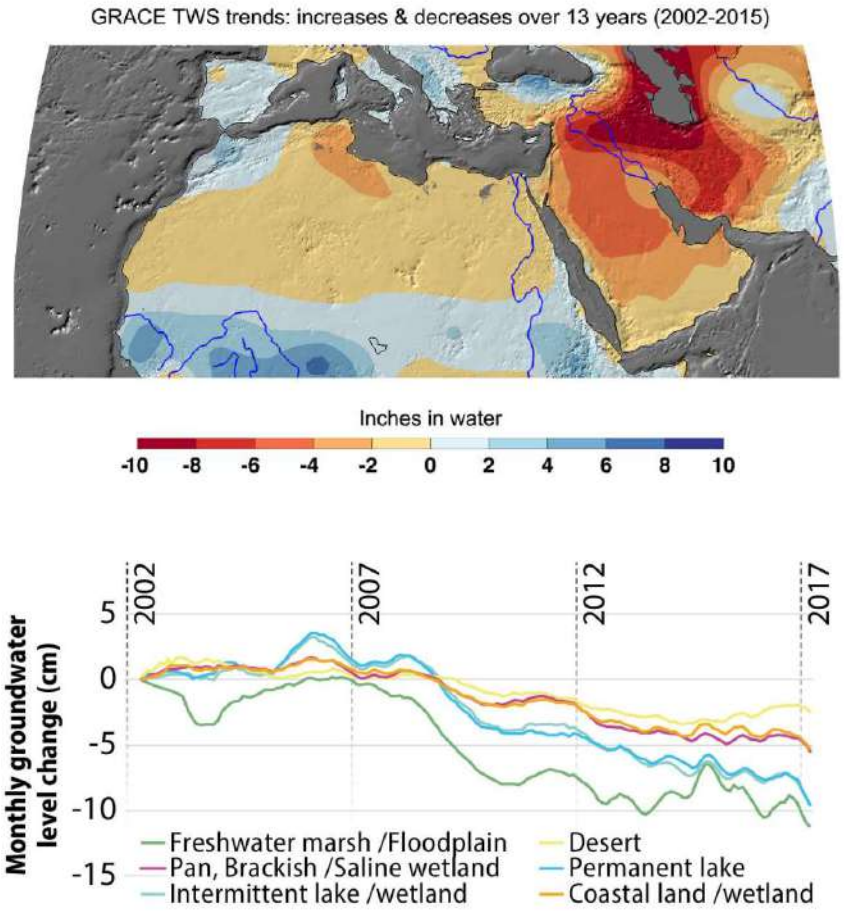


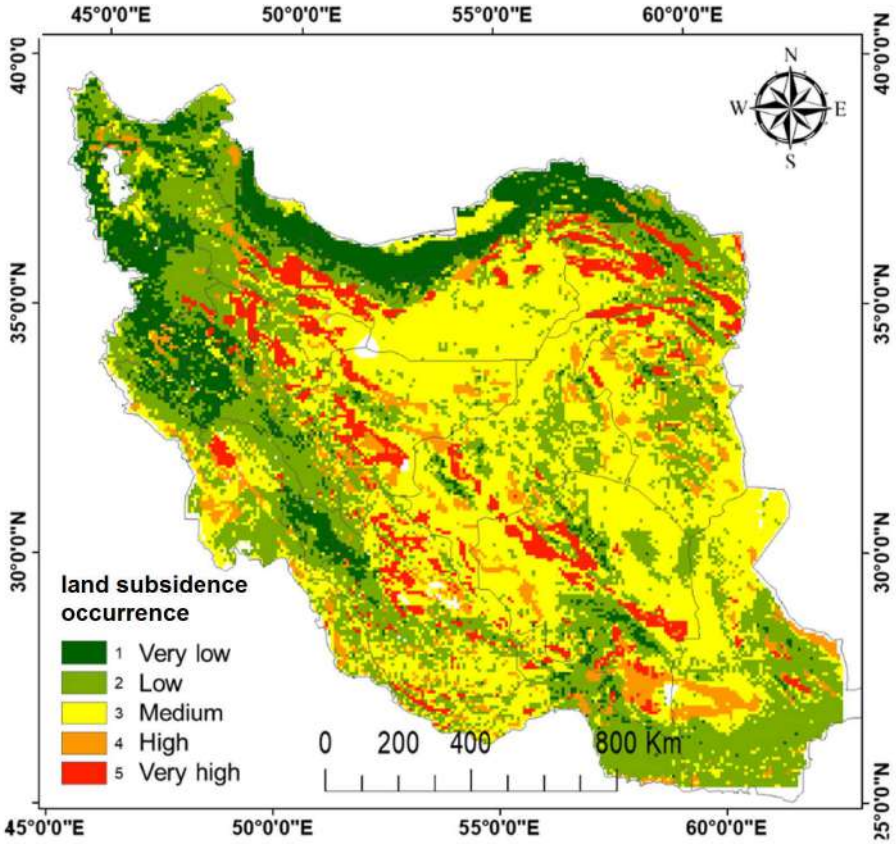
## Groundwater level Change




## Cumulative Total Freshwater Losses



# Expansion of subsidence in the country



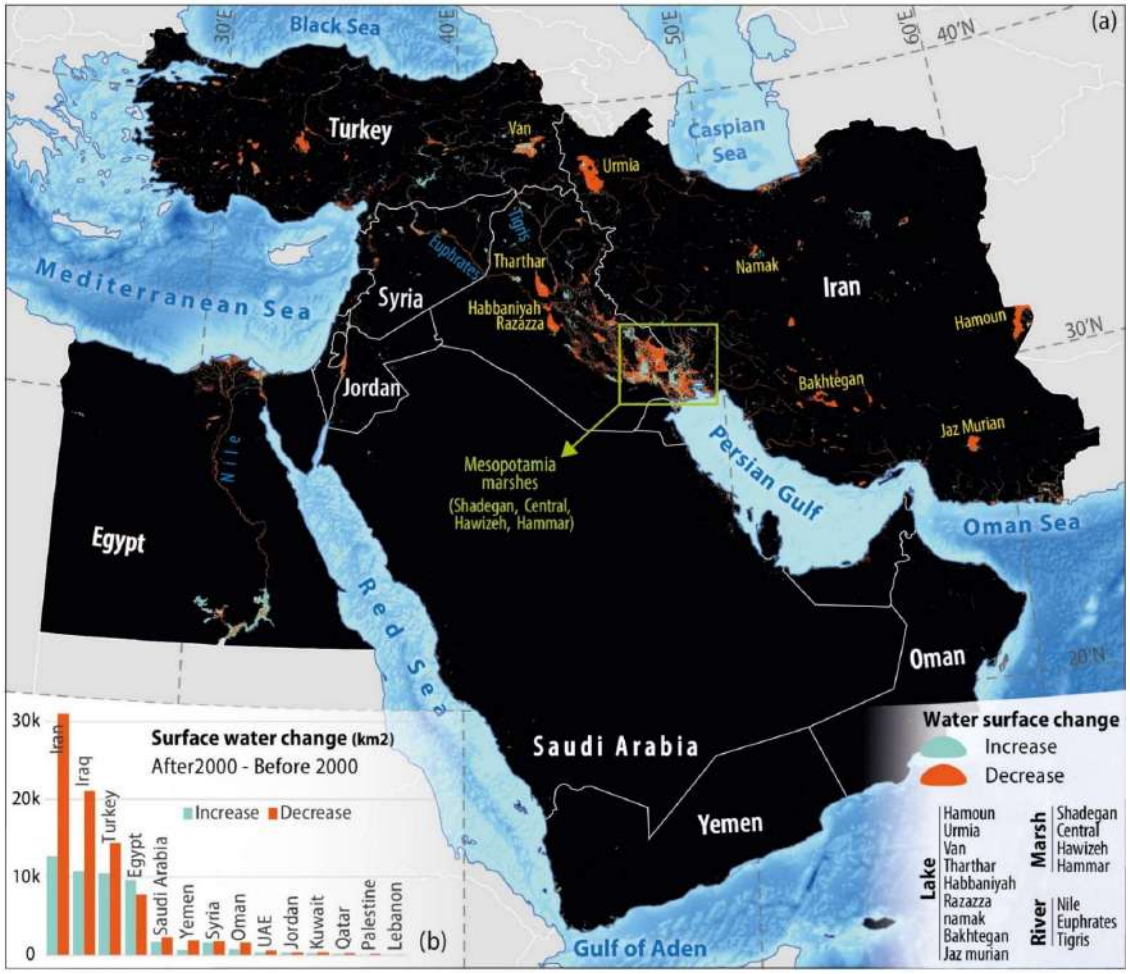

**Classifying the level of land subsidence occurrence (Sadeghi et al., 2023)**

# Changes in the area of natural glaciers in Iran over the past 12 years


**Natural glaciers of Iran**

| Glacier | Area in 2010 (km2) | Area in 2022 ($km^2$) | Changes % |
|---|---|---|---|
| Takht Soleyman | 9/75 | 10/18 | %4 |
| Sabalan | 8/57 | 6/65 | -%22 |
| Zardkooh | 10/21 | 5/35 | -%47 |
| Damavand | 2/11 | 1/65 | -%21 |
| Oshtorankoh | 4/21 | 2/7 | -%36 |
| Sayalan | 3/85 | 2/58 | -%33 |
| Shahalborz | 2/13 | 2/13 | -- |
| Dena | 0/82 | 1/96 | %131 |
| Kholeno | 0/87 | 1/06 | %23 |
| Doberar | 0/16 | 0/14 | -%12 |
| Alvand | 0/28 | 0/04 | -%85 |
| SUM | 42/9 | 34/72 | -%19 |

# Surface Water Change



# Climate Risk Assessment

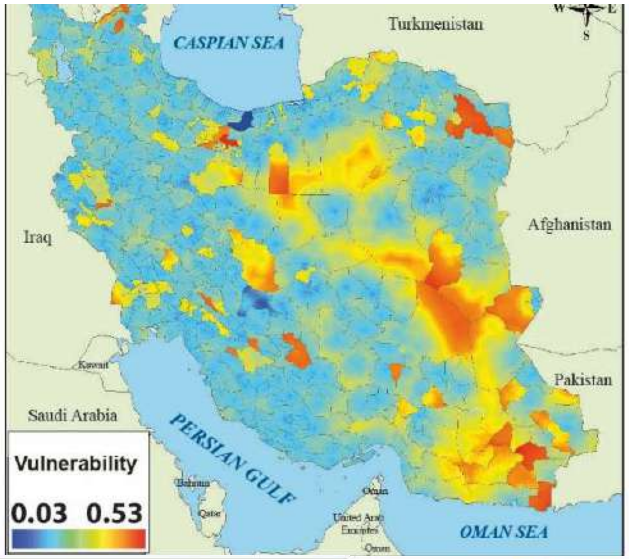
a) AR5 IPCC Risk Framework

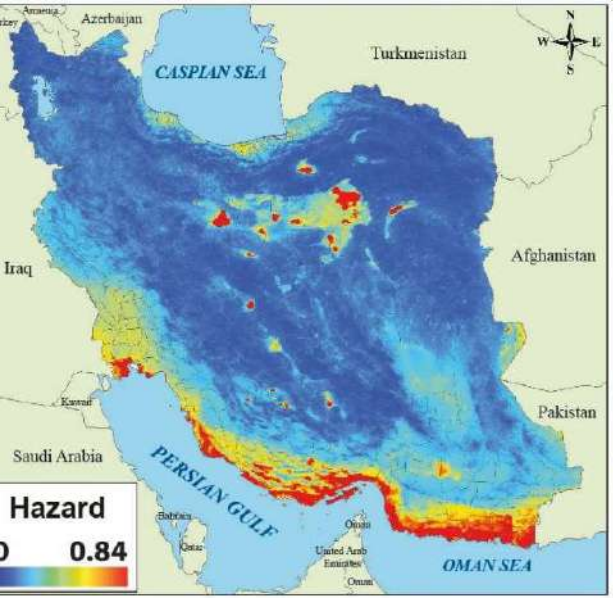

**Risk = Vulnerability × Hazard × Exposure**

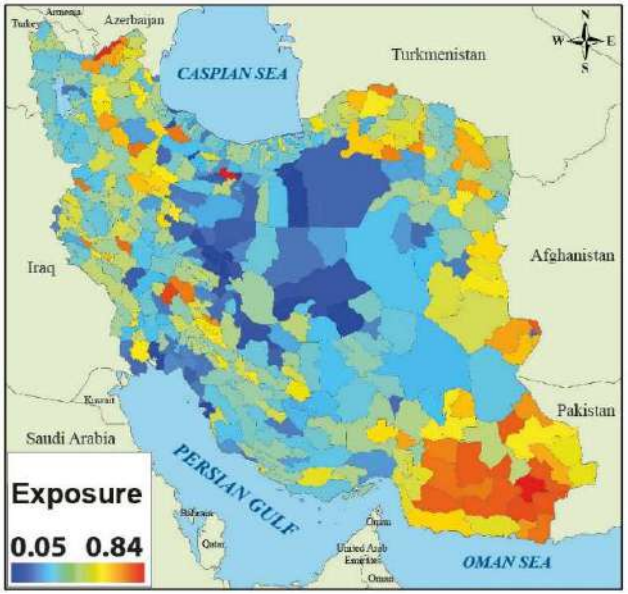
b) AR6 and future of the IPCC Risk Framework

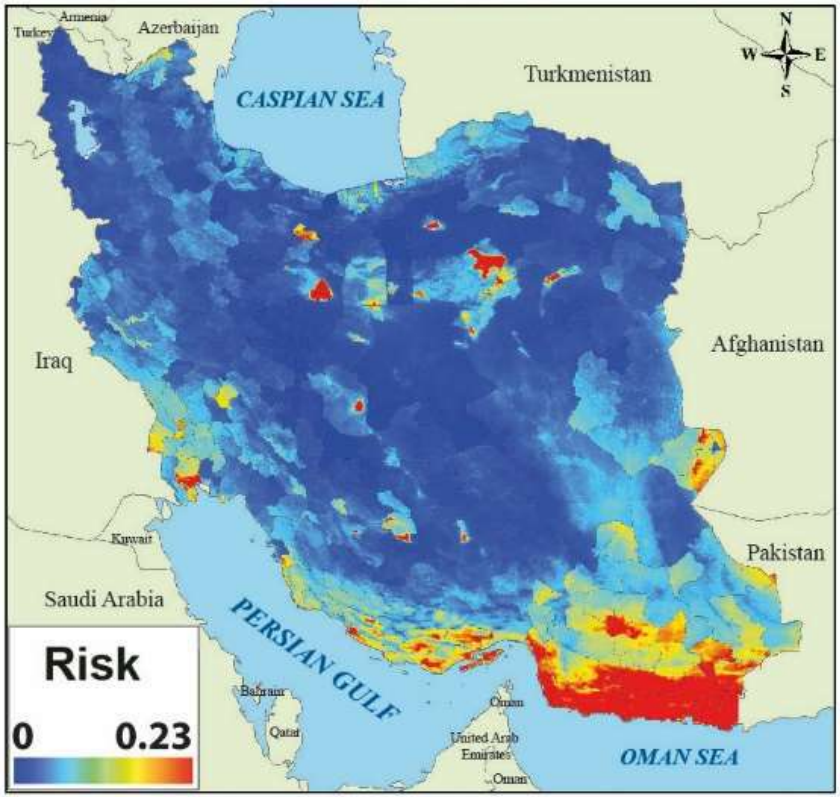
# Risk of dust impact on health in Iran

**Risk = Vulnerability × Hazard × Exposure**



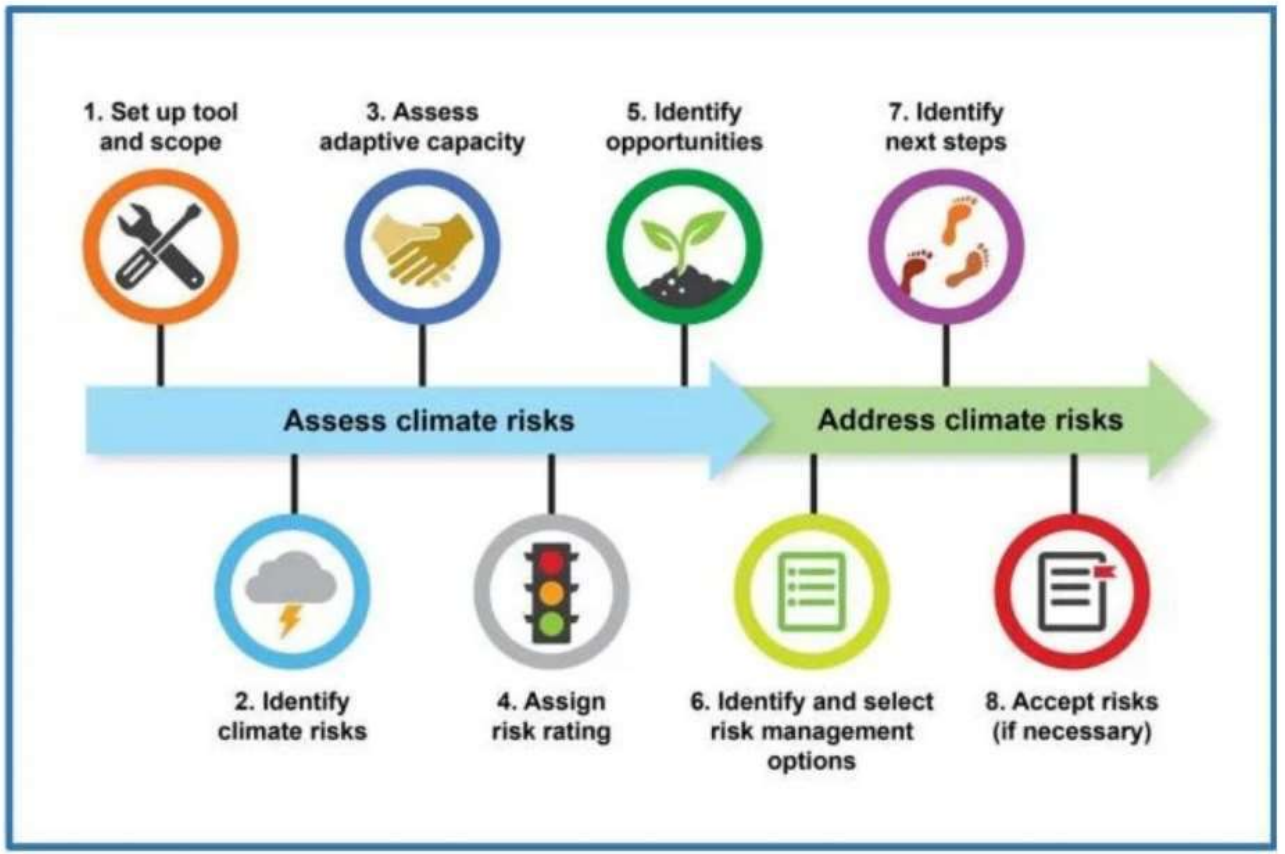



S1

# The Climate Risk assessment and Management Tools and steps

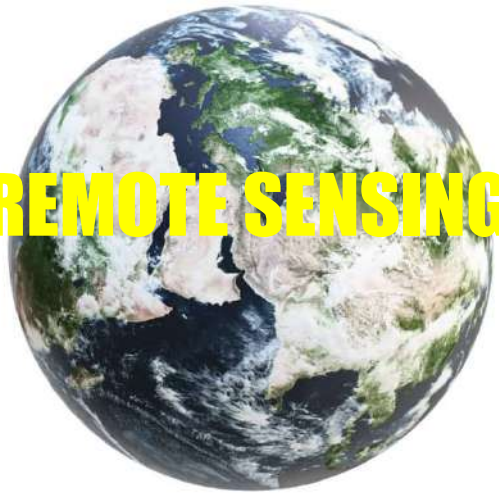


## Slide 12

**S1** Currently, existing approaches to incorporating CRM into national policies at the global level rely on strong linkages and possible integration with national adaptation planning processes (NAP), Disaster Risk Reduction (DRR) and Disaster Risk Management (DRM). It is therefore clear that the structural integration of both DRR and DRM approaches is crucial to incorporate CRM considerations into disaster planning processes and budget allocation for development programs, across all relevant institutions, sectors and levels.

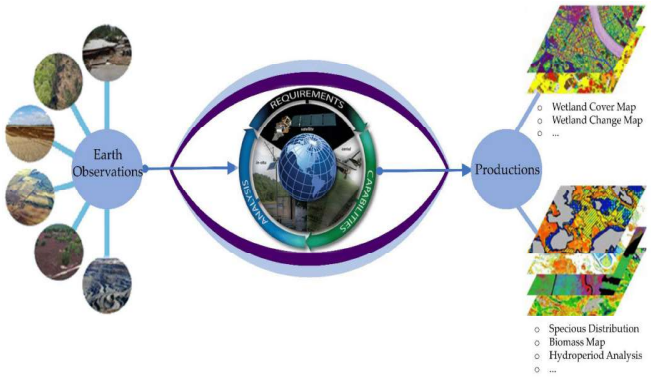
Admin, 24-11-2024

# Two important technology for climate risk assessment

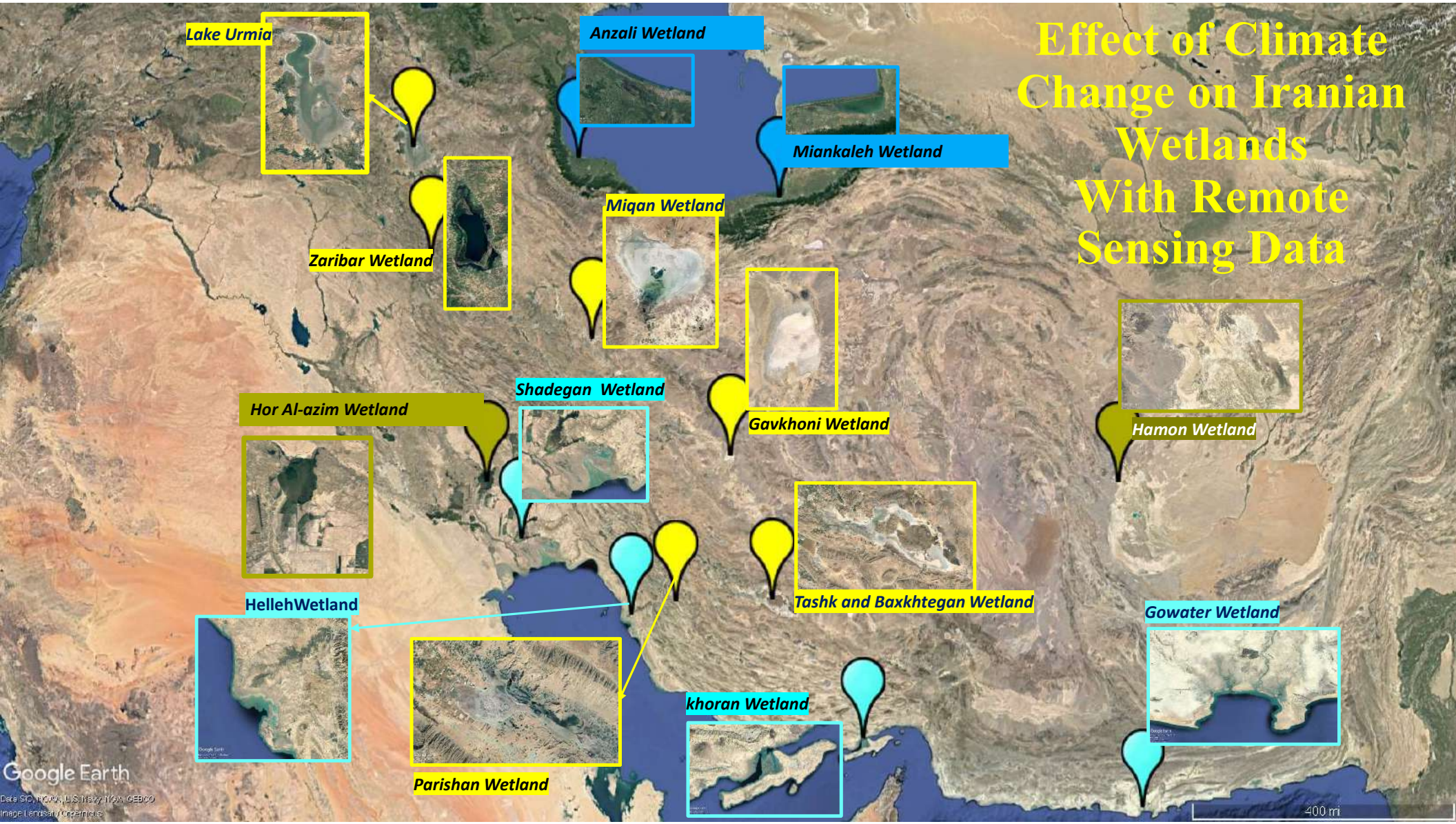




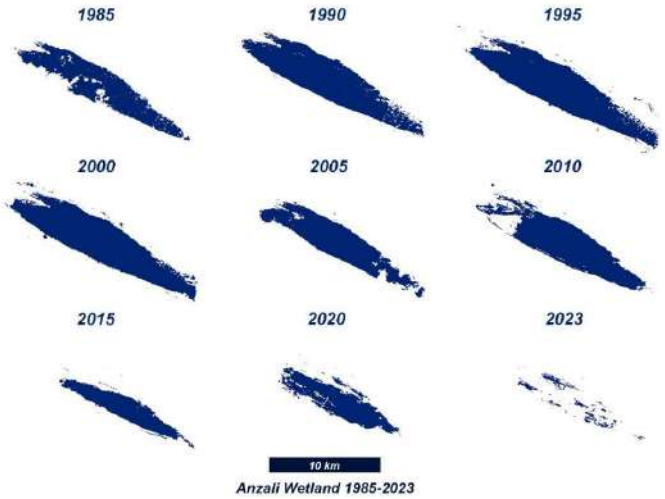
1. Monitoring Climate Variables
2. Land Use and Land Cover Changes
3. Carbon Cycle Monitoring
4. Extreme Weather Events
5. Climate Models and Projections

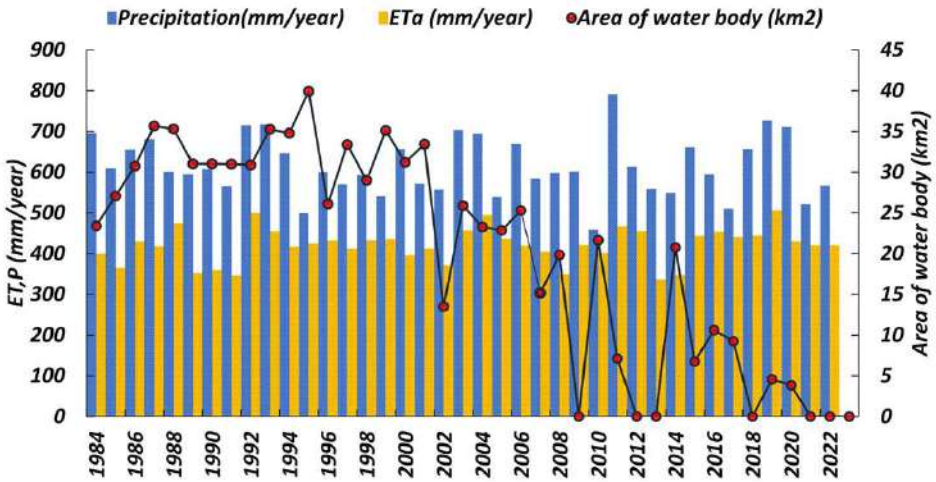


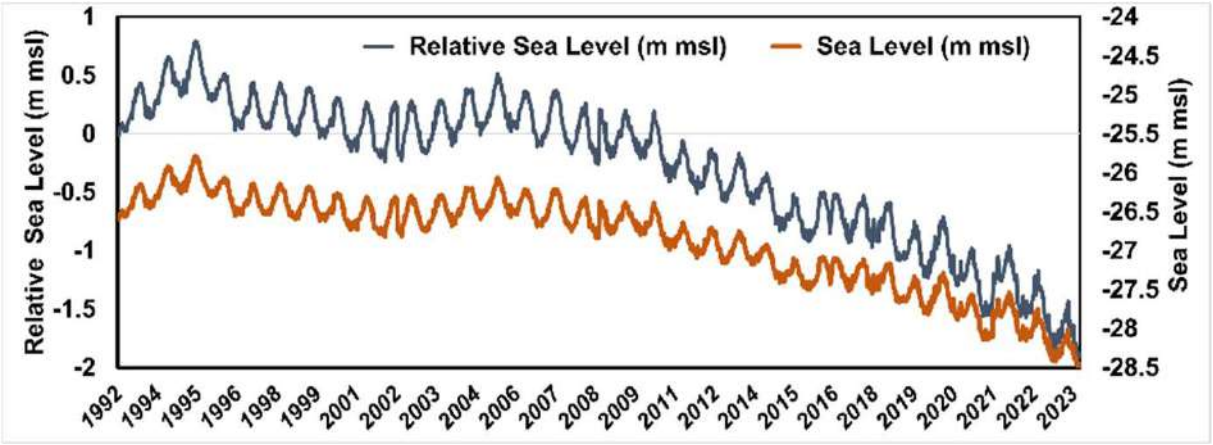

1. Data Integration and Analysis
2. Land Use and Planning
3. Spatio-temporal modelling
4. Vulnerability Mapping
5. Hazard Mapping
6. Impact Assessment and Projection
7. Disaster Risk Management


Effect of Climate Change on Iranian Wetlands With Remote Sensing Data
Lake Urmia
Anzali Wetland
Miankaleh Wetland
Zaribar Wetland
Miqan Wetland
Gavkhoni Wetland
Shadegan Wetland
Hor Al-azim Wetland
Hamon Wetland
HellehWetland
Tashk and Baxkhtegan Wetland
Gowater Wetland
khoran Wetland
Parishan Wetland
Google Earth
400 mi

Anzali Wetland



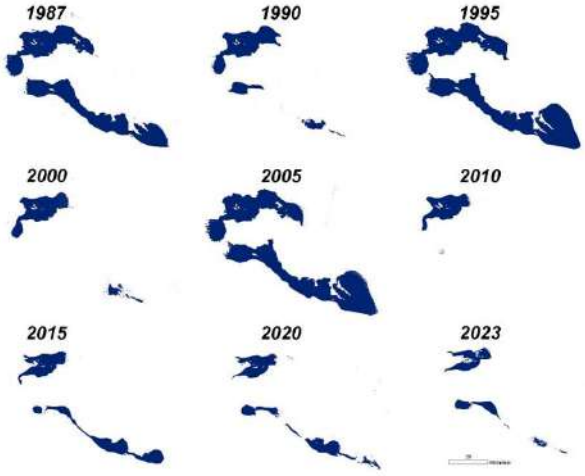



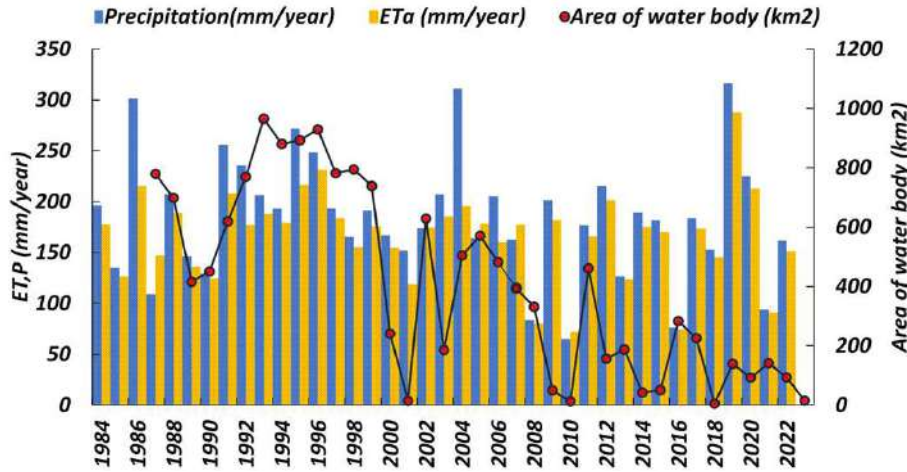

**Caspian Sea level (CSL) from1992 till 2023 based on satellite radar altimetry data.**

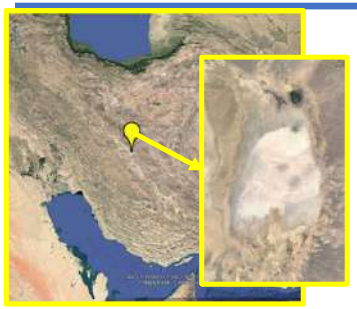
The Caspian Sea level has decreased about 2 m during the last 25 years.

Bakhtegan Wetland

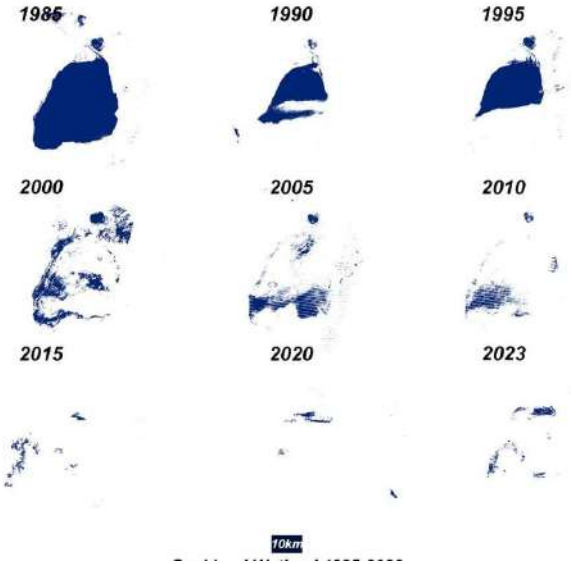


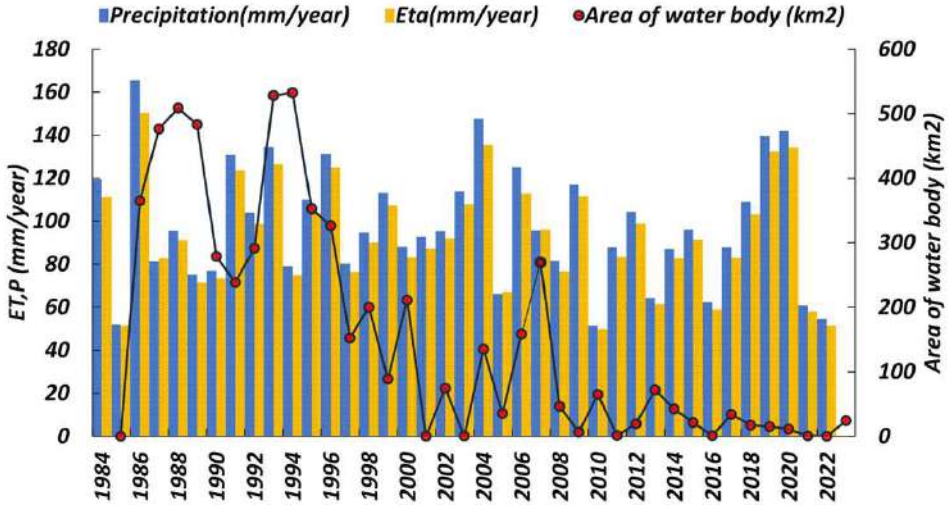

Tashk and Bakhtegan Wetland 1985-2023



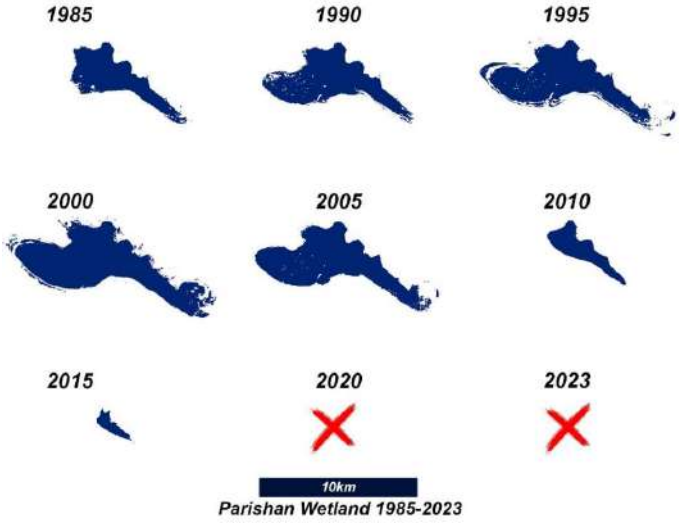



Gavkhoni Wetland

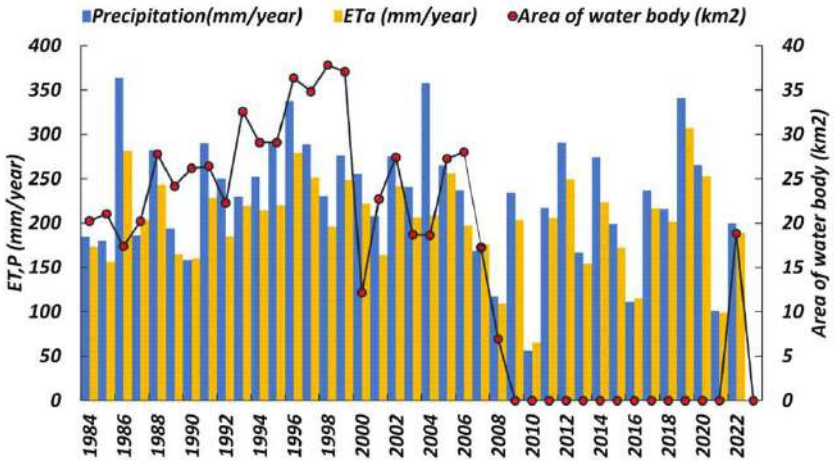


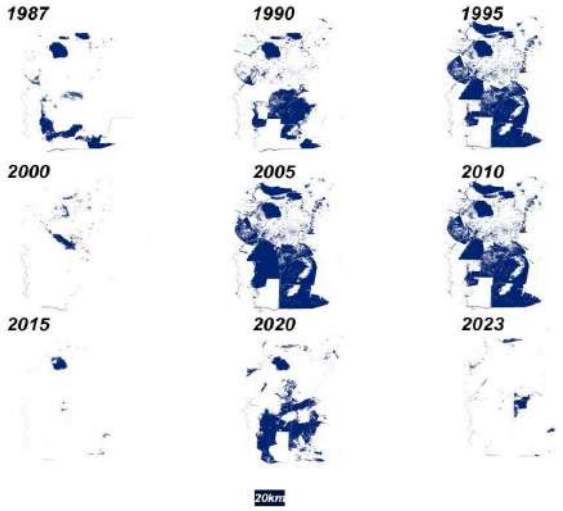
Parishan Wetland



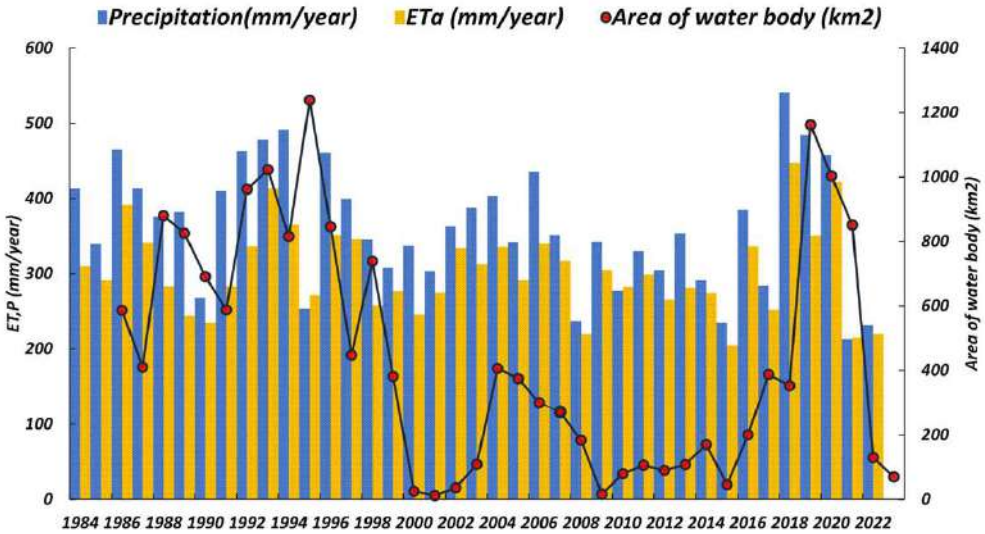

Parishan Wetland 1985-2023




Hor Al-azim Wetland




Horol azim Wetland 1985-2023



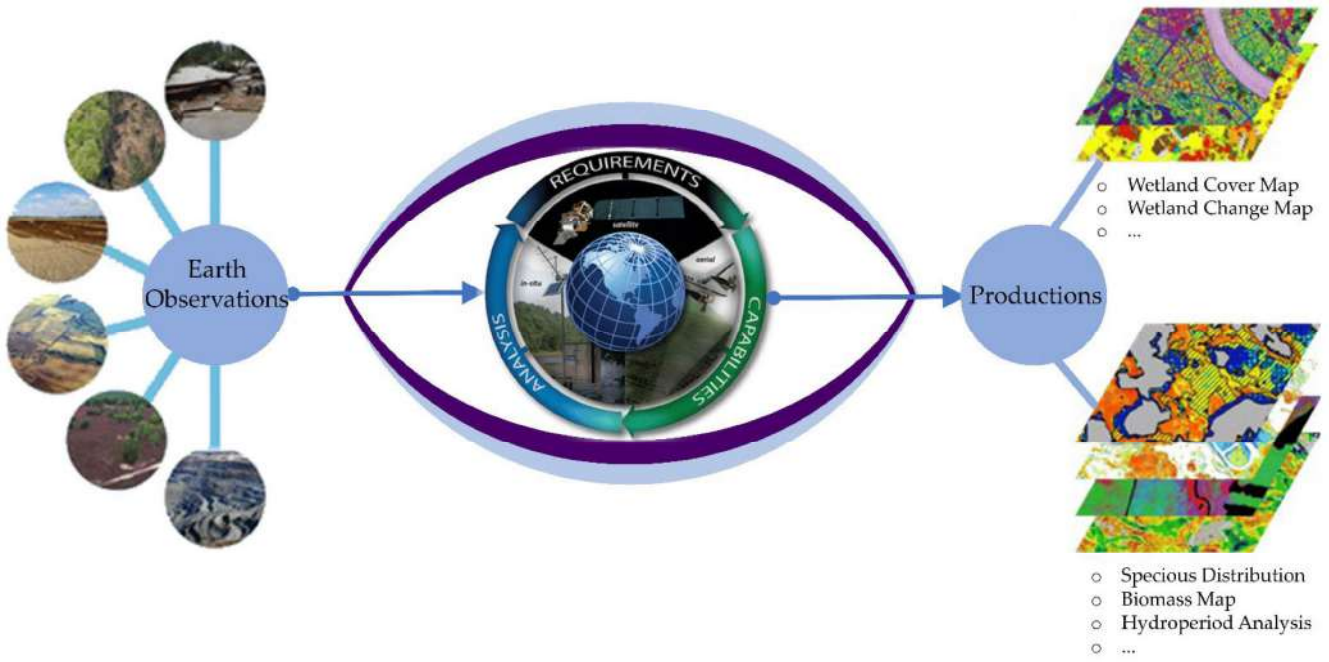
# The level of risk in Iran's wetlands

| *Number* | *Wetland Name* | *Situation* |
|---|---|---|
| 1 | Miankale | At high risk and negative changes |
| 2 | Anzali | At high risk and negative changes |
| 3 | Urmia | critical |
| 4 | Zarivar | At risk |
| 5 | Miqan | At high risk and negative changes |
| 6 | Hor Al-azim | critical |
| 7 | Gavkhoni | critical |
| 8 | Parishan | critical |
| 9 | Bakhtegan | critical |
| 10 | Shadegan | At high risk and negative changes |
| 11 | Hlleh | critical |
| 12 | Khor -Khoran | At Risk |
| 13 | Gowater | At high risk and negative changes |
| 14 | Hamun | critical |

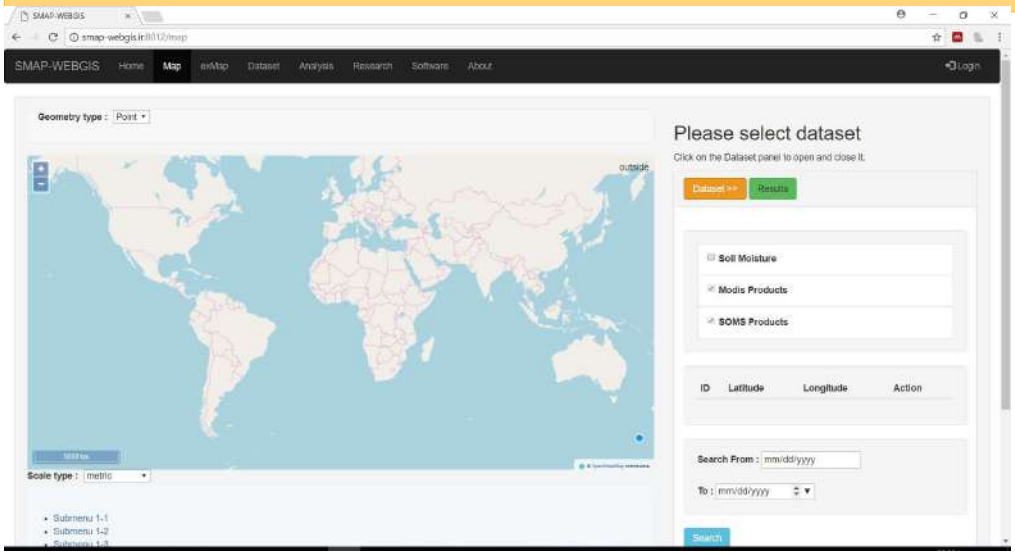
All wetlands in Iran have faced a sharp decrease in water depth and water area during the last decades

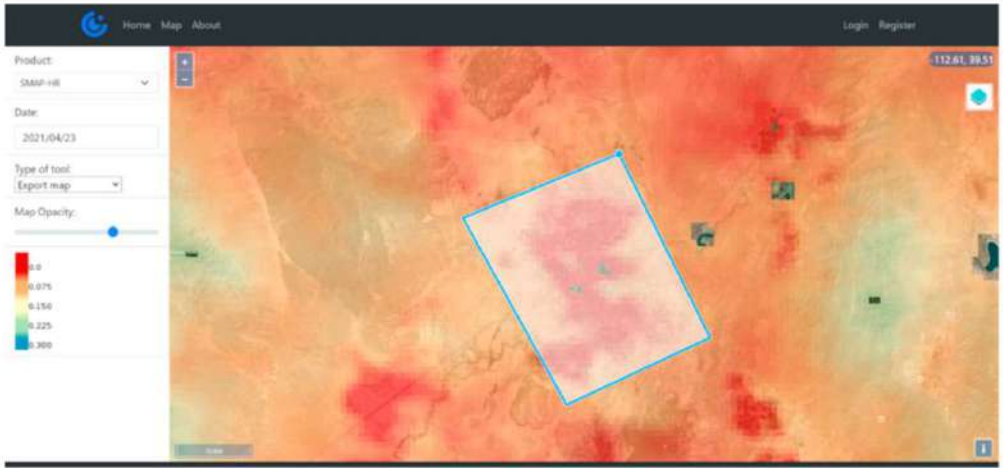
**This commentary is a call for action to both develop sustainable restoration ideas and to put new visions and strategies into practice before these wetlands falls victim.**

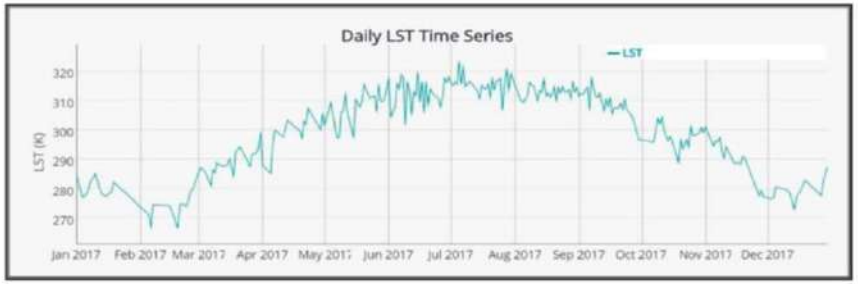
# Web-based systems for real time Environmental monitoring and assessment in Iran

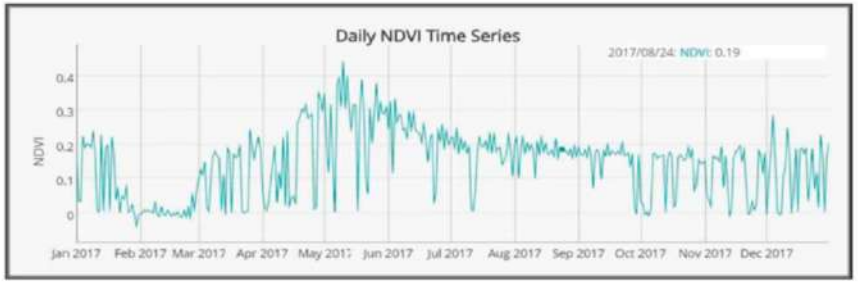


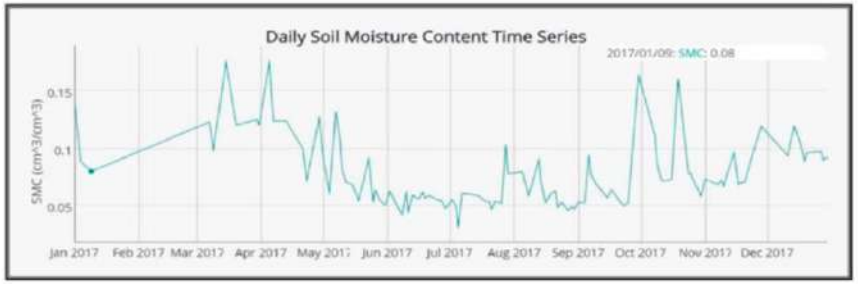
# A web-based system for high-resolution global soil moisture maps



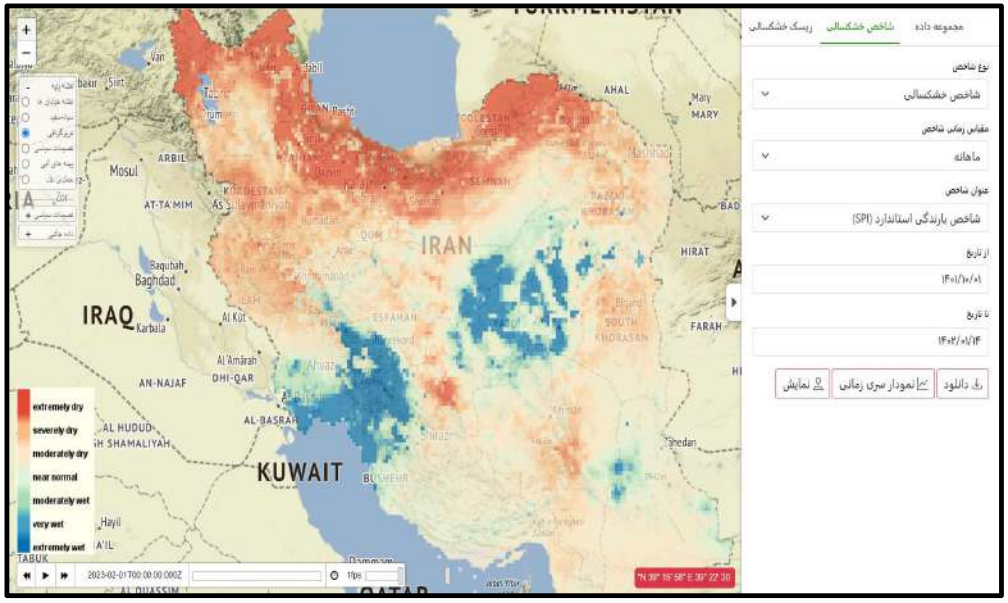



# Drought risk monitoring system using satellite data

## Features:

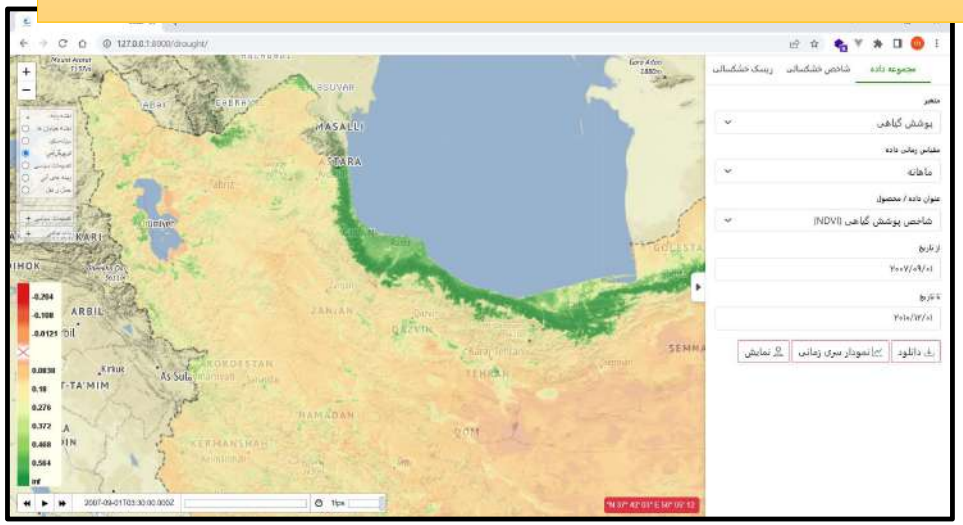
- Receiving and storing data from the global data providers
- Real-time calculation of drought indicators
- Real-time calculation of drought risk indicators
- Reporting
- ...

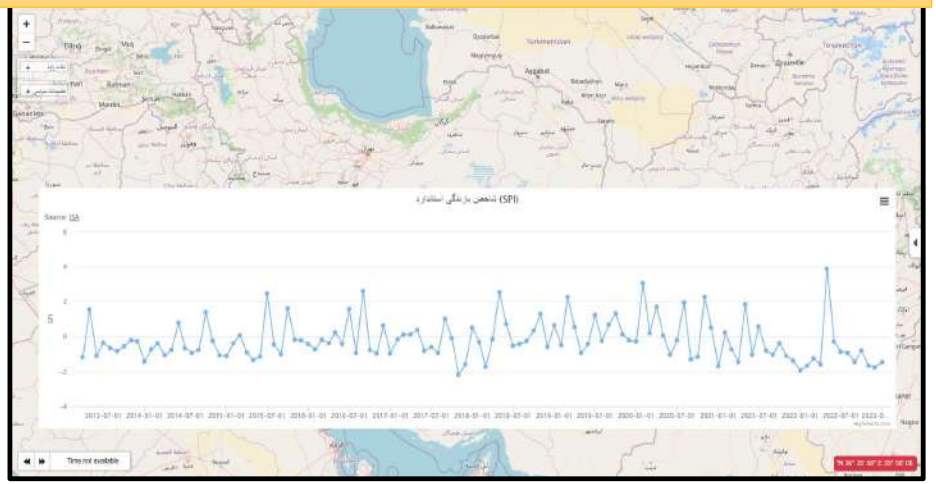


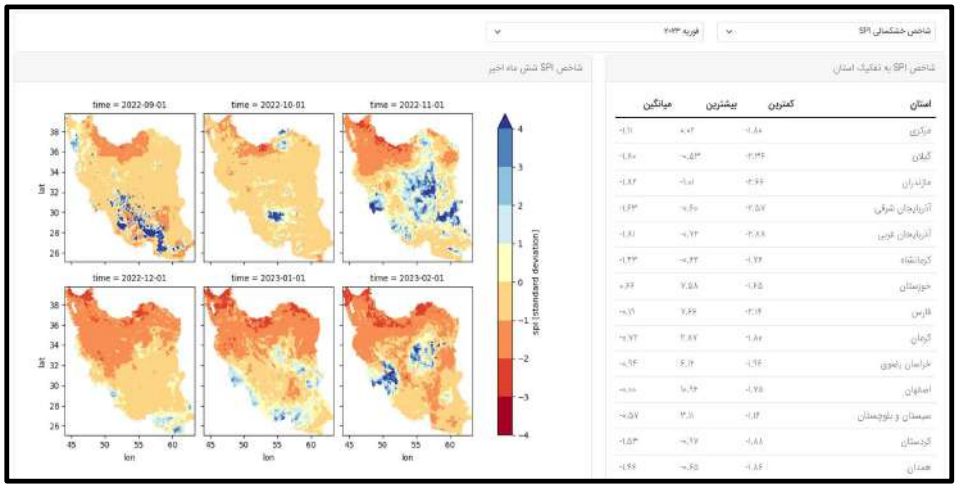

## Dataset / Indexes:

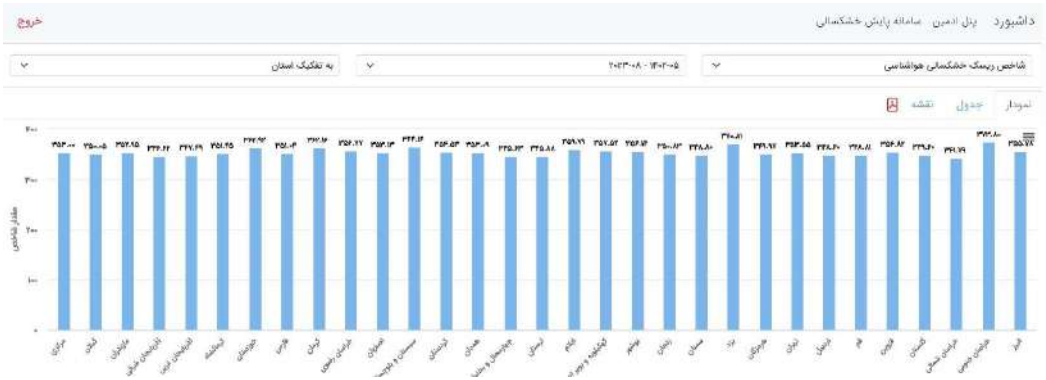
- Vegetation indicators (NDVI, EVI, VCI,TCI, VHI)
- Soil moisture
- Air and and land surface temprature (LST)
- Precipitation
- Anomaly analysis
- Standard Precipitation Index (SPI)
- Risk analysis

# Drought risk monitoring system using satellite data

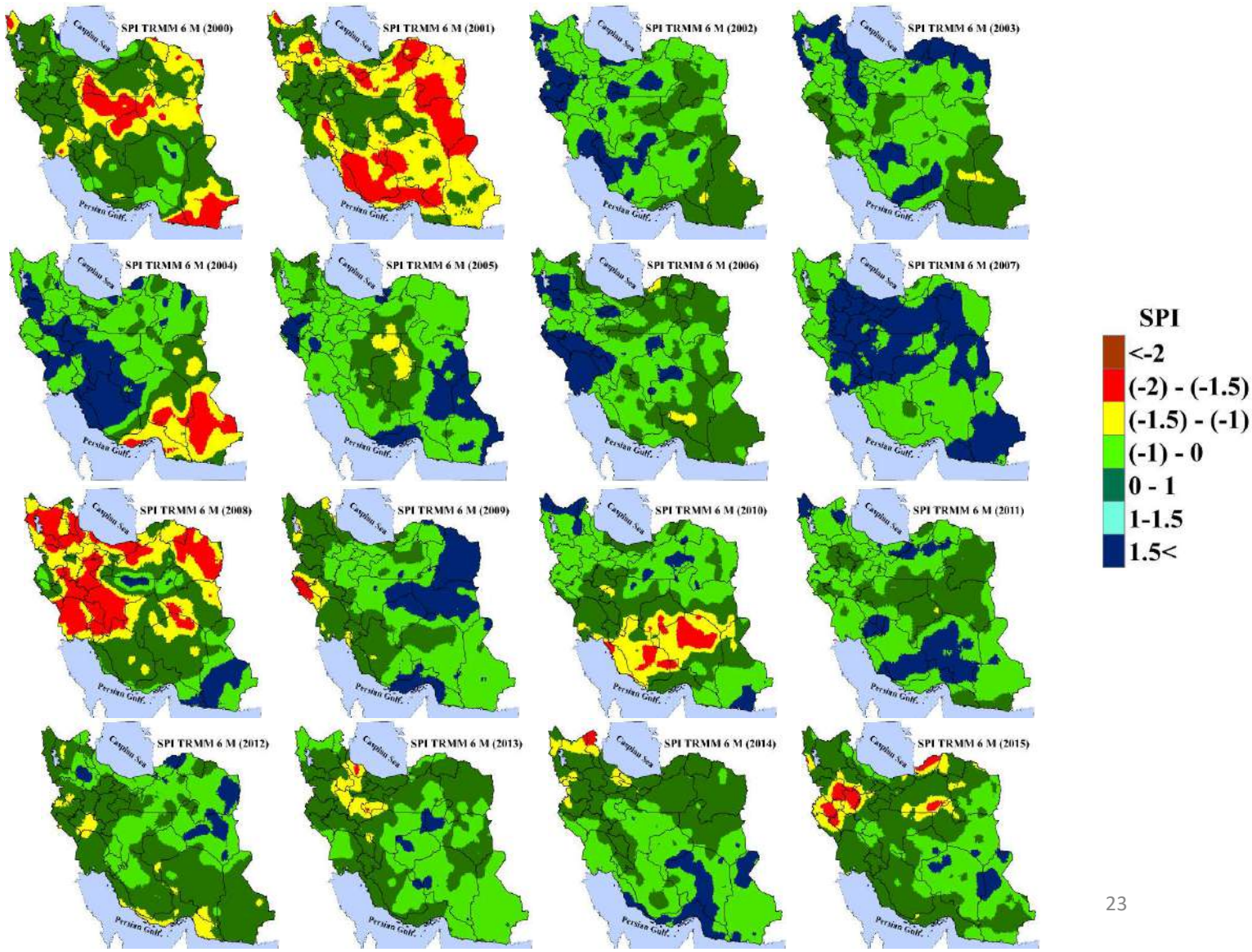


**Satellite-base SPI maps derived from TRMM**



# A Location-based Web And Mobile System For Smart Agricultural Monitoring in Iran

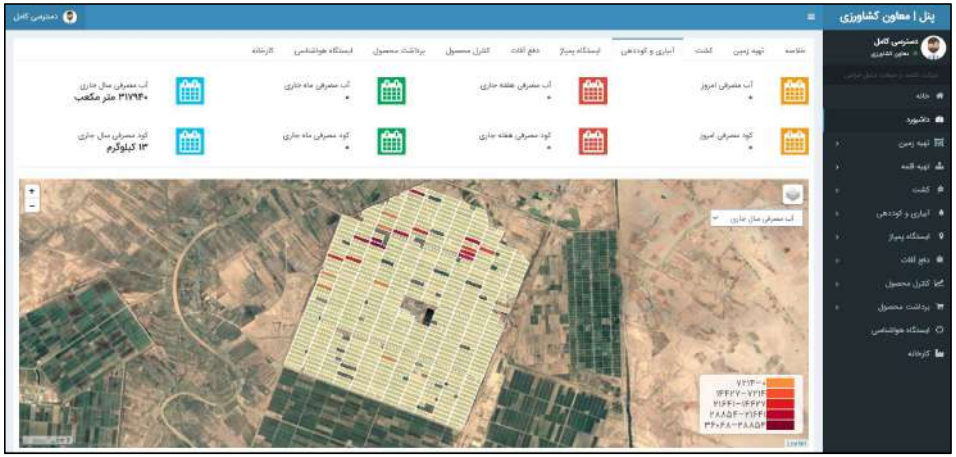

## Features:

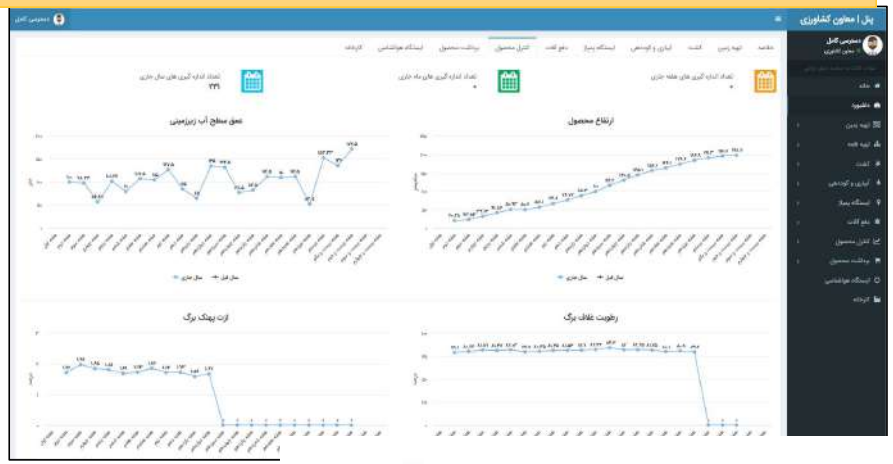
- Data collection
- Project planning and control
- Agricultural process management (Planting to harvest)
- Monitoring
- Reporting
- ...

## Modules:

- User management
- Land preparation
- Planting
- Irrigation
- Irrigation and drainage pumping stations
- Pest control
- Crop log
- Harvesting
- Irrigation
- Access levels and permissions
- ...

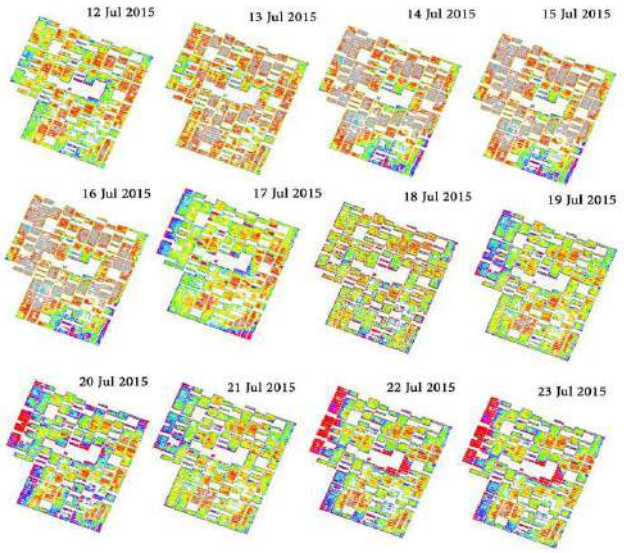
# A Location-based Web And Mobile System For Agricultural Land Monitoring











# What to do

Individual Actions
Community Initiatives
Corporate Responsibility
Government Policies
Global Cooperation

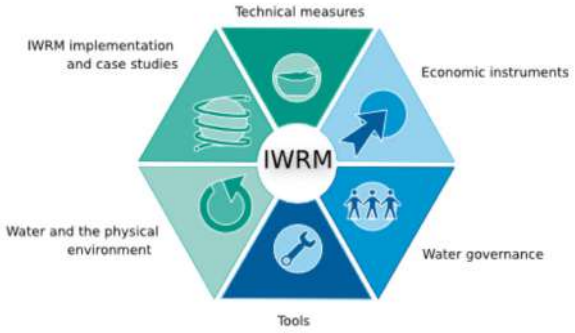
# Key strategies for climate risk management

**•Coastal areas:**

•Constructing seawalls and coastal defenses
•Implementing wetland restoration projects
•Relocation of vulnerable communities

**•Agriculture:**

•Developing drought-resistant crop varieties
•Implementing precision agriculture techniques
•Diversifying agriculture practices with climate-resistant crops,
•Improving water storage and irrigation systems




**•Water management:**

•Managing water resources effectively
•Water conservation practices
•Rainwater harvesting
•Improved water storage and distribution systems

# Key strategies for climate risk management

**•Urban planning:**

•Green infrastructure development (rain gardens, permeable pavements)

•Building design for heat resilience (shade, ventilation)

•Improved stormwater management systems

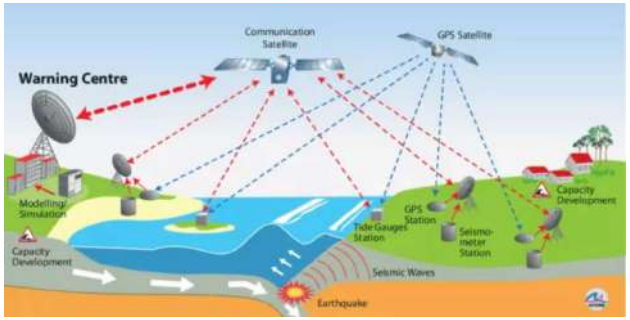
•Urban green spaces for heat mitigation

**•Disaster preparedness:**

•Implementing early warning systems,

•Evacuation plans and shelters

•Community education and awareness campaigns



# Key strategies for climate risk management

- **Vulnerability analysis:** Identifying communities and regions most at risk from climate change impacts.

- **Stakeholder engagement:** Involving local communities, businesses, and government agencies in decision-making.

- **Economic analysis:** Assessing costs and benefits of adaptation options

# Thank for Your Kind Attention