Remote Sensing use for flood monitoring and disaster management in the region and importance of such technology for advancing the water related goals in the region

Arab Regional Preparatory Meeting for the Midterm Comprehensive Review of the Water Action Decade Beirut, Lebanon, 18-19 May 2022

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New Data Sources for 2030 Agenda for Sustainable Development

• To monitor progress on the SDG indicators, countries use traditional data sources such as Census and Surveys on population and households, and the economy, administrative records such as civil and vital registers, customs data, water and electricity records, cadasters, etc..

• Integrating data coming from new technologies, such as Geospatial Information and Earth Observations (EO) can produce more timely, frequent, and disaggregated SDGs indicators, in particular the following:

Special Issue "EO Solutions to Support Countries Implementing the SDGs"
Earth Observation (EO) and Remote Sensing (RS)
Free, high-quality satellite imagery

- USGS Earth Explorer
- NASA’s Earthdata Search
- ESA’s Copernicus open
- NOAA’s Digital Coast
EO for SDG Indicator 6.6.1, ‘Change in the extent of water-related ecosystems over time

The spatial extent of water-related ecosystems, and the partial quality of water within these ecosystems investigated using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) and Landsat 5, 7, and 8 with Shuttle Radar Topography Mission (SRTM) are used to measure surface water extent at 250 m and 30 m spatial resolution.

The UN Environment, in collaboration with the Group on Earth Observations (GEO) and space and research agencies including the National Aeronautics and Space Administration (NASA), the European Space Agency (ESA), and the Joint Research Centre (JRC), are working to support the use of EO for Indicator 6.6.1 data collection and reporting.

After decades of war and insurgency, Iraq faces another huge challenge: climate change. Changing weather patterns in recent years have led to extreme weather events becoming more frequent, including dust storms, prolonged heat waves and reduced rainfall across the country.
EO and AI for Ecosystem Services (ARIES) Ecosystem Accounting

Our vision to take open science to the next level

- Unfair access to scientific knowledge
- Uninformed policies
- Compartmentalization across disciplines and countries
- Black box
- Industry-oriented research
- Centralized control over AI technologies
- A democracy of knowledge through AI

- Fair access to scientific knowledge
- Nature-based policies
- Multi- and transdisciplinary science
- Transparency
- Society-oriented research

ARIES - Artificial Intelligence for Environment & Sustainability
Earth Observations for Floods Monitoring - ESCWA Google Earth Engine (GEE) Project

Objectives

1. Exploring new data sources to integrate with official statistics with the aim to fill data gaps and better monitor and report on SDGs and Global agendas such as Sendai Framework

2. Testing the effectiveness of remote sensing for detecting disaster areas

3. Estimate disaster areas, number of affected population, affected land and infrastructure

4. Provide Codes on GEE for Public for Free
Remote Sensing Data

- Sentinel-1 Synthetic Aperture Radar Imagery
- Sentinel-2 Multispectral Optical Imagery
- Copernicus Global Land Cover Layers: CGLS-LC100 Collection 3
- CHIRPS Daily: Climate Hazards Group InfraRed Precipitation with Station Data (version 2.0 final)

Other Data Sources

- GLIDE datasets – Asian Disaster Reduction Center (ADRC)
- UNDRR Disaster loss database
- World pop data 100 meter resolution population data (to be explored)

GEE Community Datasets

- Facebook’s High Resolution Settlement Layer
- ESRI/Microsoft 2020 Global Land Use Land Cover from Sentinel-2
Partnership and Cooperation

At the National levels between NSOs & Water and Environment Agencies;

With UN, Regional Organizations and Other Partners:

- GEO (Group on Earth Observation in Geneva) Plan to set a GEO for Arab Countries
- UNGGIM and UN-GGIM Arab states
- UNSD, UN regional Commissions, UK Statistical Office
- OCHA, UNDRR on disaster risk management
- UNFPA on Population and Housing Census
- FAO on Crop mapping and land Cover
- UNHabitat, on neighborhoods and informal areas
- Qatar Computing Research Institute (QCRI)
2015 Flood


25 people died. 26 people injured³.

Of the 25 people dead, 16 drowned in flood waters and 9 electrocuted⁴.

“The October 2015 floods led to the resignation of Governor Hani El-Mesery after criticism of his administration’s lack of preparation and management of the city’s drainage system.” ⁴
2015 Analysis Approach

- Al Kawm Al Asmar and Al Natron Valley assessment
- SAR Sentinel-1 satellite imagery
  - 10-meter resolution
  - Time series comparison between before and after images
  - SAR image smoothing and speckle filtering (noise reduction)
# 2016 Flood

## Red Sea Governorate

- Heavy rains, flooding and exceptionally high winds\(^1\). Maximum daily precipitation: 182 mm.


- 26 people died. 72 people injured\(^2\).

- 6500 families needed emergency food, shelter and water.\(^1\)

- Main roads closed, telephone and power lines were cut and main ports were shut off.\(^1\)

- Red sea Provinces, Sohag, Assuit, Qena.

- Torrential rain hits annually in late October and early November\(^1\).

- Areas with particularly poor infrastructure\(^1\).

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1. [https://reliefweb.int/disaster/fl-2016-000114-egy](https://reliefweb.int/disaster/fl-2016-000114-egy)
2. GLIDE datasets – Asian Disaster Reduction Center (ADRC)
### 2020 Floods

#### Background

<table>
<thead>
<tr>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of emergency declared</td>
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<tr>
<td>Airports and ports were shut</td>
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<tr>
<td>Heavy precipitation on March 12, 2020</td>
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<tr>
<td>Maximum estimated daily precipitation: 139 mm</td>
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</tbody>
</table>

#### Affected Areas

- Al Natron Valley
- Qarun Lake
- Along the Nile river
Social Media Data
Results for Ras Ghareb, Red Sea Governorate

Inundated streets and Sedimentation in the coast
Social Media Data

An Arab Group on Earth Observation in cooperation with the Global Group on Earth observation (GEO) to be established
UN-GGIM Arab States-Subgroup on Geoinformation and Disaster Reduction

UN –Habitat: Exploration of the effects of disasters on low-income Settlements

Expert Forum on Users and Producers on Disaster-Related Statistics 6-8 Sept 2022 Beirut 2022
Thank You

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