جهـــاز التخطيـــط والإحصـــاء
Planning and Statistics Authority
State of Qatar • دولـــة قطـــر

Regional Workshop on the Changing Role of Official Statistics in the State of Qatar:
Why Data Culture Matters

21st -22nd September 2022, Doha, Qatar
Pullman Hotel, Al Thuraya Ballroom - West Bay

ورشـة العمل الإقليمية حول الـدور المتغير للإحصاءات الرسـمية فـي دولة قطر:
ثقافة البيانات مهمة

٢١-٢٢ سبتمبر ٢٠٢٢، الدوحة، قطر
فندق بولمان الدوحة، قاعة الثريا - الخليج الغربي

Economic and Social Commission for Western Asia

Remote Sensing for flood monitoring and disaster management in local communities in the Nile Basin and coastal areas in Egypt

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Statistics, Information Society and Technology Cluster UNESCWA

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Shared Prosperity **Dignified Life**

Social, Economic, and environmental challenges in Arab Countries

Challenges in order to protect human lives, their health, their assets, and the environment and achieve the targets of the United Nations (UN)'s 2030 Agenda for Sustainable Development (SDGs) :

- Rapid population growth
- Income Inequality and high unemployment rate
- Unplanned rapid urbanization
- Need for adequate infrastructure, access to water and sanitation, reliable housing, public transportation,
- Millions of migrated populations caused by conflicts and wars
- Environmental pollution, drought, floods, water scarcity, resources exploitation

Disasters are obstacles in the way of progress towards achieving the SDGs

Links Between Statistical and DRR Communities (Disaster-Related Statistics)

Monitoring and reporting for the Sendai Framework and SDGs disasters related indicators

The UN Committee of Experts on Global Geospatial Information Management (UN-GGIM)-Strategic Framework on Geospatial

Information and Services for Disasters Working Group on Geospatial Information and Services for Disasters (WG-GISD)

Inter-Agency and Expert Group on Disaster-related Statistics (IAEG-DRS) in 2020 as per the recommendation of the UN Statistical Commission UNSC

Expert Fora for Producers and Users of Disaster-related Statistics 2021 (Geneva), 2022 (Beirut) 2023 (Bangkok)

Data Sources for DRR and SDGs

A. Traditional Data Sources such as Census and Surveys on population and households, Administrative records such as civil registration and cadastres

B. New data sources on using geospatial technologies, remote sensing Earth Observations (EO) and social media

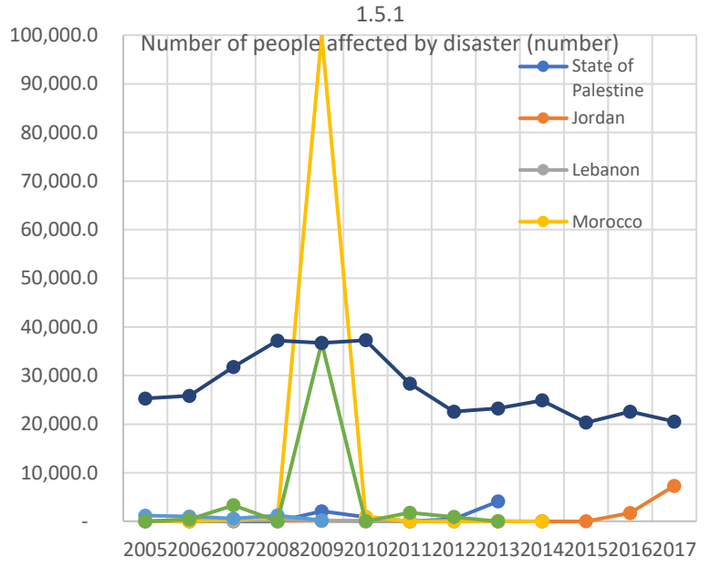
C. Integrating data coming can produce more timely, frequent, and disaggregated SDGs indicators for more information for monitoring and analysis for remote areas, and more timely and efficient response

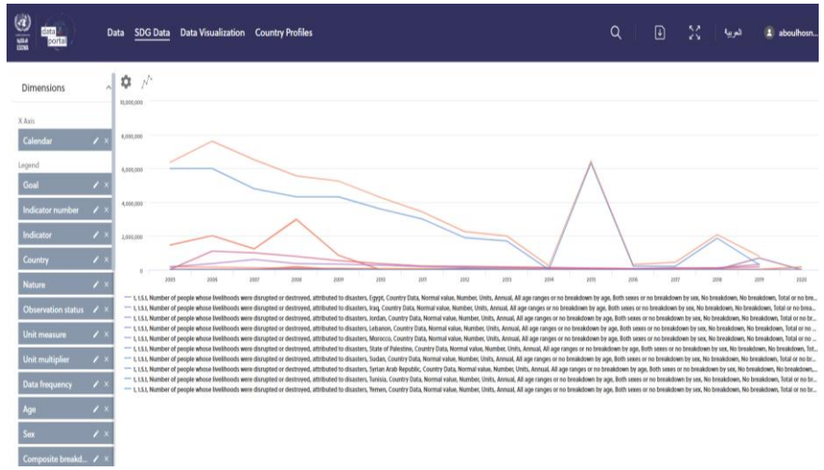
Special Issue "EO Solutions to Support Countries Implementing the SDGs"

SDGs Data gaps on Disasters in Arab Countries

SDGs 1.5.1, 1.5.2, 11.5.1, 11.5.2, 13.1.1, 13.1.2

- Disaster occurrences, disaggregation by hazards types, etc…
- On-Going Review of the hazard terminology and classification
- Scale, and geographic region: Geo Region 1 Large Medium Small (Local scale)





https://data.unescwa.org

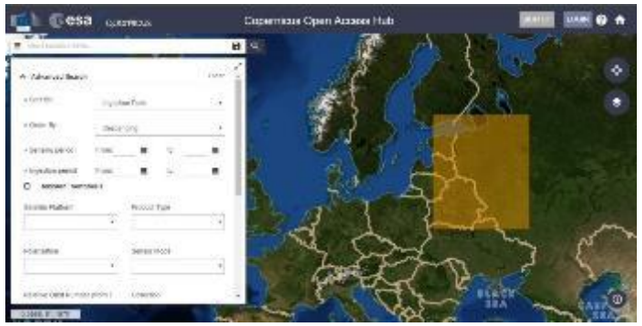
Earth Observation (EO) and Remote Sensing (RS)

Free, high-quality satellite imagery

[USGS Earth Explorer]

[NASA's Earthdata Search]

[ESA's Copernicus open]



[NOAA's Digital Coast]

Partnership and Cooperation

- At the National levels between NSOs & NMAs and DRR 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: On use of geospatial data in different applications including disasters
  - UNSD, UN regional Commissions, UK health on Disaster related Statistics
  - OCHA, UNDRR on disaster risk management
  - UNFPA on Population and Housing Census
  - FAO on Crop mapping and land Cover

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 at local community levels
3. Estimate disaster areas, number of affected population, houses, land and infrastructure
4. Share Algorithms and Tools on GEE for Public Use

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Data Sources for the ESCWA- GEE Project

Remote Sensing Data	Other Data Sources	GEE Community Datasets
Sentinel-1 Synthetic Aperture Radar Imagery	Emergency Events Database (EM-DAT). Centre for Research on the Epidemiology of Disasters (CRED)	Facebook's High Resolution Settlement Layer
Sentinel-2 Multispectral Optical Imagery	GLIDE datasets – Asian Disaster Reduction Center (ADRC)	ESRI/Microsoft 2020 Global Land Use Land Cover from Sentinel-2
Gridded Population of the World, Version 4 (GPWv4): Population Count, Revision 11 (1KM resolution)	UNDRR Disaster loss database	
Copernicus Global Land Cover Layers: CGLS-LC100 Collection 3	World pop data 100 meter resolution population data (to be explored)	
CHIRPS Daily: Climate Hazards Group InfraRed Precipitation with Station Data (version 2.0 final)		

Center for International Earth Science Information Net

Marcel Buchhorn, Bruno Smets, Luc Bertels, Bert De Roo, M
2015-2019: Pr

Methodology

Identification of Possible Inundation

Objective is to detect candidate area for deeper examination

Visual exploration of disasters using disaster databases, Sentinel sensors, CHIRPS precipitation layer

Cross referencing disasters with tweets and news articles to get background information

Generating the Inundation Image

Objective is to extract actual inundation extent from the images

Use of Sentinel-2 (2A/1C) and SAR Sentinel 1 to visually inspect damage using before and after images

Preprocessing Sentinel-2 (L1C) and Sentinel 1 using atmospheric correction and speckle filtering respectively

Delimiting inundated areas either using thresholding method or K means clustering

Validating delimited areas through visual inspection

Quantifying Impact

Objective is to estimate impact of inundated areas

Calculate the area of the intersection of inundated areas with the following:

Areas classified as urban

Areas classified as containing vegetation

Calculate intersection of inundated areas and spatially distributed population estimate datasets

Better

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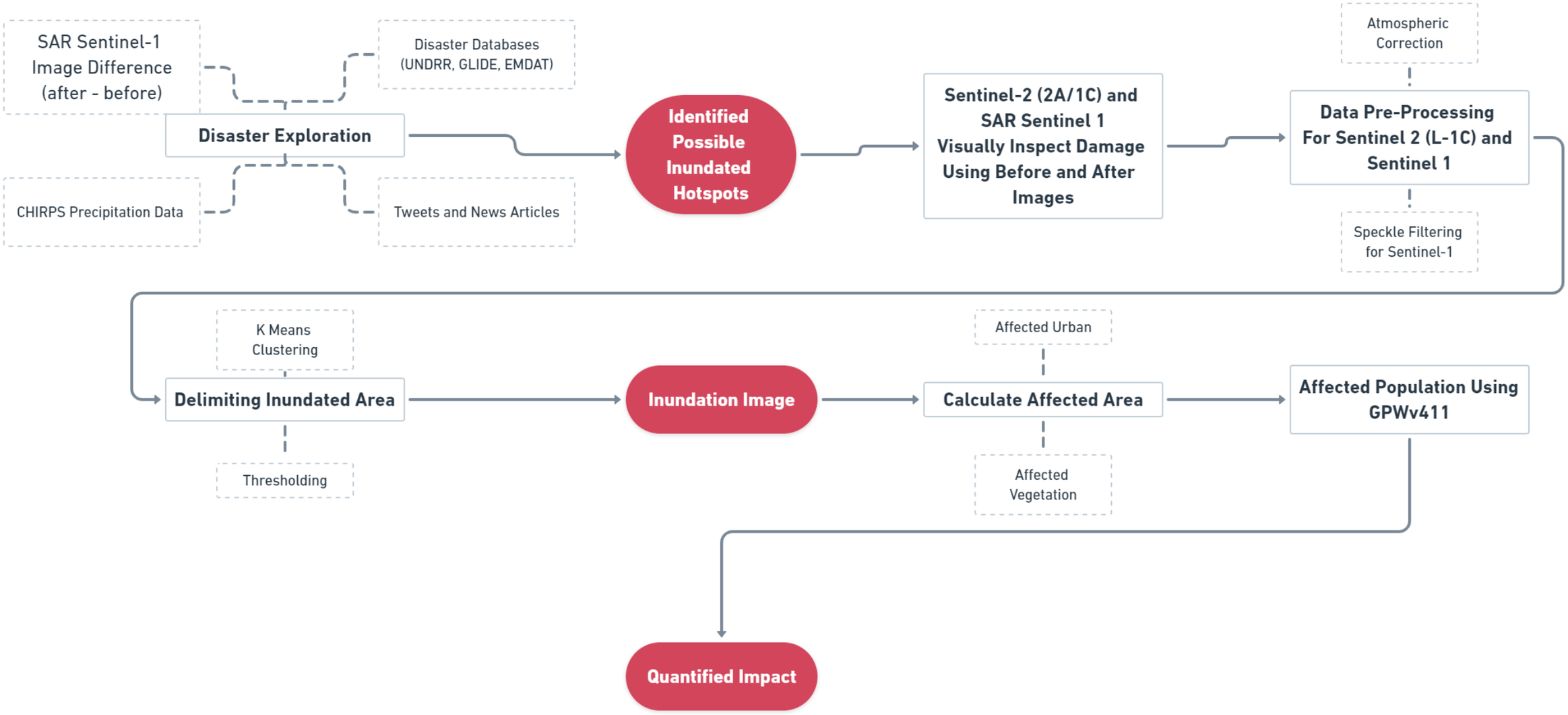
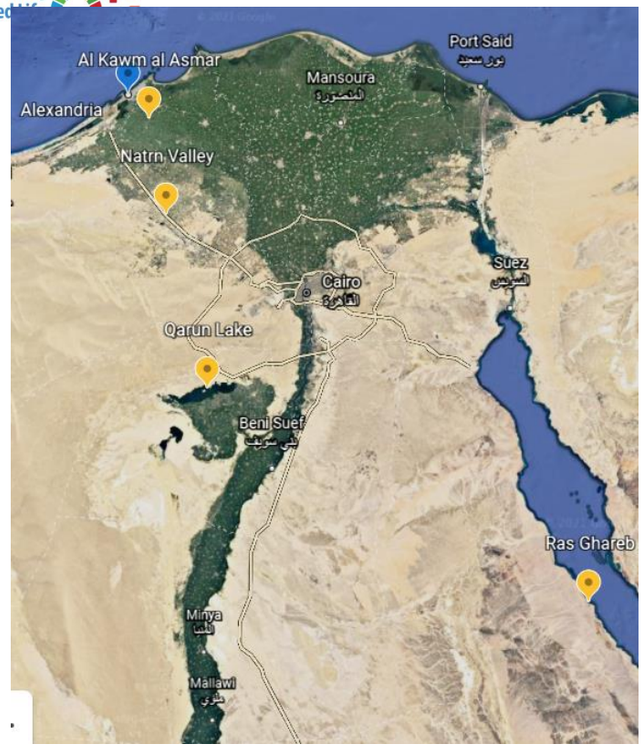
Methodology For Inundation Detection Using Google Earth Engine





Area	Governorate
Al Kawm Al Asmar Wadi Al Natroun 2015	El Beheira Governorate
Qarun Lake Al Natroun Ras Ghareb 2020	El Fayoum governorate Red Sea Governorate
Rosetta Branch of the Nile River	Qaliubiah, Kafr El-Sheikh, El-Gharbia, El-Menofyia and El-Behira
Damietta Branch of the Nile River	Alexandria, Beheira, Dakahlia, Damietta, Sharqiyah, Port Said

Summary Results on Identified Floods

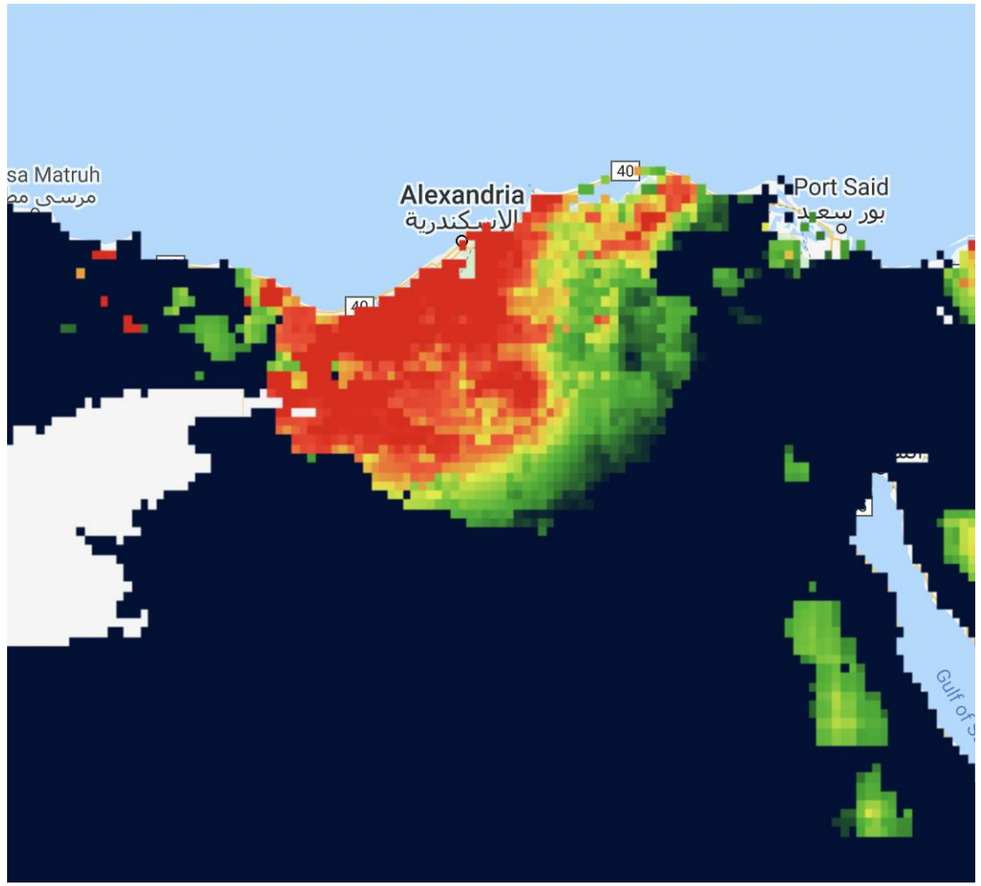
- Time Period: 2015 October-November, 2016, March 2020
- Egypt Localities around Nile Basin, North Coast and Red Sea Coast

2015 Flood and Analysis Approach

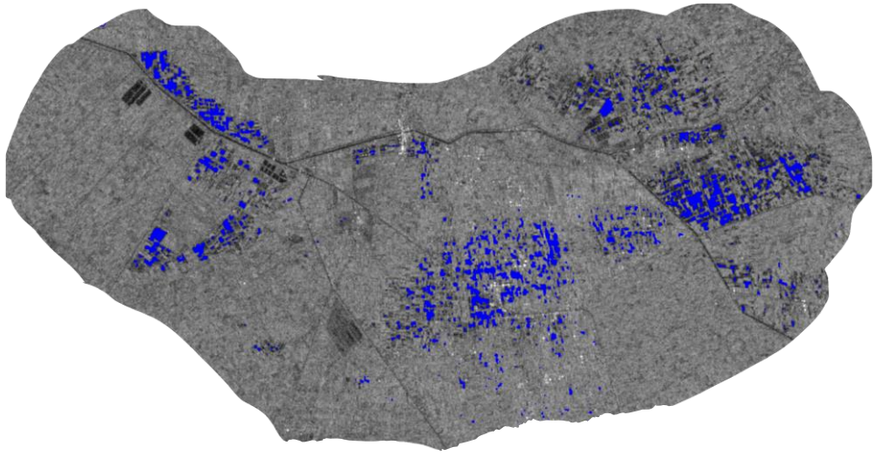
- 25-October-2 015 till 13-November 2015.
- 25 people died. 26 people injured[3].
- Of the 25 people dead, 16 drowned in flood waters and 9 electrocuted[4].
- “The October 2015 floods led to the resignation of Governor Hani El-Mesery after criticism of his administration’s lack of preparation and management of the city’s drainage system.” [4]

3 Emergency Events Database (EM-DAT). Centre for Research on the Epidemiology of Disasters (CRED)

4 http://floodlist.com/africa/egypt-floods-beheira-alexandria-november-2015



Chirps Precipitation Data, 14-November-2015



Al Kawm Al Asmar and Al Natron Valley assessment

SAR Sentinel-1, 10-meter resolution, Time series comparison between before and after images, SAR image smoothing and speckle

2016 Flood
Red Sea Governorate

Heavy rains, flooding and exceptionally high winds[1]. Maximum daily precipitation: 182 mm.

27-October-2016 till 13-November-2016.

26 people died. 72 people injured[2].

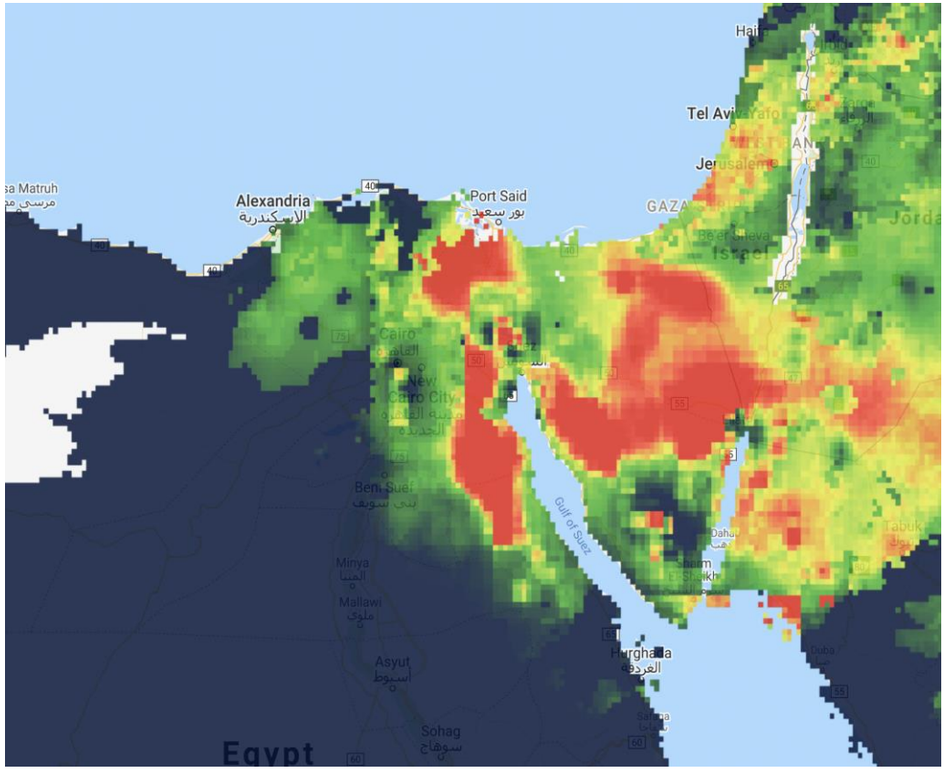
6500 families needed emergency food, shelter and water.[1]

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].



1 https://reliefweb.int/disaster/fl-2016-000114-egy

2 GLIDE datasets – Asian Disaster Reduction Center (ADRC)

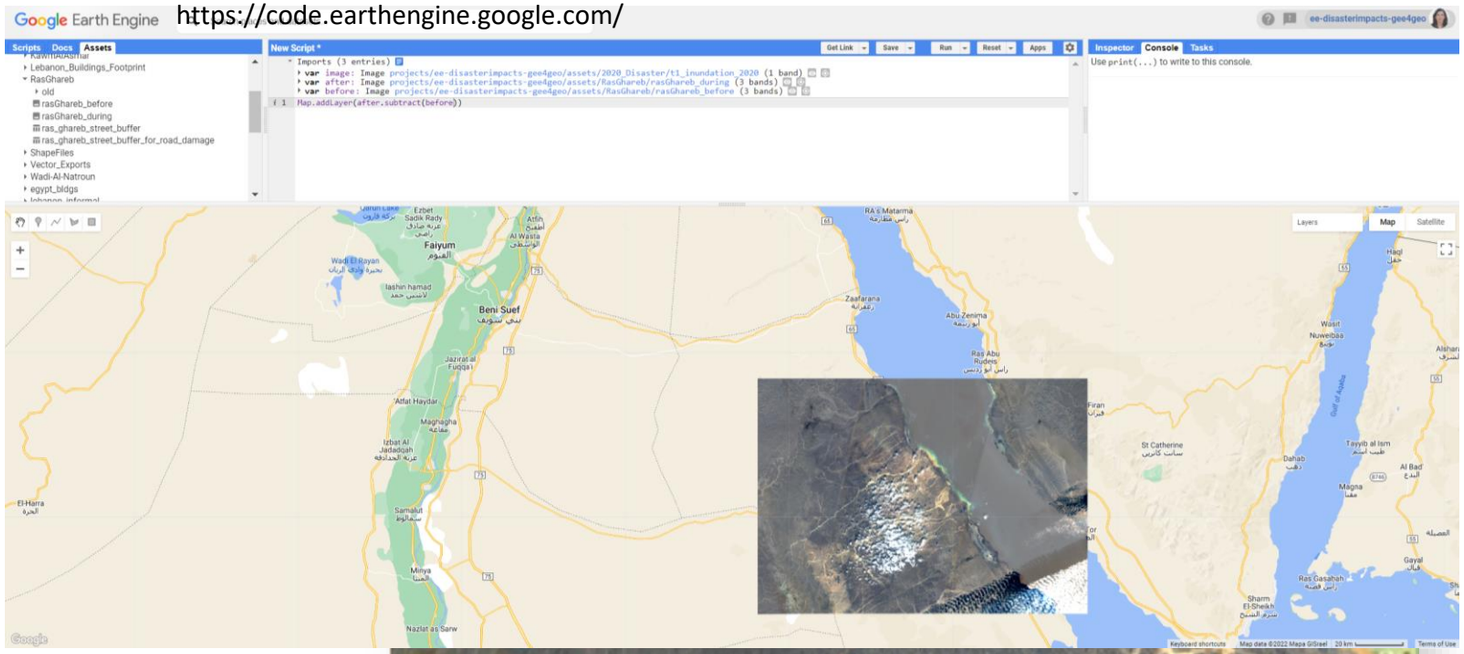
Results for Ras Ghareb, Red Sea Governorate 2016

Heavy rains, flooding and exceptionally high winds. Maximum daily precipitation: 182 mm.

Social Media Data

GEE Codes

https://code.earthengine.google.com/



2020 Floods

Background

State of emergency declared

Airports and ports were shut

Heavy precipitation on March 12, 2020

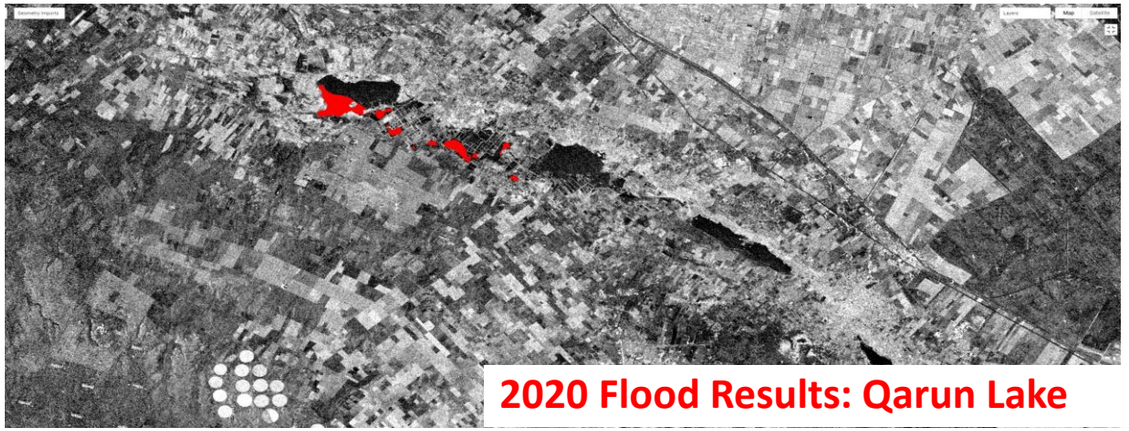
Maximum estimated daily precipitation: 139 mm

Affected Areas

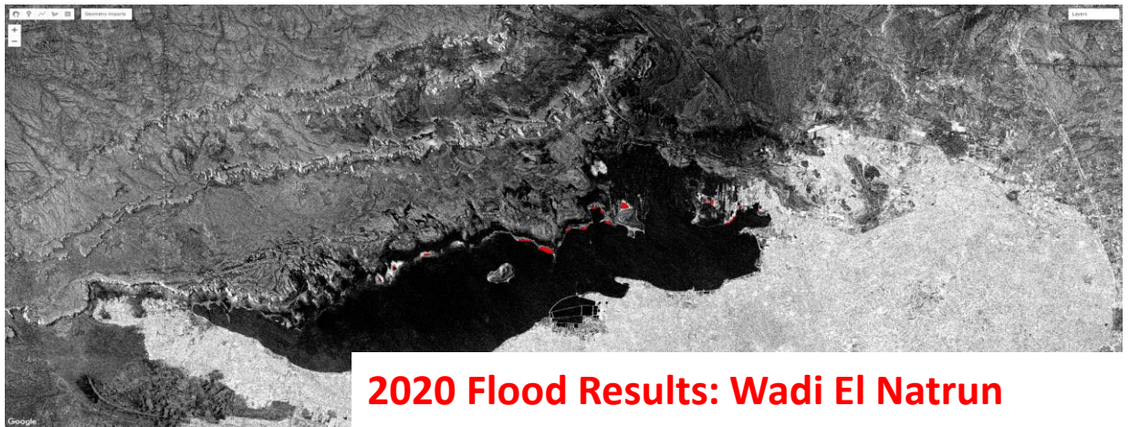
Al Natron Valley

Qarun Lake

Along the Nile river



2020 Flood Results: Qarun Lake



2020 Flood Results: Wadi El Natrun

Ongoing Work

UN HABITAT: Exploration of the effects of inundation on low-income Settlements

AIS Big Data team at UNSD: Exploration of ship movement within the Suez canal as the floods led to the shutdown of main ports

Qatar Computing Research Institute (QCRI): To adapt work on Flood Detection to Arab region on testing 2 tools for the use of deep learning for flood inundation mapping

Use of twitter data: service setup enabled streaming live data only but no historical data to match up with floods dates

For the deep learning tool developed for flood detection, the training dataset used was based on open data on previous flooding events that weren't based in Arab Region (India QCRI model was unfamiliar with how floods look like in radar images on our region's terrain and geography so the model wasn't able to properly distinguish between flooded and non-flooded lands.

Challenges and Opportunities

Challenges for implementation by governments

1. Mandate: Governments (NSOs) are not engaged in remote sensed data for disaster risk reduction because other entities have the mandate defense, national security etc.
2. Institutional: NSOs did not put in place coordination mechanisms with other national agencies
3. Capacity building: to enable their staff to use and produce new data sources and integrate with their regular data production

Opportunities for people and policy makers

1. More inclusive flood maps. Even small floods affect lives, livelihoods, health, assets and mobility
2. People can now find that their posts on social media are supporting disaster analysis, policy, and response
3. Our team is Developing a Flood Estimation Tool for Localized Floods for any user and a Guide for Flood Detection with EO and GEE

Thank You

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