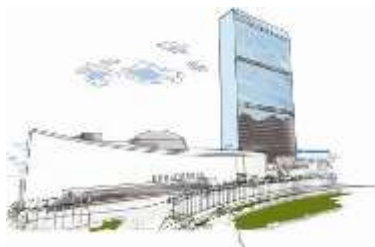




United Nations Geospatial Operations



Chief UNGIS
Kyoung-Soo Eom

Technology Operations Service, Office of Information & Communications Technology

Why GIS for United Nations?

- Maps communicate → **integrated information**
- Spatial analysis & Intelligent imagery
- New technology → **integrating real-time data**



... Better understanding
... Faster Decision Making
... Improved Communication
... Increased Efficiency

What added value from GIS?

Data

Information

Intelligence



... Better understanding
... Faster Decision Making
... Improved Communication
... Increased Efficiency

UN Geospatial Operations

Mandate:

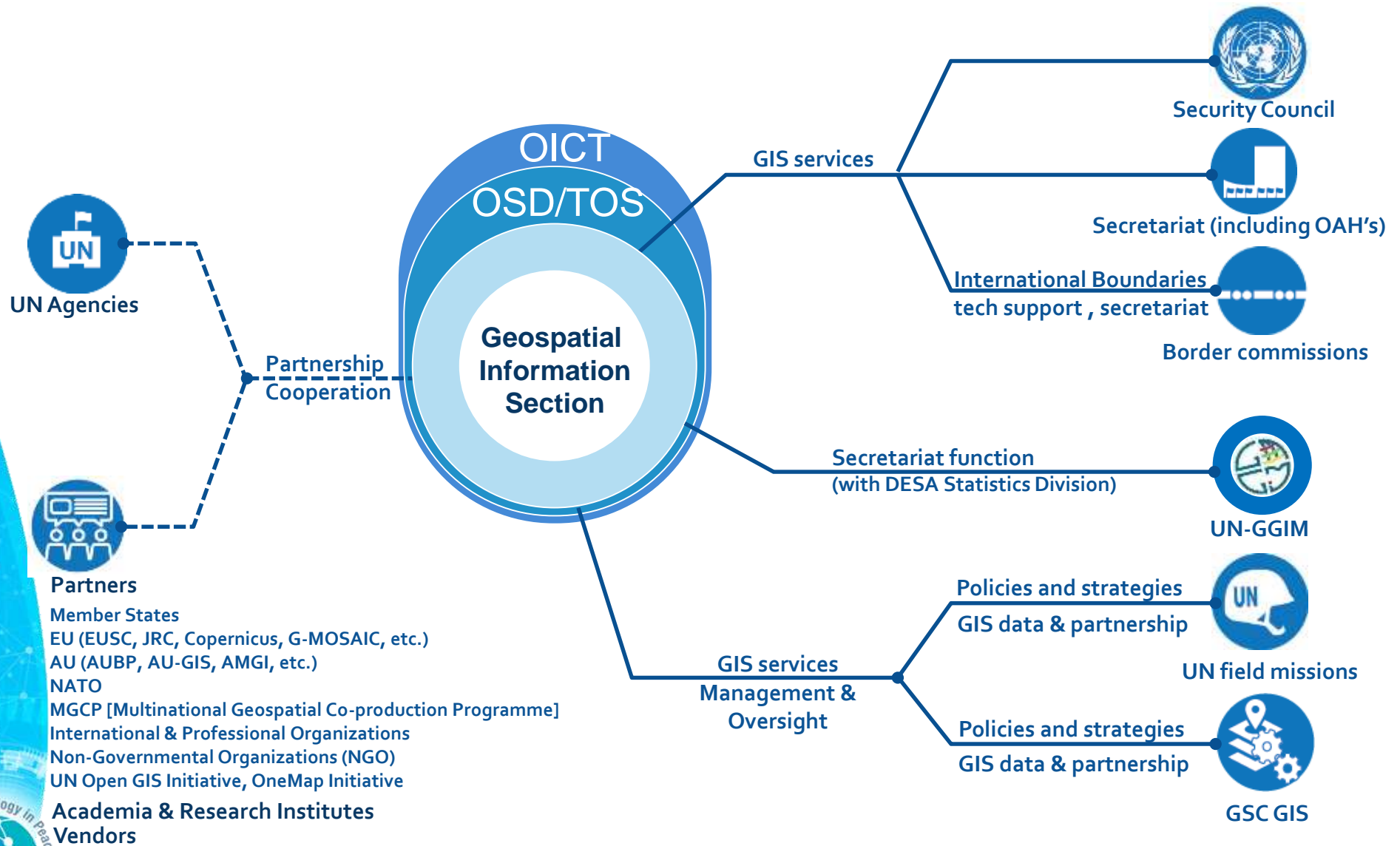
UNGIS provides geospatial information & services to the full range of UN operations, which includes

HQ GIS Operations

- UN Security Council
- UNOCC, Executive Committee & Deputy Committee (EC/DC)
- UN Peace Operations
- UN Secretariat (all departments/offices, UNOCC and OAH's)
- Co-Secretariat (with DESA/Statistics Division) to UN Committee of Experts on Global Geospatial Information Management (UN-GGIM)
- Technical assistance on International Boundary issues
- Program Management for UN field mission GIS operations
- UN system (UN AFPs)



UN Geospatial Operations



Where We Operate

UNHQ
New York



UN Field Missions
(PK & SPMs)



UNGSC
Brindisi
Italy



UNICTFV
Valencia
Spain



“Twin Technology Centres”



Global Geospatial Support

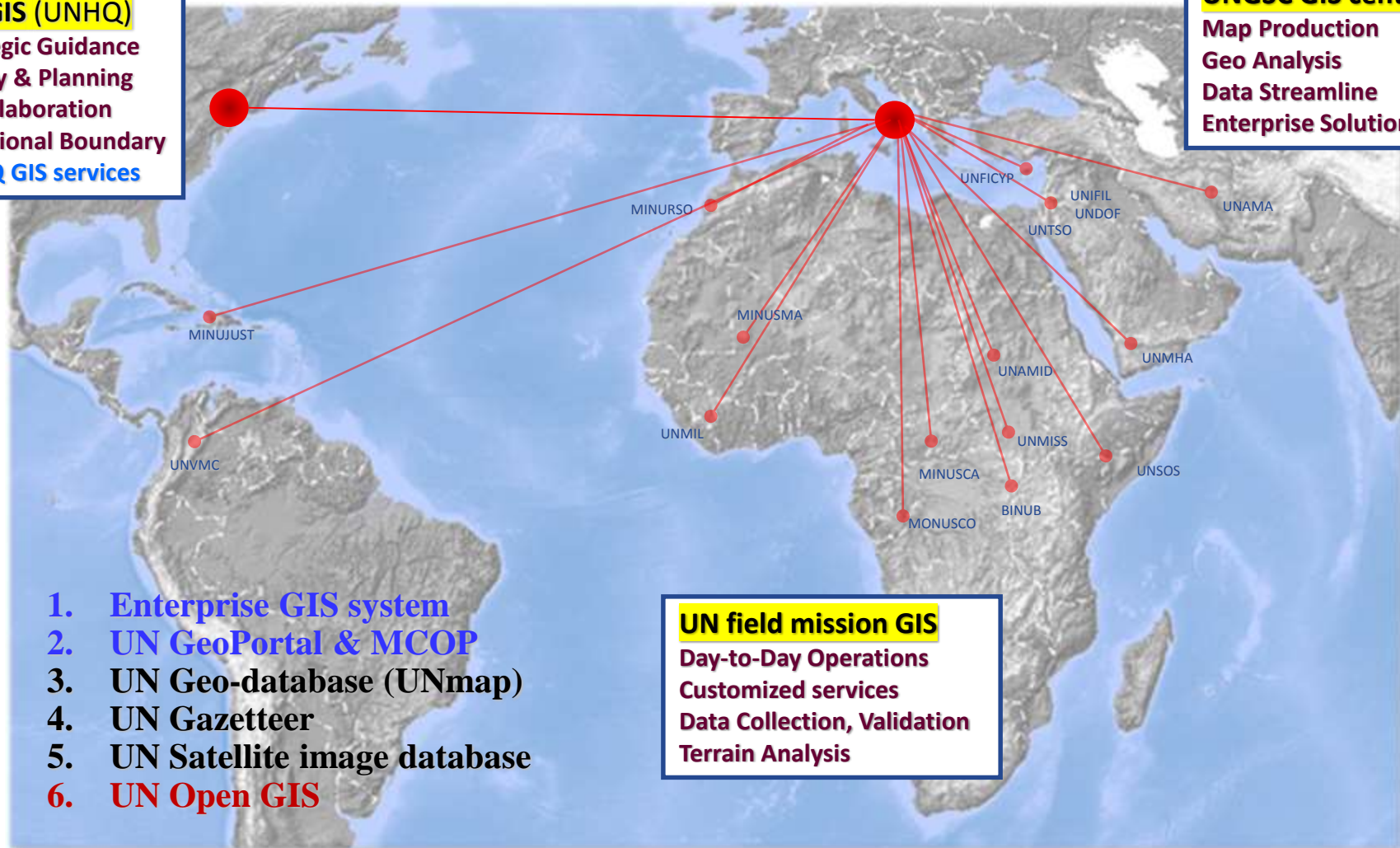
3-tier: UNHQ–UNGSC–Missions

UNGIS (UNHQ)

Strategic Guidance
Policy & Planning
Collaboration
International Boundary
UNHQ GIS services

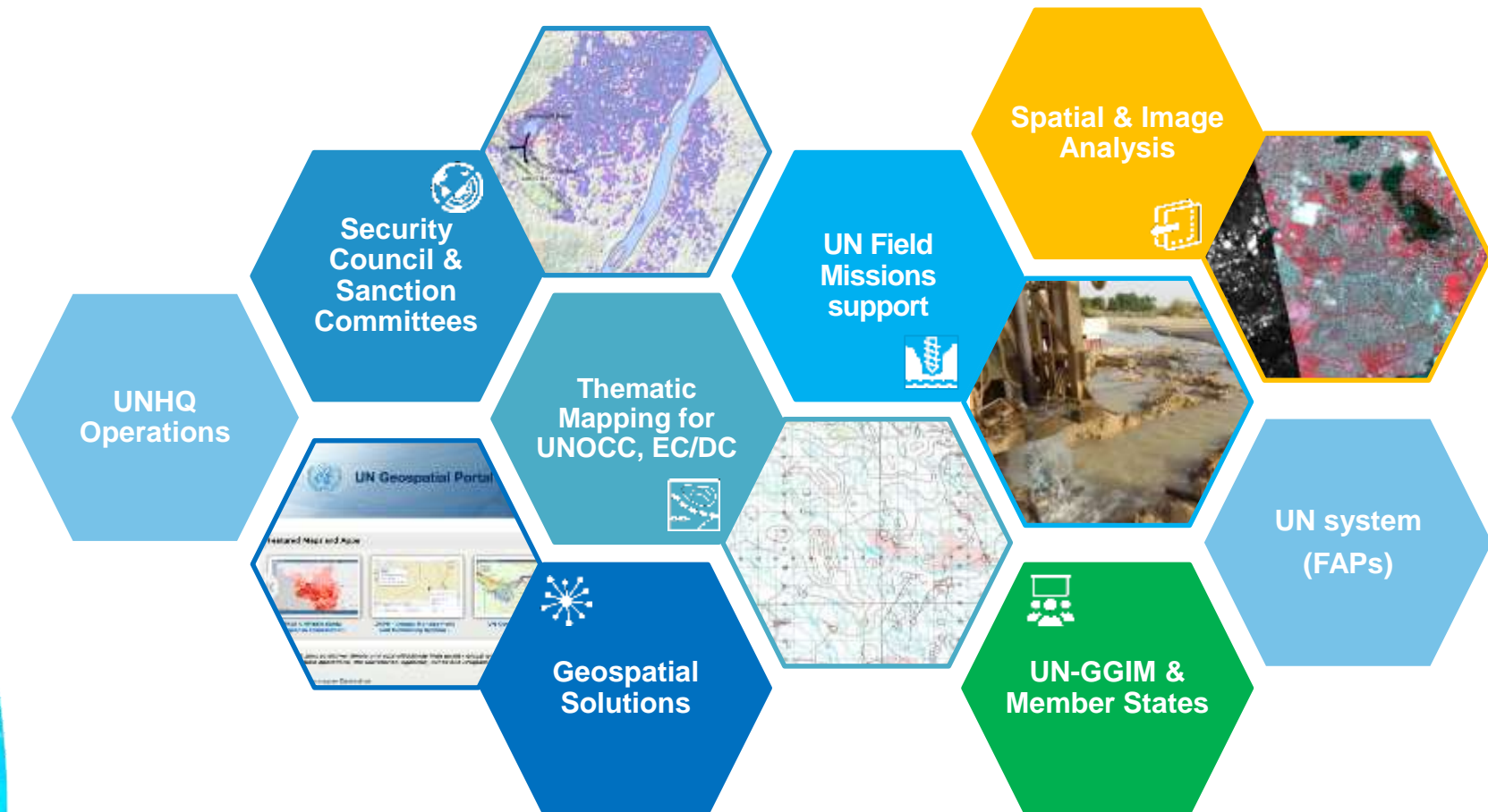
UNGSC GIS centre

Map Production
Geo Analysis
Data Streamline
Enterprise Solutions



17 UN field missions

Geospatial Service & Support



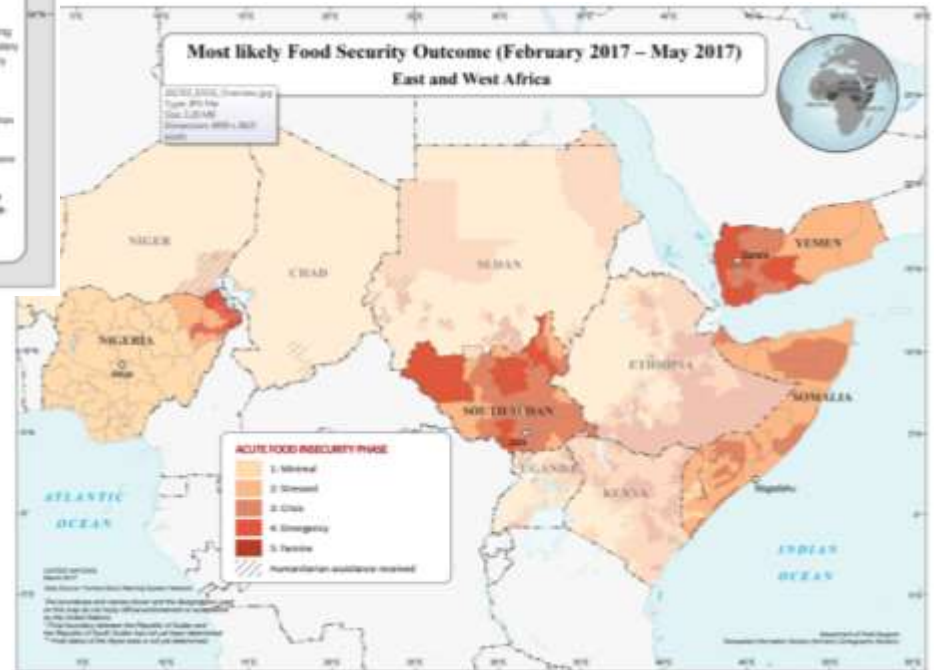
UN Security Council

- Daily support to the Security Council consultation
- Special briefing maps
- Geospatial analysis support to the subsidiary bodies (Sanction's committees) of the Security Council

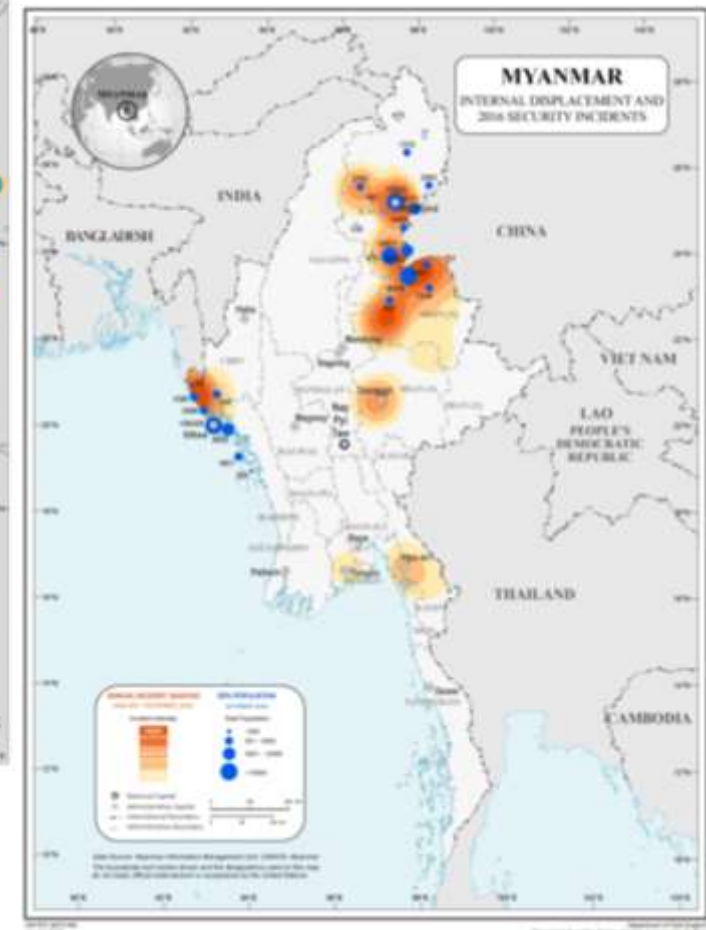
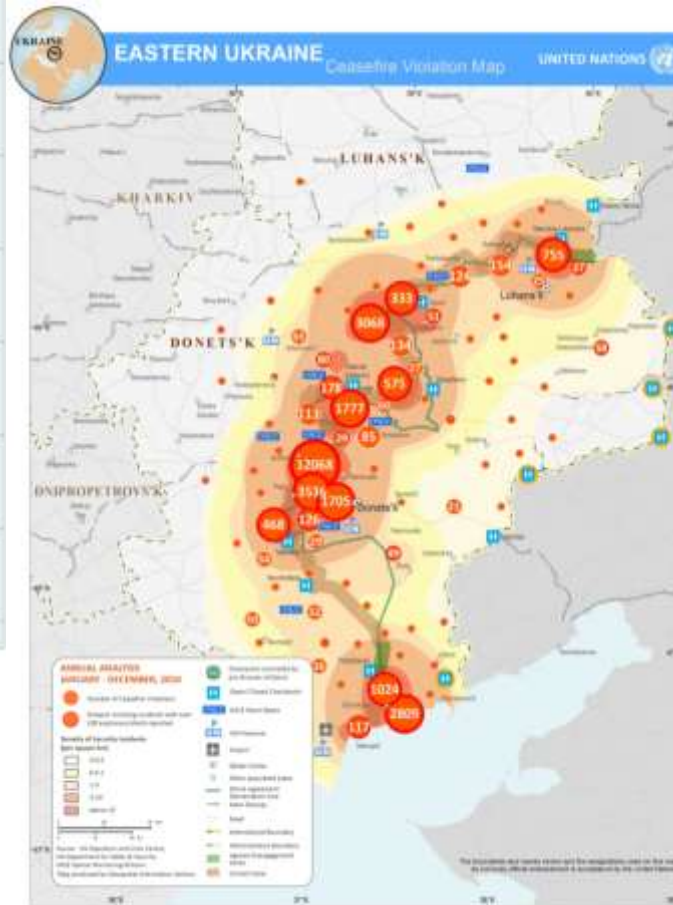
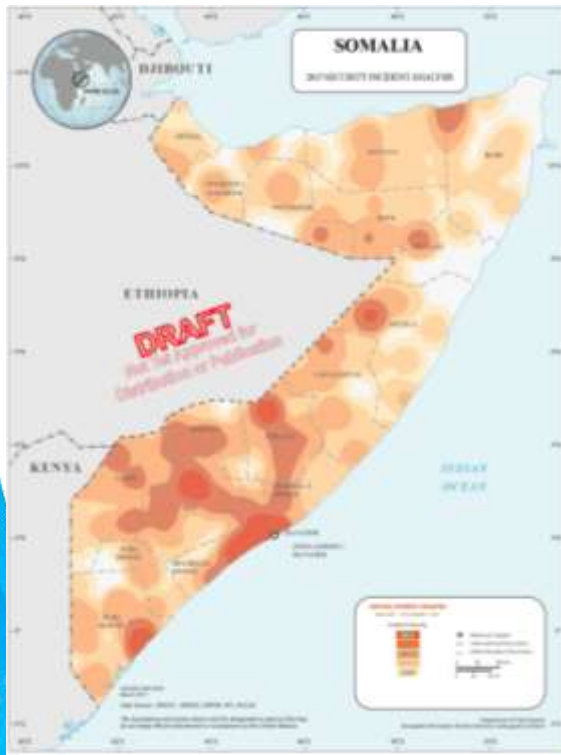


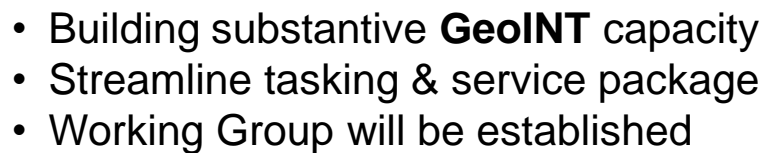
Spatial Analysis

The image displays two maps used for spatial analysis. The top map, titled 'SYRIAN ARAB REPUBLIC Estimated Areas of Influence 3 - 31 January 2017', shows the Syrian Arab Republic with various regions color-coded to represent different levels of influence or control. It includes a legend with symbols for cities, towns, military assets, and infrastructure, as well as a scale bar and a note about the data source. The bottom map, titled 'Most likely Food Security Outcome (February 2017 - May 2017) East and West Africa', shows the food security status across East and West Africa. It uses a color scale from light yellow (1. Minimal) to dark red (5. Severe) to indicate the level of food insecurity. A legend for 'ACUTE FOOD INSECURITY PHASE' is provided, along with a note about the data source and a small inset map of Africa.



Incident & IDP Analysis



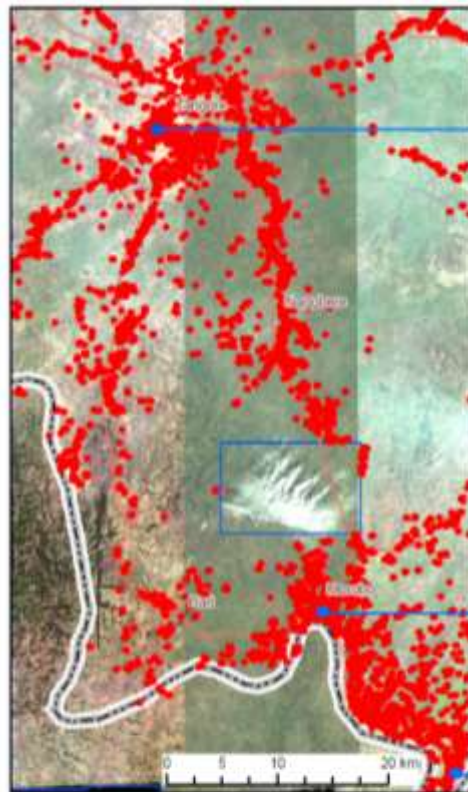


- ### DAMAGED BRIDGES IN MOSUL, IRAQ
- image as at 25 February 2017
- Geospatial Information Section
UNITED NATIONS
-
- Alkadisiya Bridge damaged (impassable)**
between 20 Nov and 30 Dec 2016
- Ninawa Bridge damaged (passable by foot only)**
Between 21 Oct and 4 Nov 2016
damaged (impassable)
Between 04 Nov 2016 and 13 Jan 2017
- Old Bridge damaged (impassable)**
between 20 Nov and 30 Dec 2016
- Fourth Bridge damaged (impassable)**
between 20 Nov and 30 Dec 2016
- Jubayl Bridge damaged (passable by foot only)**
between 10 and 16 Oct 2016
damaged (impassable)
between 16 and 21 Oct 2016
- Red arrow points at the damaged part of the bridge
- Images source: WHS, VNA 2017-02-25 08:25 UTC image Copyright 2017 DigitalGlobe Inc.
Prepared by Geospatial Information Section, ICTD, DFS, United Nations
8 March 2017

Destruction Analysis

DESTRUCTIONS IN SOUTH SUDAN

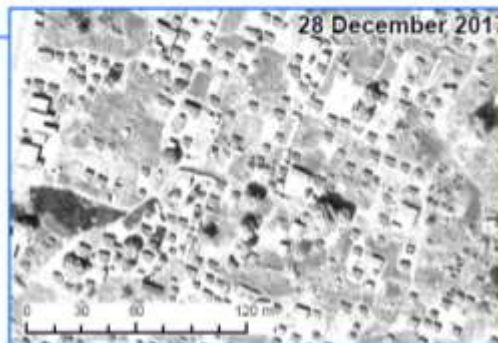
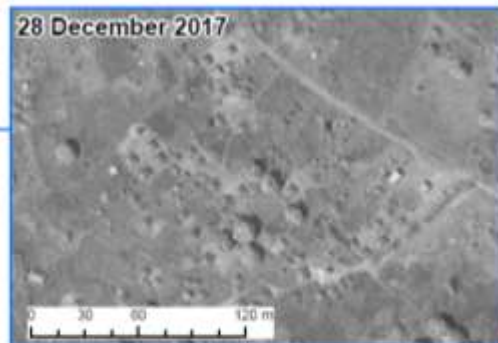
Geospatial Information Section
UNITED NATIONS



Legend

- Destroyed structure (UNOSAT data)
- Destroyed and damaged structure (UNOSAT data)
- National Capital
- City
- Town/Village
- International Boundary
- Main Road
- Secondary Road
- Other Road

Prepared by:
Geospatial Information Section,
ICTD, DPS, United Nations
16 April 2017



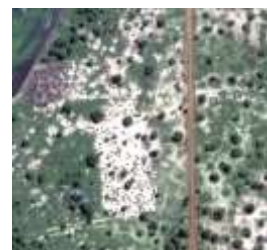
Imagery source: WV02 2017-03-05 Image Copyright 2017 DigitalGlobe Inc. WV01 2017-01-28 Image Copyright 2017 DigitalGlobe Inc.

2

Mission Planning, Start-up

Geospatial support to:

- Technical Assessment Mission (TAM)
- Mission Planning (Military, Police, Logistics, etc.)
- Mission Start-up
- Situational awareness
- Crisis monitoring/response/management



2012



3 Jan 2014

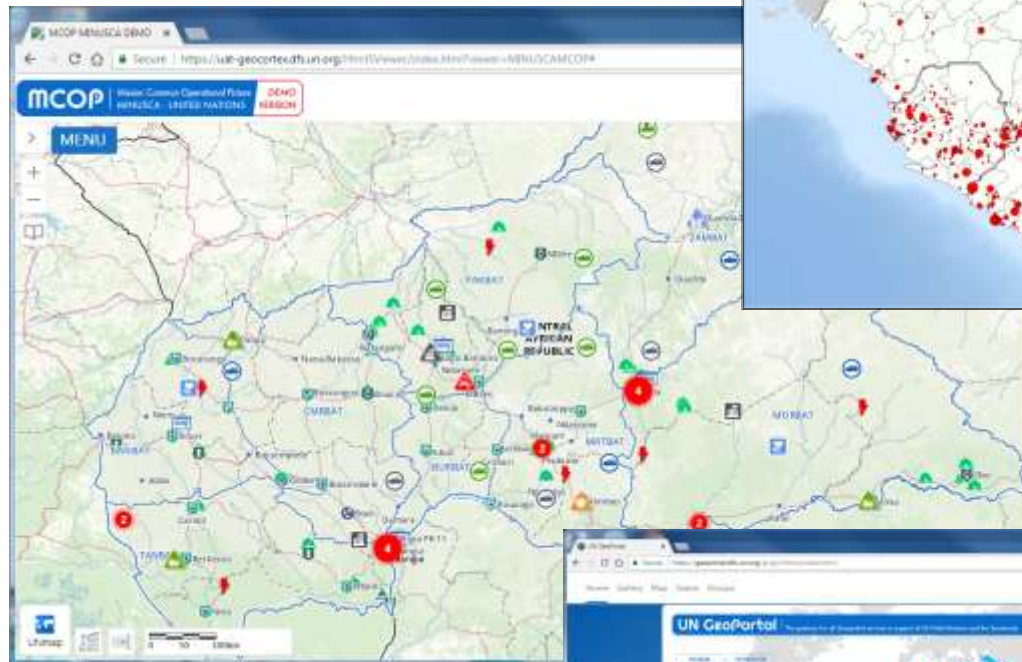
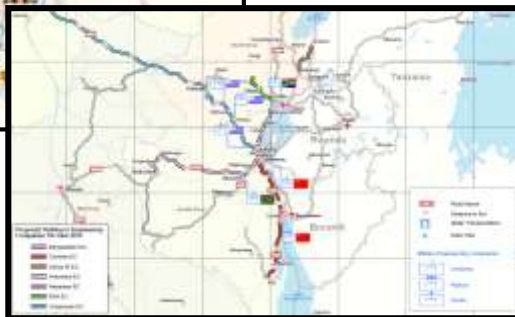


16 Jan 2014



UN field missions

- Day-to-day operations and decision-making for all mission components:
 - Political process
 - Force, Police, Security
 - Electoral, DDR
 - Logistics, Engineering
 - Air operations



Inter'l Boundary Project

Geospatial support to International Boundary issues

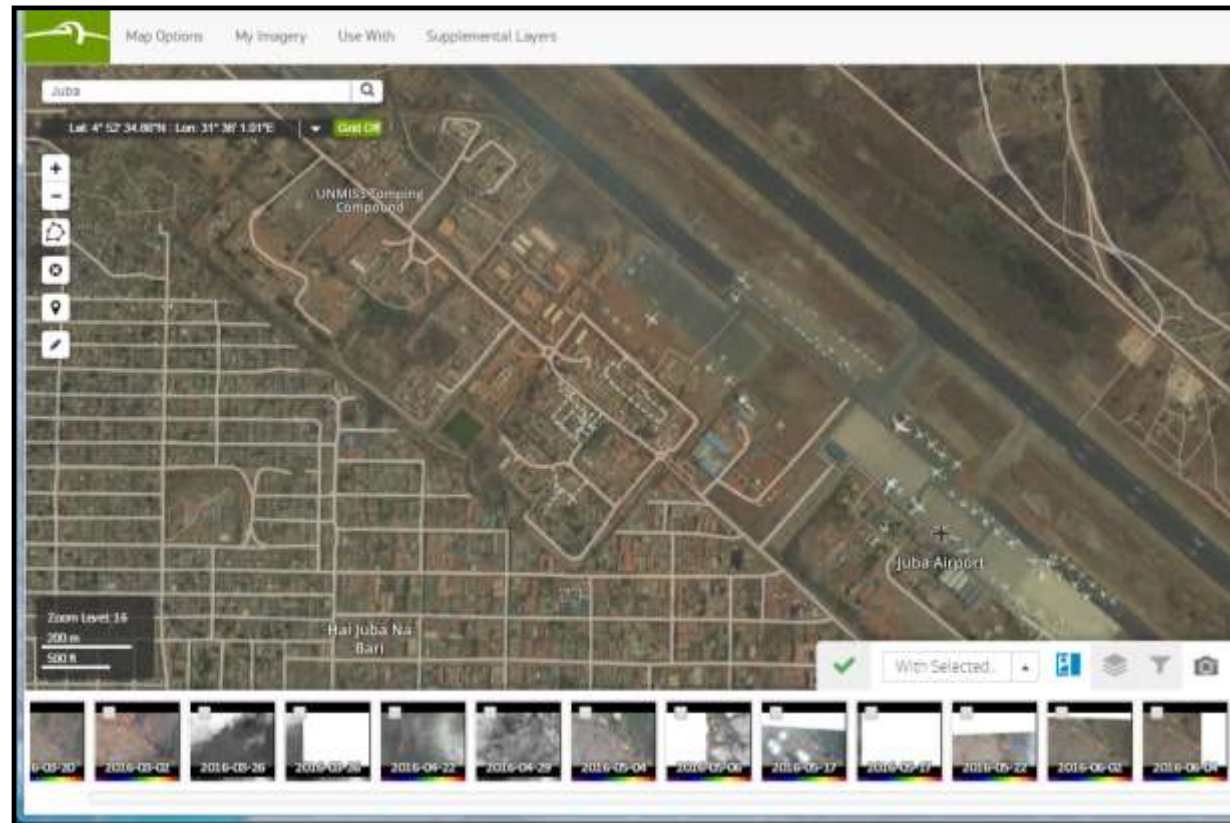
- Boundary delimitation and demarcation projects by the Security Council resolutions and mandates (Iraq-Kuwait, Eritrea-Ethiopia, Lebanon-Israel, Cyprus, etc.)
- Request from Member States concerned (**Cameroon-Nigeria, Sudan-South Sudan, etc.**)



Rapid Access Satellite Imagery

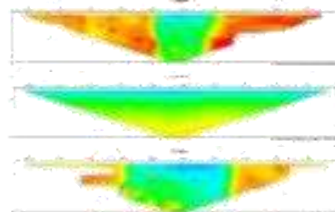
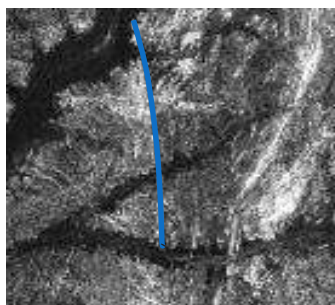
■ My DigitalGlobe

- Satellite imagery access in near real-time (4-6 hours)
- Access archived satellite imagery (over 3 years)
- Commercial platform provided by US Gov't
- Meets UN operational requirements (near real-time & historical imagery)
→ Allow better analysis and planning



Groundwater Exploration

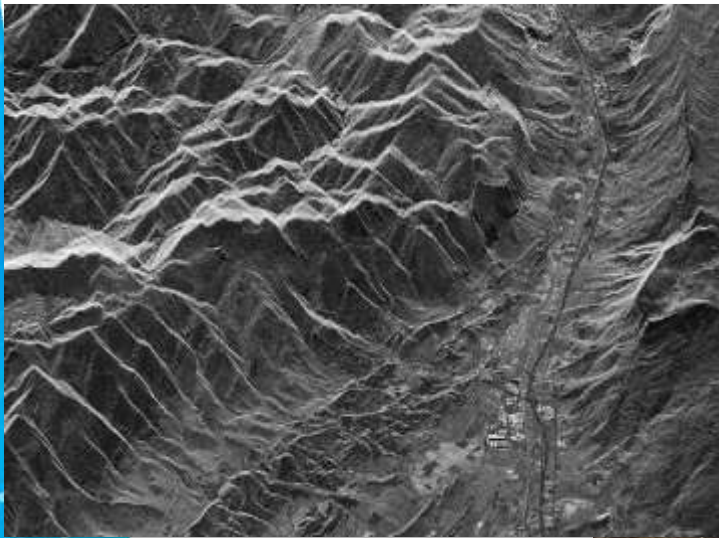
- Using GIS, Remote Sensing, Geophysics, Underground 3D modeling
- High success rate to identify water source using modern geospatial technology
- Water found in 6 towns, Mali (Tombouctou, Gao, Kidal, Almoustarat, Aguelhoc, Tessalit)
- Currently support to UNSOS/AMISOM in Somalia and UNMISS in South Sudan



SAR Satellite Imagery Exploration

Enhancing UN capacity to monitor, change detection & analyze

- Exploring **Synthetic Aperture Radar** (SAR) satellite imagery
- **Independent** of **weather** and **light** conditions
- Joint projects with **EU Copernicus** (EU Satellite Centre) and **Government of Finland**



ICEYE-X2: Aratz National Park, Spain



UN GeoPortal

The UN gateway for all geospatial services for collection, processing, analyzing & visualization

MAPPING SERVICES

- Basemaps
- Common Operation Geospatial Information (COGI)
- Mission Operation Geospatial Information (MOGI)

APPLICATIONS

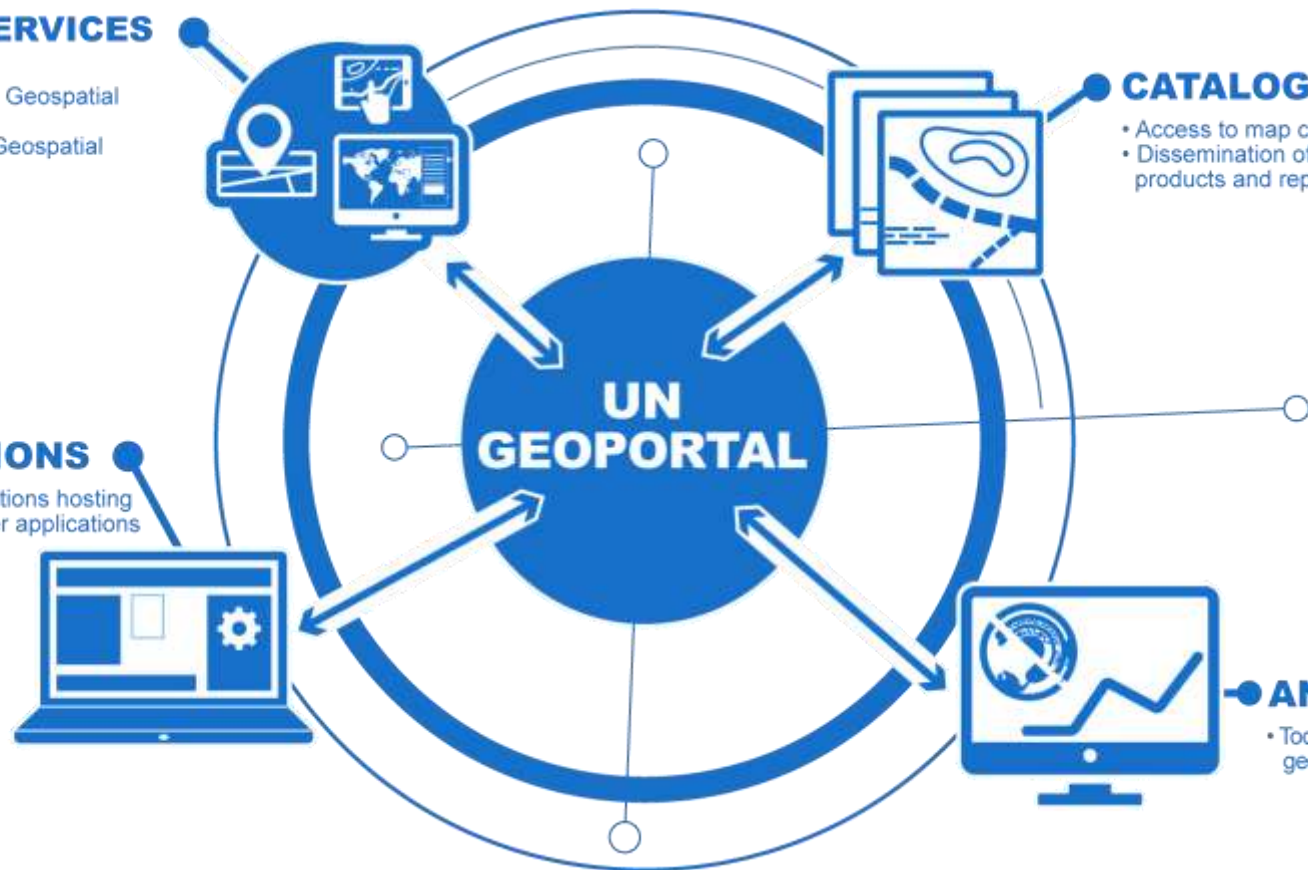
- Geospatial applications hosting
- Creating basic user applications

CATALOGUE

- Access to map catalogues
- Dissemination of geospatial products and reports

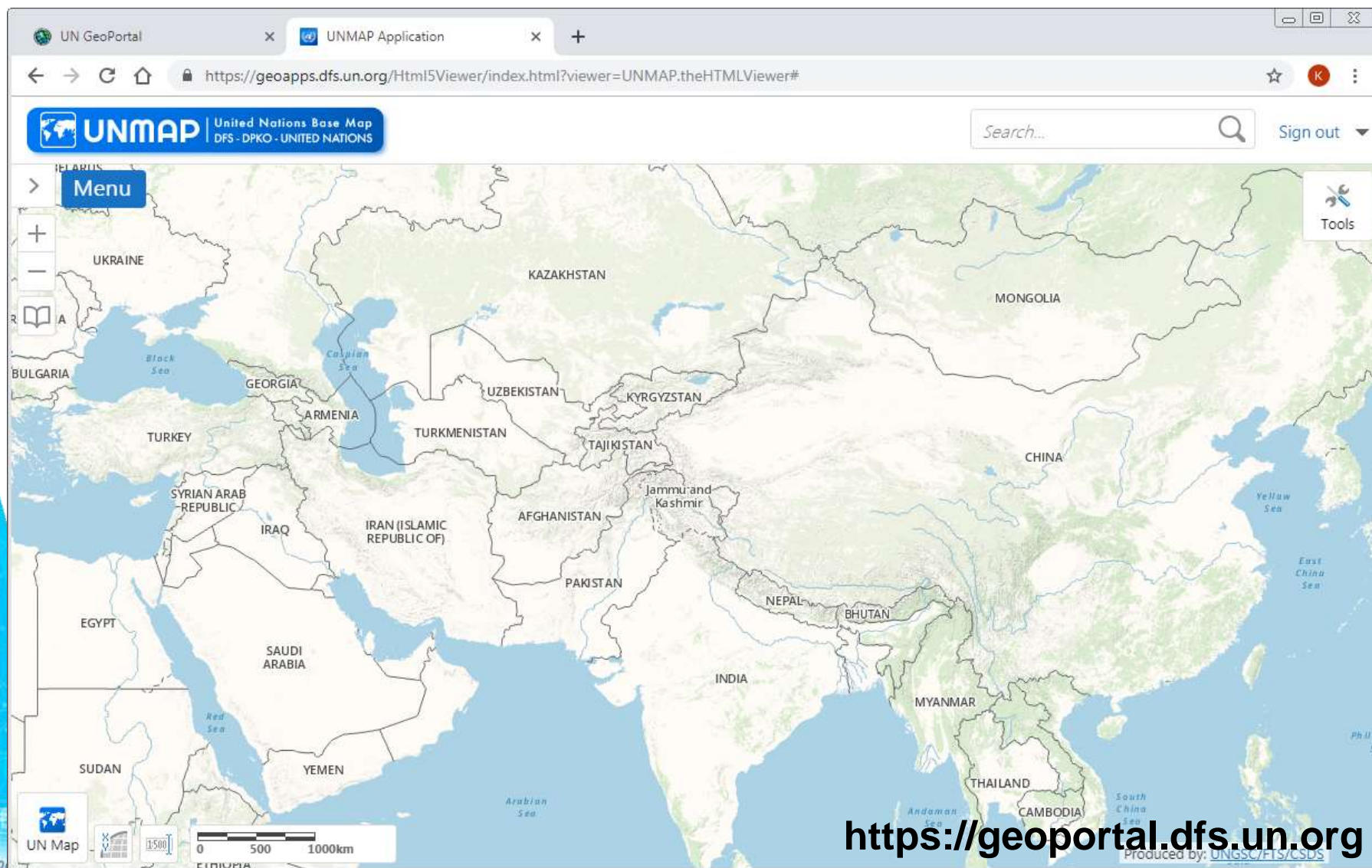
ANALYSIS

- Tools to support basic geospatial analysis



<https://geoportal.dfs.un.org>

UN GeoPortal



Common Operational Picture

Mission Common Operational Picture (MCOP)



Visualize

View, browse, export maps to reports and presentations



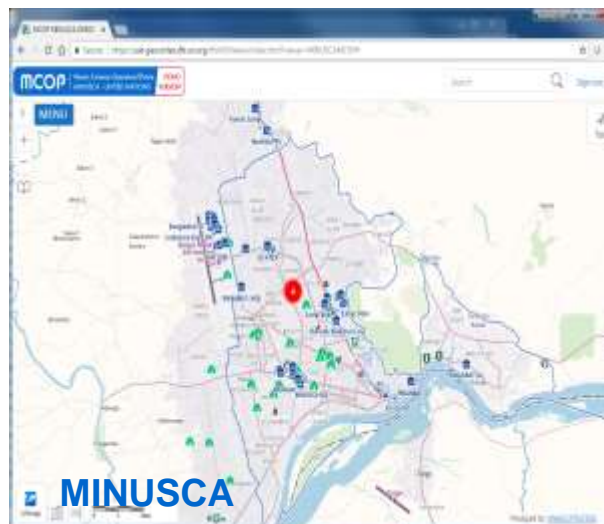
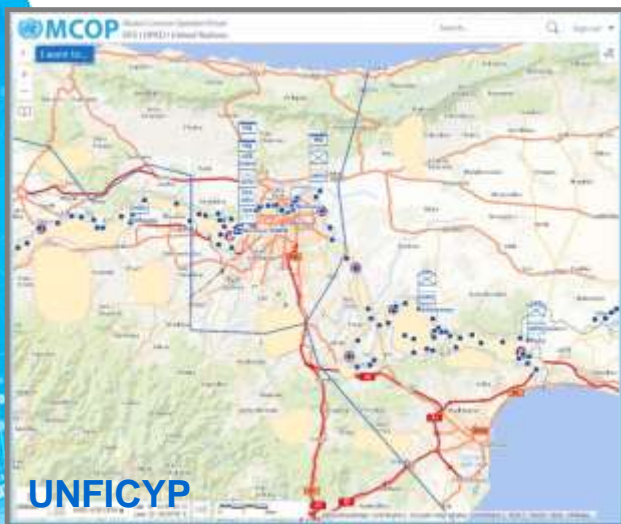
Monitor

Identify objects on layers, bookmark locations for briefings, search for available data



Analyse

Locate incidents with buffer distance, analyse available recourses in the area, identify shortest and safest route, evaluate elevation, use analytical layers



UN Committee on GGIM



United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM)

- UN Committee to discuss, enhance and coordinate global geospatial activities by Member States to make joint decision and set directions on geospatial in global and national policy frameworks
- Strengthening geospatial information management (national, regional & global)
- Established in 2011 by UN Economic and Social Council (ECOSOC)
- Joint Secretariat (OICT-UNGIS and DESA-Statistical Division)



UN Committee on GGIM



Working Group on Geospatial Information & Services for Disasters

- UN-GGIM adopted the Strategic Framework on GI&S4D (August 2017)
- ECOSOC resolution for the Strategic Framework on GI&S4D (July 2018)
 - ensure the availability & accessibility of quality geospatial information & services
 - member states and all stakeholders to adopt strategic framework

Strategic Framework on Geospatial Information and Services for Disasters				
Scope and Purpose				
The strategic framework aims to guide all stakeholders and partners in the management of geospatial information and services in all phases of disaster risk management				
Expected Outcome				
The social, economic, and environmental risks and impacts of disasters are prevented or reduced through the use of geospatial information and services				
Goal				
Quality geospatial information and services are available and accessible in a timely and coordinated way to support decision-making and operations within and among all stakeholders and partners in all phases of disaster risk management				
Priorities for Action				
Member States with the support of regional and international organizations as well as other relevant organizations should focus their action on the following five priorities for action:				
Priority 1 Governance and Policies	Priority 2 Awareness Raising and Capacity Building	Priority 3 Data Management	Priority 4 Common Infrastructure and Services	Priority 5 Resource Mobilization
Policies, collaborative agreements and legal frameworks aiming at improving the availability and accessibility of quality geospatial information and services among all stakeholders and partners established and implemented in all phases of DRM	Awareness is raised among concerned entities on the importance of geospatial information and services and all necessary technical and human capacities are built and/or strengthened	Geospatial databases and information products are developed based on common standards, protocols and processes as important tools in every decision-making process across all phases of DRM	Common facilities and services are established for all key stakeholders and partners to have a common operational picture of emergency scenarios	All necessary technical, human and financial resources are available to sustain all the activities of DRM
Guiding Principles				
The strategic framework is guided by the 2030 Agenda for Sustainable Development, International Strategy for Disaster Reduction, Sendai Framework for Disaster Risk Reduction (2015-2030), the UN-GGIM Global Statistical Geospatial Framework, UN General Assembly resolution on international cooperation on humanitarian assistance in the field of natural disasters, from relief to development and other relevant instruments. It is also guided by the principles of open data and requirements of national data infrastructure, and by the UN-GGIM's Statement of Shared Guiding Principles for the Management of Geospatial Information.				

United Nations
E/2018/L.15

Economic and Social Council
Distr.: Limited
20 June 2018
Original: English

2018 session
27 July 2017–26 July 2018
Agenda item 18 (i)
Economic and environmental questions:
geospatial information

Jamaica* and Philippines: draft resolution

Strategic Framework on Geospatial Information and Services for Disasters

The Economic and Social Council,
Recalling General Assembly resolution 66/285 of 27 July 2012, by which the Assembly endorsed the outcome document of the United Nations Conference on Sustainable Development, entitled "The future we want", which recognized the importance of space technology-based data, in situ monitoring and reliable geospatial information for sustainable development policymaking, programming and project operations,
Recalling also General Assembly resolution 70/1 of 25 September 2015, by which the Assembly adopted the document entitled "Transforming our world: the 2030 Agenda for Sustainable Development", which recognized that quality, accessible, timely and reliable disaggregated data will be needed to help with the measurement of progress and to ensure that no one is left behind,
Recalling further General Assembly resolution 69/283 of 3 June 2015, by which the Assembly endorsed the outcome documents of the Third United Nations World Conference on Disaster Risk Reduction, entitled "Sendai Declaration" and "Sendai Framework for Disaster Risk Reduction 2015–2030", which recognized the importance of a concise, focused, forward-looking and action-oriented post-2015 framework for disaster risk reduction and the importance of disseminating risk information with the best use of geospatial information technology,
Recalling General Assembly resolution 71/256 of 23 December 2016, by which the Assembly endorsed the outcome document of the United Nations Conference on Housing and Sustainable Urban Development (Habitat III), entitled "New Urban Agenda", which committed to strengthening the resilience of cities and human settlements, including through the development of quality infrastructure and spatial planning, by adopting and implementing integrated, age- and gender-responsive policies and plans and ecosystem-based approaches in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 and by mainstreaming holistic

* In accordance with rule 72 of the rules of procedure of the Economic and Social Council.

18-10117 (E) 260618
Please recycle

<http://ggim.un.org/UNGGIM-wg5/>

UN Open GIS Initiative

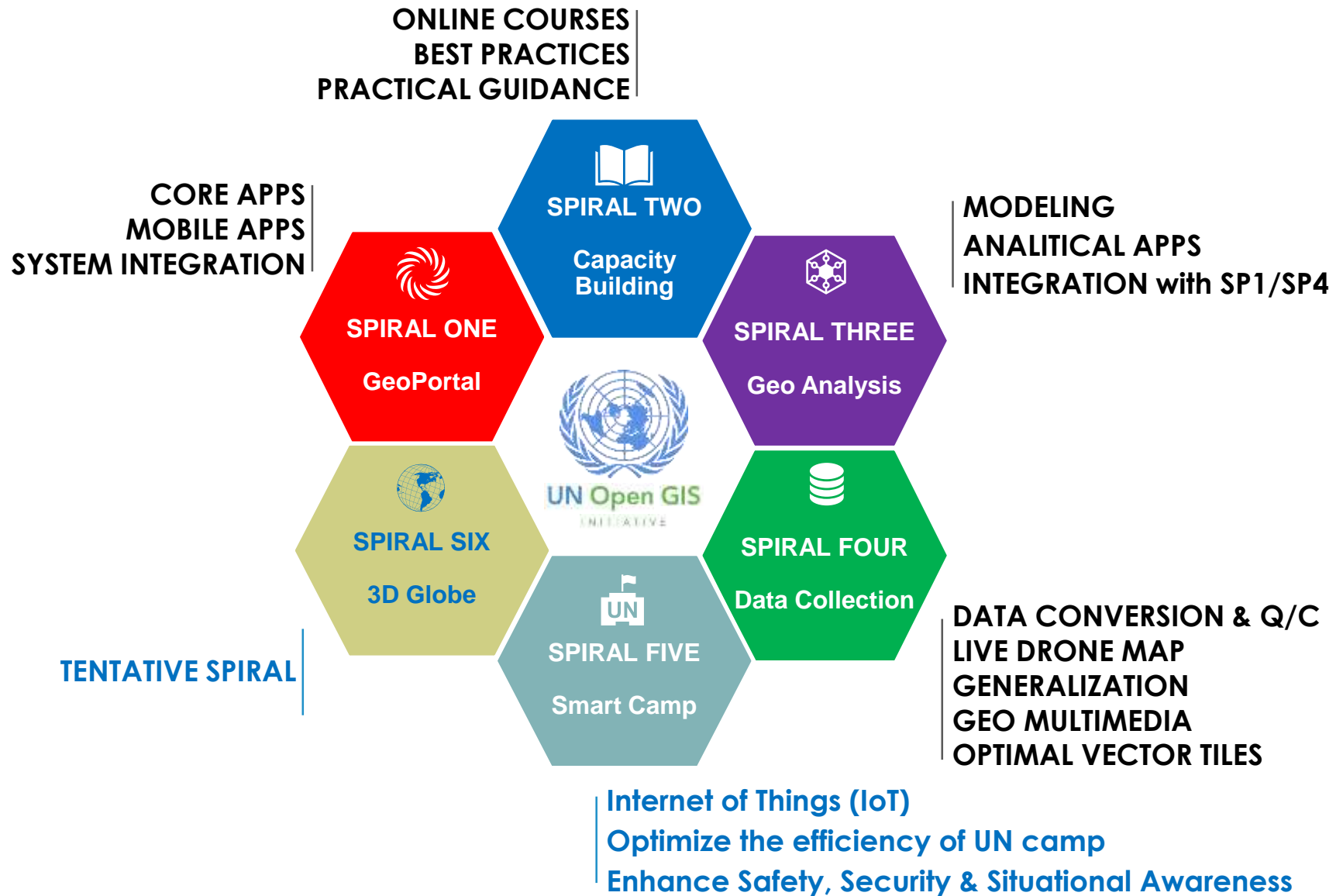
Established: March 2016



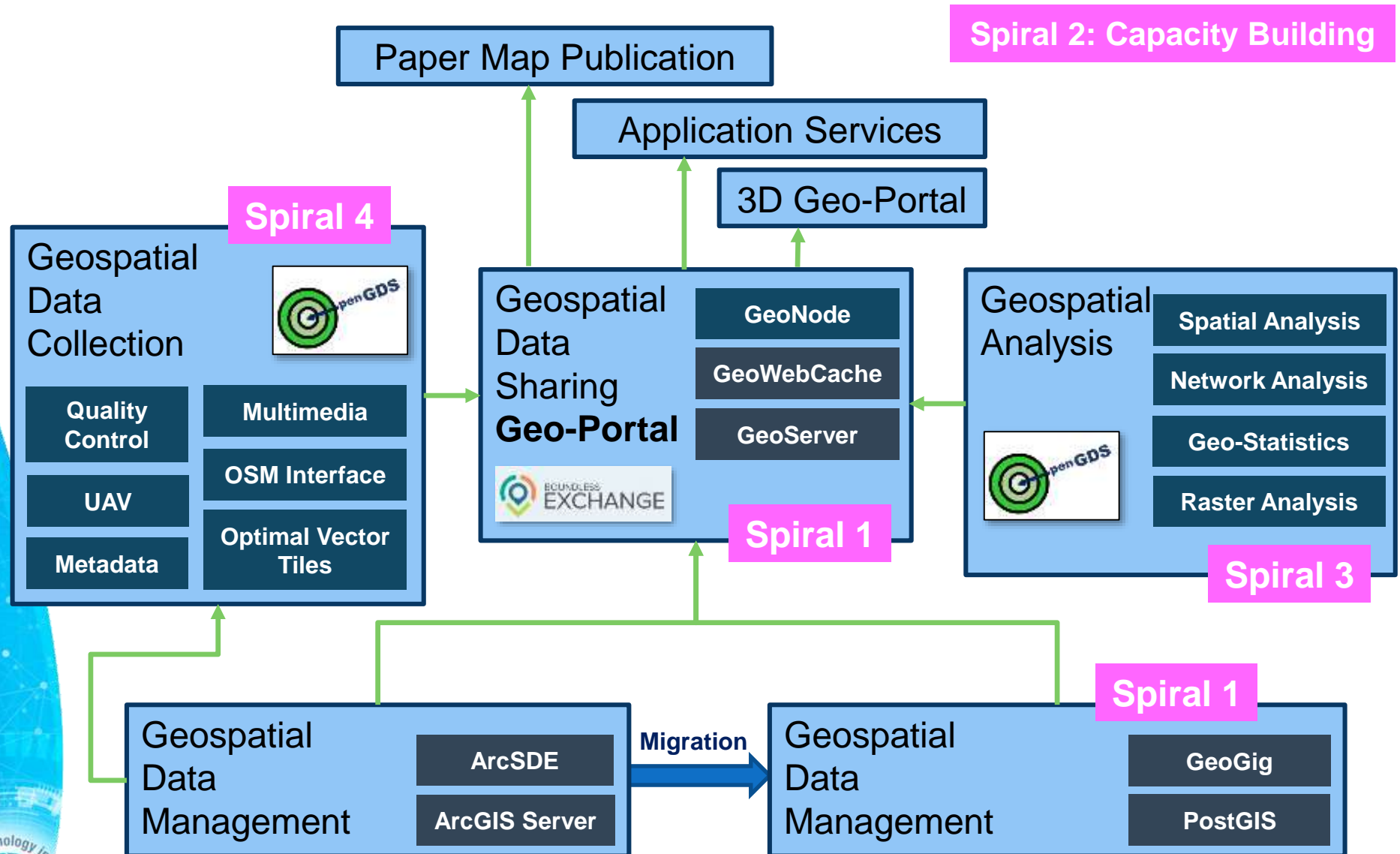
The **UN Open GIS Initiative** is to **identify and develop** an **Open Source GIS bundle** that **meets the requirements of UN operations, taking full advantage of the expertise from partners** (member states, technology contributing countries, international organizations, academia, NGO's, private sector)



UN Open GIS: Six Spirals



System Architecture



UN Open GIS: milestone



Phase 1: Setting Up

Fundamental Setting

1. Governance structure
2. System infrastructure
3. Training mechanism

Phase 2: Development

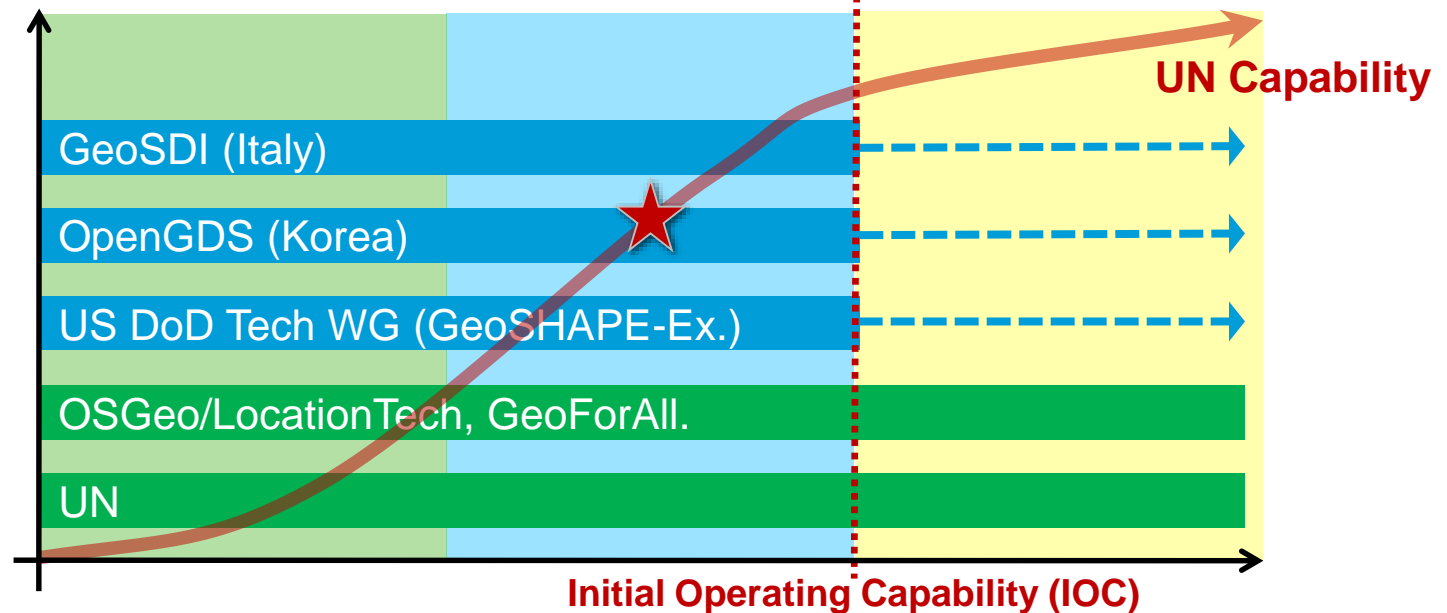
Solution Development

1. Develop solutions & testing
2. Training & capacity building
3. Implement/operational in UN working environment

Phase 3: Sustain

Sustainable Capacity

1. Operation & maintenance
2. New services & functions
3. Training & link with Open source GIS community
4. Transfer to 3rd parties



Progress and Achievement

2016

MAR

First UN Open GIS Workshop in Brindisi
Established UN Open GIS Initiative

AUG

Strategic Board meeting in Seoul

NOV

Second UN Open GIS Workshop, Technology Partnership Symposium in Seoul

SEP-DEC

QGIS online training (39 UN staff)

2017

Monthly VTC meeting

JAN-MAY

QGIS online training (22 UN staff)

PostGIS online training (61 UN staff)

APR

Demo for UAV GIS solution in Brindisi

SEP

SP-1 Tech Demo of GeoSHAPE-Exchange in Brindisi

NOV

SP-3 Geospaital Analysis Workshop in Sejong, Korea

2018

Monthly VTC meeting

APR

SP-1 Operational Demo of GeoSHAPE-Exchange in Entebbe

APR

SP-5 UN Smart Camp Workshop in Brindisi

MAY

Third UN Open GIS W/S Technology Partnership Symposium in Berlin

AUG

Tech Workshop, St. Louis, USA

DEC

Piloting UN open GIS Prototype in UNMISS (TBC)

2019

Monthly VTC meeting

JAN-JUN

Piloting UN open GIS Prototype in UNMISS (TBC)

AUG

FOSS4G 2019, Bucharest

NOV

SP-3 Geo Analysis Technical Demo (TBC)

Major contributors:

Italy (PolMi), Japan (GSI, OSGeo/Japan), Rep. of Korea (OpenGDS, KRIHS, PNU, KAIST, ETRI)
USA (DoD, US Africa Command), OSGeo, GeoForAll

OneMap Initiative

Background

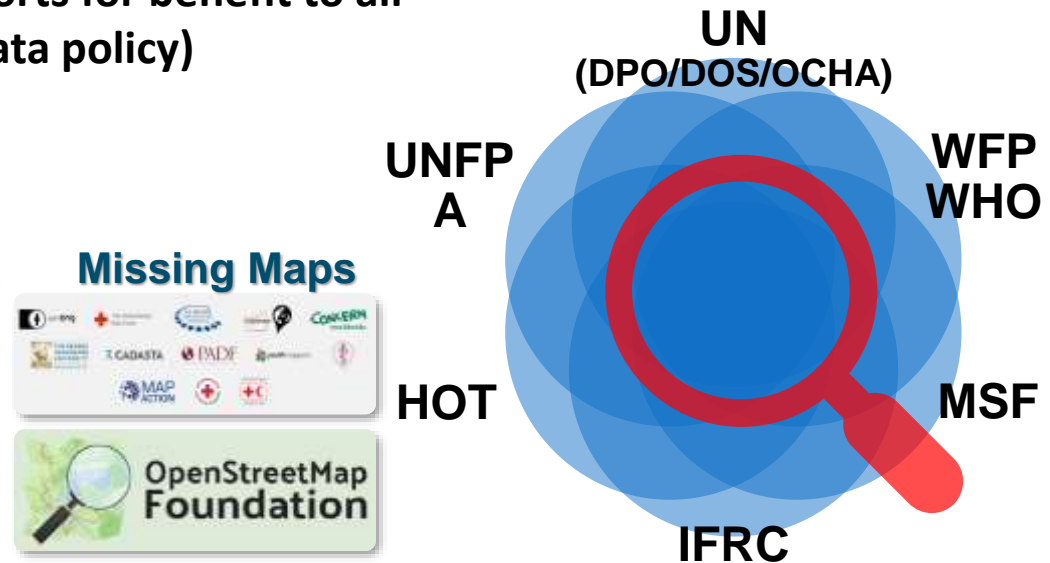
- **Lack of accurate, reliable and up-to-date geospatial data**
- **Tackled by individual organizational effort**
- **Limited resource, unsustainable, possible duplication**
- **Need to strengthen, through collective effort, for effective**
- **Demanded by and for Users and Peoples**

Way Forward: Common Framework

- **Produce geospatial information together, through minimum agreeable common framework, to avoid duplication and to synchronize/integrate collective efforts for benefit to all**
- **Common Framework (with Open Data policy)**
- **Practical level of Agreement**

Pilot project in South Sudan

- **Identify the collective requirements**
- **Develop common framework**
- **Establish sustainable mechanism**



Thank You



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Reference Information

Soil Moisture Monitoring System

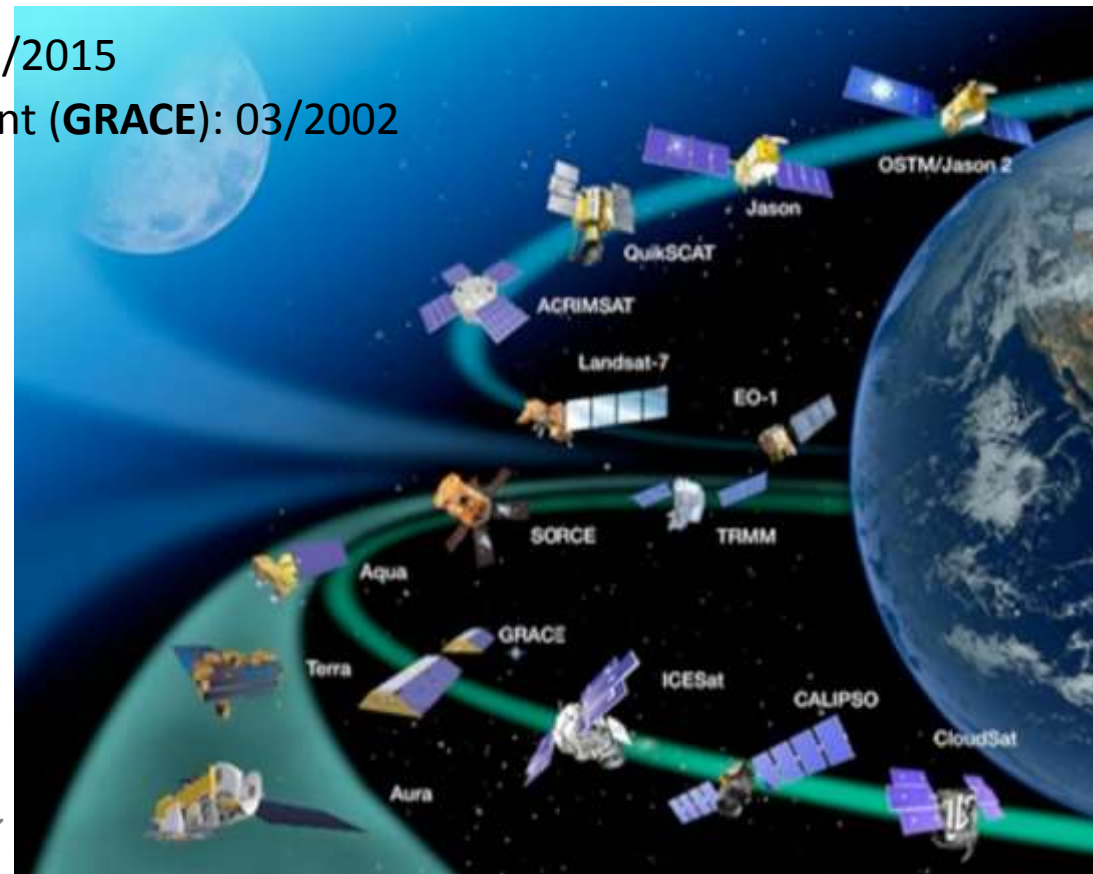
Name	Launched	Characteristic	Band (wavelength)	Instrument	Note
SCAN	USDA	200 Ground Stations		Radiometer	Texas A&M University
NOAA CRN		137 Stations across U.S.		Radiometer	
EOS AMSR-E	NASA, Aqua	>50 km	X- band, C-band (1 – 5 cm)	Radiometer	Low sensitivity to soil moisture
SMOS	ESA, Nov 2009	~40 km with sensing depth of ~5 cm	L – band (1.4 GHz or ~21 cm)	Radiometer	
SMAP	NASA, Jan 2015	1 -3 km with sensing depth of ~5 cm, 40 km (Radiometer)	L – band (1.4 GHz or ~21 cm)	Radiometer & Radar	RADAR stop working since 7 Jul 2015

- Relative advantages of lower frequency (< 5 GHz) microwave radiometry for mapping soil moisture content at the land surface
- At lower frequencies the atmosphere is less opaque, the intervening vegetation biomass is more transparent, and the effective microwave emission is more representative of the soil below the surface skin layer.



NASA for Drought Monitoring

- **Landsat**: 07/1972
- Tropical Rainfall Measuring Mission (**TRMM**): 11/1997 – 04/2015
- Global Precipitation Measurements (**GPM**): 02/2014
- **Terra**: 12/1999
- **Aqua**: 05/2002
- Soil Moisture Active Passive (**SMAP**): 01/2015
- Gravity Recovery and Climate Experiment (**GRACE**): 03/2002



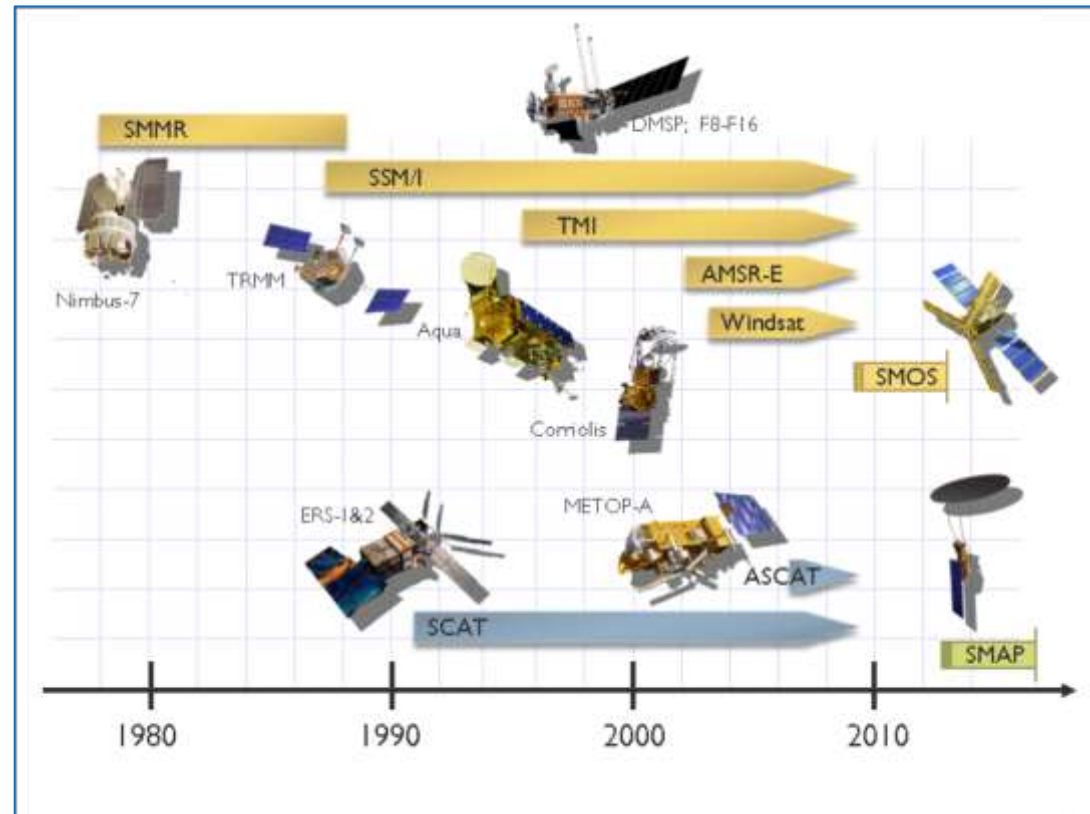
Remote Sensing of Drought

<https://arset.gsfc.nasa.gov/water/webinars/drought17>



ESA for Essential Climate Variables (ECV)

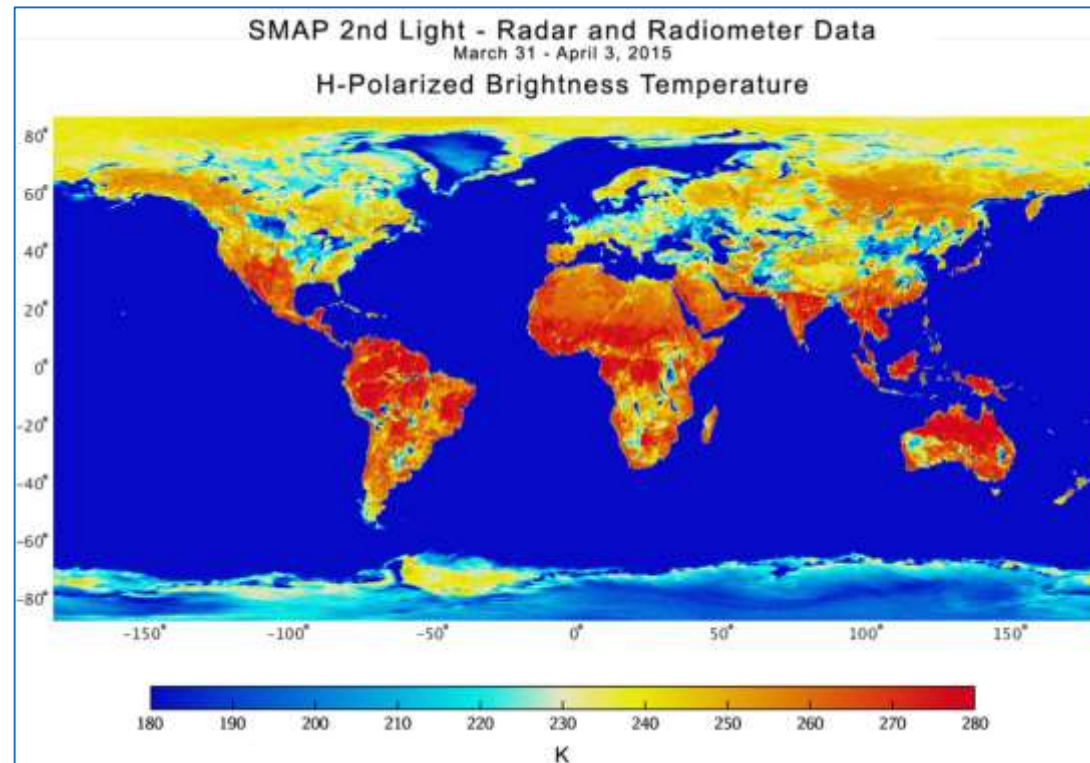
- Analyse the needs of the climate research in terms of soil moisture data.
- Adapt soil moisture satellite measurements for their use.
- Create a long-term consistent soil moisture time series, based on active and passive data.



<https://www.esa-soilmoisture-cci.org/node/93>

SAR in Drought Monitoring

- NASA SMAP Radiometer map
- Brightness temperatures in the Sahara Desert reach about 300 Kelvin due to its low moisture content.
- The impact of soil moisture is evident over a large region south of the Great Lakes, where an increase in soil moisture due to precipitation in March resulted in relatively cool brightness temperatures of about 200 Kelvin.
- Similar impacts of rain on soil moistures and brightness temperatures are seen in Namibia and Botswana, where there was significant rainfall in late March.



Dryland (China, Kazakhstan)

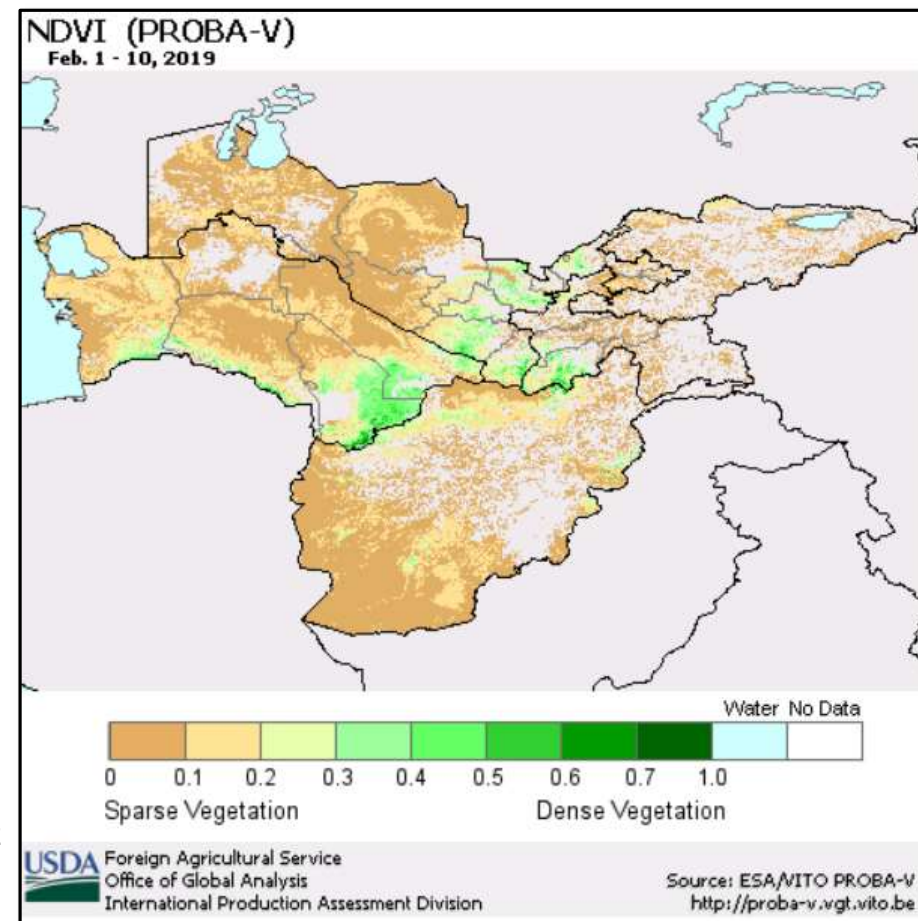
- Visible borders between eastern Kazakhstan and northwestern China due to land-use policies.
- China farms any land that can be sustained for agriculture. In this image, fields are dark green in contrast to the surrounding dry landscape, a sign that the farms are irrigated.
- Much of the agriculture on the Kazakh side is rain-fed, so fields are tan like the surrounding, natural landscape.



*Reference: Landsat 8, September 2013
NASA Earth Book 2018*

Vegetation, Fire Susceptibility

- Vegetation Indices help to determine the plant health
- When plants become dehydrated or stressed they reflect less near infrared light, but the same amount in the visible range
- Monitoring VIs provides changes in moisture content
- May need adjustment in methodology to reflect regional condition



<https://ipad.fas.usda.gov/cropexplorer/imageview.aspx?regionid=kz>



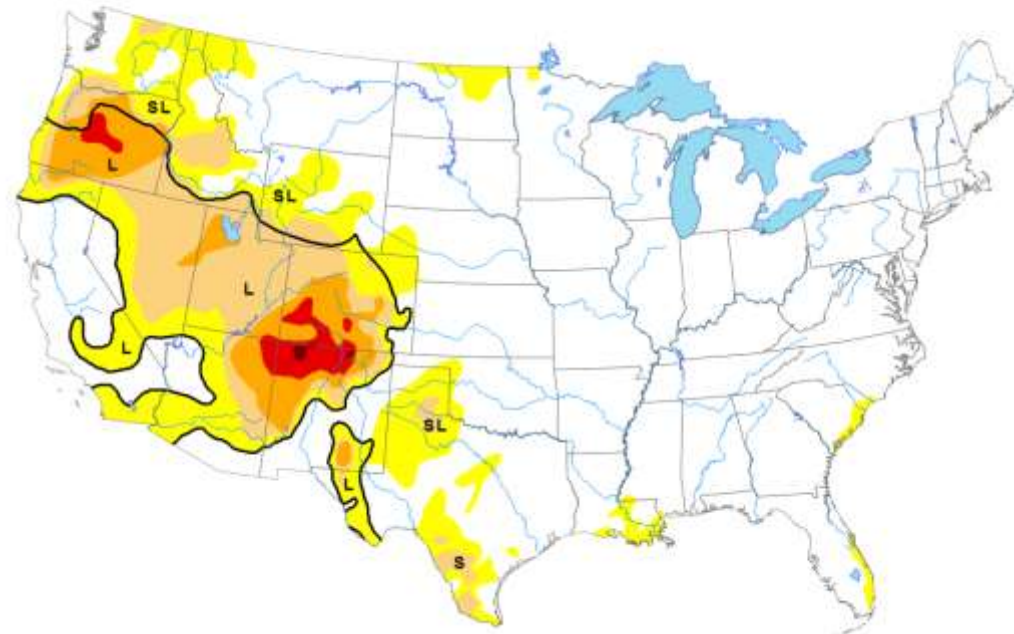
US Drought Monitoring

- Weekly assessment of drought conditions
- Not a statistical model nor a forecast, it looks backward.
Data use;
 - Palmer Drought Severity Index
 - Standardized Precipitation Index
 - Keech-Byram Drought Index for fire
 - satellite-based assessments of vegetation health
 - soil moisture
 - Surface Water Supply Index
 - Snowpack
- Produced jointly by National Drought Mitigation Center
NOAA, USDA

Reference: <https://droughtmonitor.unl.edu>

Map released: February 21, 2019

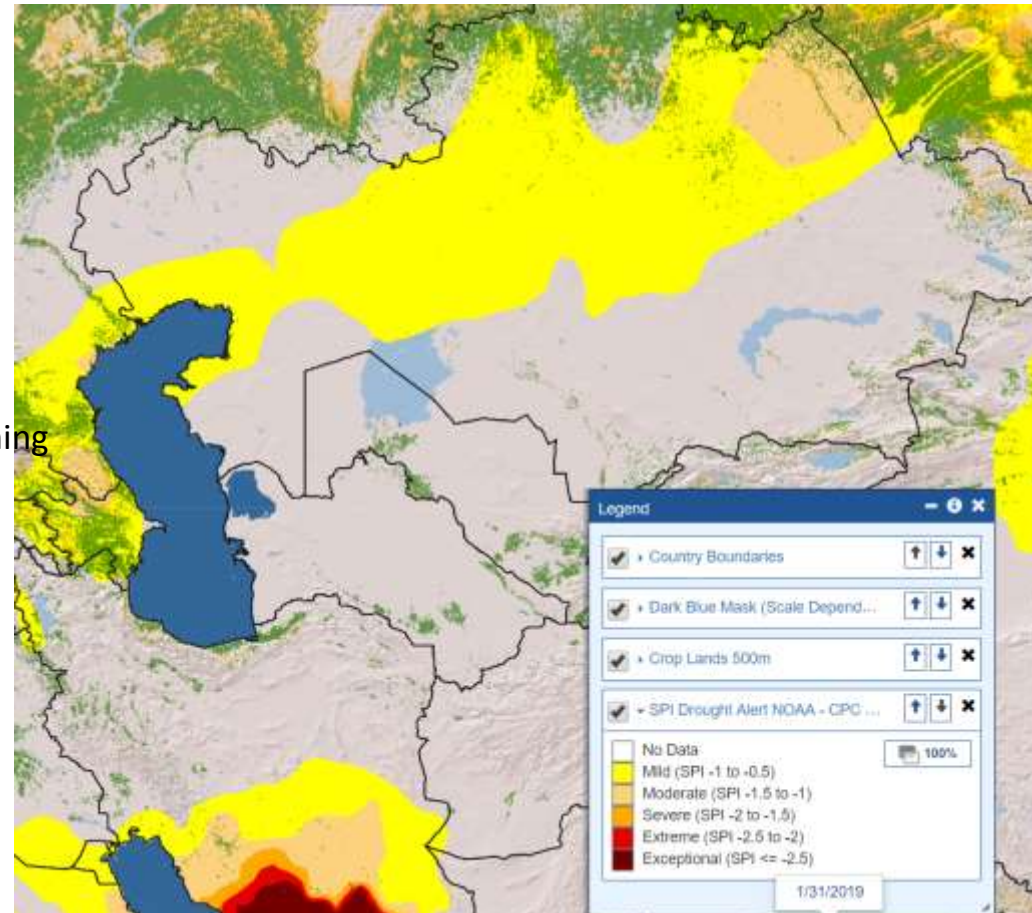
Data valid: February 19, 2019 | Author: Brad Rippey, U.S. Department of Agriculture



GADAS

Global Agricultural & Disaster Assessment System

- Developed by US Department of Agriculture.
- Web-based GIS system (ArcGIS Platform), uses remote sensing data to assist in its agricultural estimates of global crop conditions
 - Global agricultural monitoring and commodity forecasting
 - Comparative climatic and satellite-derived **vegetation analysis**
 - Environmental change detection studies and analysis
 - **Drought monitoring**
 - Natural disaster assessment and analysis
 - Tracking current and historical disaster events
 - Highlighting regional risk posed by natural disasters
 - Spatial modeling of potential disaster impacts
 - Delineation of major land-use categories worldwide
 - Regional planning and climate-resilience studies
 - Program or project-specific data archive and data mining
- No Fire Susceptibility Index



<https://geo.fas.usda.gov/GADAS/index.html#>

NASA Crop Explorer

- “If you have better soil moisture data and information on anomalies, you’ll be able to predict, for example, the occurrence and development of drought,” Mladenova, NASA.
- Crop Explorer is a clearinghouse for global agricultural growing conditions, such as soil moisture, temperature, precipitation, vegetation health and more.
- NASA Soil Moisture Data Advances Global Crop Forecasts
- tools developed by a team at NASA’s Goddard Space Flight Center in Greenbelt, Maryland, SMAP soil moisture data is being incorporated into the Crop Explorer website of the USDA’s Foreign Agricultural Service, which reports on regional droughts, floods and crop forecasts
- NDVI from PROBA-V , SPOT
- NDVI from MODIS

