

Open Data and Analytics at your Fingertips

Nagaraja Rao Harshadeep (Harsh)

Global Lead (Disruptive Technology)

Disruptive Technology



WORLD BANK GROUP

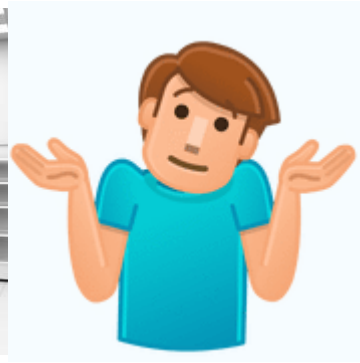
Environment, Natural Resources & Blue Economy

Economic and Social Commission for Western Asia (ESCWA)

Building Capacity for Accessing Disruptive Technologies for Improved Water Resources Management under Climate Change

14-15 January 2020, Beirut, Lebanon

We have NO data...



Of course we have data...



Data, data everywhere...



The “Old” Ways...

Are YOU part of the problem?



“But all you need is to fill a form...”

“Please write a letter to us why you want the data...”

“That department does not share data with us...”

“I know someone who knows someone with some of the data...”

“Its on the website – somewhere - all you need is a password that you can get when you register for free...”

“All the data is accessible in pdf format...”

“What if they misuse the data?”

“I remember seeing some of that on some website somewhere...”

“We can download and install a model to analyze the data...”

“I’m waiting to publish a few papers and then I will release the data...”

...

Information & Analysis Trends

What's Out?



What's In?



Static, Infrequent data

Data Secrecy

Desktop Databases

“Retail” Analytics & Websites

Focus on Data

Paper Records/Publications

Fragmented activities

Real-time & curated data services

Open, Public-Domain, Available

“Analysis Ready” Cloud Data Services

Cloud Analytics – “Wholesale” Platforms

Focus on Visualizations for Decisions

Digital Data/Portals/Apps/e-books...

Shared vision partnerships; Interoperability

The “New” Ways:

Can YOU be part of the solution to reduce the barriers?

Online Analysis-Ready Data Services

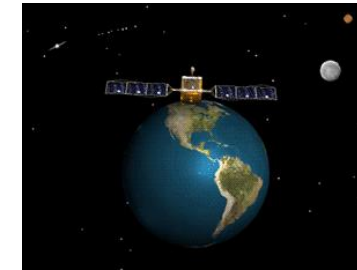
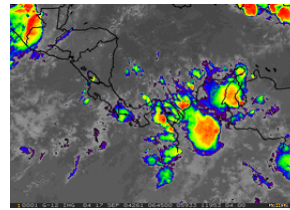
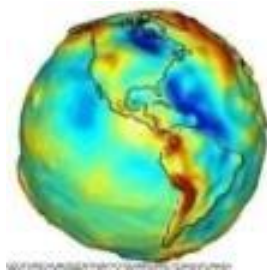
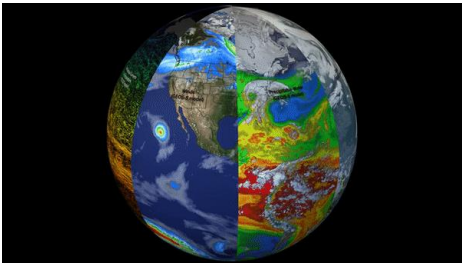
- Open Data APIs (Application Programming Interfaces)
- Use common standards – e.g. Open Geospatial Consortium (OGC) formats for spatial data – especially to provide “analysis ready” interoperable data
- Full-text publications



Online Analytical Services

- Cloud analytics (free and subscription) – data science/modeling
- Modeling services using open APIs and drawing upon online data services

"Top-Down" Data Acquisition System



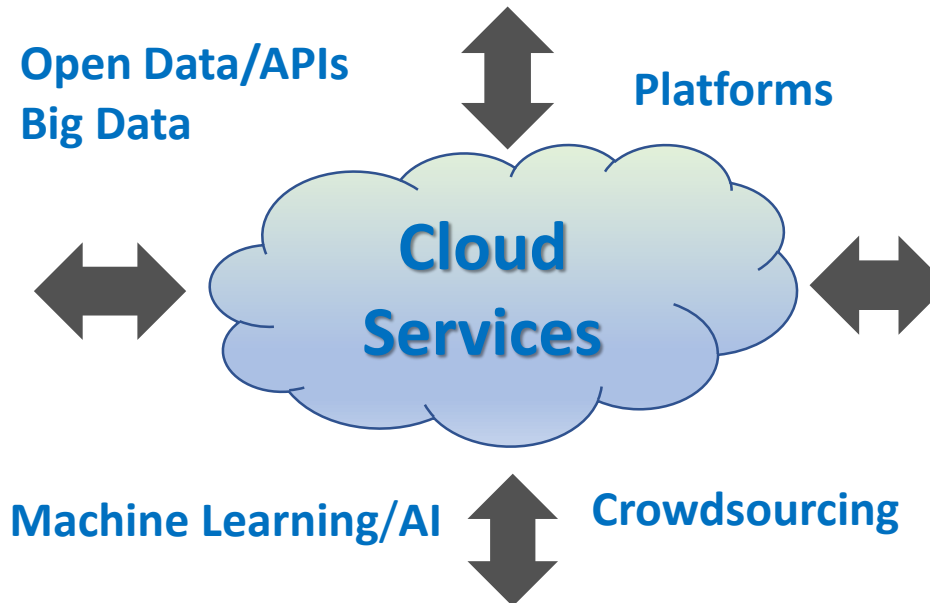
Satellite & UAV Earth Observation

GIS & other datasets

Data Rescue

Data Management

Analytics/Models/Visualization



Web Portals/Apps/e-books

Stakeholder Alerts

Operational Control Rooms



Manual Monitoring



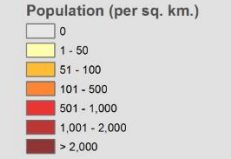
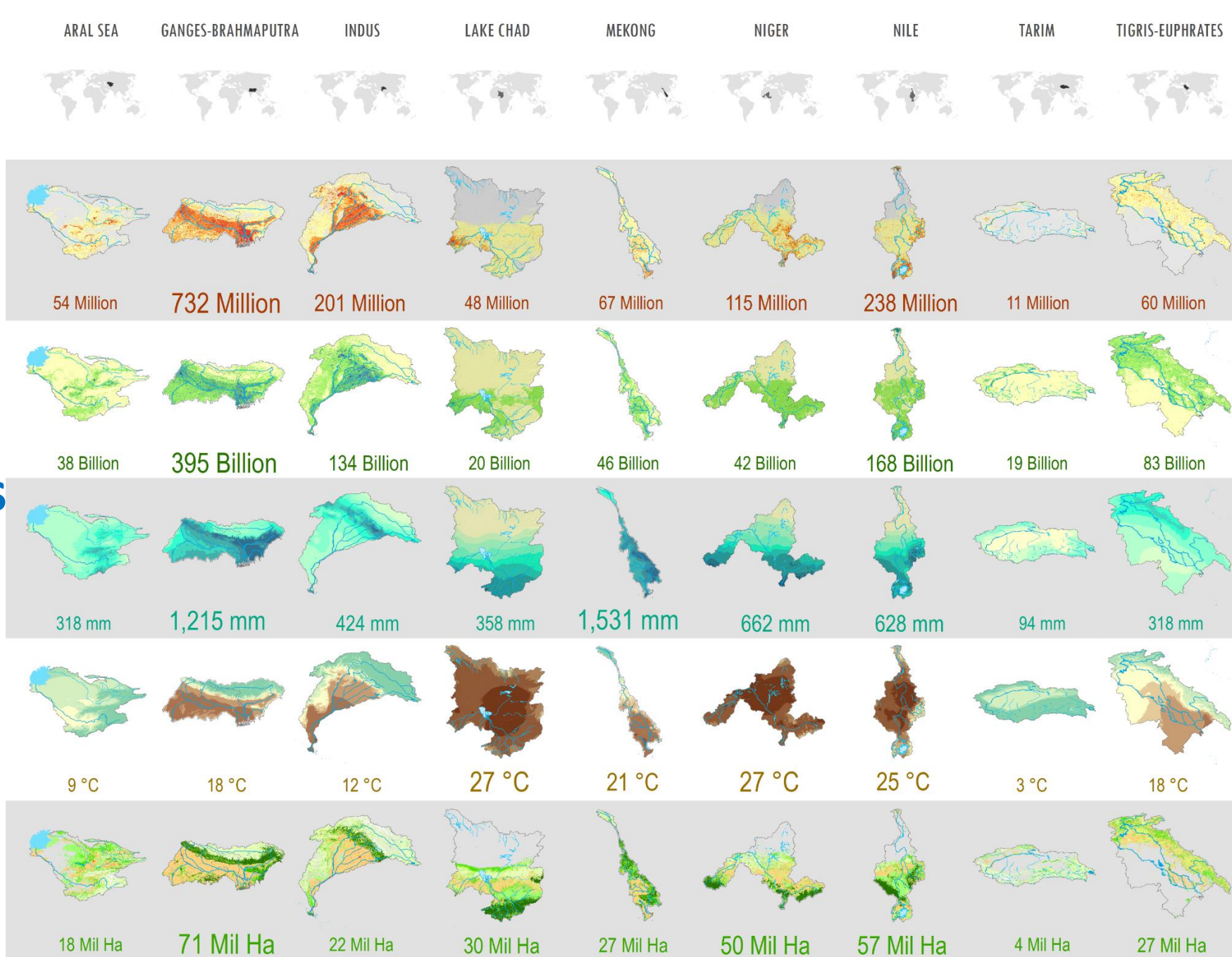
Automated Monitoring



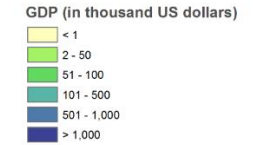
"Bottom-up" Data Acquisition System → IoT

Infographics

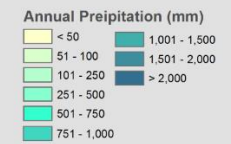
Global Transboundary Basins Facts



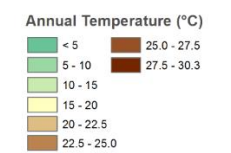
◀ Total Pop. (2012)



◀ Total GDP (2014)



◀ Basin Avg. (1950-2000)



◀ Basin Avg. (1950-2000)



◀ Total Cropland (2015)

Population: Oak Ridge National Laboratory (ORNL); GDP: DECRG, The World Bank; Landcover: ESA; Climate Data: World Clim

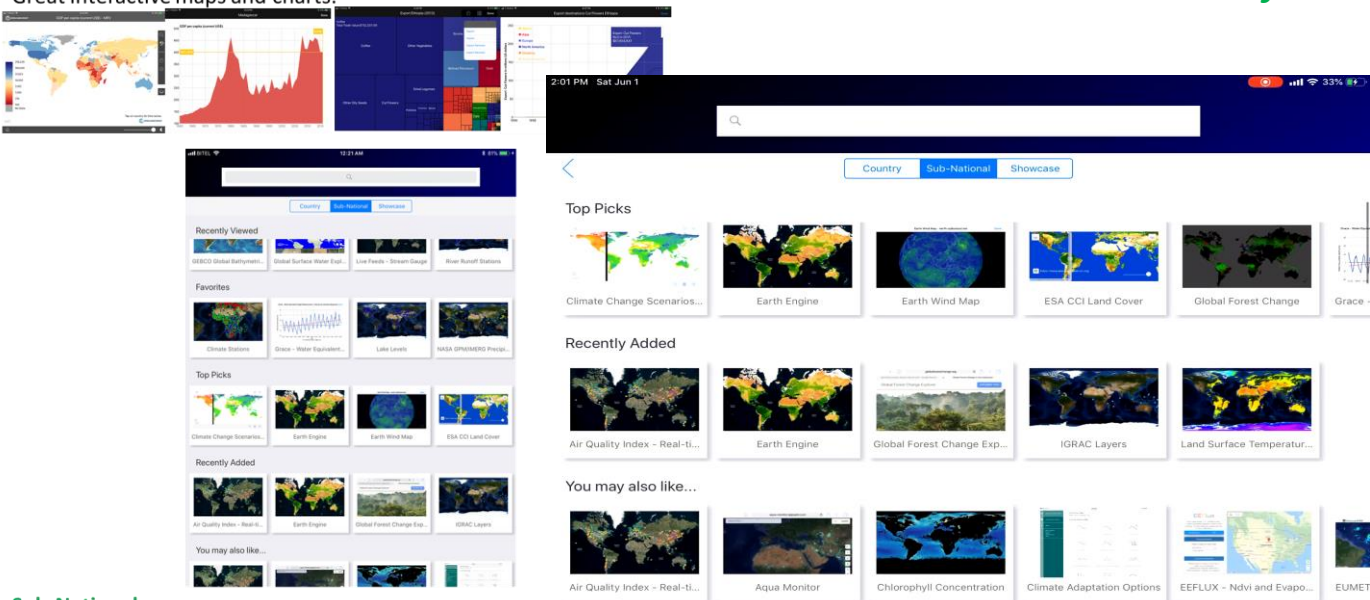
Note: Total and average figures are derived using GIS processing.

Spatial Agent App

A new world of data and analytics at your fingertips!

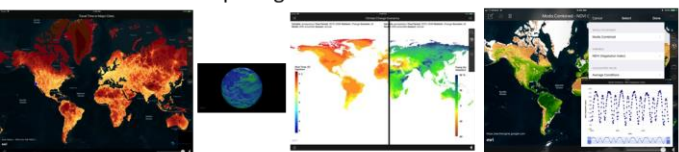
Country-Level

Check out global data from WDI, MIT Atlas on Trade, etc. Great interactive maps and charts.



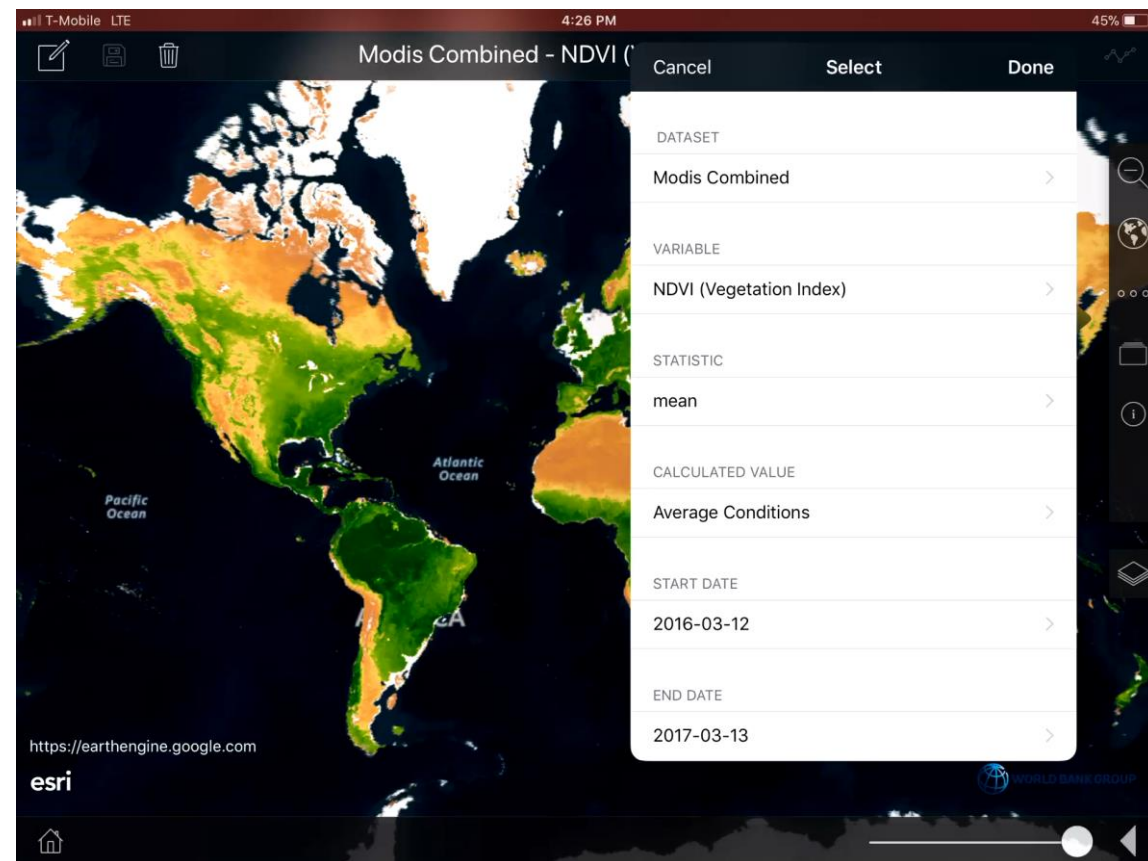
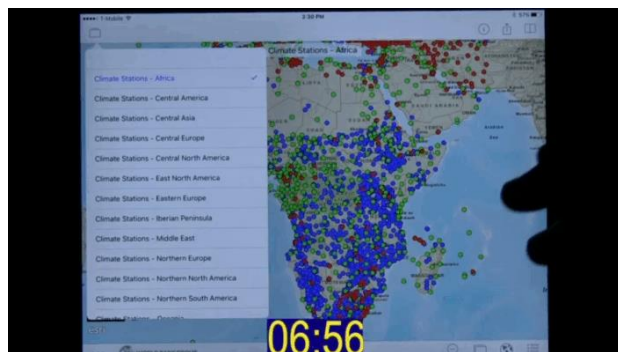
Sub-National

Check out thousands of global datasets from NASA, UN, ESA, GEO, etc. Great interactive tools, including use of the Google Earth Engine API for live cloud computing.



Showcase

Check out great showcase data on Mekong Delta, Poverty, Forecasts, etc. for selected areas and specialized themes



Download free from: <http://apps.worldbank.org> [OLC Resource Page](#) and [Blog](#)
iOS (iPad and iPhone): search "Spatial Agent" on Appstore or from <http://apple.co/2eVu5xJ>
[Android Draft version](#)

Contact: Nagaraja Rao Harshadeep



🔍 Search Data Sets by Keyword



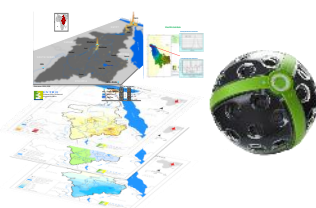
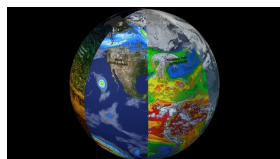
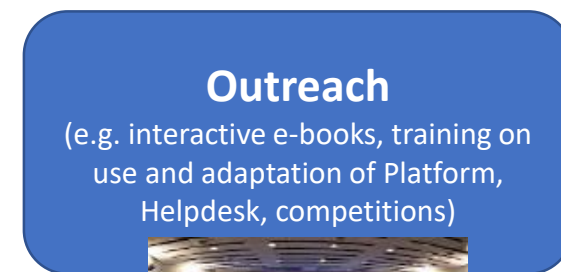
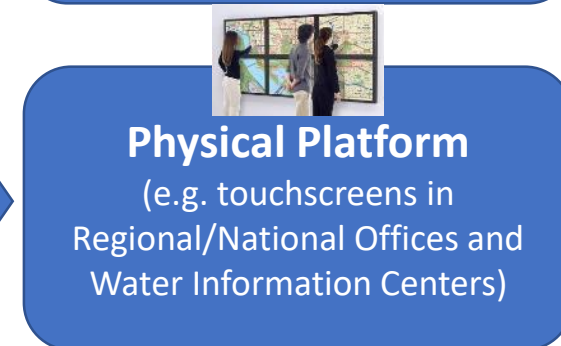
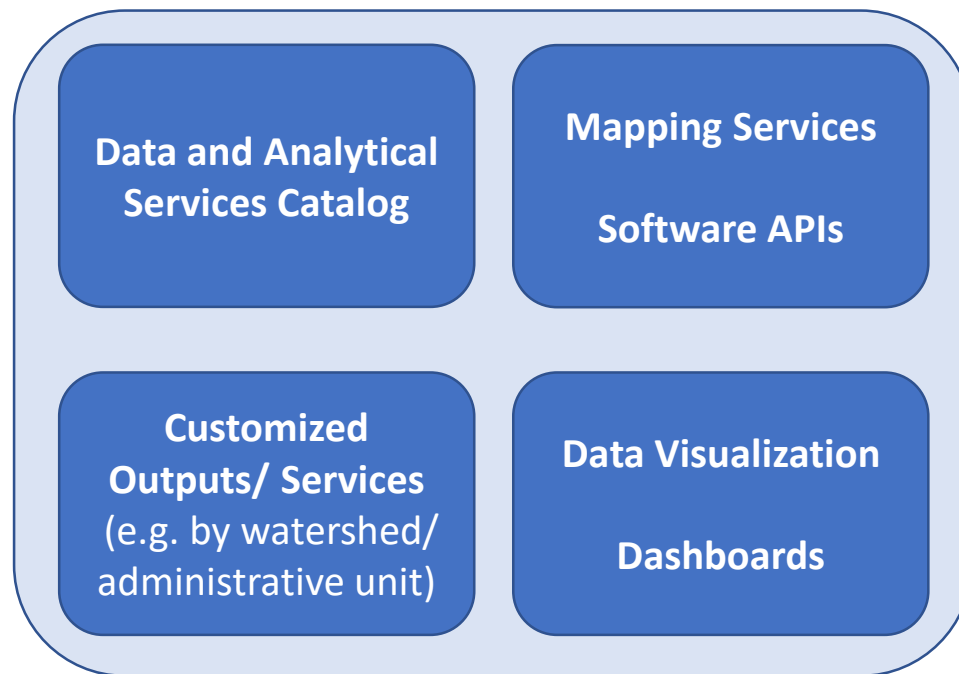
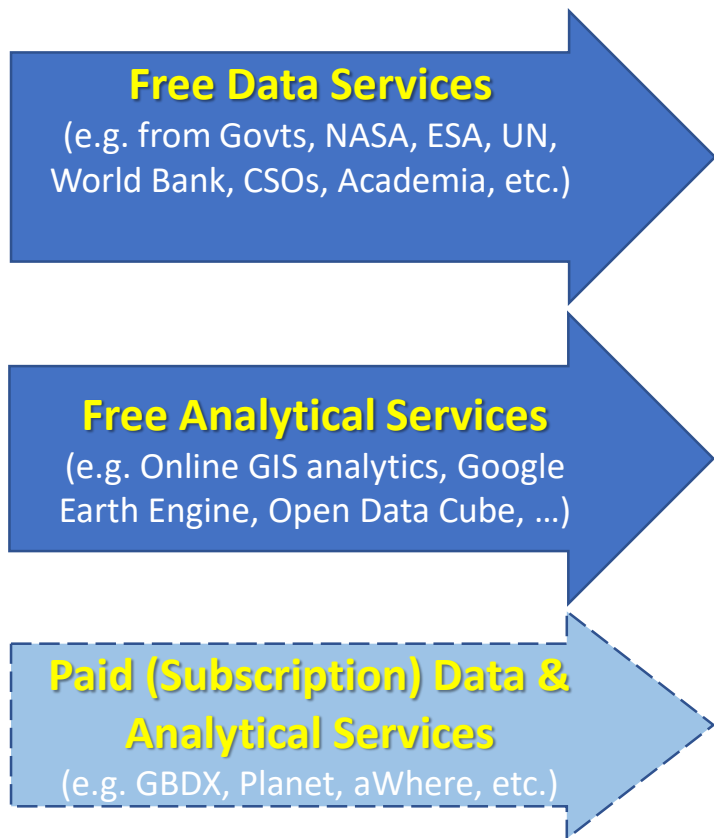
WORLD BANK GROUP

Spatial Agent

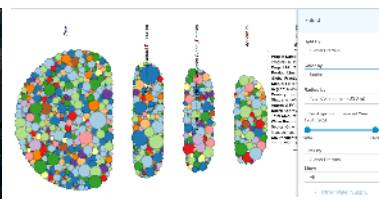
[Take a Tour](#)

[Start Exploring](#)

Integrated World Bank “HydroInformatics Platform” for Water Data & Analytics



Online Data & Analytical Services



Data Processing & Analytical Engine “Middleware”



User Access Platforms

Explore Layers

Upload Layers

Selected Layers
Add layers through the "checkboxes".

Create a Map

Filters Clear

TEXT

Search by text

KEYWORDS

TYPE

Raster Layers 89

Vector Layers 237

CATEGORIES

OWNERS

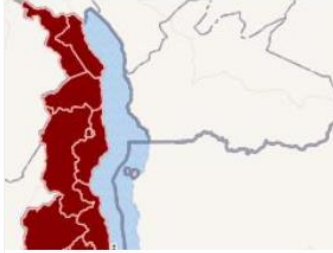
GROUPS

GROUP CATEGORIES

DATE

326 Layers found

1 2 3



HEALTH

NSO

Percentage use of Toilet Facilities

This layer shows percentage use of different types of toilet facilities in Malawi. Data from 2018 Malawi Population and Housing Census

silence.chirwa 17 Sep 2019 105 0 0
Create a Map



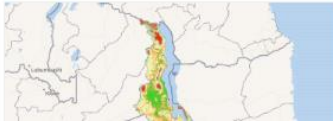
UTILITIES COMMUNICATION

DODMA

mwi_trs_roadaccessconstraints_wfp

This dataset is based on an extraction of OpenStreetMap. In addition, it contains access constraints status in the column "status" and is edited regularly with information received by partners.

silence.chirwa 16 Sep 2019 83 0 0
Create a Map



SOCIETY

DODMA

malawi_national_poverty_levels0

Knowledge Platforms

<http://www.appsolutelydigital.com/dt/technologies.html>

The screenshot shows a web browser window with the URL <http://www.appsolutelydigital.com/dt/technologies.html>. The page is titled "INTERACTIVE TECHNOLOGY APPLICATION EXPLORER". Below the title, there is a brief introduction: "Use the following interactive tool to explore examples of the use of technology across sectors to improve sustainable development. You can filter examples based on sector, technology or a combination of the two." The page features three main filter sections: "Filter by Sector" with buttons for various sectors like Agriculture, Manufacturing, etc.; "Filter by Technology" with buttons for technologies like AI, Robotics, etc.; and "Filter by Types" with buttons for content types like Article, Report, etc. Below these filters is a grid of 48 small, colorful cards, each representing a different technology application example, such as "Farm from a Box - Compact Farming build", "Growing 6000 lbs of food in 1/10th acre", "Augmented Reality for Smarter Farming", etc.

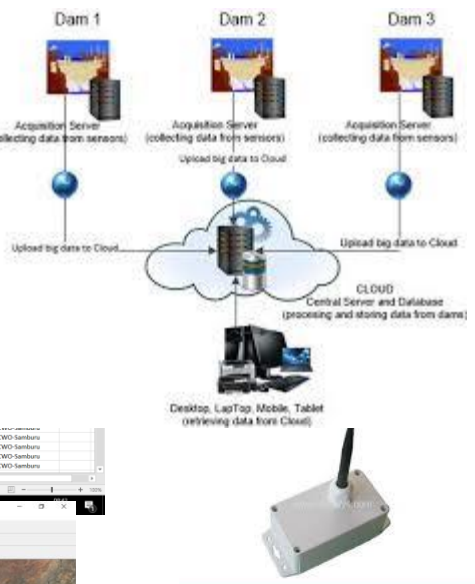
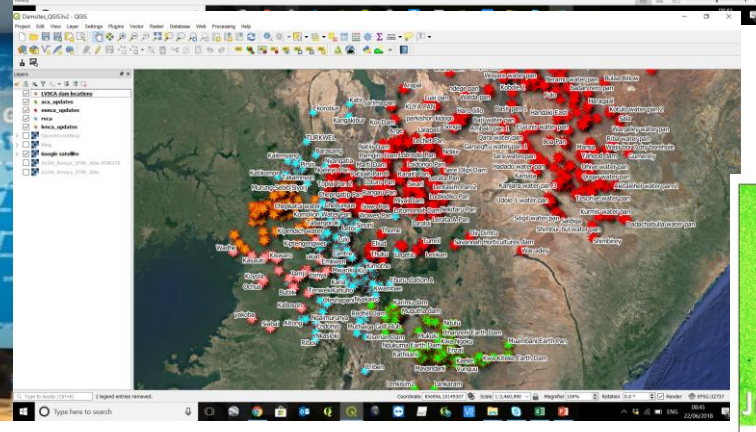
<http://www.appsolutelydigital.com/CongoBasin/chapter6.html>

The screenshot shows a web browser window with the URL <http://www.appsolutelydigital.com/CongoBasin/chapter6.html>. The page is titled "ANNEX B: CONGO BASIN KNOWLEDGE PORTAL". Below the title, there is a section "CONGO BASIN" with three filter sections: "Filter by Location" with buttons for various countries like Central African Republic, Democratic Republic of Congo, etc.; "Filter by Types" with buttons for Article, Dataset, Investment, etc.; and "Filter by Keywords" with a search input field. Below these filters is a grid of 48 small, colorful cards, each representing a different literature entry, such as "Simulation of West African monsoon using RegCM3 Part II: impacts of deforestation and bioaerosol variability", "Potential impacts of afforestation on climate change and extreme events in Nigeria", etc.

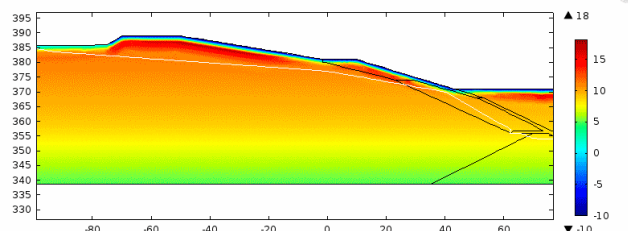
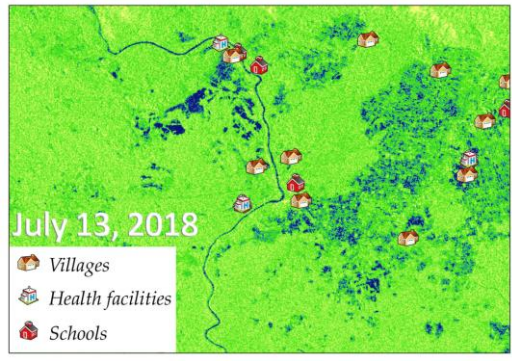
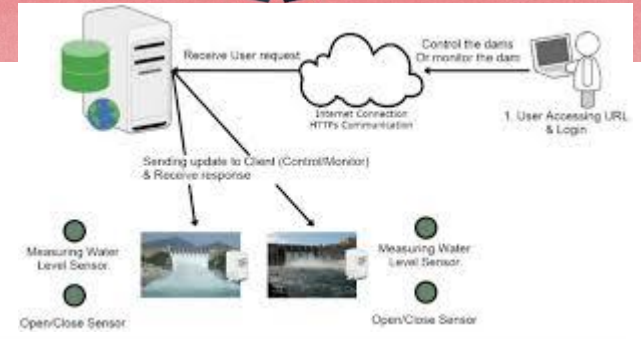
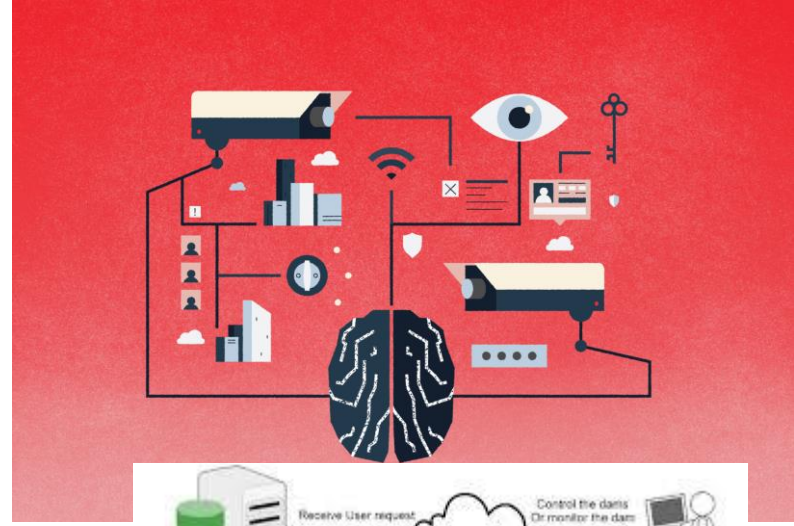
Dam Safety



Type	ID	catchment	subregion	name	class	Height_m	lat	long	country	status	storage_mcm	purpose	contnr	owner
Pan	1	ENRICA	Rumanti	Kamweli Pan		16,000			Laikipia	Complete	18,000	Domestic & Irrigation	Public	
Pan	2	ENRICA	Rumanti	Tang'Ngao pan		15,000			Laikipia	Incomplete	15,000	Domestic & Irrigation	Public	
Pan	3	ENRICA	Rumanti	Shigari OP Pan					Laikipia	Complete		Domestic & Irrigation	Public	
Pan	4	ENRICA	Rumanti	Ligenge Water Pan		9,518,039	36.45681		Samburu	Complete		Domestic & Irrigation	Public	
Pan	5	ENRICA	Rumanti	Mari/Karito Axis Pan		9,906,004	36.45191		Samburu	Complete		Domestic & Irrigation	Public	
Pan	6	ENRICA	Rumanti	Nahaywaasin Pan 1		1,349,221	37.40592		Samburu	Complete		Domestic & Irrigation	Public	
Pan	7	ENRICA	Rumanti	Nahaywaasin Pan 2		1,348,028	37.40596		Samburu	Complete		Domestic & Irrigation	Public	
Pan	8	ENRICA	Rumanti	Lentasin Pan		1,129,944	37.40722		Samburu	Complete		Domestic & Irrigation	Public	
Pan	9	ENRICA	Rumanti	Lentasin Pan 2		1,178,900	37.51007		Samburu	Complete		Domestic & Irrigation	Public	
Pan	10	ENRICA	Rumanti	Lentasa Pan		1,154,932	37.45776		Samburu	Complete		Domestic & Irrigation	Public	
Pan	11	ENRICA	Rumanti	Libibarti Pan		9,994,249	36.80205		Samburu	Complete		Domestic & Irrigation	Public	
Pan	12	ENRICA	Rumanti	Libibarti Pan		9,988,729	36.73432		Samburu	Complete		Domestic & Irrigation	Public	
Pan	13	ENRICA	Rumanti	Libibarti Pan		1,742,724	36.59423		Samburu	Complete		Domestic & Irrigation	Public	
Pan	14	ENRICA	Rumanti	Libibarti/Ledero Pan		1,008,096	36.74724		Samburu	Complete		Domestic & Irrigation	Public	
Pan	15	ENRICA	Rumanti	Seroyipi Pan		1,128,819	37.42088		Samburu	Complete		Domestic & Irrigation	Public	
Pan	16	ENRICA	Rumanti	Shalenge Pan		9,907,721	37.3034		Samburu	Complete		Domestic & Irrigation	Public	
Pan	17	ENRICA	Rumanti	Melumai Pan		1,068,831	37.54887		Samburu	Complete		Domestic & Irrigation	Public	
Pan	18	ENRICA	Rumanti	Mari/Karito Natural Depression/Pan		9,934,828	36.48009		Samburu	Complete		Domestic & Irrigation	Public	
Pan	19	ENRICA	Rumanti	Mburak Ong'ron Pan		9,703,481	37.35171		Samburu	Complete		Domestic & Irrigation	Public	
Pan	20	ENRICA	Rumanti	Rabasso Pan		8,877,726	37.38077		Samburu	Complete		Domestic & Irrigation	Public	
Pan	21	ENRICA	Rumanti	Nahaywaasin Pan		8,826,602	37.29882		Samburu	Complete		Domestic & Irrigation	Public	
Pan	22	ENRICA	Rumanti	Siraya Pan		8,989,849	37.29673		Samburu	Complete		Domestic & Irrigation	Public	
Pan	23	ENRICA	Rumanti	Karabasa Pan		1,913,881	36.88128		Samburu	Complete		Domestic & Irrigation	Public	
Pan	24	ENRICA	Rumanti	Arakia Pan		1,933,881	37.25147		Samburu	Complete		Domestic & Irrigation	Public	
Pan	25	ENRICA	Rumanti	Lodibidhi Pan		8,815,211	37.46816		Samburu	Complete		Domestic & Irrigation	Public	CWO-Samburu
Pan	26	ENRICA	Rumanti	Sipeta Pan		1,889,648	37.05832		Samburu	Complete		Domestic & Irrigation	Public	CWO-Samburu
Pan	27	ENRICA	Rumanti	Lohoro Pan		9,780,705	37.51356		Samburu	Complete		Domestic & Irrigation	Public	CWO-Samburu
Pan	28	ENRICA	Rumanti	Lentasa Pan		9,719,817	37.52353		Samburu	Complete		Domestic & Irrigation	Public	CWO-Samburu



ULTRASONIC RIVER/DAM SENSOR
USE CASE: Agriculture, Research, Industrial



Build Your Industry 4.0 Situation Room



Factory OEE Overview

- OEE indicators (availability, performance, quality)
- 7-day OEE trend
- Machine status distribution
- Top error events and work hour abnormalities



Country Platforms: e.g. Pakistan Digital Platform

<http://appsolutelydigital.com/Pakistan/>

Pakistan Digital Platform, The World Bank (Draft)

All Environmental Social Economic Climate Water Disasters

The screenshot displays a web browser window with the URL <http://appsolutelydigital.com/Pakistan/>. The page title is "Pakistan Digital Platform, The World Bank (Draft)". Below the title is a navigation bar with seven colored tabs: All (yellow), Environmental (green), Social (orange), Economic (blue), Climate (pink), Water (light blue), and Disasters (red). The main content area is a grid of 48 thumbnails, each representing a different data visualization or tool. The thumbnails are arranged in five rows: the first row has 7 thumbnails, and the subsequent four rows have 8 thumbnails each. The thumbnails include maps, charts, and data visualizations, each with a title below it. The titles are: World Bank Projects, Interactive Portfolio Visualization, Pakistan Development Data, Pakistan at a Glance, GADAS (Agr), FAOSTAT, Google DataSearch, Land Cover (Satellite), Topography, Landsat Vegetation Analysis, Biomes, Biomass, NDVI, NDVI Amplitude, NDVI Phase, NDVI Animated, Land Cover Changes, Earth Engine Calculation, Protected Areas, Forest Loss/Extent/Gain, Human Footprint, Human Influence Index, Air Quality, Winds, Fishing Watch, Ocean Health Index, FAO Aquastat, Fire Data, and several others in the bottom row.

World Bank Projects

Interactive Portfolio Visualization

Pakistan Development Data

Pakistan at a Glance

GADAS (Agr)

FAOSTAT

Google DataSearch

Land Cover (Satellite)

Topography

Landsat Vegetation Analysis

Biomes

Biomass

NDVI

NDVI Amplitude

NDVI Phase

NDVI Animated

Land Cover Changes

Earth Engine Calculation

Protected Areas

Forest Loss/Extent/Gain

Human Footprint

Human Influence Index

Air Quality

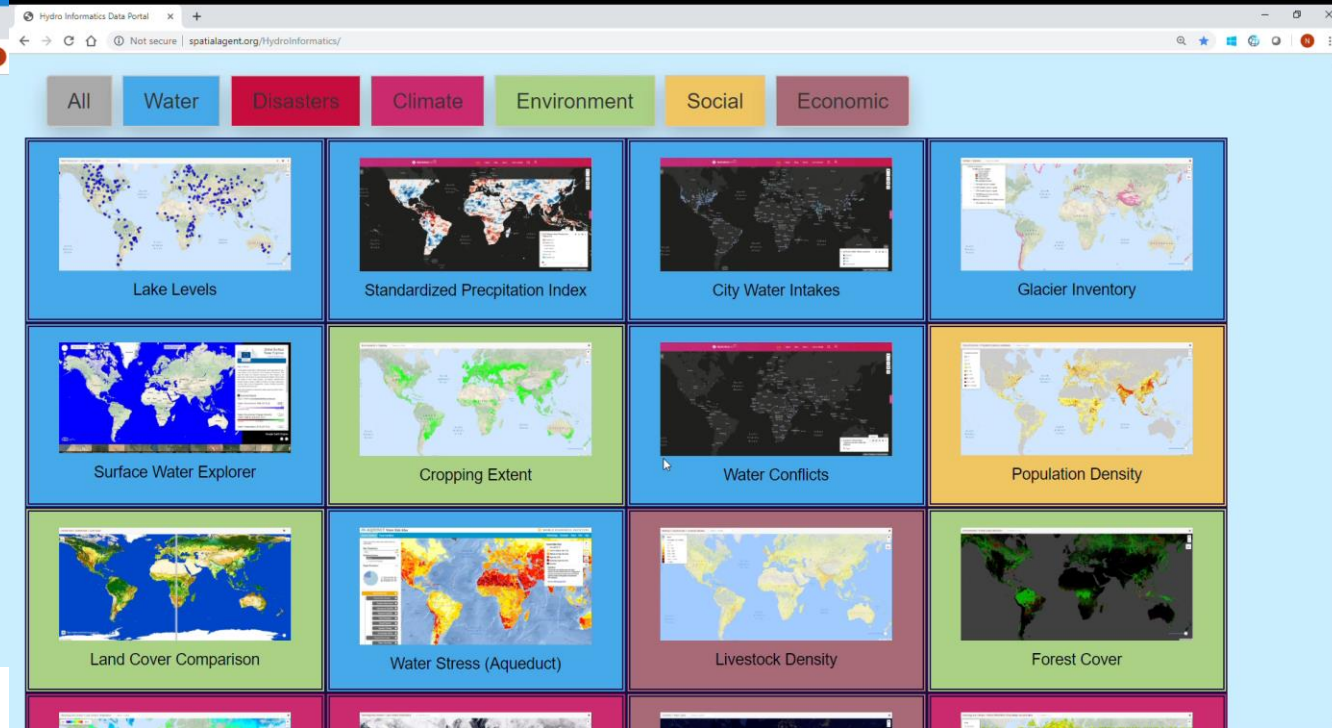
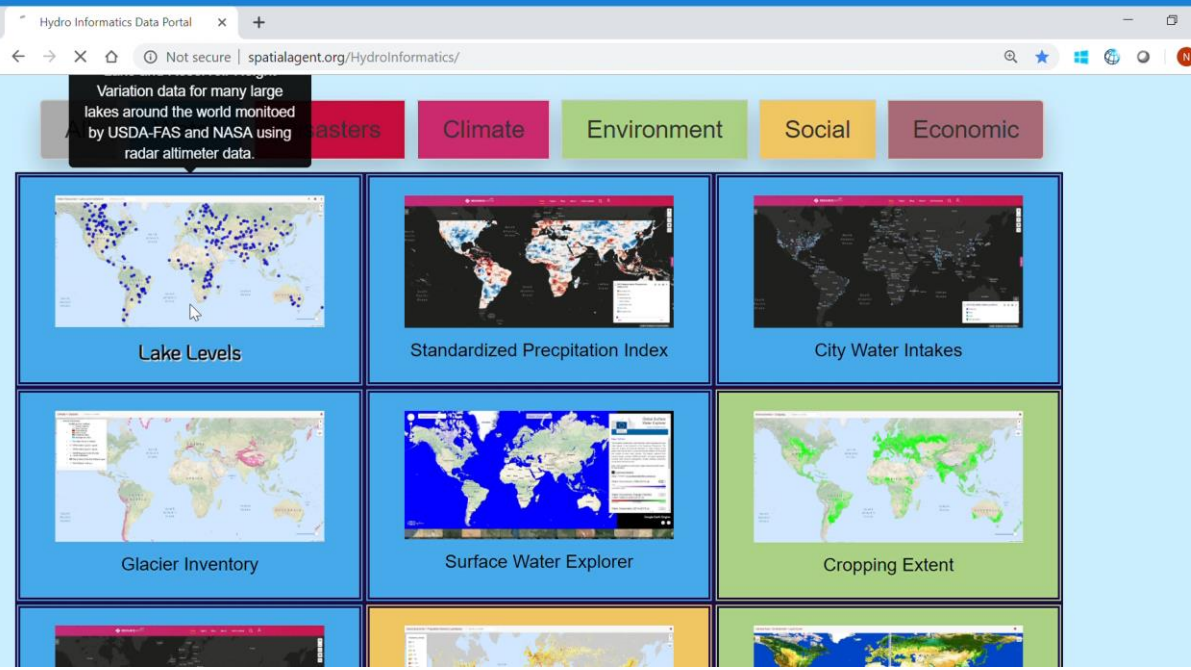
Winds

Fishing Watch

Ocean Health Index

FAO Aquastat

Fire Data




Try our new global **HydroInformatics Platform** to illustrate open services...
<http://spatialagent.org/HydroInformatics>

<http://spatialagent.org/OPDI/>



MASHREQ WATER RESOURCES PORTAL

- All
- Environmental
- Social
- Economic
- Climate
- Water
- Disasters



Water Transition



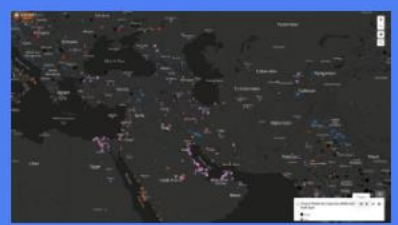
RICCAR



JRC Urban Explorer



Fishing Watch



Power Plants



Watershed Delineation



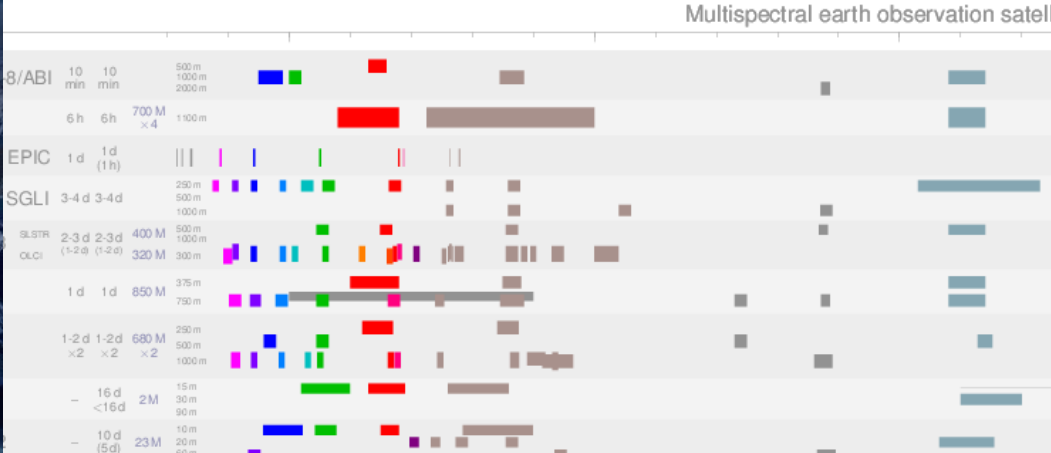
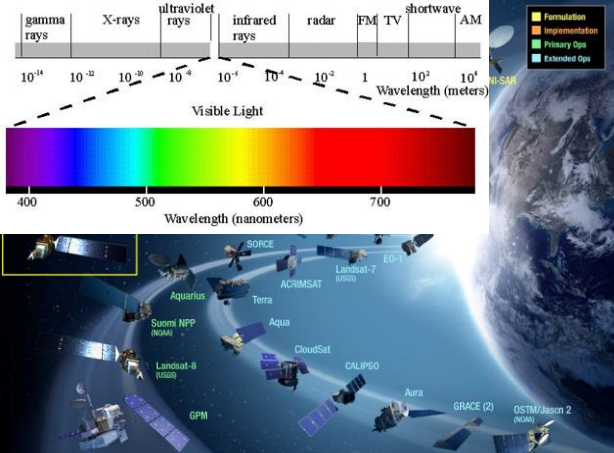
NASA Disasters Portal



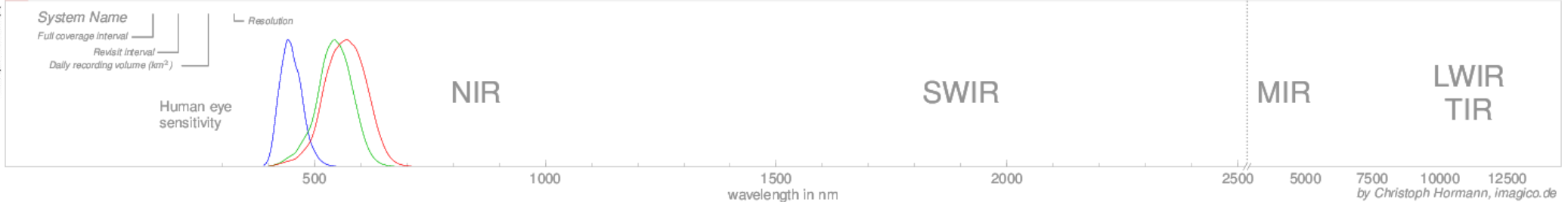
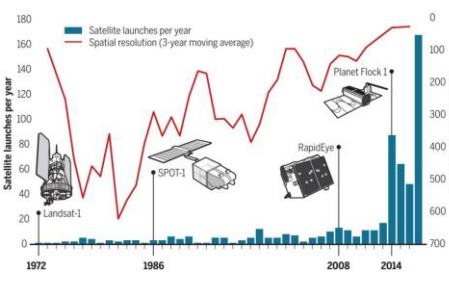
GEOGLOWS Streamflow Forecast





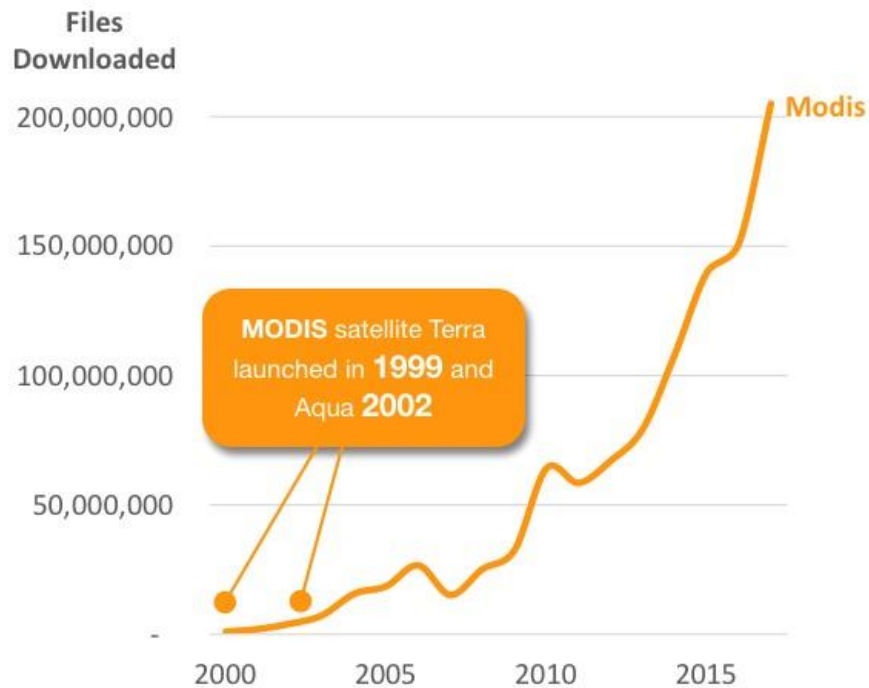



Trends in earth observation satellites
 Data reflect 488 earth observation satellites launched since 1972 by commercial and government providers (excluding military). We followed methods established in (5) and added satellites from the Union of Concerned Scientists database and public launch information from SpaceFlightNow and Planet. See the supplementary materials for details.



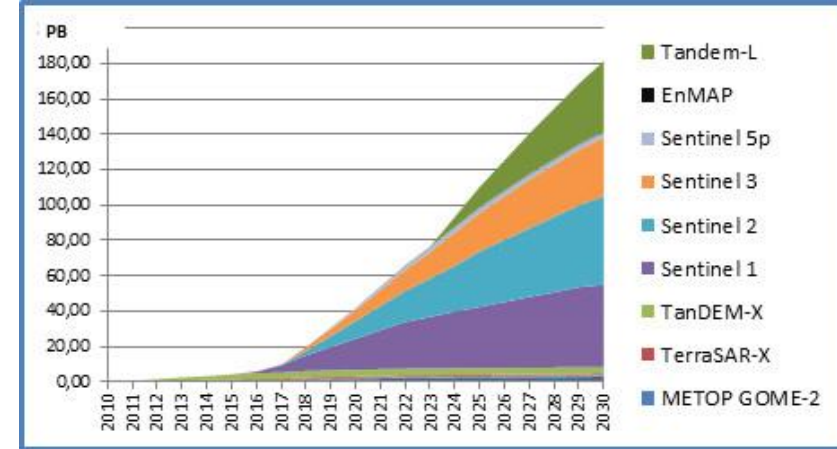
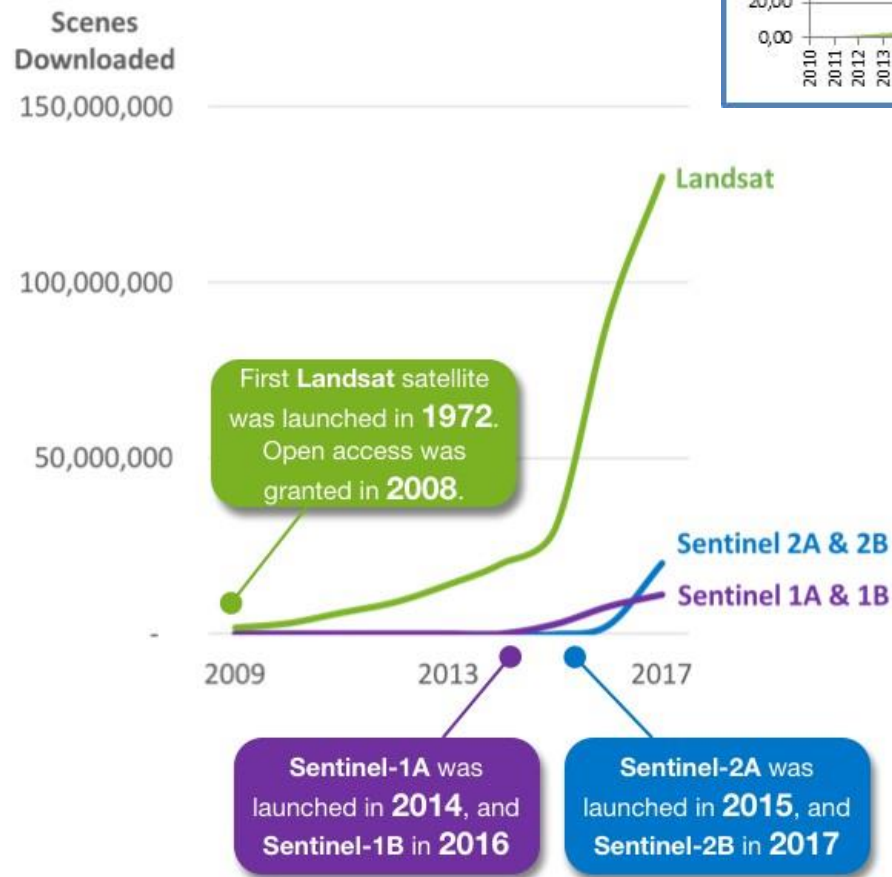
Open Satellite Data Downloads

The number of downloads every year from the open data portals has increased exponentially!



SOURCES: MODIS and Landsat data was provided by NASA
Sentinel data was obtained via their annual reports, 2015-2017

*Files downloaded from the MODIS portal often contain multiple scenes



RESOLUTION



Source: Earth-i, Presentation at World Bank Disruptive Tech in Agriculture & Watersheds Workshop, May 2019

Map Analytics Mode

1. Select Data Source
USAF

2. Select Attribute
Subsurf Soil Moist

Include Normals

3. Select Time Aggregation
Weekly

4. Select Time Interval
Jan to Dec

5. Select Years
2016,2017,2018,2019

6. Select Chart Type
Line Chart

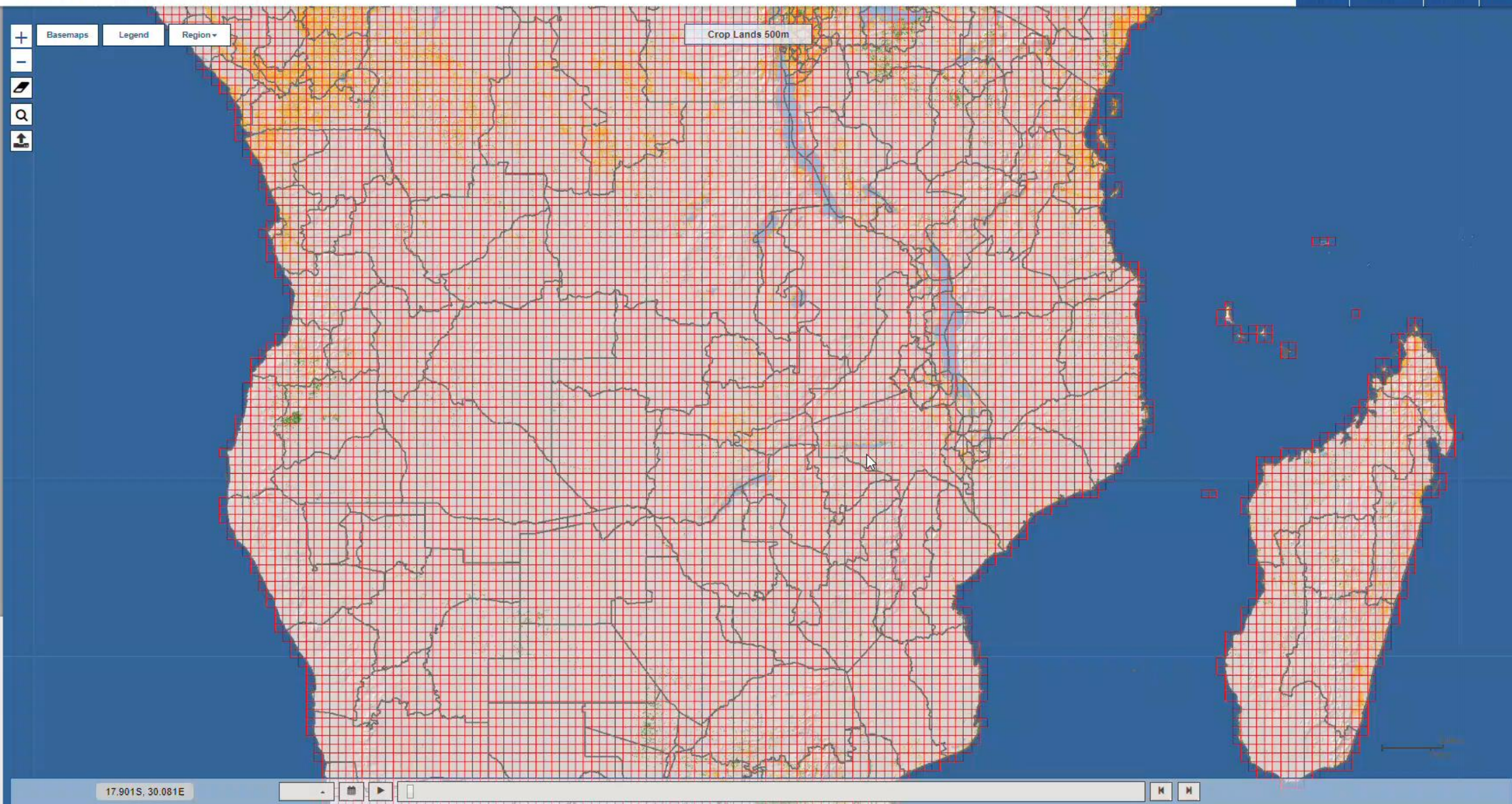
7. Select Selection Type
Draw Area Admin Units

8. Draw Area
Admin Type State or Province

Run Analytics
Reset

Data Layers

- Search for...
- Weather
- Vegetation Index
- Crop Condition
- Agricultural Lands
- Water
- Political

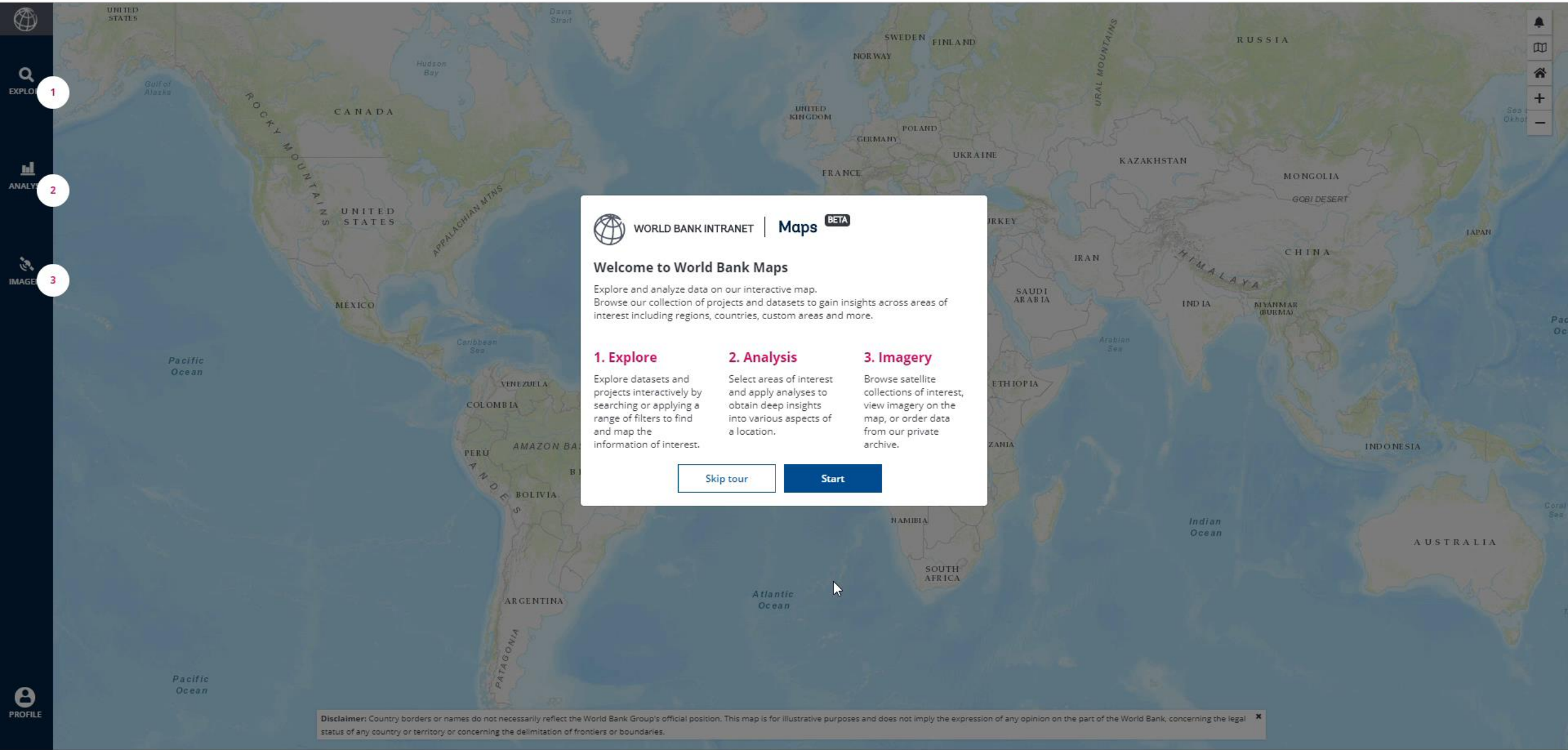


Find address or place [Search Icon]

Map navigation controls: Home, Refresh, Full Screen



600mi
61.486 17.072 Degrees



1 EXPLORE

2 ANALYSIS

3 IMAGERY

PROFILE


🔔

📖

🏠

+

-

 WORLD BANK INTRANET | Maps **BETA**

Welcome to World Bank Maps

Explore and analyze data on our interactive map. Browse our collection of projects and datasets to gain insights across areas of interest including regions, countries, custom areas and more.

1. Explore

Explore datasets and projects interactively by searching or applying a range of filters to find and map the information of interest.

2. Analysis

Select areas of interest and apply analyses to obtain deep insights into various aspects of a location.

3. Imagery

Browse satellite collections of interest, view imagery on the map, or order data from our private archive.

Skip tour
Start

Disclaimer: Country borders or names do not necessarily reflect the World Bank Group's official position. This map is for illustrative purposes and does not imply the expression of any opinion on the part of the World Bank, concerning the legal status of any country or territory or concerning the delimitation of frontiers or boundaries.

- EXPLORE
- ANALYSIS
- IMAGERY
- PROFILE



- Home
- Search
- Layers
- Full Screen
- Print
- Share

< Disclaimer

EXPLORE

ANALYSIS

IMAGERY

PROFILE

Satellite

SENTINEL

Imagery view

NATURAL

2019-06-13 2019-05-24 2019-05-19

Date

6 MONTHS before 2019-10-21

Maximum cloud cover

0% 25% 50% 75% 100%

SENTINEL 2

2019-05-19 - 18% CLOUD COVERAGE

Satellite

MODIS

Imagery view

NATURAL

Date

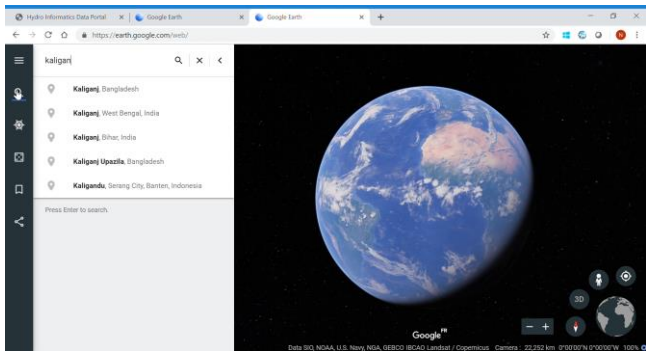
2019-05-19

MODIS

19 May 2019

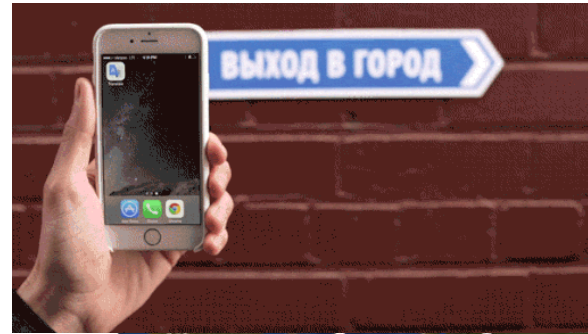
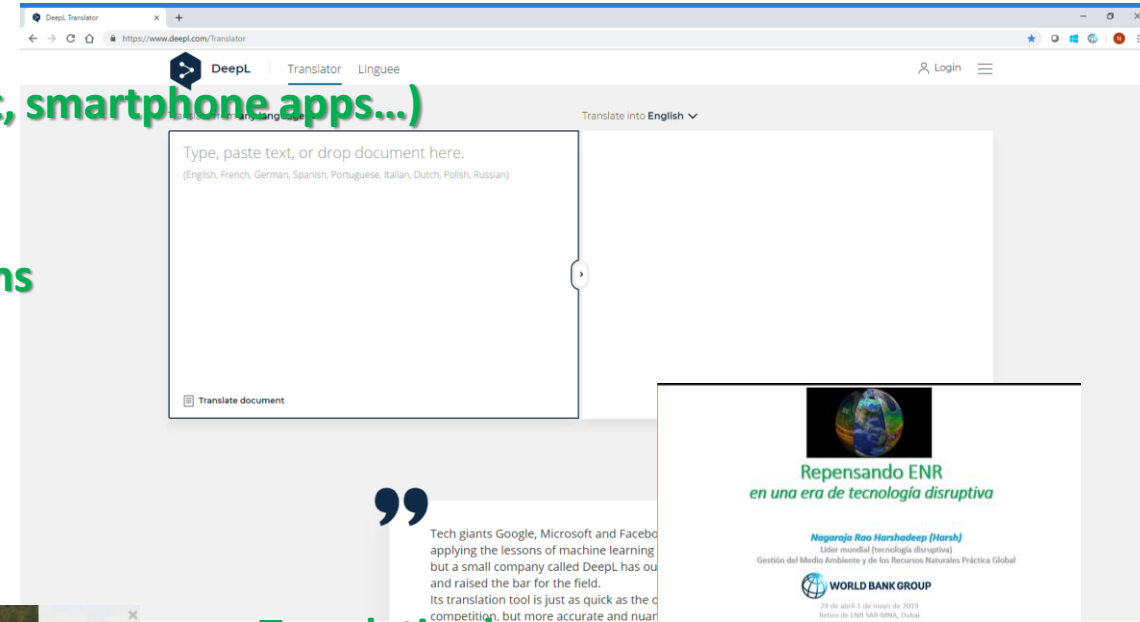
Examples of Lowest Hanging Fruit

Maps! Open Data! Visualizations – GIS, D3, etc., Google Earth, Flythroughs, Spatial Analytics, Online GIS, Google Earth Engine...



IT (touchscreens, VC, good internet, smartphone apps...)

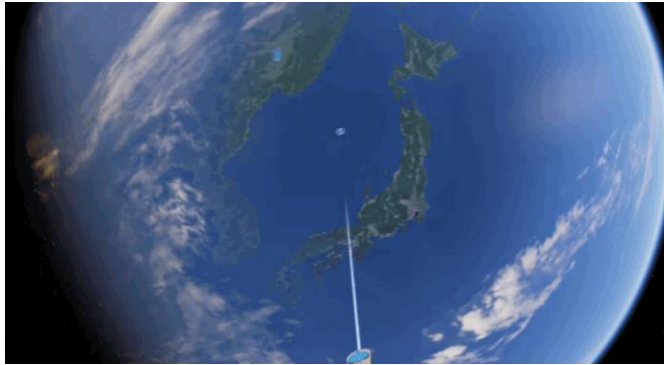
Chatbots with NLP
Training Data for AI/ML Applications



”
Tech giants Google, Microsoft and Facebook are applying the lessons of machine learning but a small company called DeepL has out and raised the bar for the field. Its translation tool is just as quick as the competition, but more accurate and nuanced.



Translation!
(e.g. Google Translate, [DeepL.com](https://www.deepl.com))



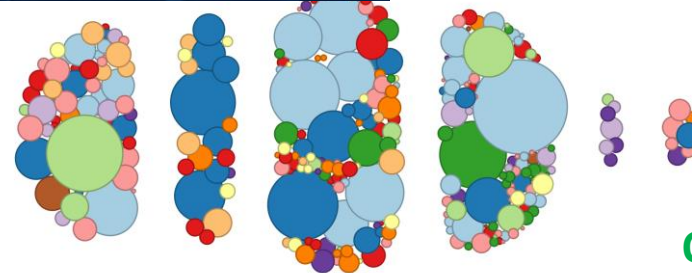
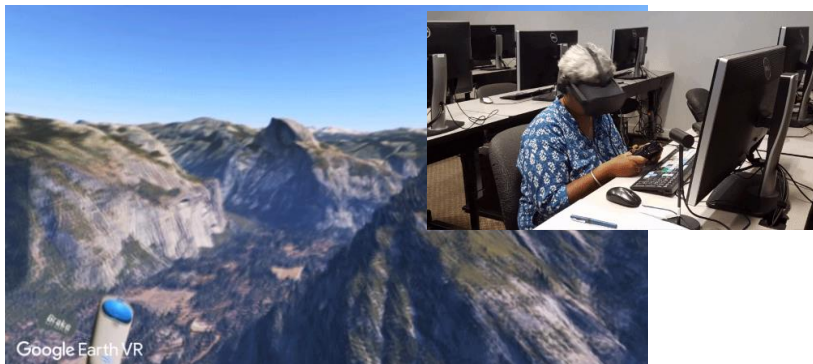
Google Earth (incl. VR)



New Skills



Outreach/e-Books/Virtual Learning
Professional Development



Portfolio Analysis



Disruptive Technology

WORLD BANK GROUP

Disruptive **KIDS** (Knowledge, Information & Data Services) Helpdesk

MC4 - 840

<http://spatialagent.org/KIDS/>



"Disrupting" Development
An Interactive Primer on Disruptive Technology in Development

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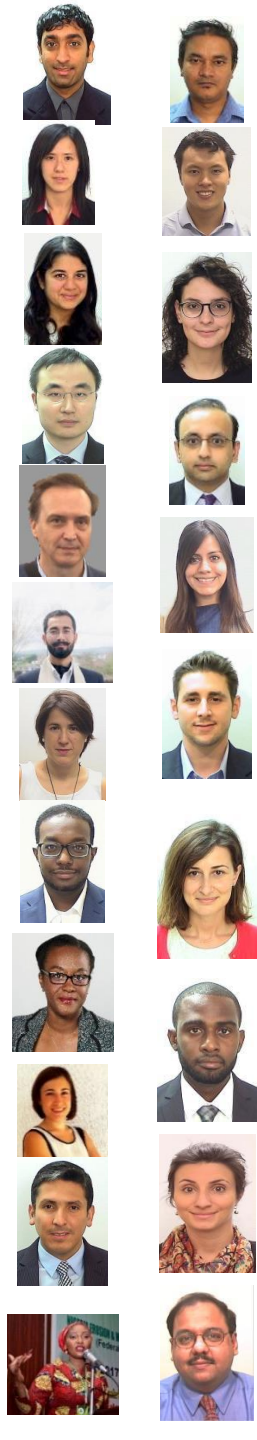
- Introduction
- Acknowledgements
- Key Development Challenges
 - Environmental
 - Economic
 - Social
- Emerging Disruptive Technologies
 - Types of Disruptive Technology
 - Examples of Disruptive Technology
- Disruptive Tech in Development
 - Reframing Development
 - Disrupting our Challenges
 - Engage Global Resources at your Fingertips
 - Interactive Tech Application Explorer
 - Case Studies
- Looking Ahead
 - Regulatory Environment
 - Moving Ahead!

ANALYSIS OF INTERNATIONAL FINANCING TO TACKLE ILLEGAL WILDLIFE TRADE

Geographical Distribution

INTERACTIVE TECHNOLOGY APPLICATION EXPLORER

Use the following interactive tool to explore examples of the use of technology-driven solutions to improve sustainable development. You can filter examples based on sector, technology or a combination of the two. When exploring these emerging technologies, try to apply The Principles for Digital Development in looking for ways to incorporate such innovations in our work.



Useful Links to Start

- Draft Mashreq Platform (draft - hot off the press!)
<http://spatialagent.org/Mashreq/>
- Disruptive KIDS (Knowledge, Information & Data Services) Helpdesk - Interactive Product Catalog: <http://spatialagent.org/KIDS/>
- New WB Geospatial Platform from ITS Geospatial ([external](#)) – analytical functionality to be added shortly (currently in an internal platform)
- Spatial Agent App ([iOS](#), [Android beta](#), [OLC resource page](#))
- E-Book Examples:
 - [Disruptive Tech Primer](#) (esp. see [typology](#), [tech examples](#) and [interactive library](#) and [case studies](#))
 - An [in-situ hydromet monitoring interactive e-book](#)
- Other Data Portal drafts ([HydroInformatics](#), [Africa](#), [Pakistan](#), [Nigeria](#))
- Example Package - Congo Basin ([data portal](#), [knowledge portal](#), [e-book](#))

Start Disrupting!



harsh@worldbank.org