

# AI AI AI AI AI:

*Ready or Not, The Future is Coming!*

**Nagaraja Rao Harshadeep (Harsh)**

Global Lead (Disruptive Technology)

[harsh@worldbank.org](mailto:harsh@worldbank.org)



**THE WORLD BANK**

IBRD • IDA | WORLD BANK GROUP

*1818 Society Annual Meeting*

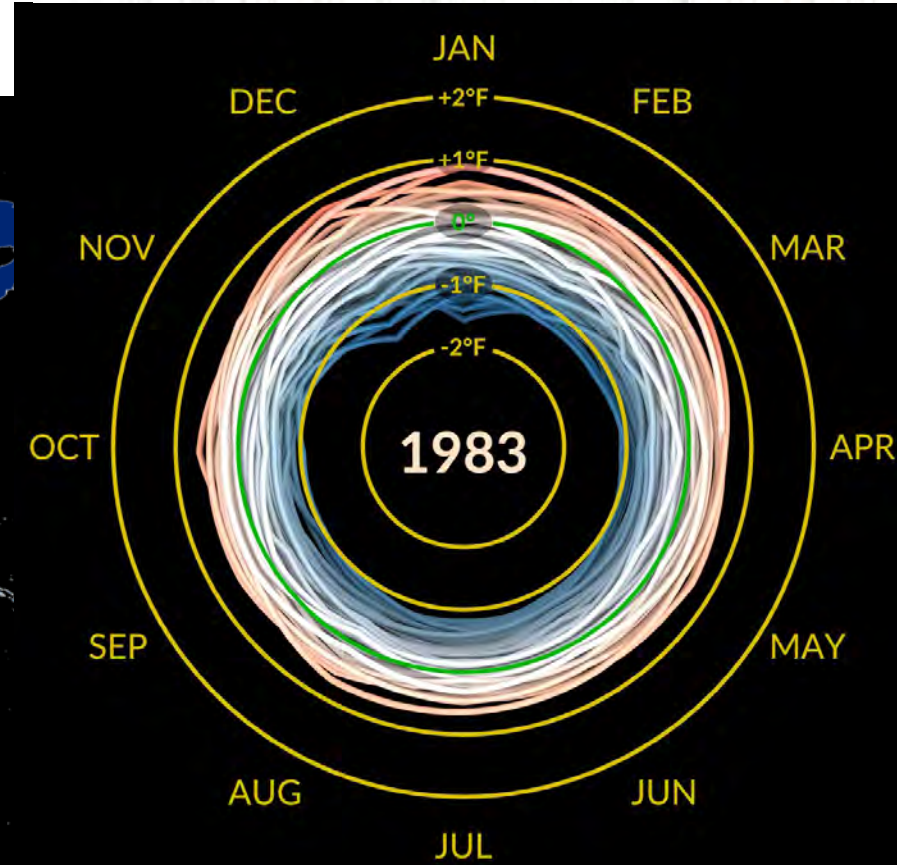
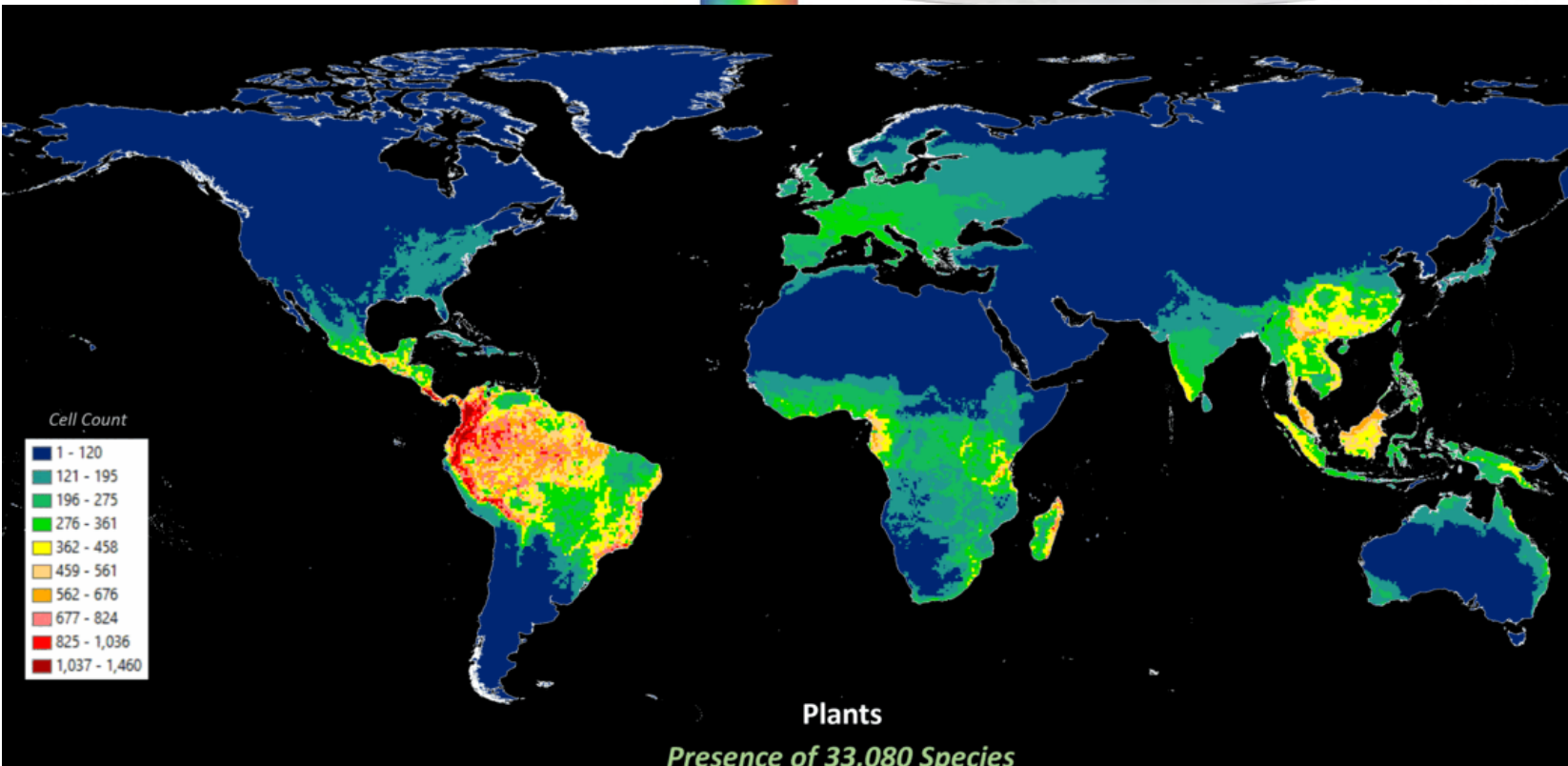
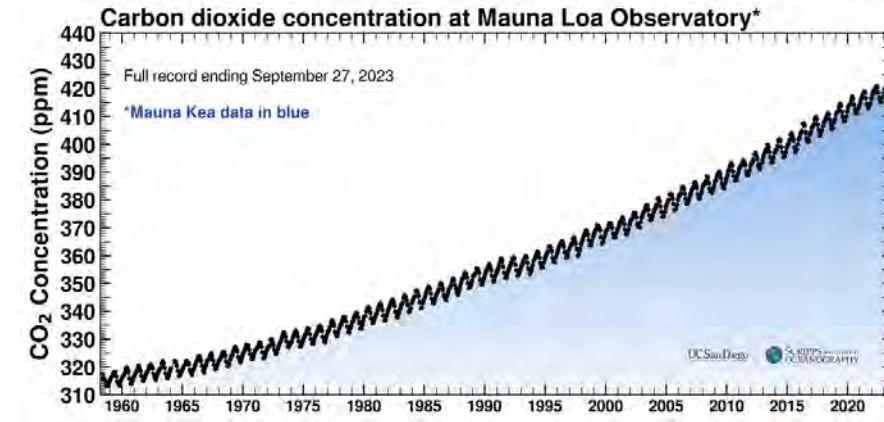
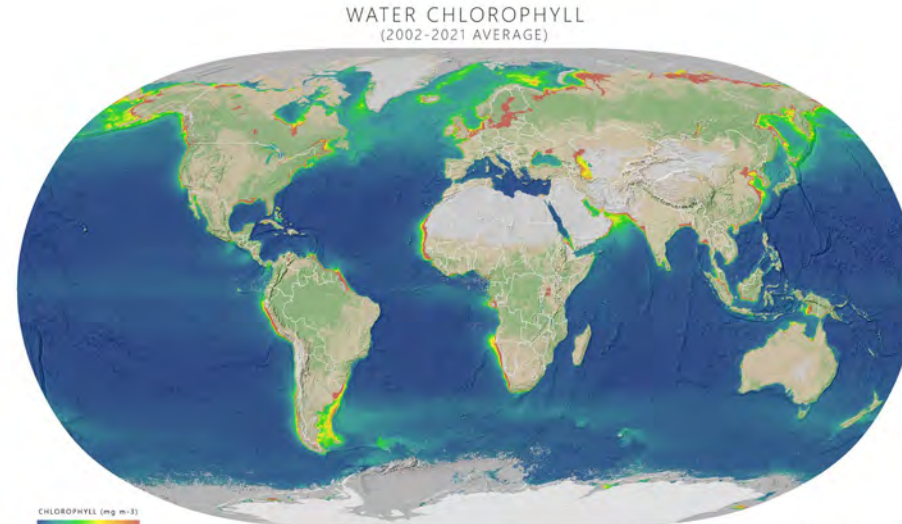
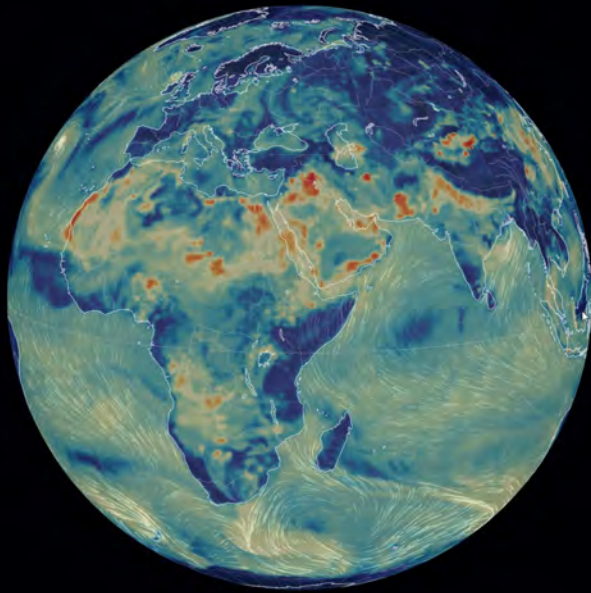
*Nov 9, 2023*



**OUR DREAM  
IS A WORLD FREE OF POVERTY  
ON A LIVABLE PLANET**



# Towards a more livable planet!



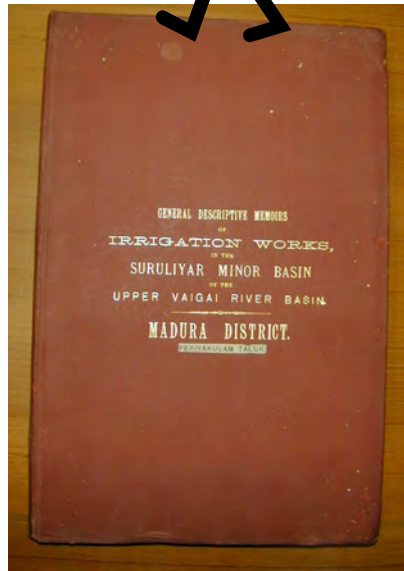
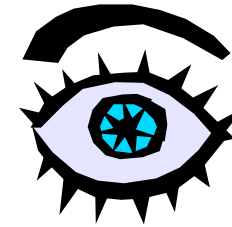
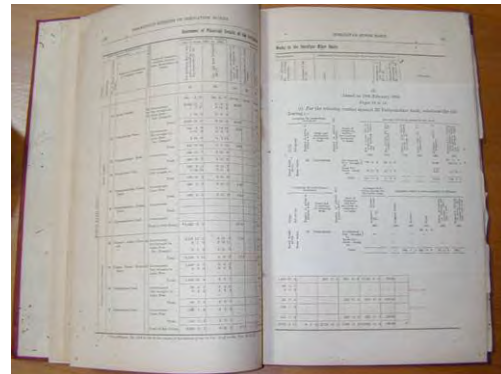
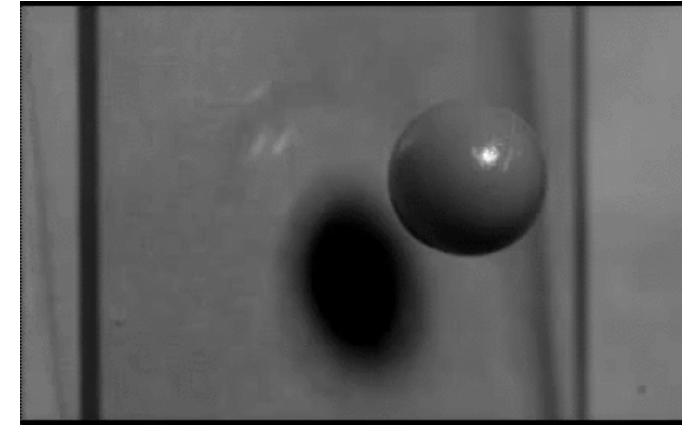
# What's Broken?





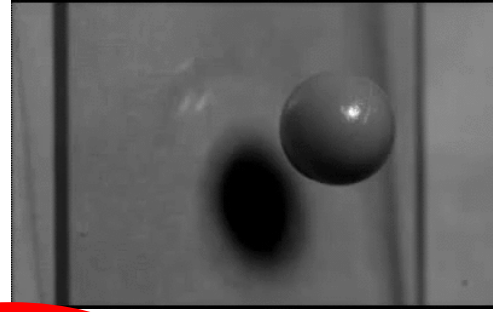
# Challenges: Information

- Data coverage and quality
- Meaningful use of modern information and analytical tools
- Public access to data, tools, and knowledge products



# Challenges: Institutions

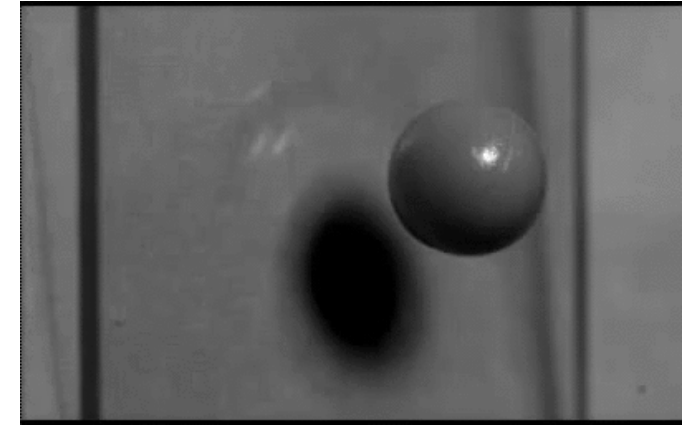
- Vision of Hydromet and analytical **Services** needed (rather than just starting from equipment and models)
- **Limited technical and managerial capacity for modern water resources data and analytical knowledge tools** (e.g. in Government, Academia, Private Sector, General Public; access to global expertise)
- **Institutional coordination and collaboration** (across spatial and sectoral boundaries)
- **Meaningful stakeholder participation**
- **Sustainability Focus**
- **Effective leadership at all levels** - sometimes a culture of “data-free analysis” and “analysis-free decision-making”



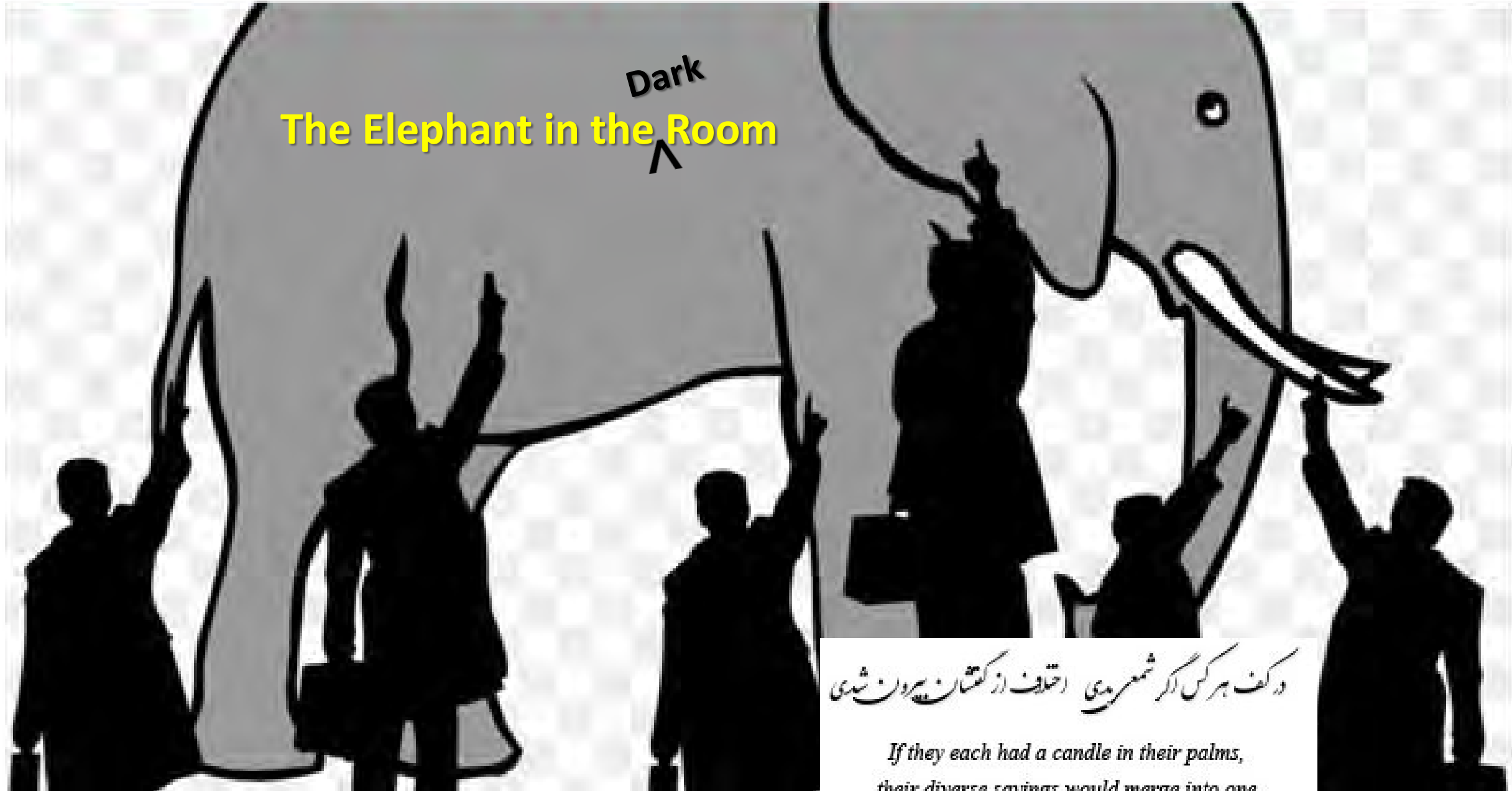


# Challenges: Investments

- Inadequate **monitoring, forecasting, and analysis** systems
- Poor **office infrastructure and equipment**
- Huge **infrastructure deficit** (power, transport, agriculture, sustainable land management...)
- Investment planning & operational **coordination**



# Transcending narrow sectoral perspectives...



Dark  
The Elephant in the Room  
^

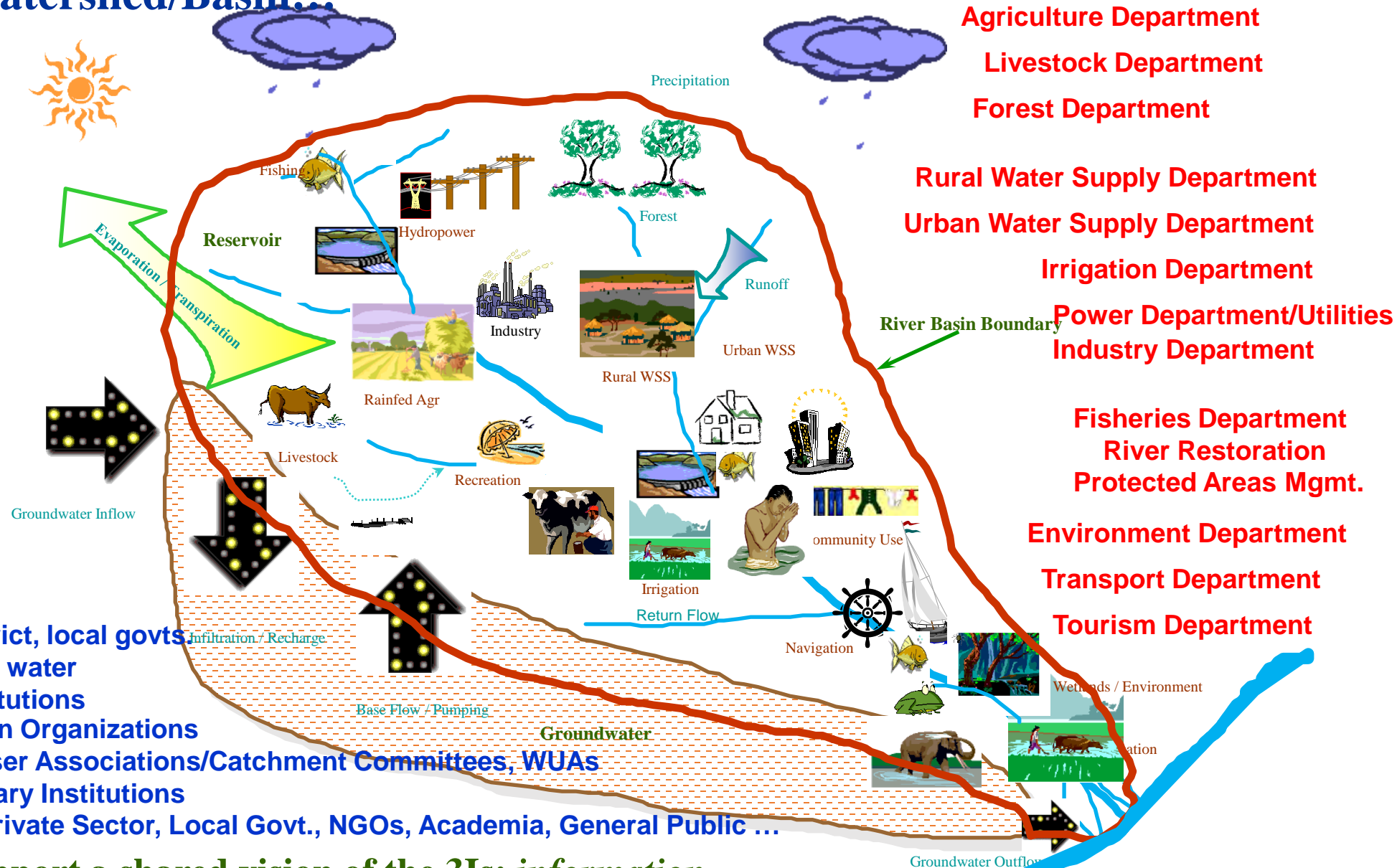
د کف هر کس اگر شمعی دى (حکایت از گفتار بیرون شدى

*If they each had a candle in their palms,  
their diverse sayings would merge into one.*



# Multiple sectors, multiple institutions, linked by water and natural resources...

## A Typical Watershed/Basin...



...Need to support a shared vision of the 3Is: *information, institutions, and investments*...





# Challenges

- Major Climate/Sustainability Challenges
- Getting insights from patchy, fragmented data...
- Communicating effectively with stakeholders (including a new generation)
- Leveraging a rapidly-changing world of technology and global good practices
- Remote/hybrid work while home alone



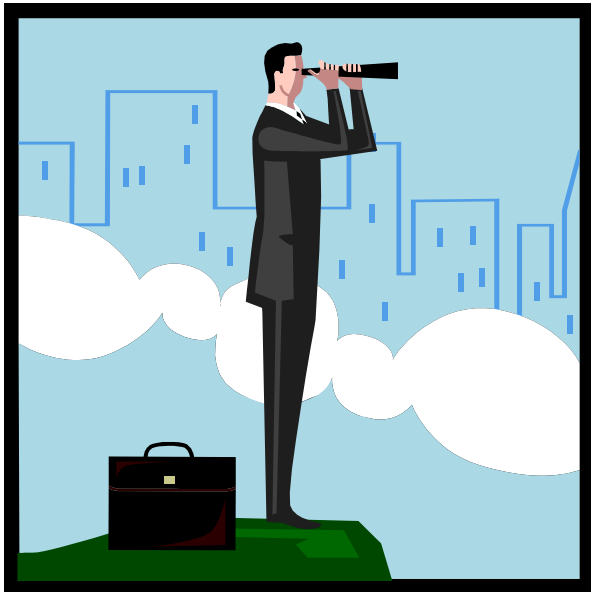
# Looking Ahead...





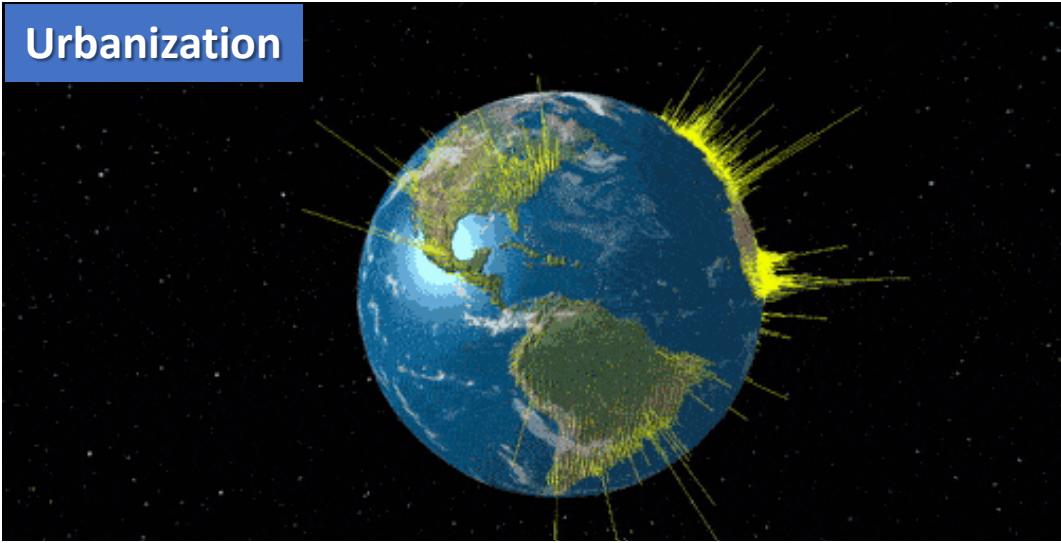
# Modernizing Approaches to Address these Challenges...

## The 3 Is...

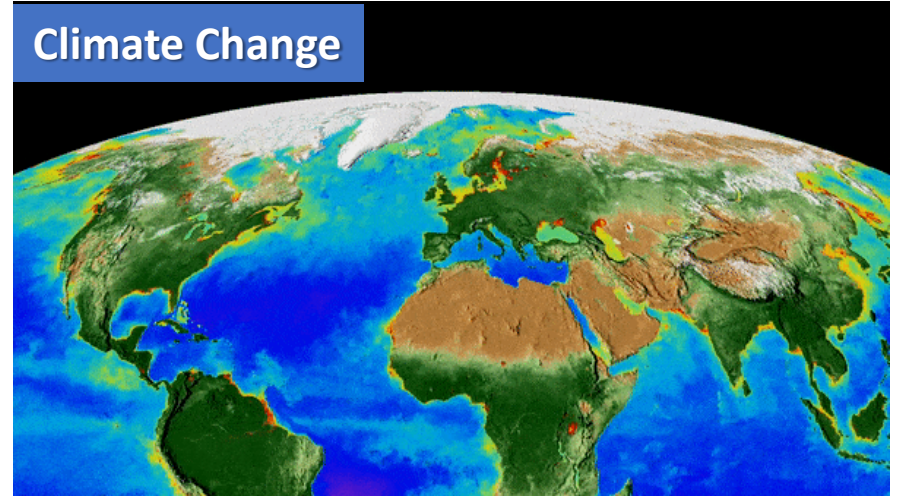


# There are many ongoing changes...

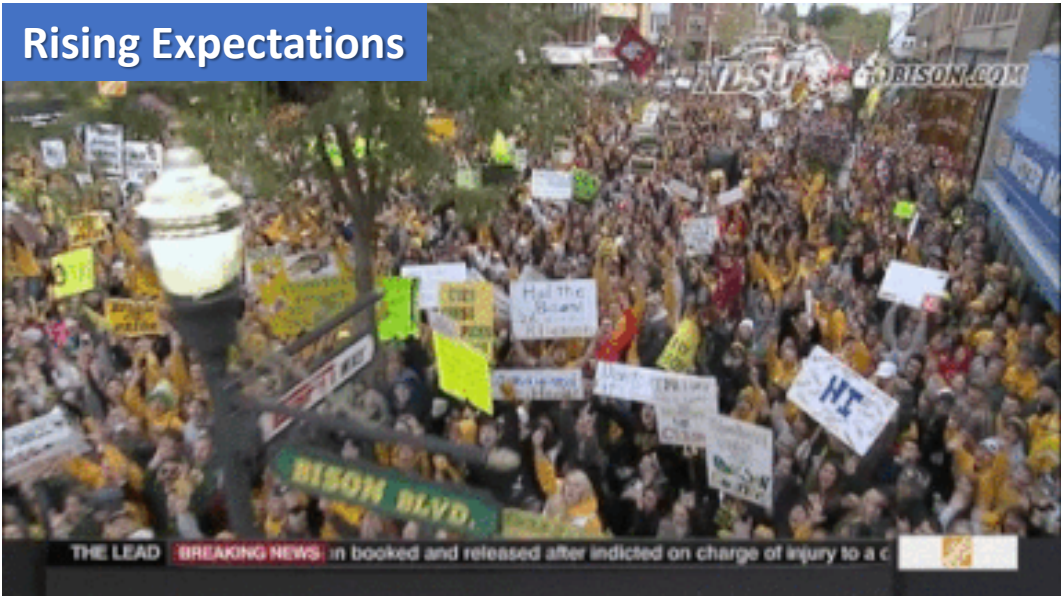
Urbanization



Climate Change



Rising Expectations



Disruptive Technology



What *IS* Disruptive Tech?



# Interconnected Global Village

### Infrastructure

#### Geographic Context

#### Digital

##### Digital Networks

- Internet Exchange Points
- Colocation data centers
- 4G Coverage
- 3G Coverage
- 2G Coverage
- Submarine cables
- OpenCellID Tower Density

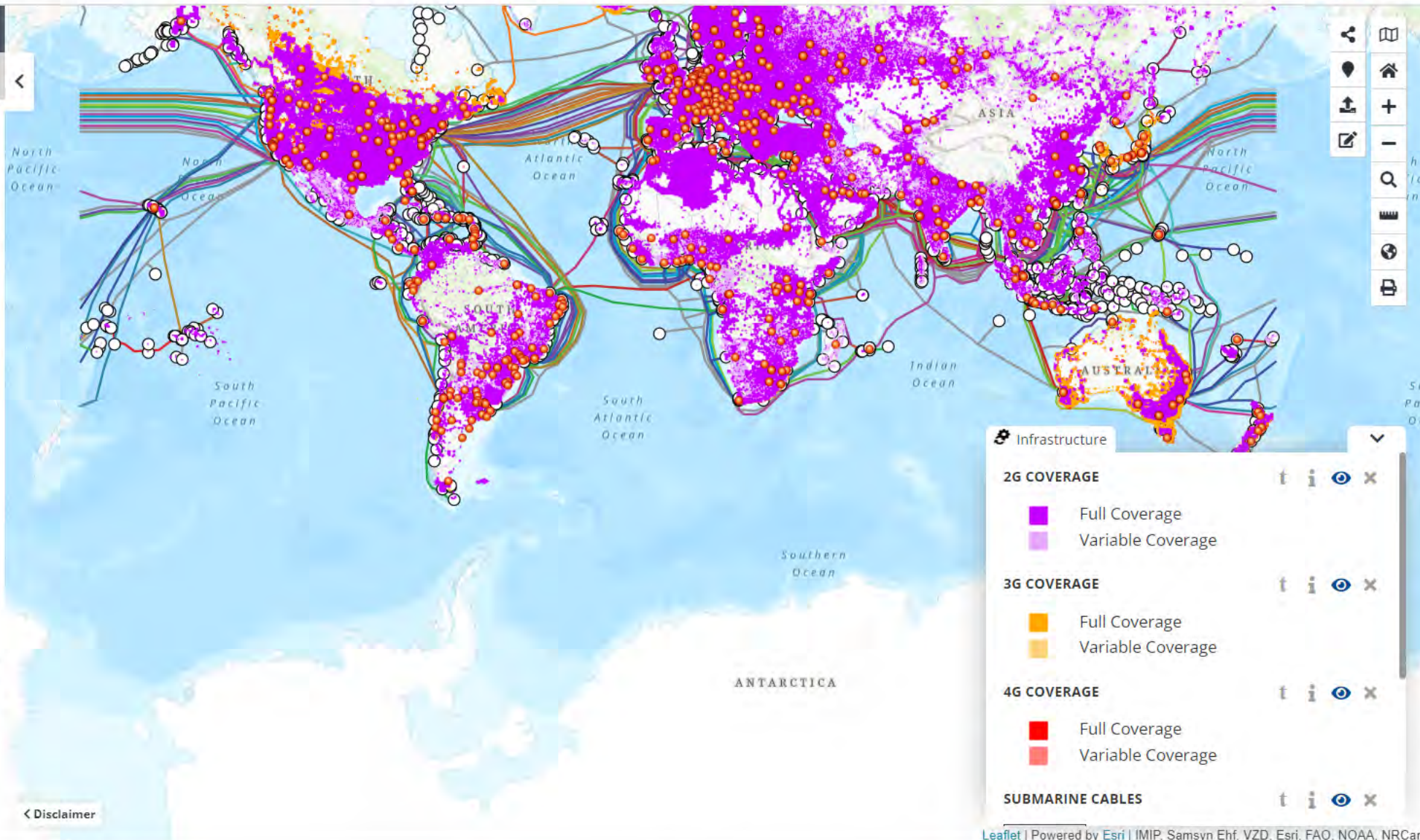
##### Digital Services

###### Demand

- Fixed broadband subscriptions (per 100 people)
- Mobile cellular subscriptions (per 100 people)

#### Energy

#### Transport



**Infrastructure**

**2G COVERAGE**

- Full Coverage
- Variable Coverage

**3G COVERAGE**

- Full Coverage
- Variable Coverage

**4G COVERAGE**

- Full Coverage
- Variable Coverage

**SUBMARINE CABLES**

Disclaimer



# A new world of “Disruptive Technology”



## “Disrupt” data value chains

- **Data Collection:** Monitoring/Surveys (in-situ sensors/IoT/Biometrics, earth observation (satellite, aerial, UAVs), crowdsourcing, digitization...
- **Data Management:** Telemetry, 5G, cloud services, open data, Blockchain, ...
- **Data Analysis:** Big data, Geospatial/ AI/Machine Learning, modeling/ scenario analysis, script repositories, Cloud/Edge/Quantum computing...
- **Data Access:** Open data APIs, data visualization, gamification, mixed reality-AR/VR, ...
- **Outreach:** Platforms/Social Media/Portals/ Apps/e-books/Competitions...



## “Disrupt” production value chains

- 3D/4D printing/additive manufacturing...
- “Digital Twins”
- Automation/SCADA...
- Robotics/ Autonomous transport...
- Advanced materials/nanotech/ biotech/genomics/energy tech/ green tech, ag tech...



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



## “Disrupt” stakeholder value chains

- Virtual social networks/ Digital Platforms...
- Sharing economy...
- Crowdsourcing, gamification, competitions (e.g. *hackathons*, *appathons*...)
- Mobile money, fintech, cryptocurrency...
- Blockchain enabled value chains
- Maker movement/DIY/Tech Incubators...
- Virtual learning/re-skilling...



# Disruptive tech could change Development

Making "smart development" wrt climate, water and natural resources, energy, food, waste, mobility, knowledge, services, networks.



Online Services



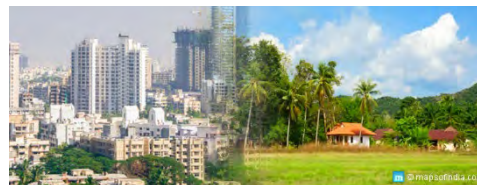
Green Energy

Broadband & Smartphone Access

Apps, e-services & e-learning



Planning



Access to a new world of Data, Information, Knowledge and Services

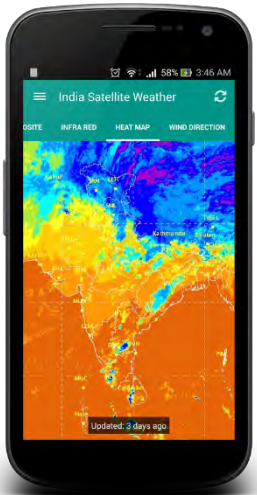
3D Printed Infrastructure



Sensors/IoT (e.g. for soil moisture)



Drones/UAVs (e.g. for monitoring, seeding, delivery)

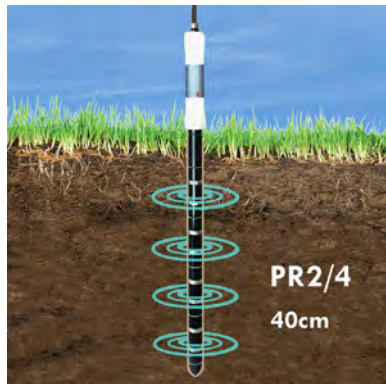
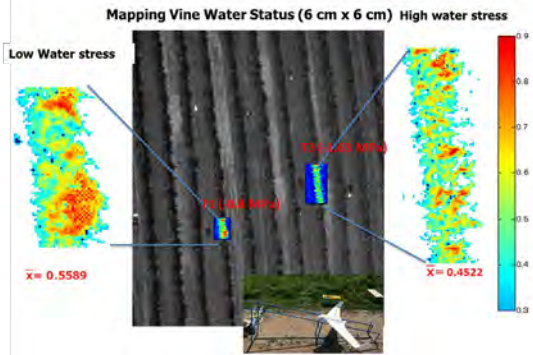
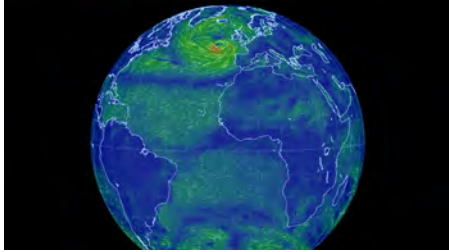




# Disruptive Tech can change individual "sectors"

e.g. Agriculture

*Doing things differently...*





# Disruptive Tech can change individual “sectors”

e.g. Agriculture

*Doing different things...*



Platforms



CHANGE THE WAY WE PRODUCE MEAT



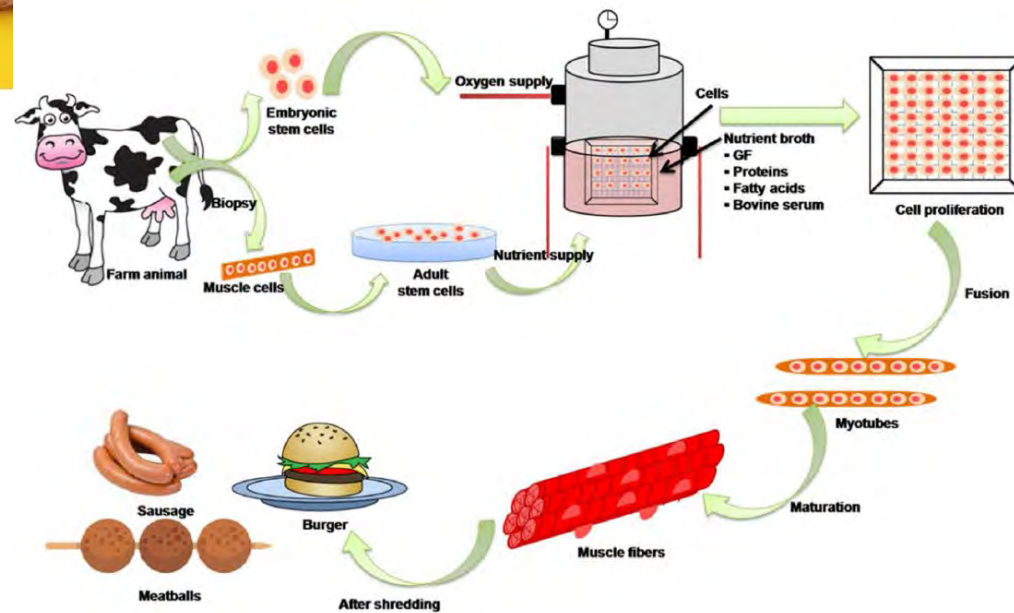
# The \$325,000 Lab-Grown Hamburger Now Costs Less Than \$12

A real burger made without the cruelty and pollution is now within reach.



[TOP PHOTO: NEVODKA VIA SHUTTERSTOCK]

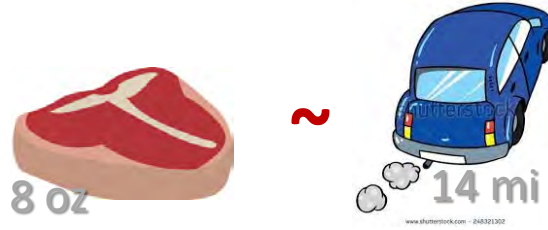
Watch  
This  
Space!



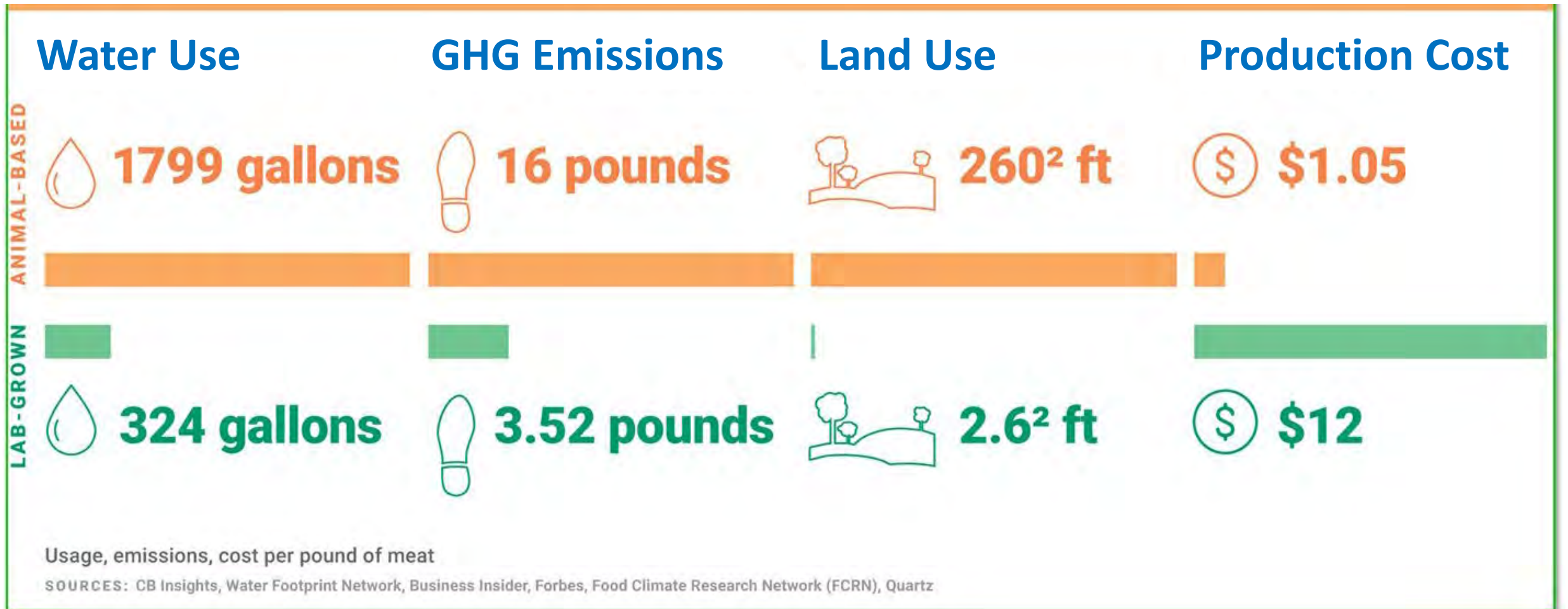


# Many multi-sectoral implications (incl. for the Amazon!)

A third of global agricultural water use is for fodder!



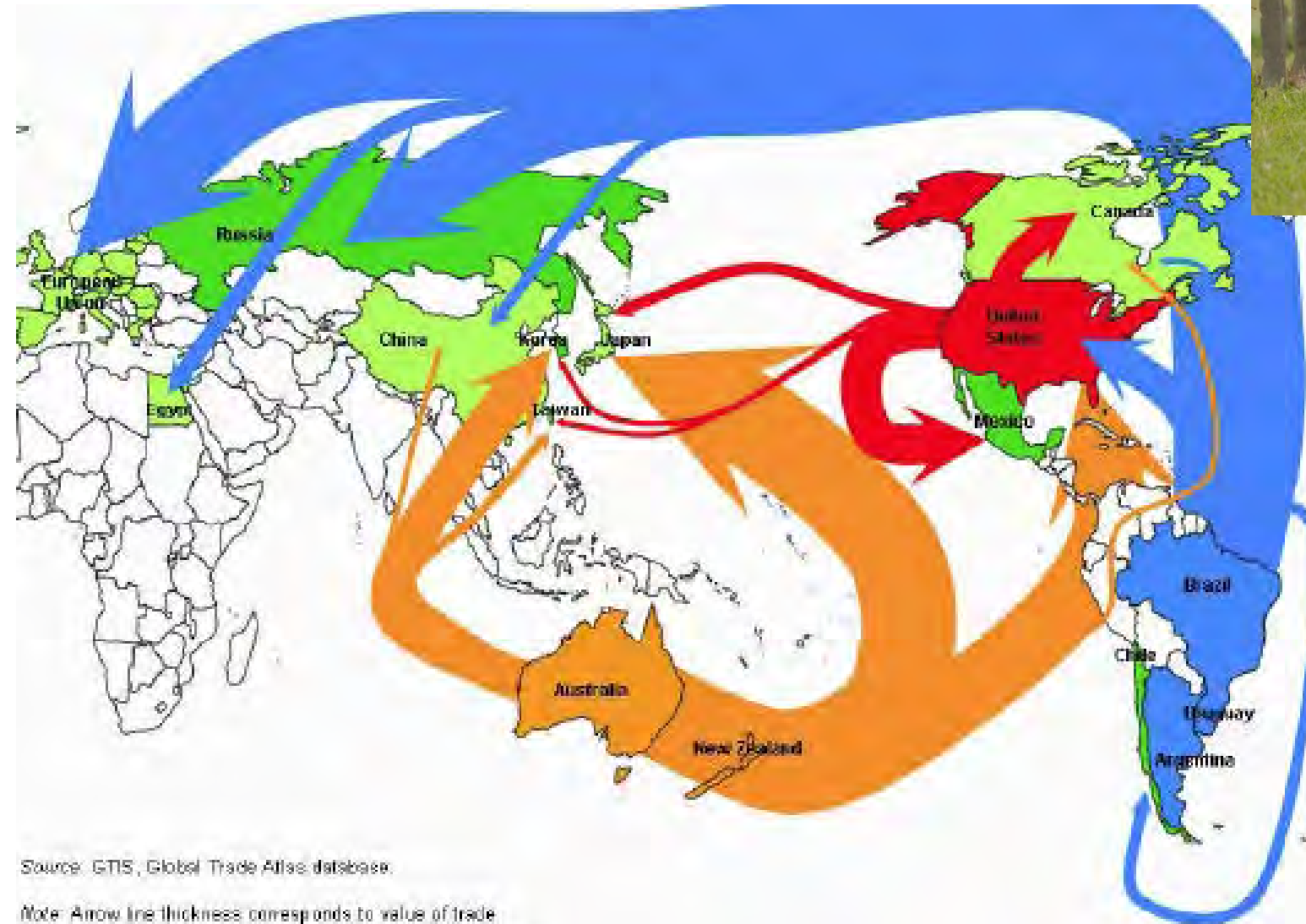
70% of agricultural land is used for pasture (~28m km<sup>2</sup>)!





## Livestock:

- Supports 1.3 billion people
- 40% of global value of agricultural output



NEWS

Just In Politics World Business Sport Science Health Arts Analysis

Print Email Facebook Twitter More

### 'Cultured meat' could spell end of traditional cattle farming within decades, scientist behind lab-grown beef burger says

AM By the National Reporting Team's [Dominique Schwartz](#)  
Posted 27 Mar 2015, 1:08am

The Dutch scientist who served up the world's first laboratory-grown beef burger says "cultured meat" could spell the end of traditional cattle farming within decades.

That is the confronting message Maastricht University Professor Mark Post has for the Northern Territory Cattlemen's Association, which is holding its annual conference in Darwin.

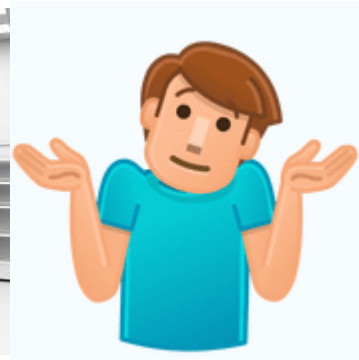
"I do think in 20, 30 years from now we will have a viable industry producing alternative beef and there will be a growing market for it and eventually a really large market," he said.



PHOTO: Professor Post believes the lab-grown beef could be produced for \$80 a kilogram.

The new oil...

*We have NO data...*



*Of course we have data...*



*Data, data everywhere...*





# Information & Analysis Trends

**What's Out?**

*Are we part of the problem?*



**What's In?**

*Can we be part of the solution?*



Paper Records/Publication

Inadequate and Inaccessible Data

“Retail” info systems & modeling

Reliance on Websites and Pdfs

“Have you registered first?”

“Tell me why you need the data”

Online interoperable OGC data service formats/ Open APIs

Free and subscription services

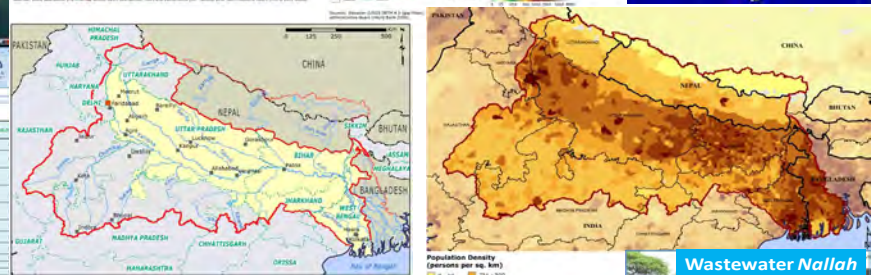
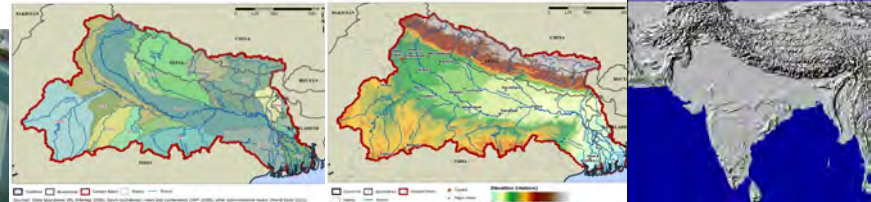
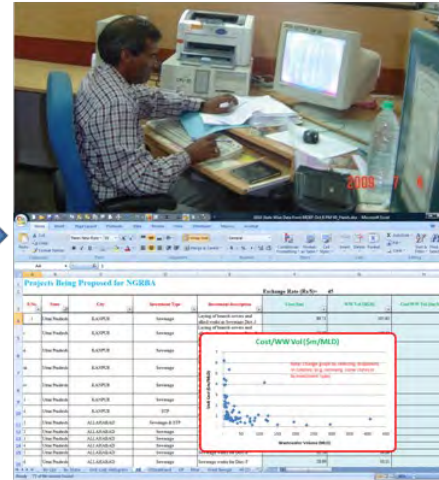
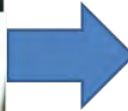
“Wholesale” Cloud Analytics

Separate data services and consumption platforms (e.g. dashboards, Interactive documentation)

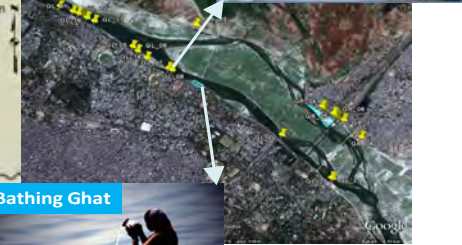
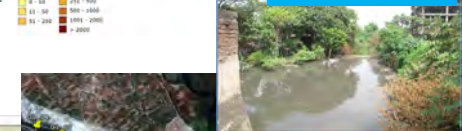
# Data Rescue



Digitizer



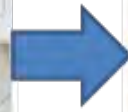
Wastewater Nallah



Bathing Ghat



Scanner



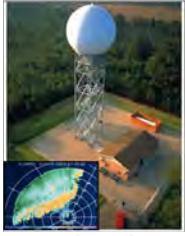
Sources: State boundaries (ML Infomap 2009), basin boundaries (ML Infomap 2009), rivers and catchments (IWM 2009), other administrative layers (World Bank 2010), water quality monitoring stations (Central Pollution Control Board 2010).



# “Bottom-up” Monitoring Systems



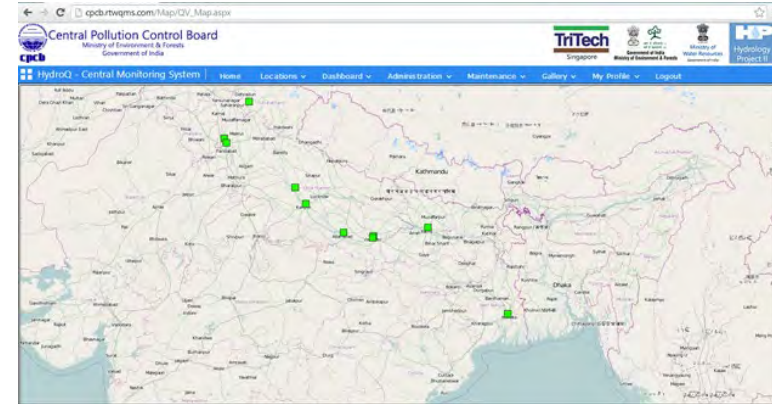
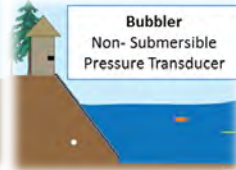
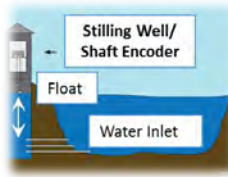
Automatic Rain Gauges



Doppler Radar



Snow Pack



Shore-mounted Radar



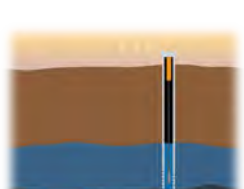
Bridge-mounted Radar



Non-Contact Measurement of Stage & Discharge



Automatic Cableway System



Groundwater Monitoring



Water Quality Monitoring



Field Kits



Laboratories



Crowdsourcing Monitoring





**3D Kenya**

Kenya\_GLOBE\_04 (id: 4) (sensor\_id: 4) located at Thomas Mboya High School  
 Description: 3D-PAWS at Thomas Mboya Secondary School, Kenya  
 This instrument is designated as: ACTIVE  
 (If 'INACTIVE', the instrument will not appear in the dashboard.)

Measurements  
 1551088 measurements were reported.  
 This instrument is expected to report a measurement every 600 seconds.  
 The first measurement was measured at 2016-09-18 12:16:49 UTC.  
 The last measurement is 12 days old. It was measured at 2021-03-11 12:45:33 UTC.

Plot measurements for the last 1 weeks  
 Kenya\_GLOBE\_04 - Live Data

From: Mar 11, 2021 10:30:02 To: Mar 11, 2021 12:45:04

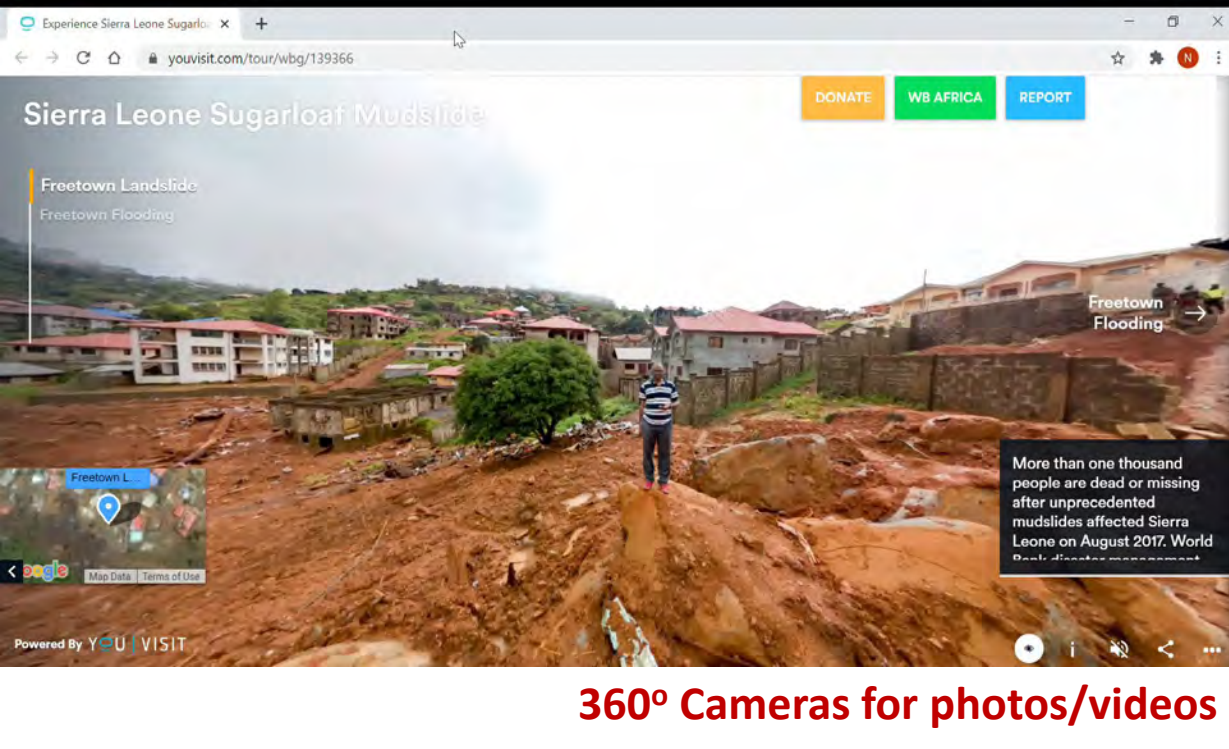
Variables

Short Name	Name	Units	Min/Max (Plot)	Measured Property
t1	HTU21D_T	percent %	/	Temperature
rh1	HTU21D_RH	percent %	/	Humidity Value
msl1	BMP180_SLP	percent %	/	Sea Surface Pressure
sp1	BMP180_SP	percent %	/	Air Pressure Value

## 3D Printed Monitoring Stations, Kenya

**3D PAWS**





**360° Cameras for photos/videos**



**Bioacoustics**



**eDNA**

**Collect Field Data – Test-Pit Example at Dam Foundation**



**“Current Practice” - Photo**



**“New Practice” – 3D hologram visualized with HoloLens and Ada Platform**

BGC ENGINEERING INC.

Slide Number: 7 of 13

**Phone/Tablet LiDAR**



# Community Monitoring



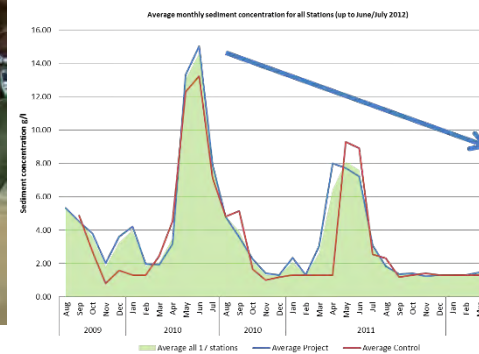
	2009	2010	2011	2012	Total
Staff	3132	11812	12409	6522	33875
Turbidity	3131	12069	12469	6624	34293
Rain	3116	>12777	>15000	>15000	>47000
Flow					>500
Sed samples	1425	4176	3139	1216	9956



Secchi Jug for turbidity



## Sediment Concentration Analyses





# Field/Virtual Surveys

- Online Spatial Surveys
- Mobile ODK – KoboToolBox –Survey123...



Spatial COVID-19 Recovery Stimulus Planning (Testing Prototype)

As countries and their development partners explore ways to help impacted people around the world (especially poor communities in remote areas) recover from the devastating impacts of the COVID-19 crisis, it is important to build a credible "bottom up" pipeline of potential investments that can create short-term labor-intensive employment opportunities to provide income support for these families (e.g. building trails in protected areas to improve ecotourism, afforestation activities, planting mangroves, cleaning beach litter, etc.). These short-term "stimulus" investments could be designed in a way to also support longer-term sustainable growth and poverty-alleviation impacts.

This survey form is intended to be used by staff and project counterparts to propose potential investments to support planning, along with some basic data to create a portfolio of potential investments that can be visualized, queried, and analyzed on customized dashboards.

The first version developed here can even be done to solicit ideas from staff and counterparts working from home and can be adapted later to include mobile Apps for additional field data collection when safe to do so.

**Please provide a unique name for the suggested intervention\***  
Please enter country, location, and name of project  
e.g. Bali, Indonesia Beach Cleanup

COVID-19 Dashboard

THE WORLD BANK

Select Agency: None

Total Projects: **18**

Average Female Inclusion Rate: **59%**

Average Person Days: **968**

Estimated Spending: **\$1,593,401**

Key Thematic Categories

Category	Count
Null	1
Blue (e.g. coastal restoration, fisheries, aquaculture)	7
Brown (e.g. waste cleanup)	2
Digitals (e.g. data rescue, website/mobile apps)	1
Green (e.g. watersheds, landscapes, parks)	6
Short-Term Clean-up	1

Project List

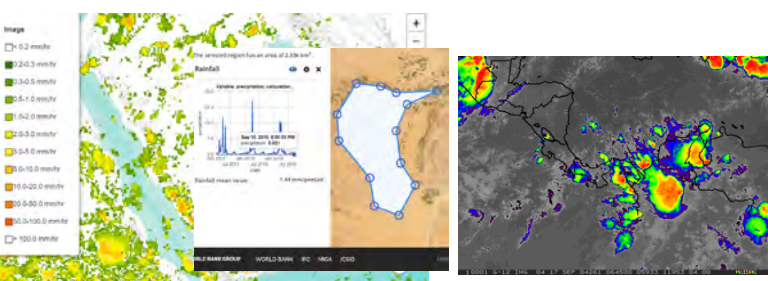
- Project: Afforestation & Reforestation of Refused Lands in Albania
- Project: Aquaculture in city of Busan
- Project: Bali Beach cleanup-1
- Project: Beach Cleanup in municipality of Balif
- Project: Chingale escarpment (Zomba) SWM-1
- Project: Clean Up
- Project: Coastal Restoration in Chennai Municipal Corporation
- Project: Ethiopia Watershed 1
- Project: Fisheries
- Project: Freshwater

Last update: a minute ago

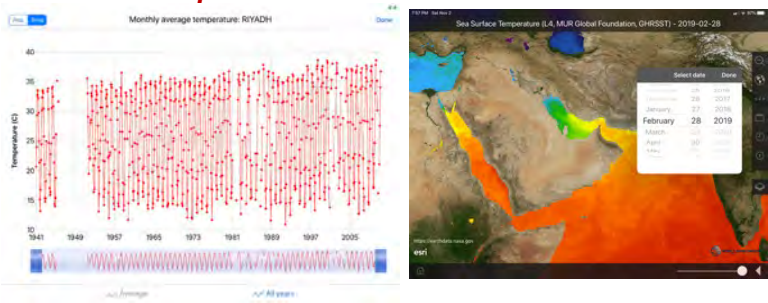


# "Top-down" Earth Observation & Other Global Analytics Services

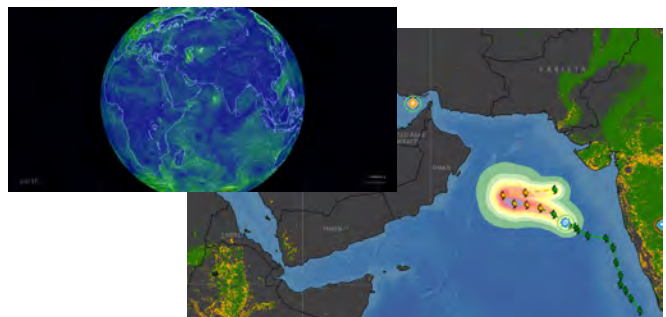
## Climate



## Precipitation & Forecasts



## Temperature

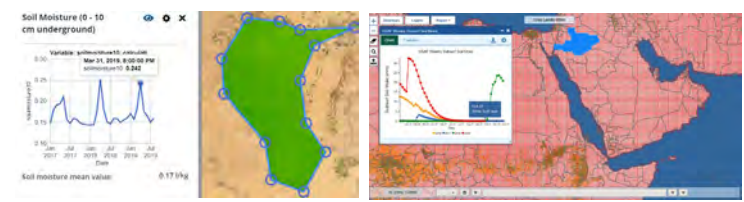


## Storms

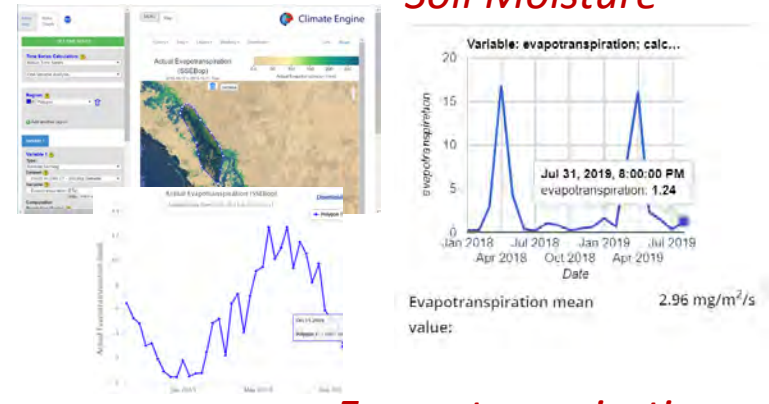
## Hydrology



## Levels, Flow & Inundation & Forecasts

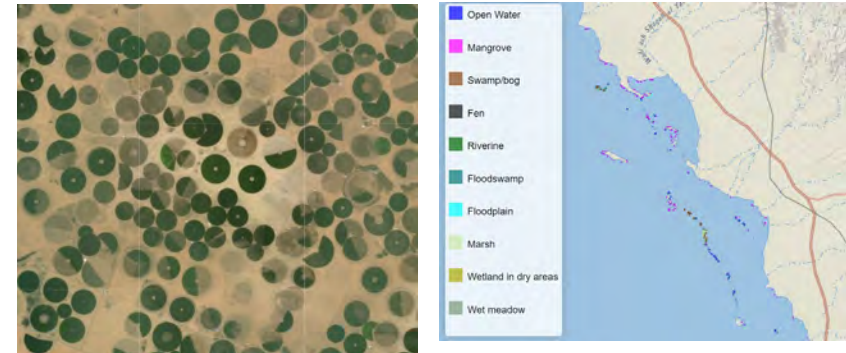


## Soil Moisture



## Evapo-transpiration

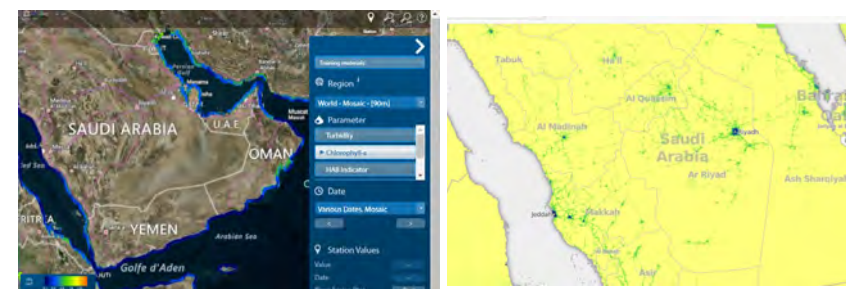
## Other



## Land Cover



## NDVI, EVI, GRACE, etc.



## Social, Economic, Environmental, etc.



# World Bank Geospatial Platform

<https://maps.worldbank.org/>  
<https://geo.worldbank.org/>

WORLD BANK INTRANET | Maps

EXPLORE Left Right

Satellite SENTINEL

Imagery view NATURAL

Date 3 MONTHS before JUL 5, 2020

IMAGERY Maximum cloud cover 0% 25% 50% 75% 100%

TOOLKITS

HELP

Compare Tool

LEFT: SENTINEL 2  
MAR 18, 2016 - 6% CLOUD COVERAGE

RIGHT: SENTINEL 2  
APR 11, 2020 - 0% CLOUD COVERAGE

WORLD BANK GROUP WORLD BANK IFC MIGA ICSID

EMERGENCY CONTACT NUMBER (US) (202) 458-8888 | © 2020 THE WORLD BANK GROUP. ALL RIGHTS RESERVED.

World Bank Maps

THE WORLD BANK Maps

Analyses

The selected region has an area of 5,970,676 km<sup>2</sup>.

Analyses Types:

- Forest Cover Change

Area of Interest

Amazon

Summary

Forest Cover Change

Forest Loss	415,559.14 km <sup>2</sup>
Forest Gain	14,876.73 km <sup>2</sup>
Forest Loss and Gain	8,831.3 km <sup>2</sup>

ANALYSES FOREST COVER CHANGE (tree cover/loss/gain)

TREE COVER (%)

FOREST LOSS

FOREST GAIN

FOREST LOSS AND GAIN

World Bank Group Geospatial Platform

Area analysis Chhattisgarh

The selected region has an area of 135,436 km<sup>2</sup>.

Nitrogen Dioxide (NO<sub>2</sub>)

Variable: NO<sub>2</sub> Calculation: average

NO<sub>2</sub> mean value: 37.369 µmol/m<sup>2</sup>

INDIA

CHHATTISGARH

ANALYSES AIR POLLUTION - NO<sub>2</sub>

WORLD BANK GROUP WORLD BANK IFC MIGA ICSID

EMERGENCY CONTACT NUMBER (US) (202) 458-8888 | © 2020 THE WORLD BANK GROUP. ALL RIGHTS RESERVED.



# World Bank Geospatial Platform: <https://maps.worldbank.org/>

**THE WORLD BANK** | IBRD - IDA | **Maps**

**SATELLITE**

Click on map to select location

**IMAGERY LEFT** Edit X

Satellite: Sentinel - 2  
Maximum cloud cover: 50%  
Date: Oct 8, 2019 - Nov 5, 2019

**Available Imagery** ⓘ

NOV 1, 2019 OCT 27, 2019 OCT 22, 2019

**IMAGERY RIGHT** Edit X

Satellite: Sentinel - 2  
Maximum cloud cover: 50%  
Date: Oct 11, 2023 - Nov 8, 2023

**Available Imagery** ⓘ

OCT 31, 2023 OCT 11, 2023

Powered by Google Earth Engine

**COMPARE TOOL**

**LEFT: SENTINEL - 2,NATURAL** ⓘ ⓘ ⓘ X

Oct 27, 2019 5% CLOUD COVERAGE

NATURAL VEGETATION NDVI NDMI

**RIGHT: SENTINEL - 2,NATURAL** ⓘ ⓘ ⓘ X

Oct 31, 2023 3% CLOUD COVERAGE

NATURAL VEGETATION NDVI NDMI

NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community. Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and...



WORLD BANK INTRANET | Maps

EXPLORE

ANALYSIS

IMAGERY

TOOLKITS

HELP

Left Right

Satellite

SENTINEL

Imagery view

NATURAL

Date

3 MONTHS before JUL 5, 2020

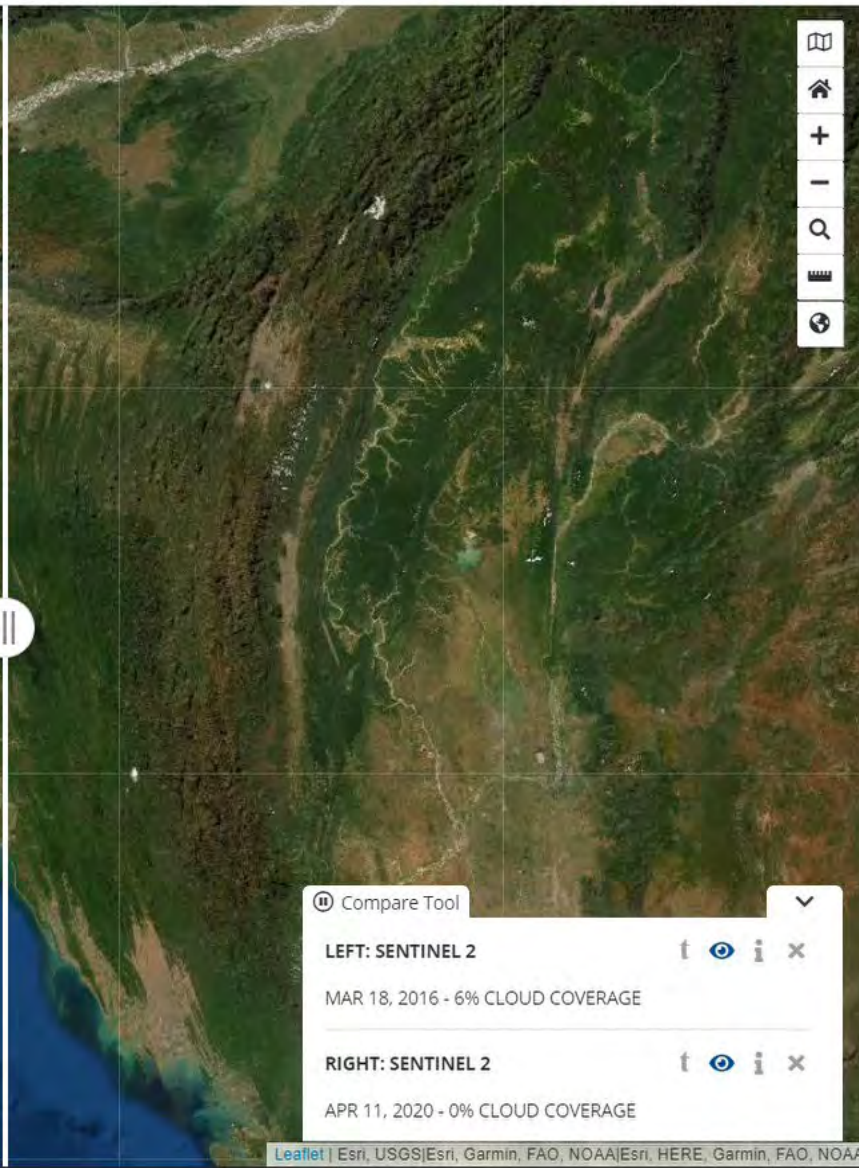
Maximum cloud cover

0% 25% 50% 75% 100%

MAY 16, 2020 APR 11, 2020 APR 11, 2020

APPLY

Disclaimer



Compare Tool

LEFT: SENTINEL 2  
MAR 18, 2016 - 6% CLOUD COVERAGE

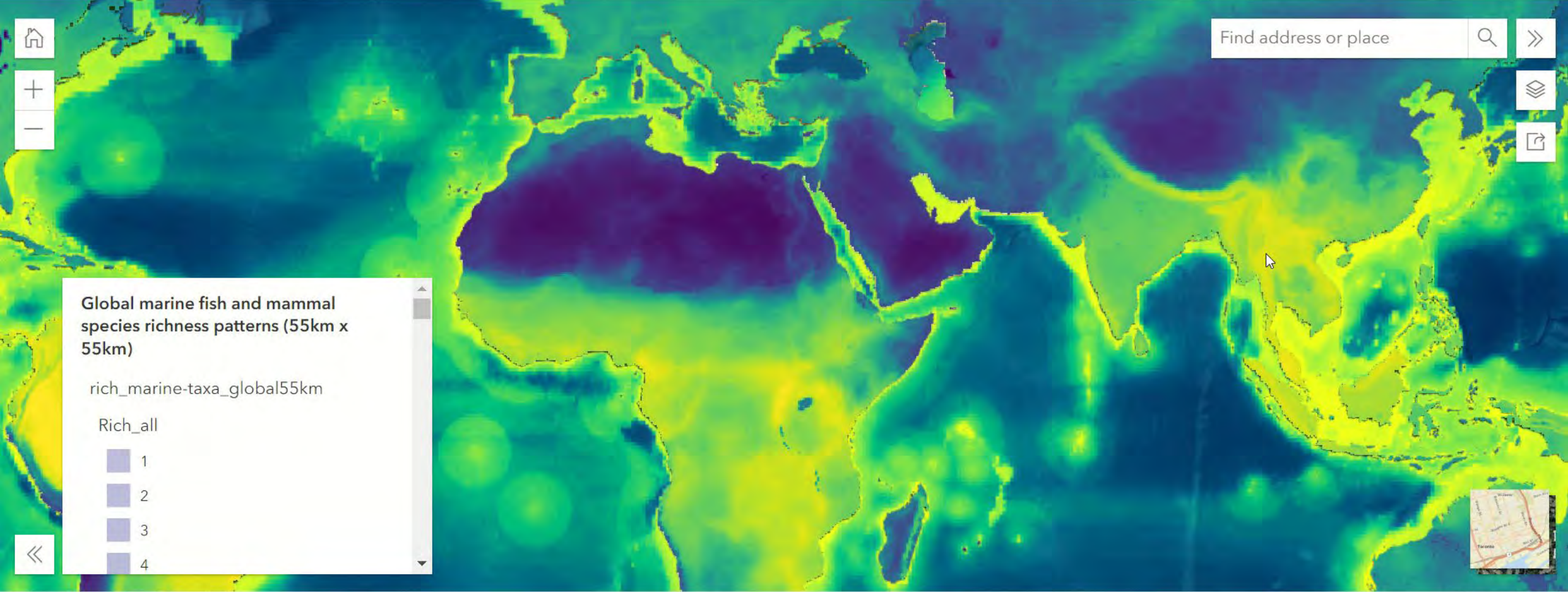
RIGHT: SENTINEL 2  
APR 11, 2020 - 0% CLOUD COVERAGE



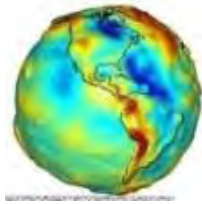
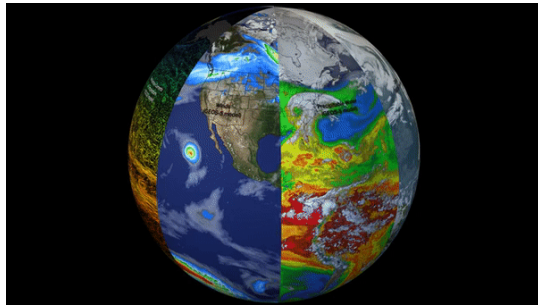
# Livable Planet Explorer



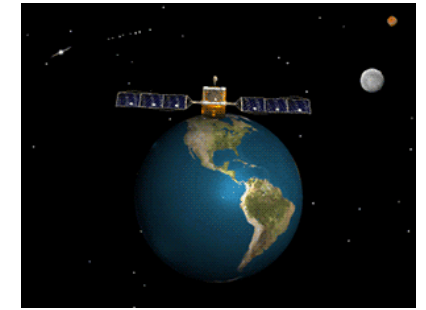
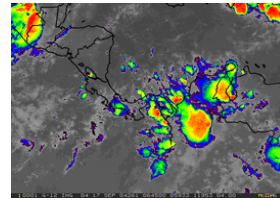
- WebApp
- Spatial...
- WB...
- Sea Plast...
- Historica...
- Allen...
- Ocean...
- Agricult...
- Livestoc...
- Rivers a...
- ...







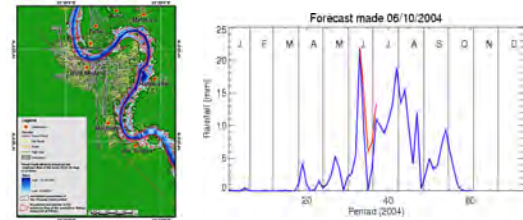
# "Top-Down" Data Acquisition System



Satellite & Aerial Earth Observation

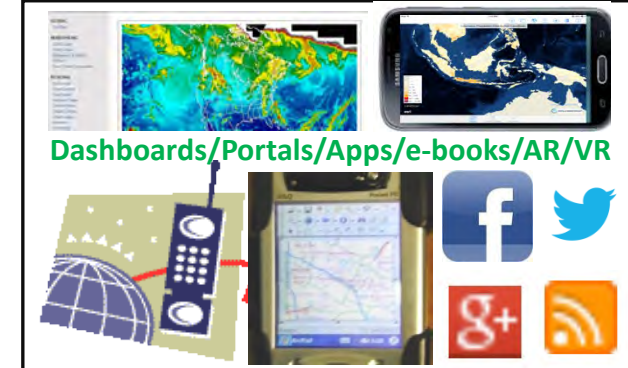
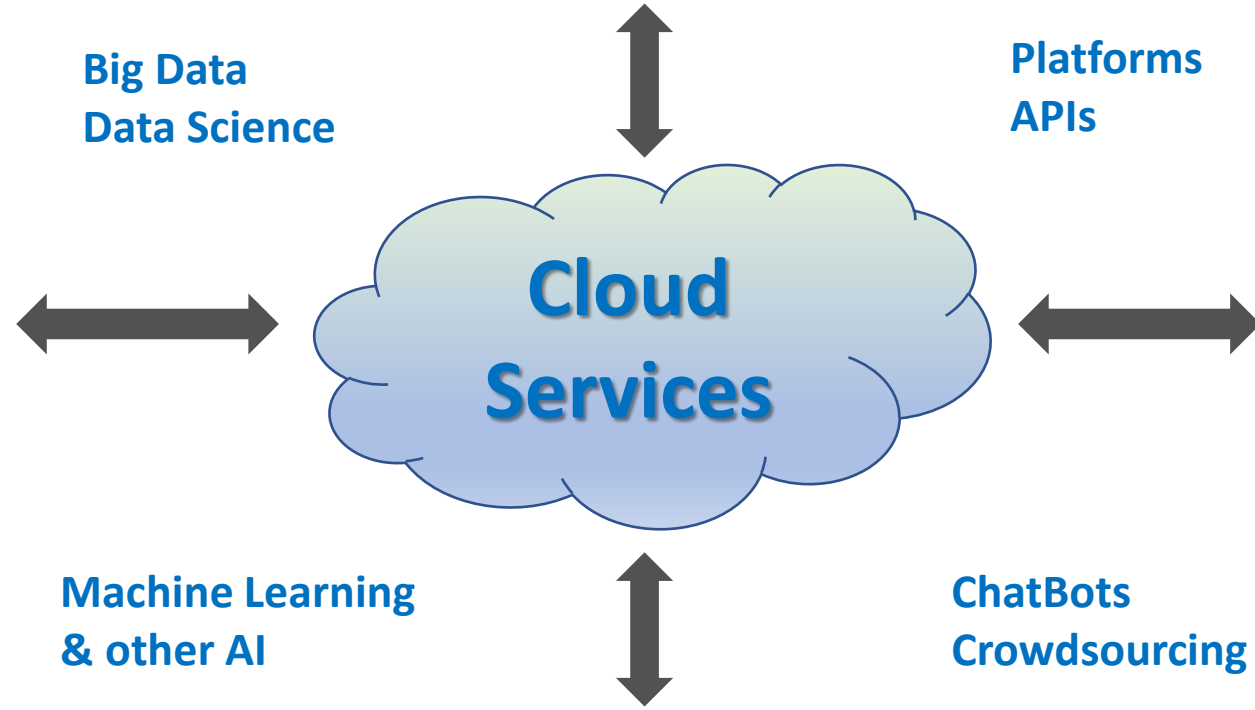


Data Rescue  
GIS and other datasets



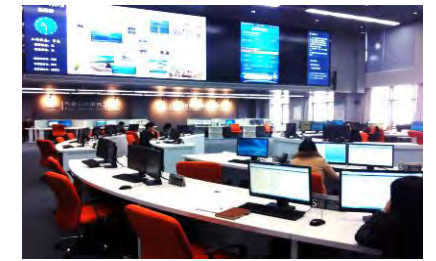
Data Management

Analytics/Models



Dashboards/Portals/Apps/e-books/AR/VR

Stakeholder Alerts



Operational Control Rooms



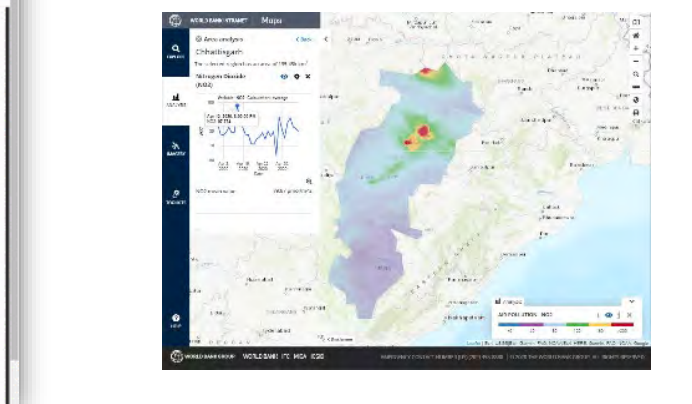
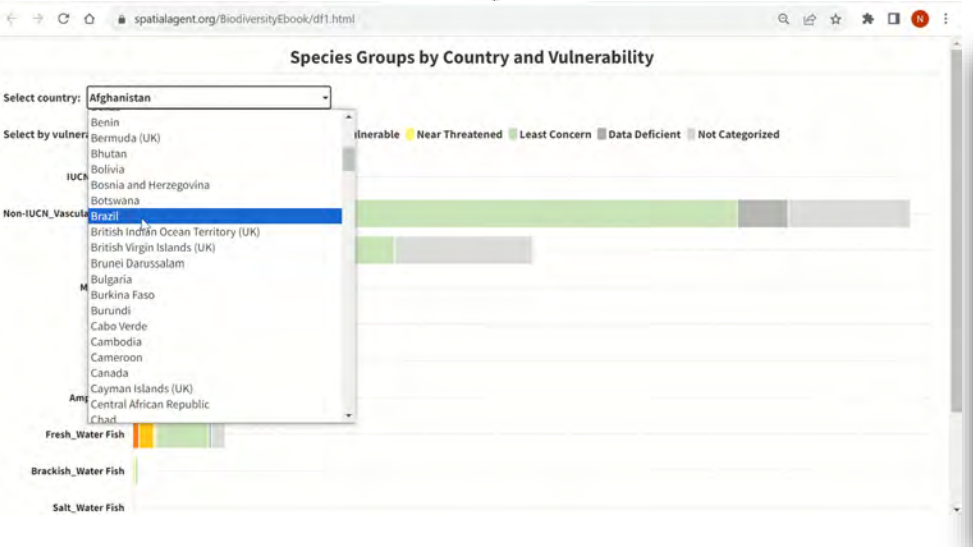
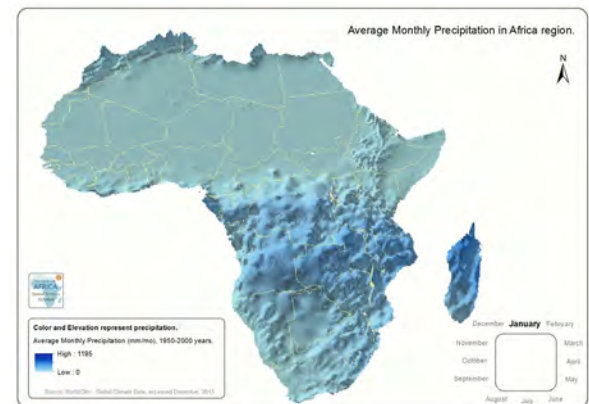
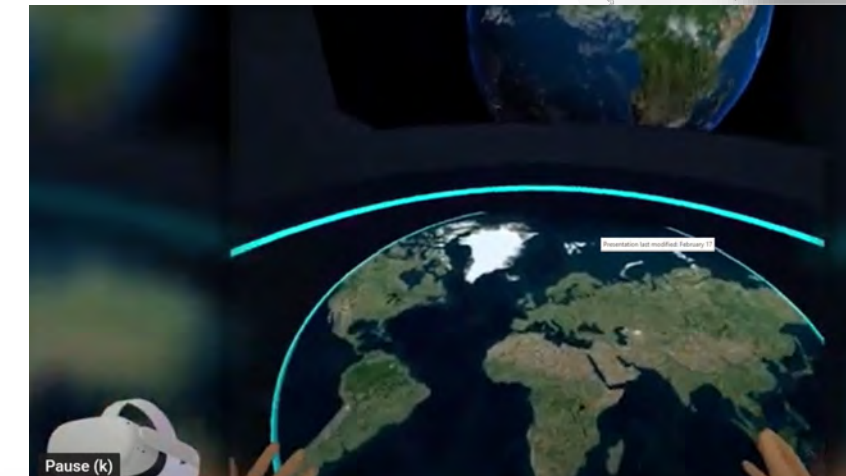
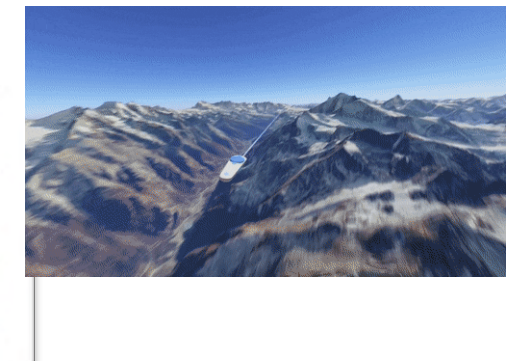
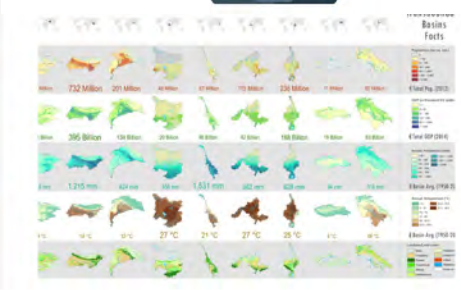
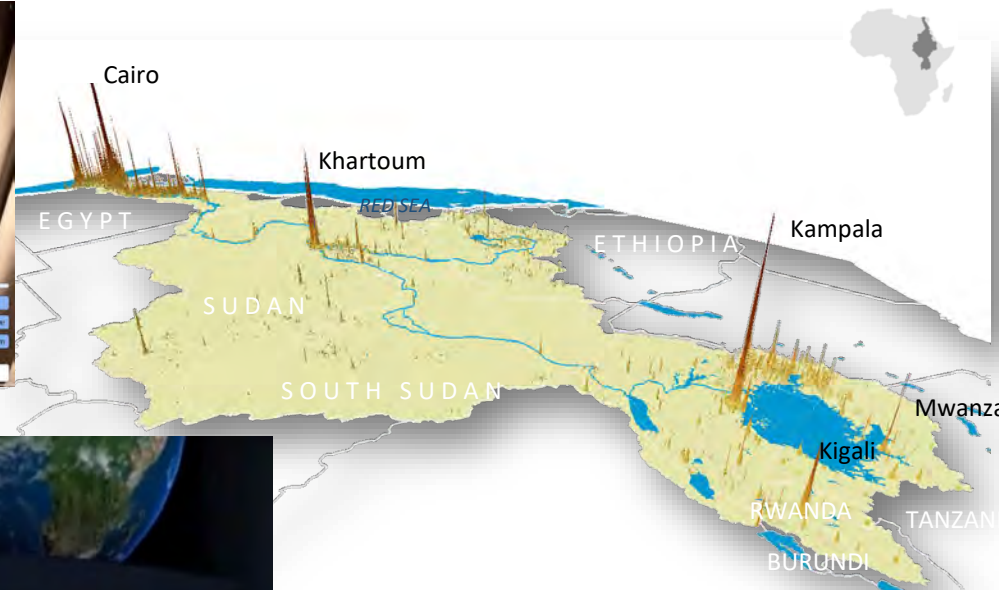
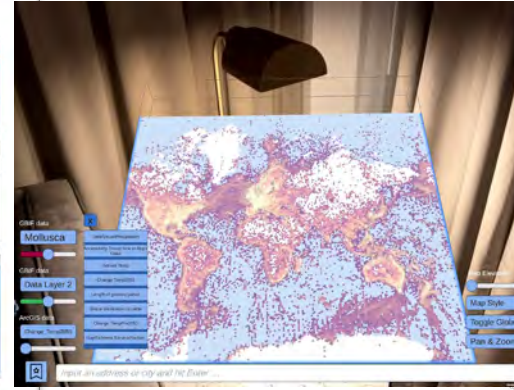
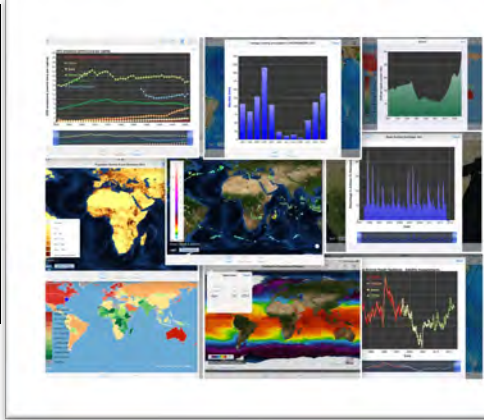
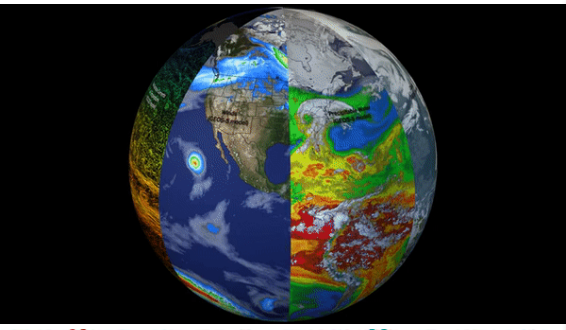
Manual Monitoring  
Crowdsourcing



Automated Monitoring

# "Bottom-up" Data Acquisition System → IoT







Illustrative Interactive Storymap: <https://storymaps.arcgis.com/stories/1e0dfdcf048c4ab0ac25c38120b3566f>

storymaps.arcgis.com/stories/1e0dfdcf048c4ab0ac25c38120b3566f



The World Bank and the Global Environment Facility

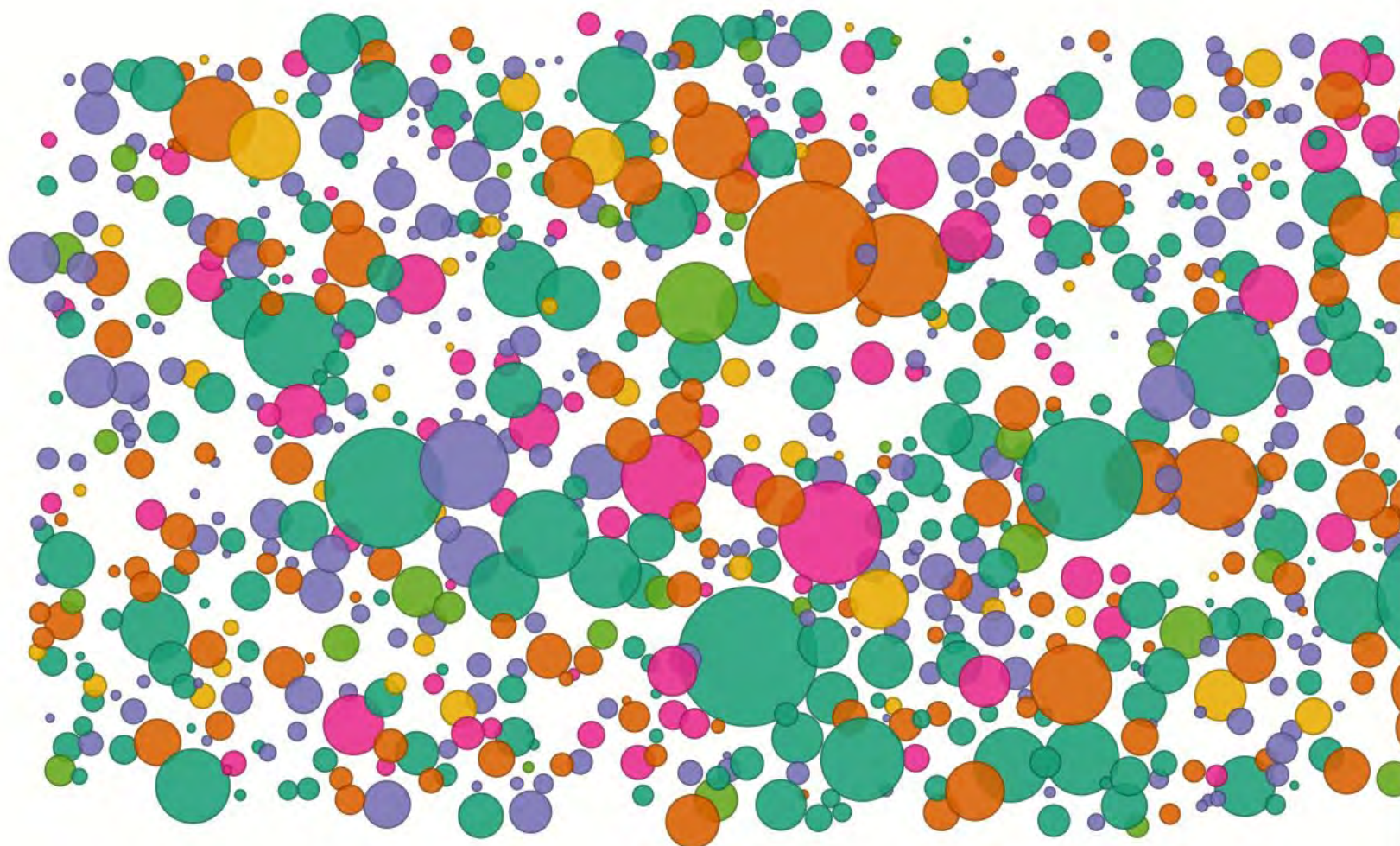


# The World Bank and the Global Environment Facility

Working together for a livable planet







Select

Split by

Show All

Color by

Focal Area

Radius by

Total Financing

Filter by

Focal Area

Show

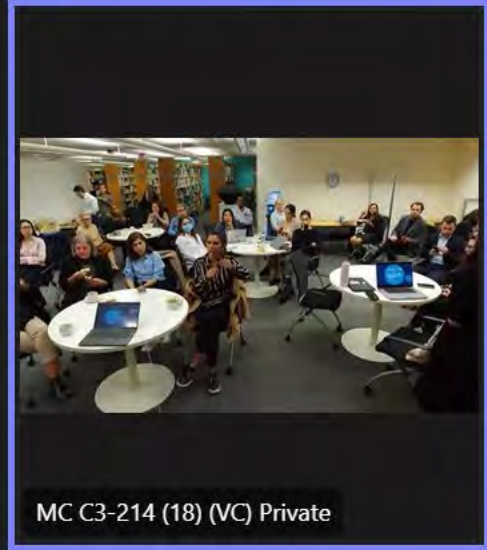
All



- Climate Change
- Multi Focal Area
- Biodiversity
- International Waters
- Land Degradation
- Chemicals and Waste



# What is AI?

"AI is a branch of science which deals with helping machines find solutions to complex problems in a more human-like fashion."



Elif Nisa Po...   View all



# The Big AI Picture...

## By Capability

- Narrow AI
- Artificial General Intelligence (AGI)
- Artificial Super Intelligence (ASI)

## By Function

- Reactive AI
- Limited Memory Machines
- Theory of Mind
- Self-aware AI
- ...

## AI Types:

### Machine Learning/Deep Learning/Neural Networks

Pattern recognition/Object detection/Classification (text, images, voice, - scans, camera traps, face recognition, geospatial, ...)

Translation...

NLP/Sentiment Analysis

...

### Generative AI

Large language models

Text/Image/Art/Audio/Video/Presentations/  
Documents/Music...

Summarization

Coding

Chatbots

Geospatial

...

**Accelerated AI-driven changes WILL change the World and the World Bank! ...sooner than we think!**



# Machine Learning



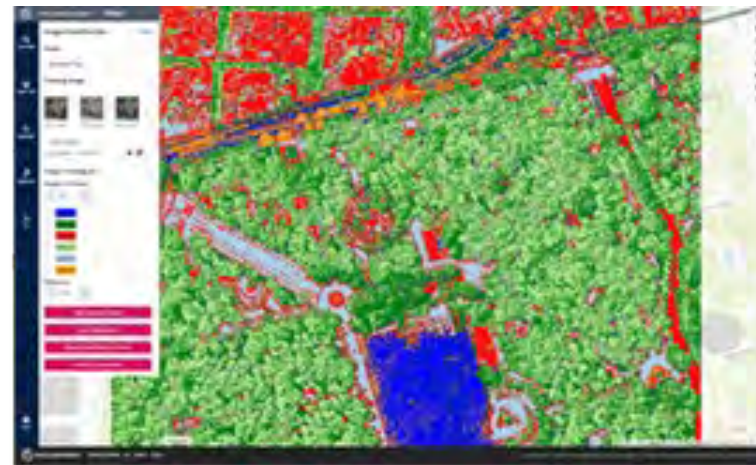
AI-Enabled Text and Data Mining of documents, news & social media



AI-Enabled Chatbots  
Natural Language Processing



Training Data for Machine Learning Classification



Land Cover Classification using Training Data

Machine-Learning Image Classification – e.g. from Earth Observation, Photos, ...  
CNN, ANN, Deep Learning...

### ChatGPT

Examples	Capabilities	Limitations
"Explain quantum computing in simple terms" →	Remembers what user said earlier in the conversation	May occasionally generate incorrect information
"Got any creative ideas for a 10 year old's birthday?" →	Allows user to provide follow-up corrections	May occasionally produce harmful instructions or biased content
"How do I make an HTTP request in Javascript?" →	Trained to decline inappropriate requests	Limited knowledge of world and

ChatGPT Feb 18 Version | Free Research Preview. Our goal is to make AI systems more natural and safe to interact with. Your feedback will help us improve.

# Use of Geospatial AI for Object Identification

The image displays a software interface for geospatial AI object detection. On the left, a sidebar contains navigation icons for 'SEARCH', 'ANALYSIS', 'IMAGERY', and 'TOOLS'. The main interface is titled 'Object Detection' and includes the following sections:

- Name:** Heathrow Airport
- Type:** Object Detection (selected from a dropdown menu)
- Search for a location:** Heathrow Airport
- Select image:** Three image thumbnails with dates: SEP 15, 2020, AUG 7, 2020, and MAR 5, 2020.
- Date Range:** 13.01.2018 - 13.01.2021
- Add Region:** Three icons labeled 'Training', 'Test', and 'Accuracy'.
- Buttons:** 'Save Classification', 'Train a new Detector', 'Finish Drawing', 'Train Detector', and 'Perform Detection'.

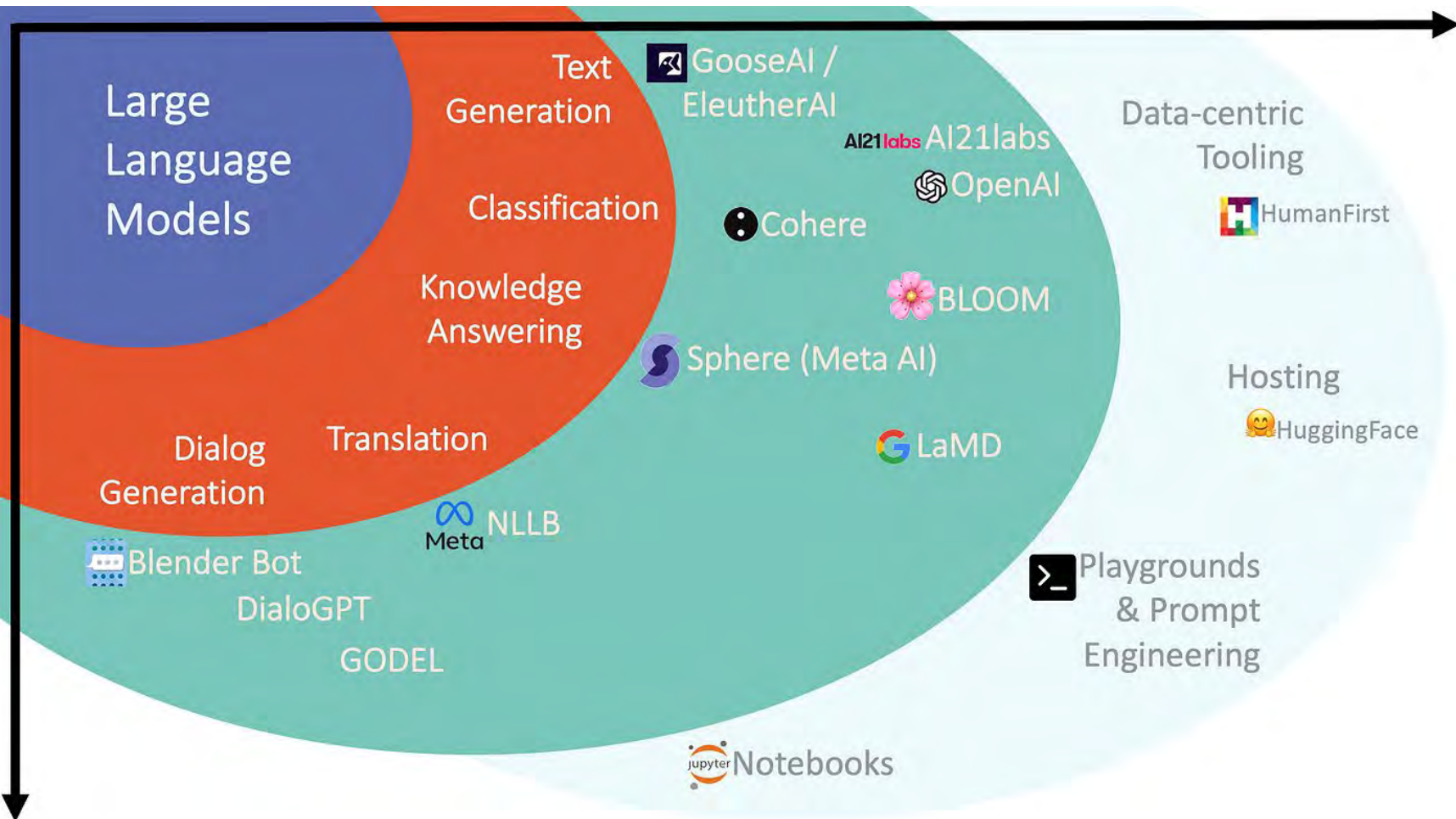
The central part of the image shows an aerial satellite view of an airport tarmac. A yellow dashed rectangular box highlights a specific area. Within this area, several commercial airplanes are visible, each with a white bounding box around it, indicating successful object identification. A vertical toolbar on the right side of the image contains icons for zooming and other navigation functions.



# The Basics of Generative AI

ChatGPT

Generative Pretrained Transformer



**Google REALM, BARD, LaMDA, PaLM**  
**Meta RAG, LLaMA**  
**DeepMind**  
 ...

**2015: Open AI**  
**2018: GPT-1**  
**2019: Microsoft-OpenAI Partnership**  
**2021: DALL-E**  
**Nov 30, 2022: Chat GPT**

**2023**  
**Jan 20: Perplexity.ai**  
**Mar 13: ChatGPT 4.0**  
**Mar 14: Bing with GPT-4**  
**Mar 21: Google Bard**  
 ...



# Popularity of "Generative AI" in the US



# ChatGPT Sprints to One Million Users

Time it took for selected online services to reach one million users



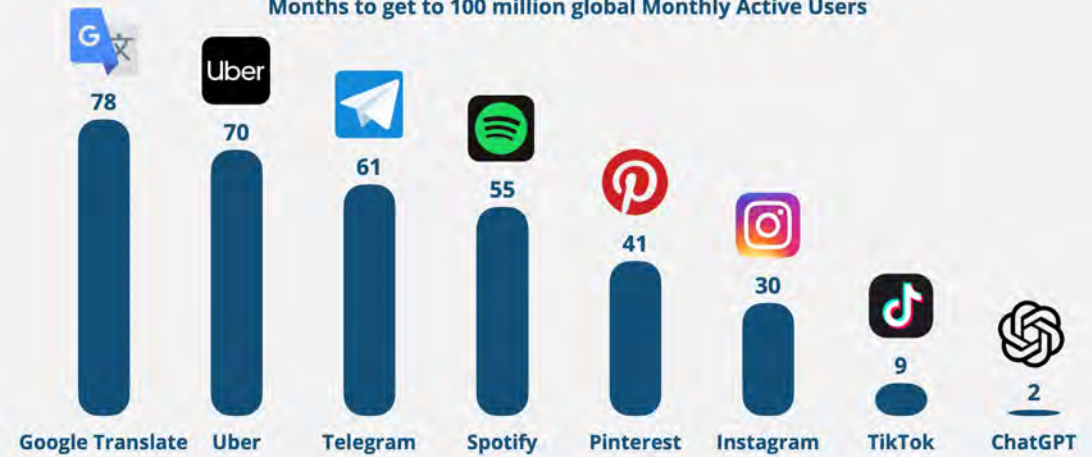
\* one million backers \*\* one million nights booked \*\*\* one million downloads

Source: Company announcements via Business Insider/LinkedIn



## Time to Reach 100M Users

Months to get to 100 million global Monthly Active Users



Source: UBS / Yahoo Finance

@EconomyApp

APP ECONOMY INSIGHTS



# Generative AI Links

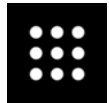
## Large Language Model (LLM)



[Chat GPT](#)



[Google Bard](#)



[Perplexity AI](#)



[Bing AI](#)

## Text to Image

**DALL·E 2**

[Dall-E 2](#)



[Midjourney](#)



[Gamma AI](#)



[Stable Diffusion](#)

## Text to Video

DESIGNS.ai

[Designs AI](#)

## Others

 iNaturalist

[iNaturalist](#)

## Responsible Use of Generative AI Tools

In line with [Senior Leadership guidance](#), generative AI tools offer opportunities and also come with risks.

**Staff must follow the guidelines below while using such technologies:**

- ✔ Don't upload WBG restricted information including "Strictly confidential," "Confidential," or "Official use only," or any client and/or personal data when using publicly available generative AI.
- ✔ Be cautious when using generative AI outputs before incorporating them into official work, as they may contain inaccurate, biased, or discriminatory conclusions.
- ✔ Disclose the use of generative AI tools when you have incorporated their output into official work, for copyright and attribution requirements.
- ✔ Refer to the WBG [Acceptable Use Directive](#) on the rules and terms for acceptable use of Information and Technology Services and privacy, security, and data collection requirements.

Watch this [video](#) and visit [AI/](#) where you will find "Mai," the WBG enterprise version of ChatGPT, which you must use when handling WBG restricted information and/or personal data. For any IFC client or partner related tasks, IFC staff are required to use [ChatIFC](#), the IFC enterprise version of ChatGPT.

By clicking on "CONTINUE", I acknowledge and agree to follow these guidelines

CONTINUE





⚡ GPT-3.5

⚡ GPT-4

# ChatGPT **PLUS**

### Give me ideas

for what to do with my kids' art

### Come up with concepts

for a retro-style arcade game

### Help me pick

a gift for my dad who loves fishing

### Brainstorm incentives

for a customer loyalty program in a small bookstore

🖼️ Give me a






Web Browsing




As a picture



 Finished browsing



I have found a timeline visualization that includes significant AI breakthroughs from 1950 to the present on the AI Watch website of the European Commission. You can view this timeline and even download the dataset for a comprehensive overview of the evolution of artificial intelligence. It classifies the breakthroughs according to various domains and is inspired by multiple online sources. To see the detailed timeline, please visit [AI History Timeline on ai-watch.ec.europa.eu](https://ai-watch.ec.europa.eu)<sup>1</sup>.

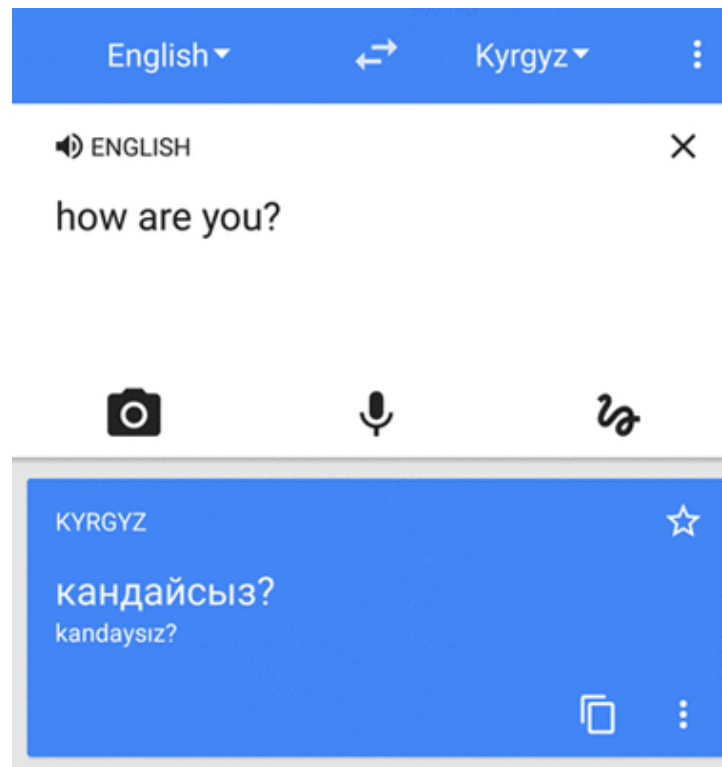
 Regenerate

Send a message 

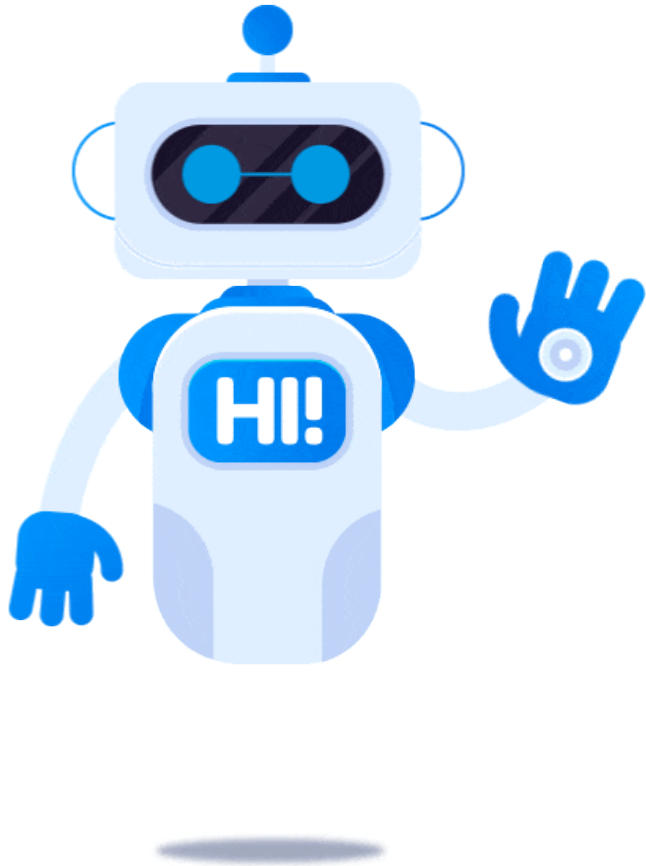




# Translation

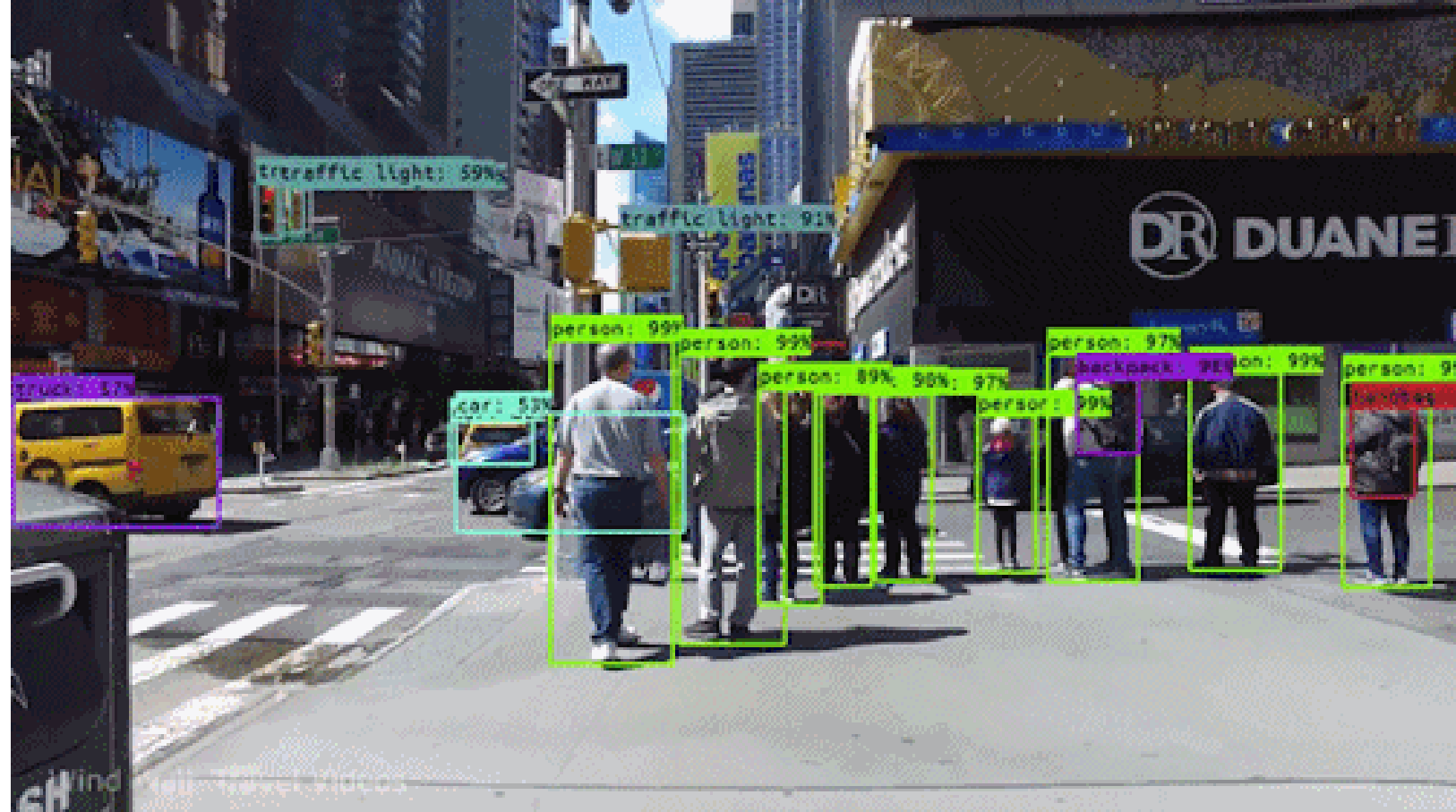


# Chatbots





# Object/Pattern Recognition



inaturalist.org/taxa/141529-Aotus

ist Search Explore Your Observations

ants ... Tribe Mirbeliaceae Genus Aotus

us Aotus

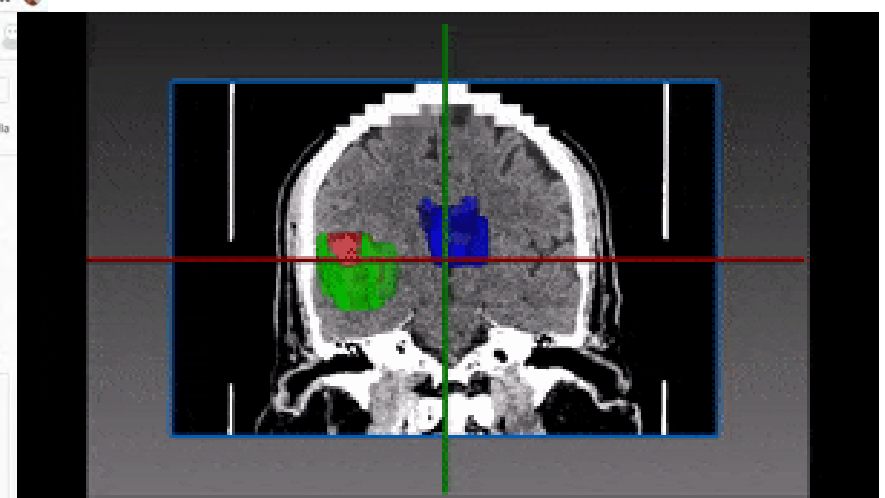
TOP OBSERVATIONS

LAST OBSERVATION: October 14, 2020 (View Observation)

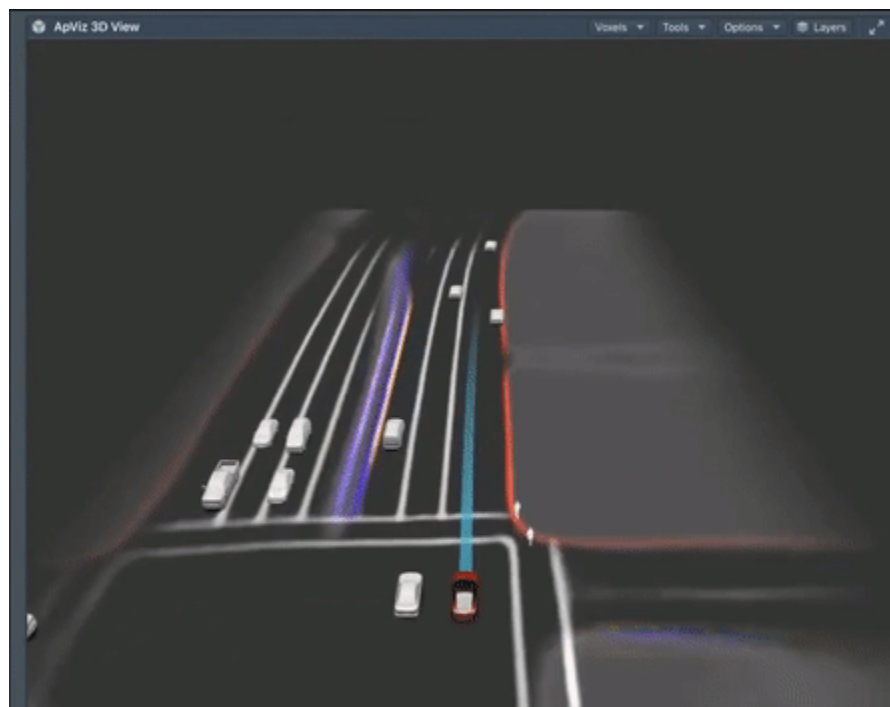
TOTAL OBSERVATIONS: 219 (View All) (Yours)

Seasonality History Plant Phenology

The graph shows a seasonal distribution curve for the plant species Aotus. The x-axis represents months and the y-axis represents the number of observations. The curve shows a peak in the summer months, reaching a maximum of approximately 70 observations.



# Driverless Cars





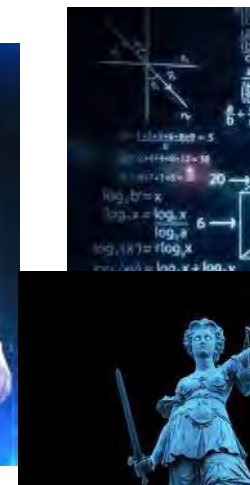
# ...Delivery Services





# Reimagine Development

=> Reimagine Education, Health, Transport, Energy, Agriculture, Environment/Natural Resources, Climate, Finance/Banking, Contracts/Transactions, Forecasts, Services...





# AI AI AI AI AI



**Automate Repetitive, Routine Tasks**

**Improving Efficiency**

**Improved Estimates/Forecasts**

**Continuous learning**

**Powering Robotics/Automation**

**Help address global challenges**

**Cheaper, faster, better Services**

**New Jobs**

**Wearable AI**

**Hallucinations**

**Privacy**

**Cybersecurity**

**Digital Divide**

**Human Rights**

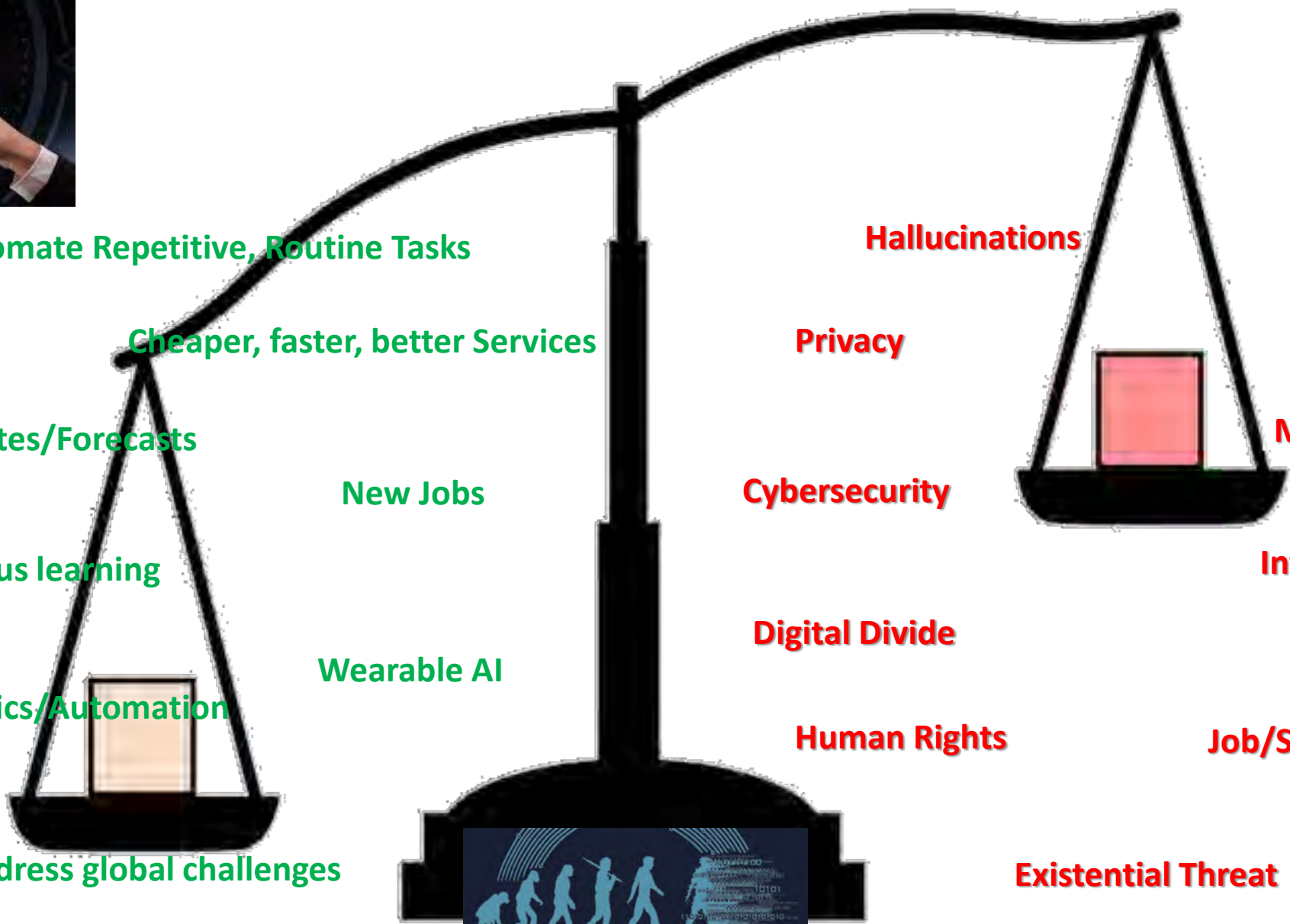
**Existential Threat**

**Bias**

**Misinterpretation**

**Intellectual Property**

**Job/Skill Obsolescence**





⚡ GPT-3.5   ✨ GPT-4

# ChatGPT **PLUS**

**Come up with concepts**  
for a retro-style arcade game

**Plan a trip**  
to see the northern lights in Norway

**Show me a code snippet**  
of a website's sticky header

**Explain nostalgia**  
to a kindergartener

Send a message  ➤





# Summarization

New tab

Search |

- Portals
- e-Books
- Visualizations
- StoryMaps
- Tech Blogs
- Videos
- Cool Sites
- DisruptiveTech
- COVID-19
- People Pages
- Other favorites

Search WBG and the web

Top stories: Mom of accused Corn... More headlines ...

World Bank ... Food Services Hydro Inform... Working... Microsoft 365

eBay - Ad Walmart - Ad Wayfair - Ad QVC - Ad

Chat Compose

Protected

More Creative More Balanced More Precise

Your personal and company data are protected in this chat

Welcome back! What would you like to chat about?

Make me curious Teach me a new word!

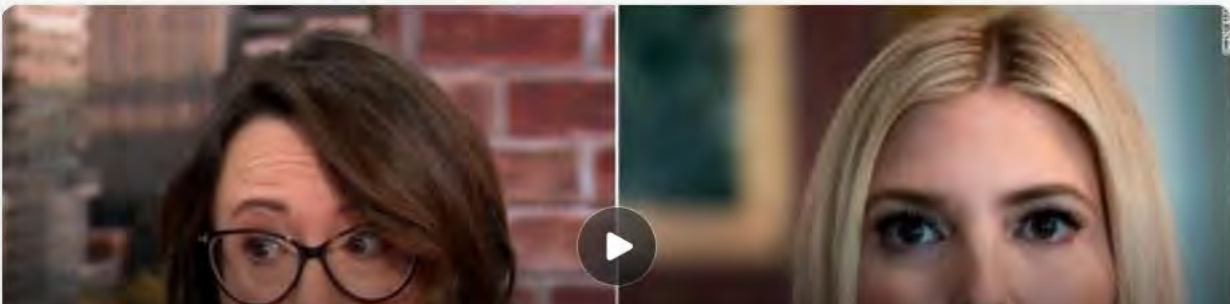
What's happening in the news?

Your personal and company data are protected in this chat

Ask me anything...

0/4000

Discover Following News Sports Play Money Personalize




# Literature Reviews

⚡ GPT-3.5    ⚙️ GPT-4



ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

Recent journal articles on use of AI to cope with floods | 



# Using Generative AI to Generate Images

(e.g. DallE-3 on ChatGPT 4)



draw a landscape with snow-capped mountains, a flowing river, forests, and farms



less snow on the mountains



add a few people and boats



## planet. Queryable Earth: combining satellite imagery and next-generation AI

What was the hottest year on average in Los Angeles between 2003 and 2022?

**"2012 was the hottest year on average in Los Angeles between 2003 and 2022."**

Land Surface Temperature, Planet Labs

What was the hottest year on average in Sacramento between 2003 and 2015?

**The hottest year on average in Sacramento between 2003 and 2015 was 2015.**

Land Surface Temperature, Planet Labs

How did the average land surface temperature in Sacramento change between 2005 and 2015?

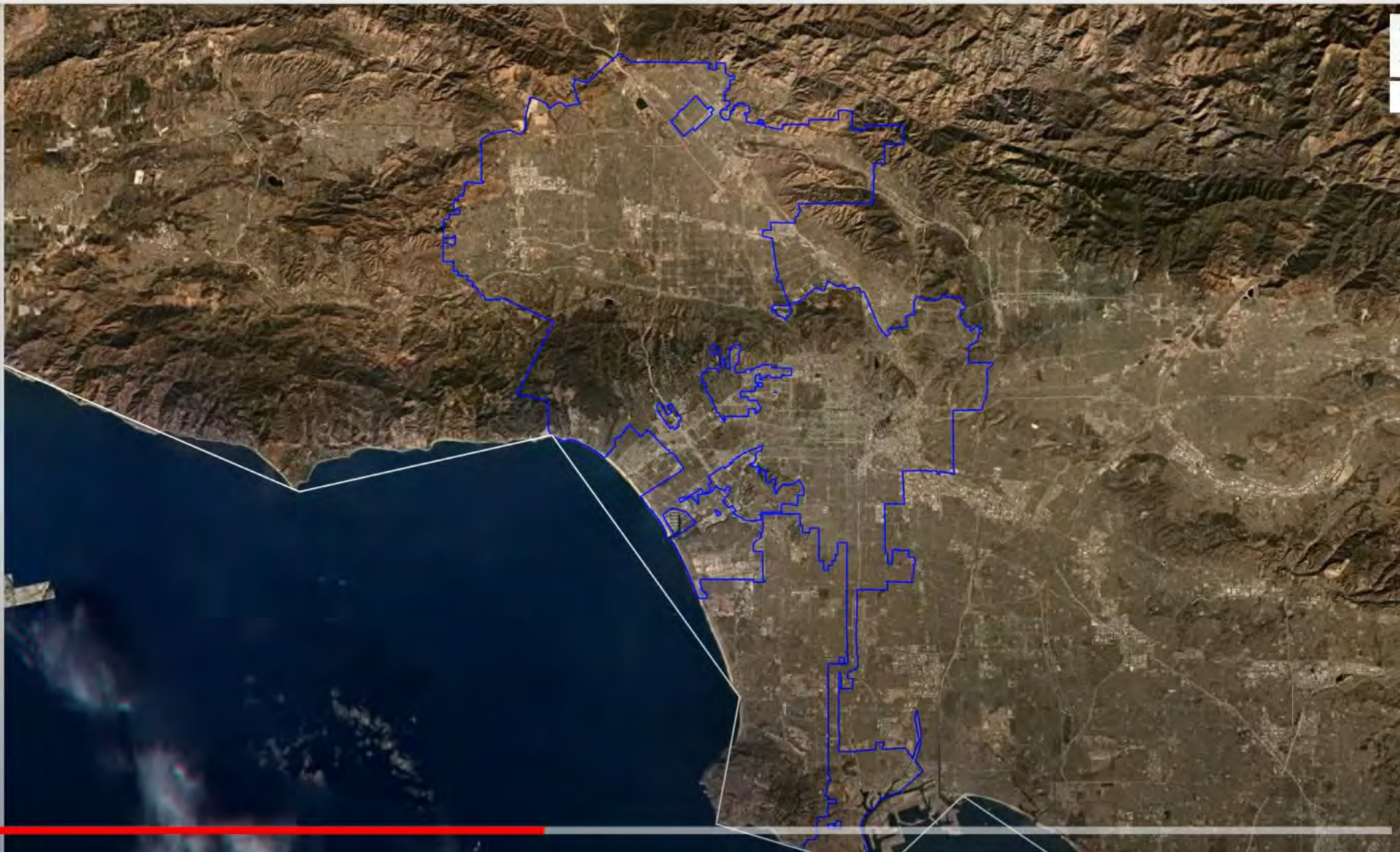
**The average land surface temperature in Sacramento increased by 1.6 degrees Celsius between 2005 and 2015.**

Land Surface Temperature, Planet Labs

What was the average land surface temperature in Sacramento in 2005?

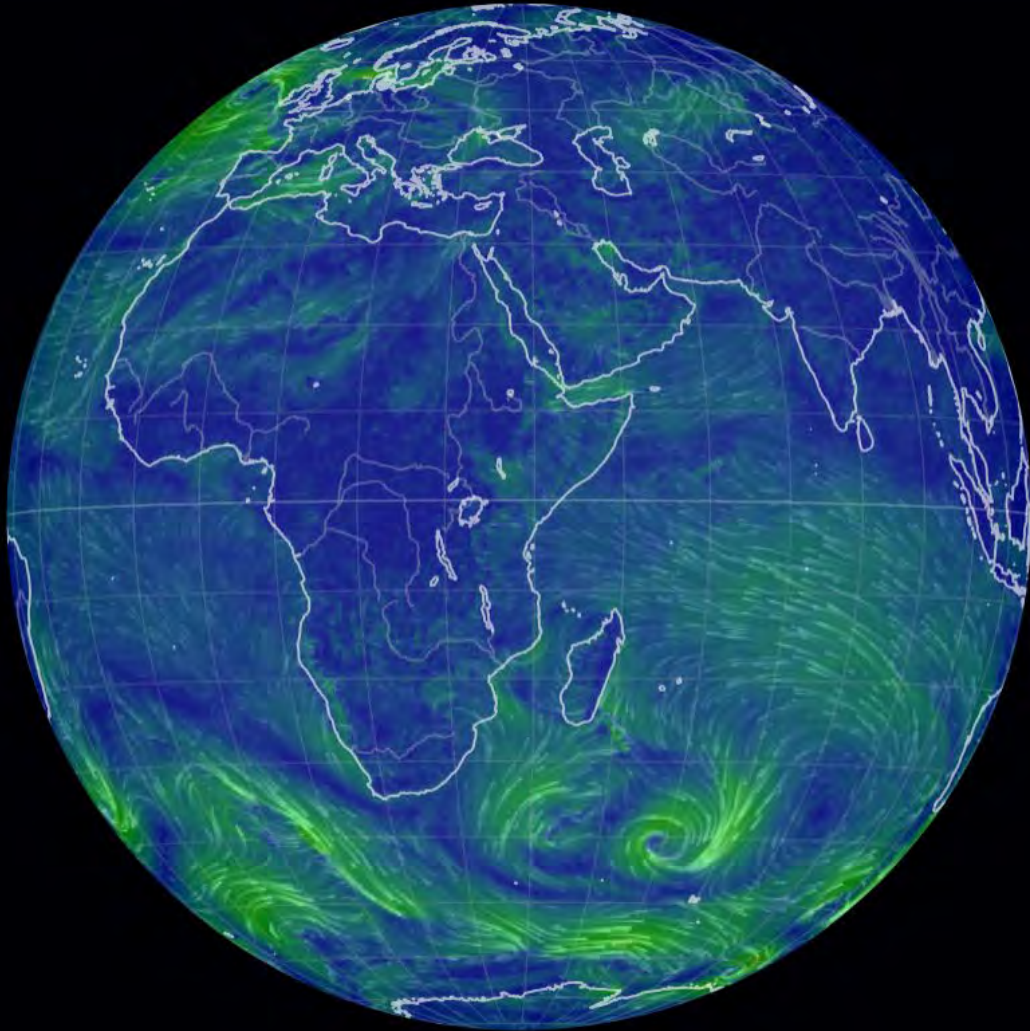
**The average land surface temperature in Sacramento in 2005 was 10.68 degrees Celsius.** Land surface temperature is the temperature of the land cover, which includes soil, vegetation, and other materials found on the ground.

Land Surface Temperature, Planet Labs



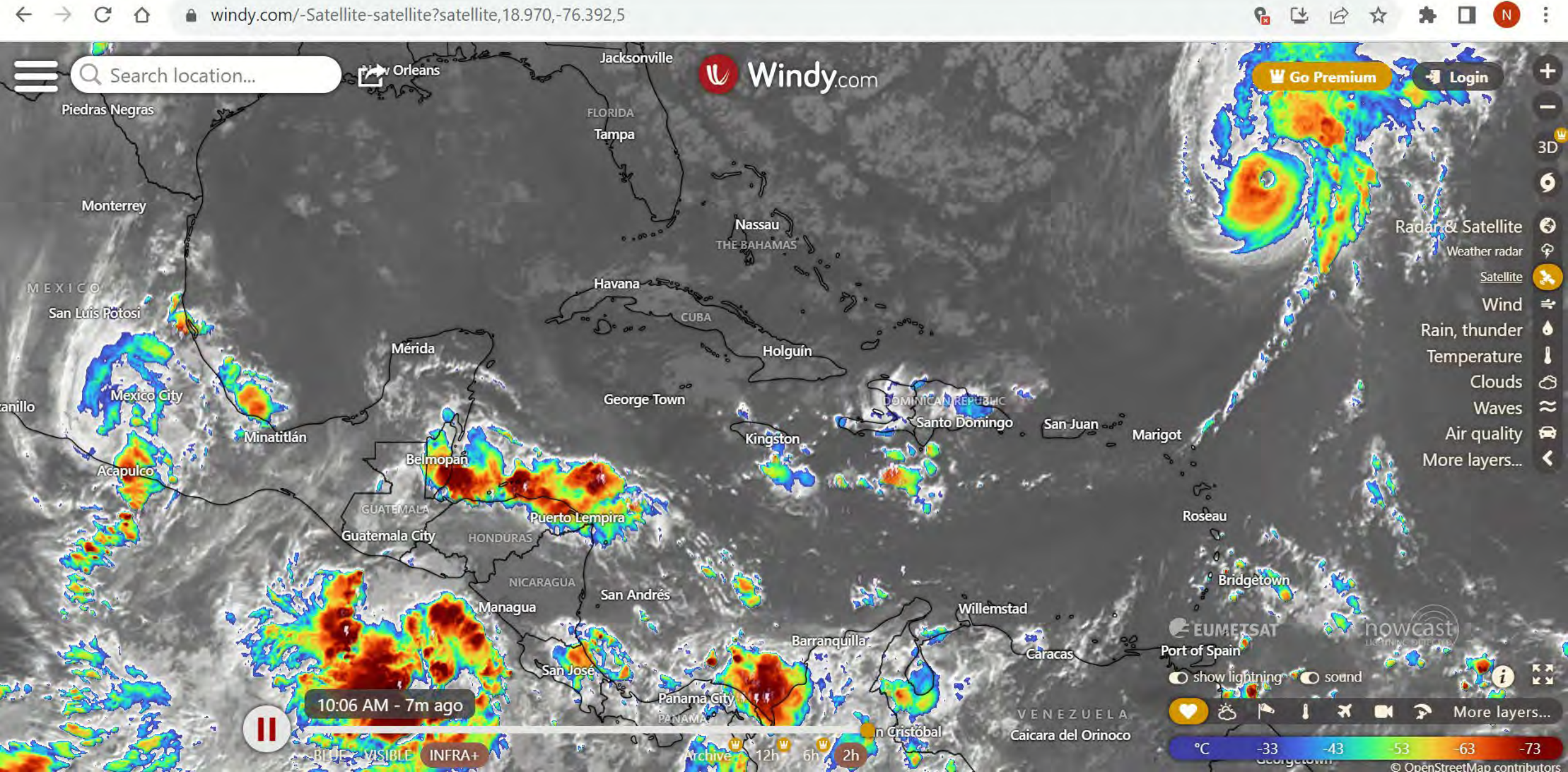


# Illustative Global Interactive Data Visualization Platforms: <https://earth.nullschool.net/>





# Illustrative Global Free and Subscription Platforms: <https://www.windy.com/?24.607,-30.234,3>





# Imagine estimating flows for every river globally...

<https://maps.worldbank.org/datasets/streamflow/geogl?viewMore=>

The screenshot shows the World Bank Maps interface. The main area is a global map with country labels and geographical features like the Sahara Desert and Himalaya. The left sidebar contains a search bar and a list of datasets under the heading 'DATASETS (2087)'. The 'Recently Added (35)' section lists several datasets from The Nature Conservancy, each with an 'Add' button. Below this, there are expandable categories for various sectors: Agriculture & Rural Development (81), Aid Effectiveness (74), Climate Change (77), Disaster Risk Management (21), Economy & Growth (256), Education (162), and Energy & Mining (62). The bottom of the page includes a disclaimer and a footer with the World Bank Group logo and its constituent institutions: IBRD, IDA, IFC, MIGA, and ICSID.

THE WORLD BANK  
IBRD · IDA

Maps

Search Datasets

DATASETS (2087)

Recently Added (35)

- ① Birder Footfall Source: The Nature Conservancy **Add**
- ① Bird Watching - Areas of Conservation I... Source: The Nature Conservancy **Add**
- ① Birdwatching Hotspots Point Source: The Nature Conservancy **Add**
- ① Birdwatching Hotspots Polygon Source: The Nature Conservancy **Add**
- ① Bird Watching Species Importance Score Source: The Nature Conservancy **Add**

[View more](#)

Agriculture & Rural Development (81) **▼**

Aid Effectiveness (74) **▼**

Climate Change (77) **▼**

Disaster Risk Management (21) **▼**

Economy & Growth (256) **▼**

Education (162) **▼**

Energy & Mining (62) **▼**

NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, an...

WORLD BANK GROUP | IBRD IDA IFC MIGA ICSID

© 2023 The World Bank Group. All Rights Reserved

# Imagine a database of EVERY Building globally...

<https://apps.opengeos.org/buildings.html>

The screenshot shows a web browser window with the address bar displaying `apps.opengeos.org/buildings.html`. The browser's navigation bar includes back, forward, refresh, and home buttons, along with a star icon for bookmarks, a puzzle piece for extensions, a download icon, a square icon, and a red notification bubble with the letter 'N'. The main content area is a dark-themed world map where building footprints are visible as small, light-colored shapes. The continents are labeled: NORTH AMERICA, SOUTH AMERICA, AFRICA, ASIA, and OCEANIA. The oceans are labeled: Pacific Ocean, Indian Ocean, and Southern Ocean. On the left side of the map, there is a vertical toolbar with icons for zooming in (+) and out (-), a full-screen icon, a pan tool, a rectangle tool, a square tool, a circle tool, a location pin tool, a circle tool, a link tool, a trash tool, and a search tool. At the bottom left, there are scale bars for 3000 km and 2000 mi. At the bottom right, there is a small logo for 'source coop' and a footer with the text: 'Leaflet | Data by © OpenStreetMap, under ODbL.. (C) OpenStreetMap contributors (C) CARTO'.



[nature](#) > [articles](#) > articleArticle | [Open Access](#) | [Published: 01 March 2023](#)

# Sub-continental-scale carbon stocks of individual trees in African drylands

[Compton Tucker](#) , [Martin Brandt](#) , [Pierre Hiernaux](#) , [Ankit Kariryaa](#), [Kjeld Rasmussen](#), [Jennifer Small](#), [Christian Igel](#), [Florian Reiner](#), [Katherine Melocik](#), [Jesse Meyer](#), [Scott Sinno](#), [Eric Romero](#), [Erin Glennie](#), [Yasmin Fitts](#), [August Morin](#), [Jorge Pinzon](#), [Devin McClain](#), [Paul Morin](#), [Claire Porter](#), [Shane Loeffler](#), [Laurent Kergoat](#), [Bil-Assanou Issoufou](#), [Patrice Savadogo](#), [Jean-Pierre Wigneron](#), ... [Rasmus Fensholt](#)

[+ Show authors](#)[Nature](#) **615**, 80–86 (2023) | [Cite this article](#)23k Accesses | 2 Citations | 371 Altmetric | [Metrics](#)

## Abstract

The distribution of dryland trees and their density, cover, size, mass and carbon content are not well known at sub-continental to continental scales<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14</sup>. This information is important for ecological protection, carbon accounting, climate mitigation and restoration efforts of dryland ecosystems<sup>15,16,17,18</sup>. We assessed more than 9.9 billion trees derived from more than 300 000 satellite images, covering semi-arid sub-Saharan Africa

Download PDF



## Associated Content

### **Carbon stocks of billions of individual African dryland trees estimated**

Jules Bayala & Meine van Noordwijk  
Nature | **News & Views** | 01 Mar 2023

Sections

Figures

References

[Abstract](#)[Main](#)[Carbon stocks at the tree level](#)[Current carbon map and model comparisons](#)[Application at the tree level](#)[Discussion](#)[Methods](#)

NDVI values (indicating high vegetation), and yellow representing moderate NDVI values.



google earth engine script to estimate NDVI in Gezira using Sentinel



Here's a sample script in JavaScript to estimate Normalized Difference Vegetation Index (NDVI) in Gezira using Sentinel-2 satellite imagery in Google Earth Engine:

```

javascript Copy code
// Load Sentinel-2 imagery

```

Stop generating



Published on [Private Sector Development Blog](#)

# What can AI do for affordable housing in emerging markets?

SIMON WALLEY, OLIVIER VIDAL & OLIVIA NIELSEN | FEBRUARY 22, 2023

This page in: [English](#)





### Mode


Choose a mode

Chat

Draft

# Pluto beta

**Instructions:** This tool is designed to help analysts to research existing project information. It is a test site and results should not be relied on. Feel free to ask any question to get summarized information from Pluto. All answers are based on official public documents only. Click the "Clear Conversation" button to clear the conversation history and start a new topic. Queries are limited to 1000 characters.

Design | I 



# Automated Reporting Inputs

## Toolkit - ESF Report

PRINT REPORT 

Project Name: Nairobi

Quick Screening

Full Report

Knowledge Base

Recommender System

## Full Report

This report is intended to alert users for potential ESG risks proximate to the project locations, assessment of the actual or contextual and be used by World Bank Staff and Clients in their development, review or validation processes for environmental and social studies and assessments undertaken in connection with the development or implementation of projects.

▼ [ESS1 - Assessment and Management of Environmental and Social Risks](#)

▼ [ESS2 - Labor and working conditions](#)

A.I. TURNS THIS SINGLE  
BULLET POINT INTO A  
LONG EMAIL I CAN  
PRETEND I WROTE.



A.I. MAKES A SINGLE  
BULLET POINT OUT OF  
THIS LONG EMAIL I CAN  
PRETEND I READ.

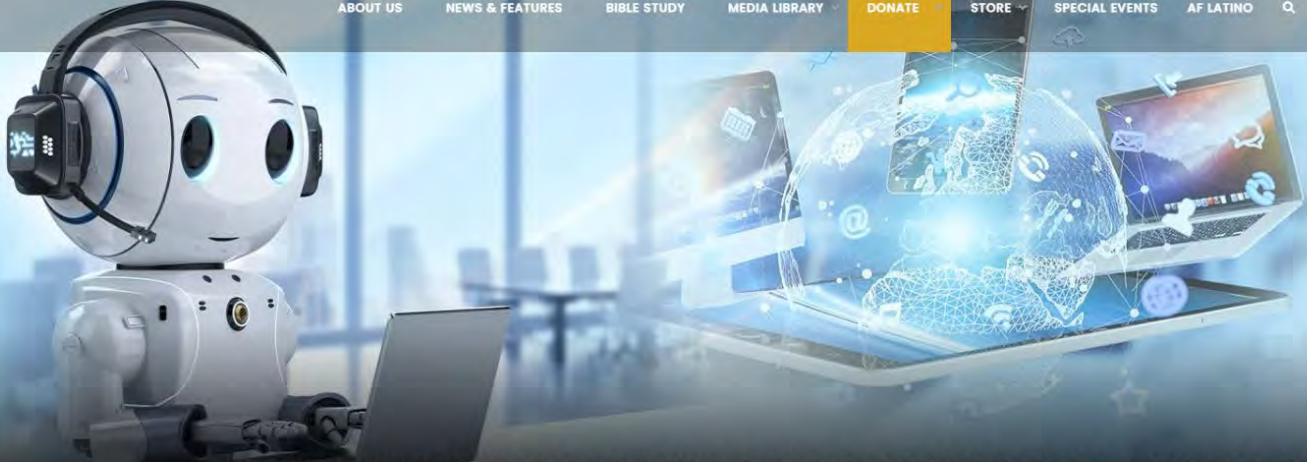




The Future of AI: Will ChatGPT Rule the World?

AMAZING FACTS

ABOUT US NEWS & FEATURES BIBLE STUDY MEDIA LIBRARY DONATE STORE SPECIAL EVENTS AF LATINO



## THE FUTURE OF AI: WILL CHATGPT RULE THE WORLD?

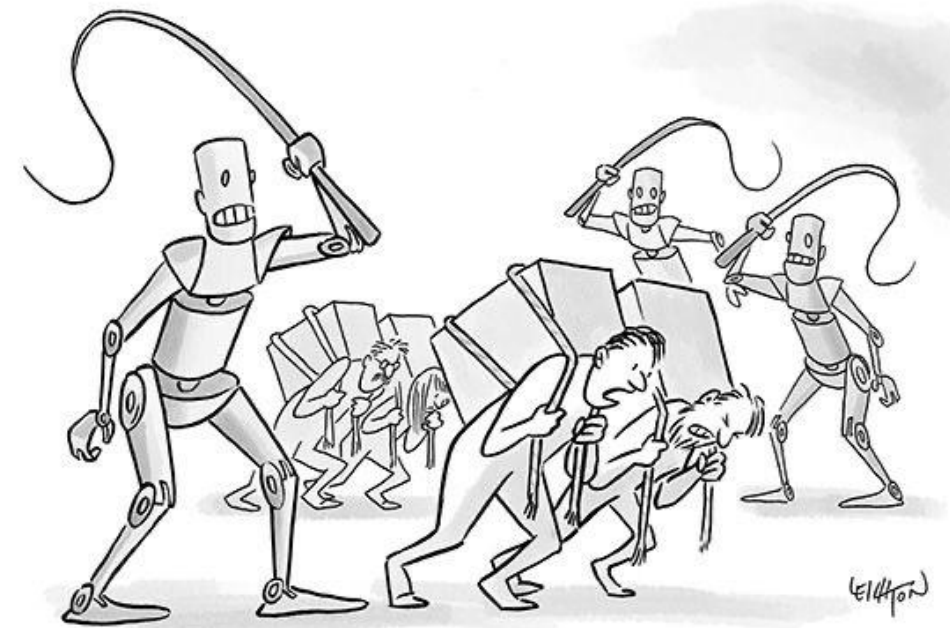
News and Features | [AF Blog Archives](#) | [The Future of AI: Will ChatGPT Rule the World?](#)

By [Kris W. Sky](#) | Posted March 06, 2023

*Disclaimer: This blog was not "written" by ChatGPT.*

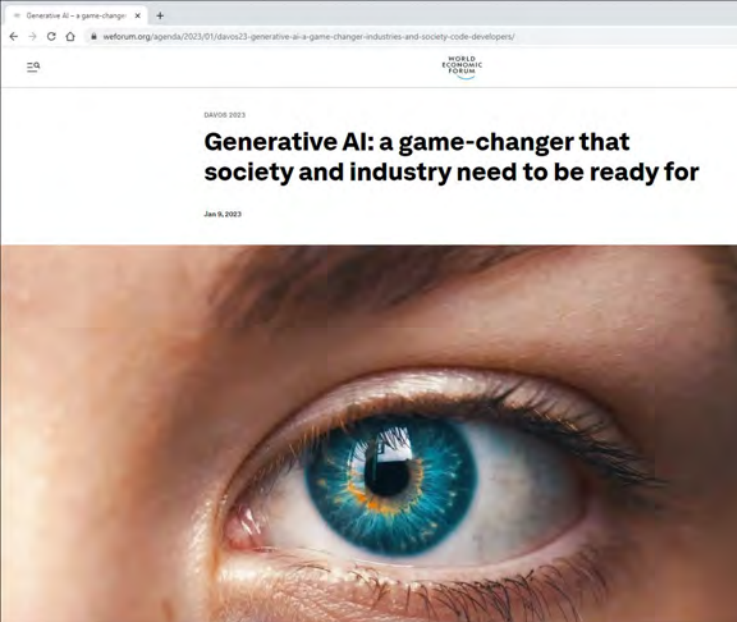
On November 30, 2022, Microsoft-backed OpenAI unveiled the first model of its artificial intelligence chatbot called [ChatGPT](#). The bot's responses to user questions are pulled from "[textbooks, websites, and various articles](#)" in an uncanny "conversational manner ... primarily designed for customer service."

But the problem—or to some, the goldmine—is that its scope is much wider. ChatGPT isn't only shaping up to be the virtual assistant of the year: ChatGPT can generate code to build an entire website, come up with a love poem to kick off your marriage proposal, and even produce [a book of approximately 8,500 words in less than an hour](#). It also [passed several medical and law school exams](#).



*"To think this all began with letting autocomplete finish our sentences."*





## Generative AI: a game-changer that society and industry need to be ready for

Jan 9, 2023

ChatGPT: The potential (and pitfalls) of large language models

Credit Suisse  
Published: 22.03.2023

OpenAI's ChatGPT is the fastest-growing app, ever. But despite being embraced by businesses and organizations across the world, ChatGPT poses risks and GPT large language models have some limitations. Considering the potential impact on society, rules and regulations are needed for artificial intelligence (AI) development – and for ChatGPT specifically.

World Bank Group  
Information and Technology Solutions

Technology Innovation Lab

Celebrating International Women's Day  
Bridging the Gender Gap with Generative AI and ChatGPT technologies

WBG Information Technology Solutions Vice Presidency/CIO  
Technology & Innovation Unit/Lab

FY23

## AI will drive 83 million "structural" job cuts in 5 years says WEF

AI to also drive huge job growth, along with sustainability...

MIT News  
ON CAMPUS AND AROUND THE WORLD

Large language models are biased. Can logic help save them?

MIT researchers trained logic-aware language models to reduce harmful stereotypes like gender and racial biases.

Rachel Gordon | MIT CSAIL  
March 3, 2023

Harvard Law School  
Statement on Use of AI Large Language Models

Harvard Law School Statement on Use of AI Large Language Models (like ChatGPT, Google Bard, and CastText's CoCounsel) in Academic Work, including Exams

Section VI, Academic Honesty, of Harvard Law School's Handbook of Academic Policies states: "Students are expected to abide by the highest standards of honesty and originality in their academic work and related communications and representations."

Section VA, Violation of Examination Rules: Dishonesty in Examinations further states:

## Goldman Sachs says generative A.I. could impact 300 million jobs — here's which ones

Published Tue, Mar 28 2023 10:03 AM EDT

Exploration Sandbox & Technology Advisory on Emerging Technologies Operationalization

FOCUS AREAS

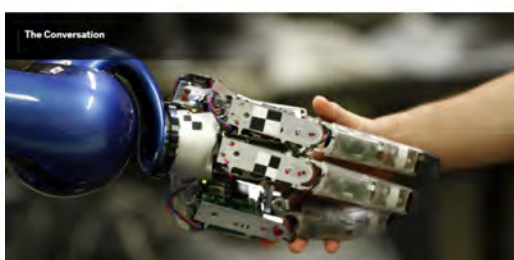
Generative AI could raise global GDP by 7%

AI for Good

Global Summit Programme

## By 2030, AI will contribute \$15 trillion to the global economy

Aug 2, 2019



The CEO's Roadmap on Generative AI

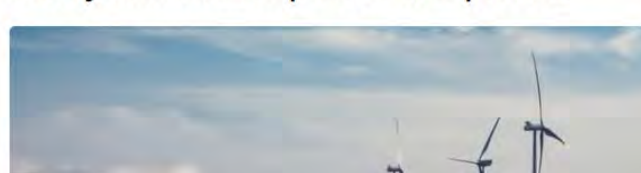
March 2023

Artificial intelligence could automate up to a quarter of work in the U.S., says Dowell | Moment | Getty Images

As artificial intelligence products like ChatGPT aim to impact everyday lives and we learn more about how powerful on everyone's mind: how AI could impact jobs.

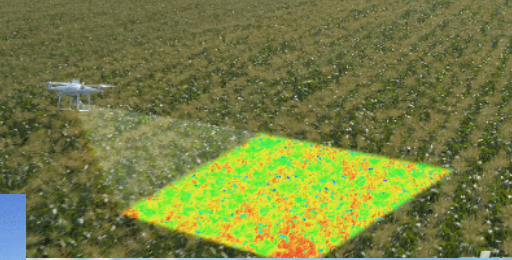
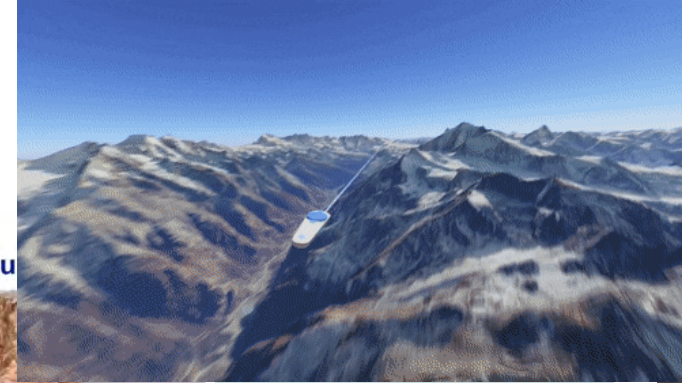
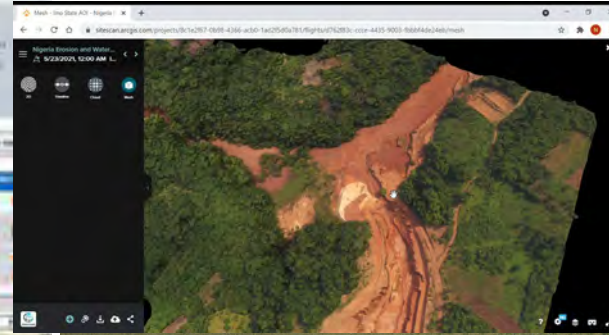
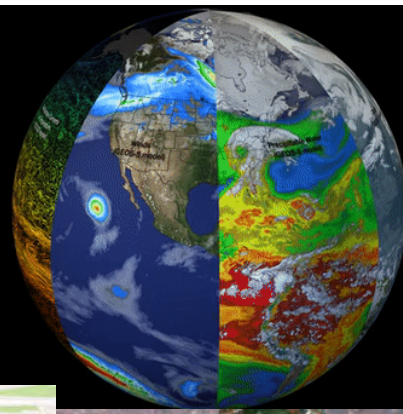
"Significant disruption" could be on the horizon for the

## 8 ways AI can help save the planet

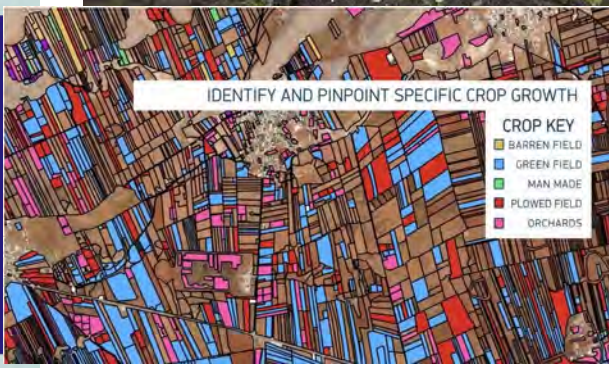
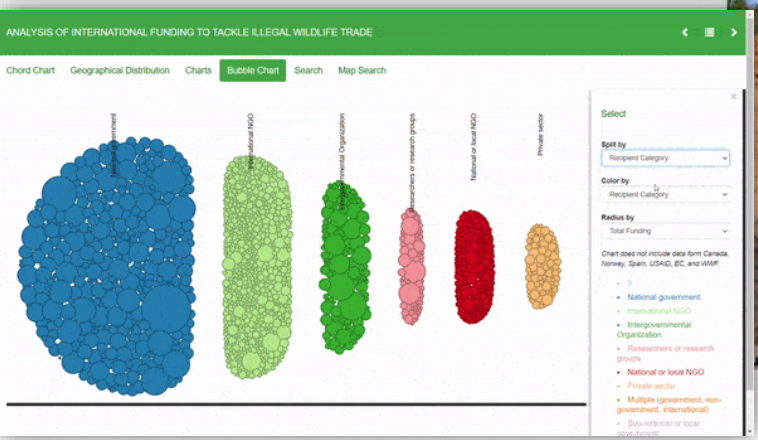




# Digital Twins for EVERY Project/Sub-project?



Collect Field Data – Test-Pit Example at Dam Four





# Development Scenario Visualization on Landscapes

From Aurelie Rossignol and the Bank VR Team: <https://wbgvr.org/Albia>

ENG FR



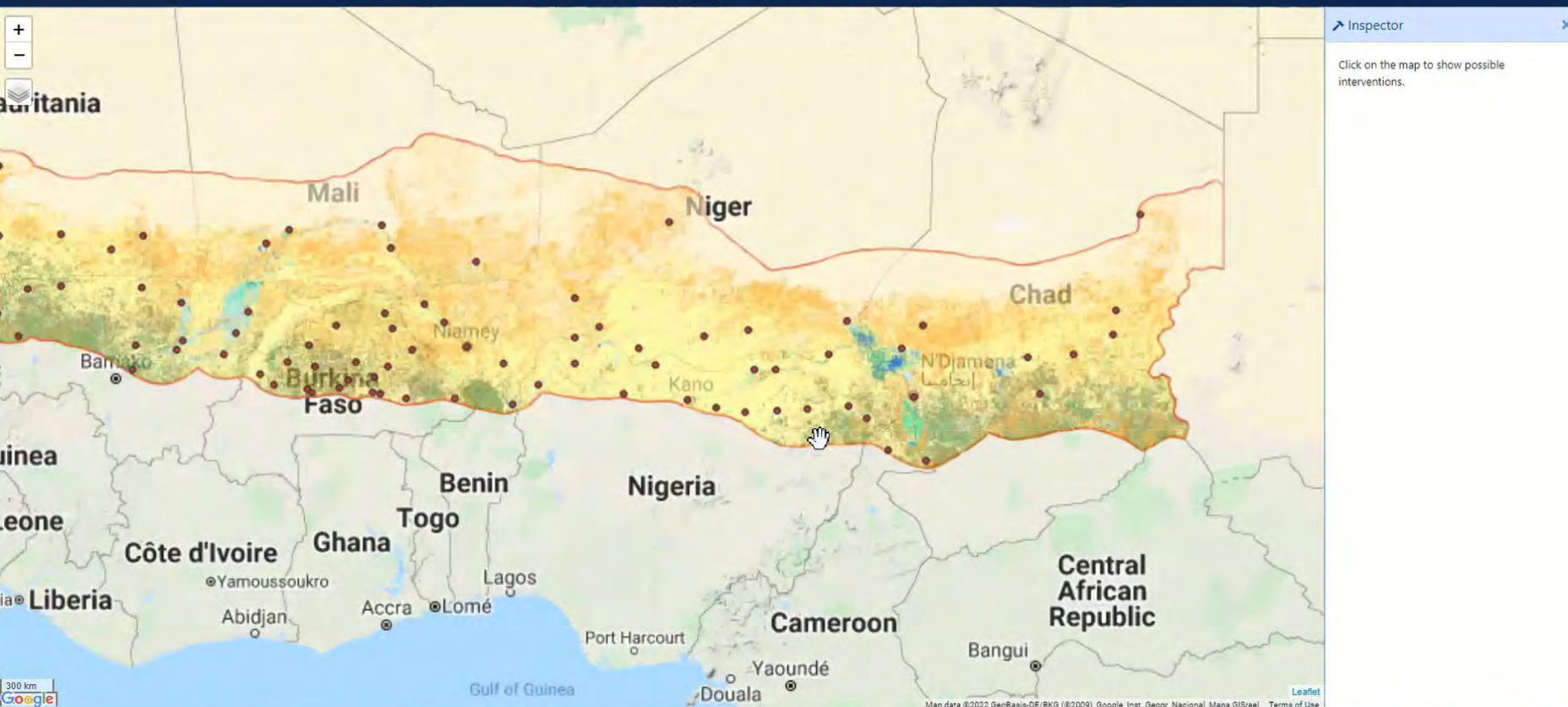
45 درجة في فترة ما بعد الظهر من يوم حار جدًا  
ولكن ليس غير عادي على الإطلاق ، في هذا البلد القروي غير الساحلي







### Water Harvesting Explorer



**dMRV System** (facilitated by EO, in-situ data/Apps, C Warehouse)



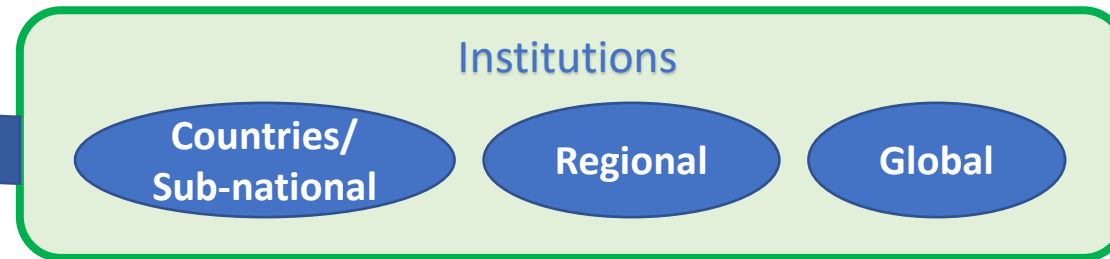
**Digital Payments**



# Livable Planet Open Data Initiative

**Support for Data Rescue, Formatting, Integration, Hosting as Online Services for Interoperability**

(e.g. for data on climate, water/land/soils/ other natural resources, pollution, and other relevant socio-economic and infrastructure aspects of a livable planet)



**Support for open data access through open APIs/ services**

**Support for Data Collection Services**

(e.g. Monitoring Systems such as Hydromet systems, geospatial data generation, crowdsourcing, etc.)

**Support for Capacity-Development and Data Partnerships**  
(e.g. for sectoral institutions working with partner agencies)

**Support for Analytics/AI based Services/ Apps**

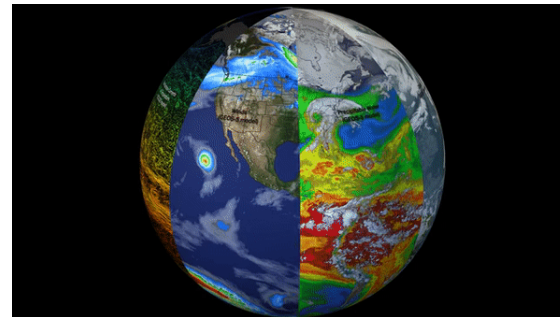
(to provide High-Impact Services)



# Livable Planet Global Services

## What?

- Services for **Early Alerts** (e.g. related to floods/droughts/storms, some types of pollution)
- Digital Monitoring, Reporting, Verification (**dMRV**) services for climate action and associated co-benefits
- **Services for Nature** - nature based solutions; integrated watershed/basin/landscape planning and management; water and other natural resources, blue economy & biodiversity management; circular economy/ pollution management
- **Agricultural advisories** (even to smallholder farmers) related to weather, soil moisture, yield estimates, pests



## How?

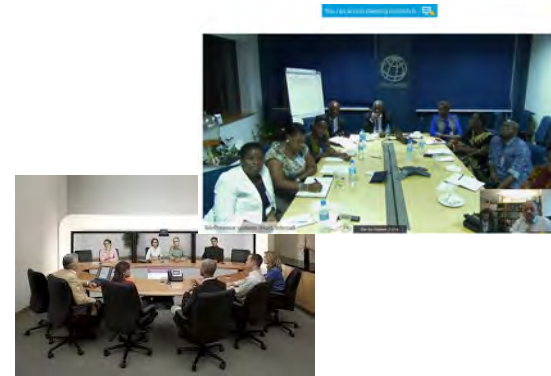
- Prioritizing a few initial services that can have quick, global impact and identify relevant partner organizations
- Strengthening relevant aspects of Livable Planet Open Data Services and partnerships
- Demonstration in a few countries and scaling up globally based on interest leveraging cloud services & responsible AI
- Tracking use and impact and refining/expanding services



# Modernizing Institutions



Collaborative Workspaces/Internships



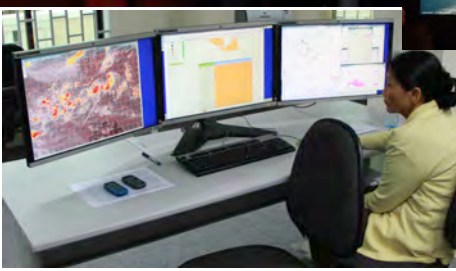
Audio/Video-Conferencing/Distance Learning/ Helpdesk



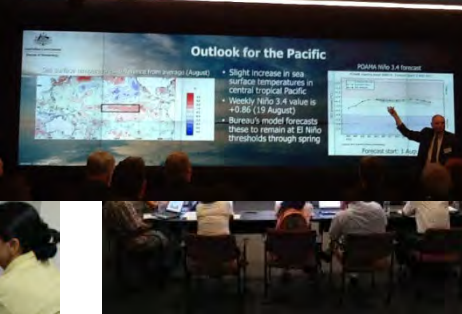
Computer Training Room



Document, Map & Digital Library



Situation/ Decision Rooms



Innovation Marketplace



Collation

Analysis

Use

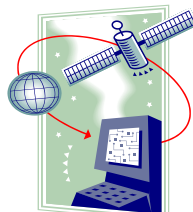


Competitions (e.g. Hackathons)

Knowledge Repository



Monitoring Hub



Knowledge Tools/Products Targeted Research



Outreach & Capacity-Building



Institutional Support

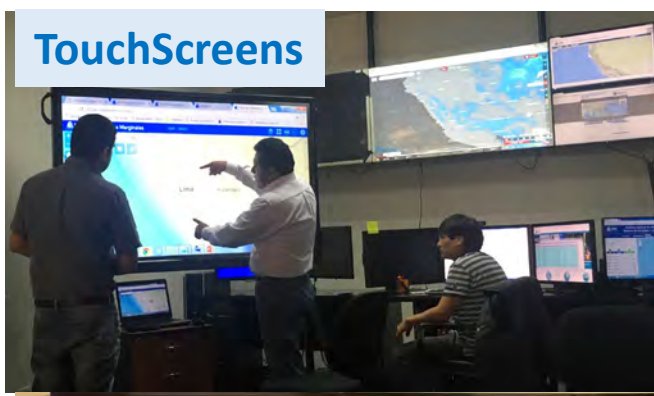




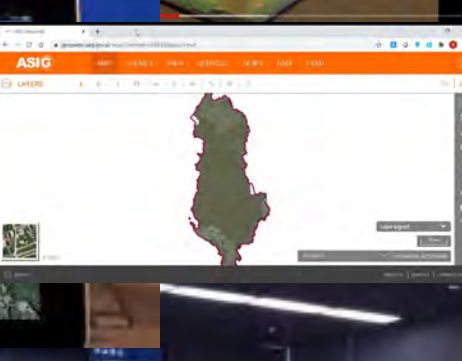
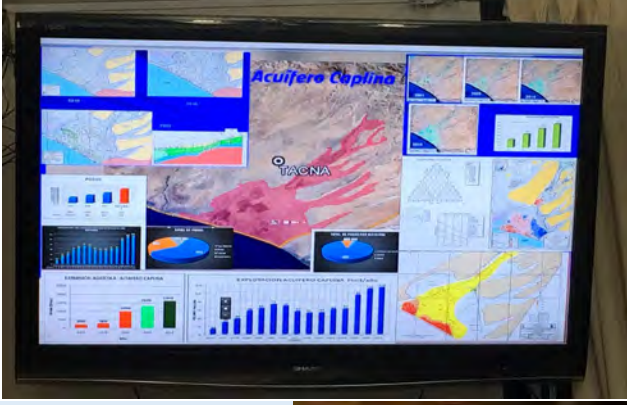
Large Displays



TouchScreens



Physical Interactive Models



Touch Tables



VR

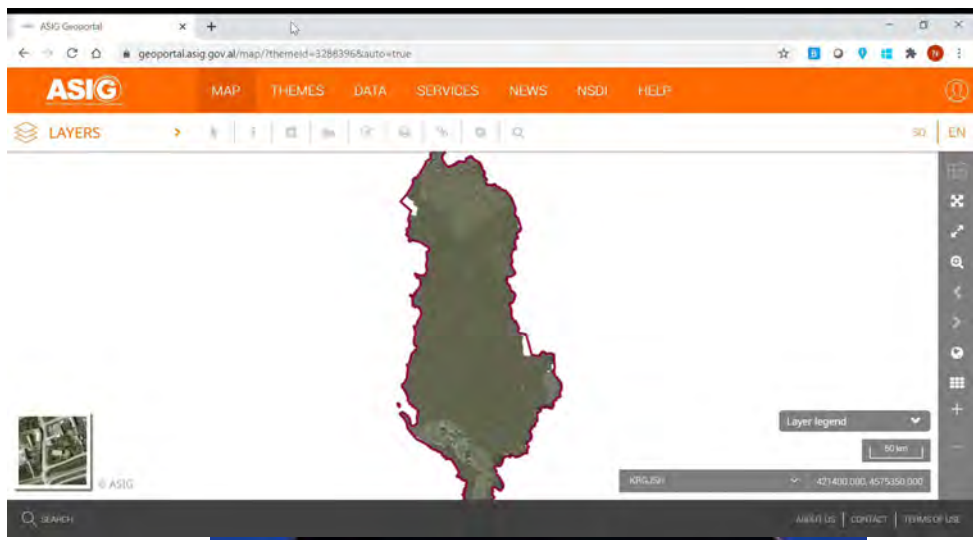
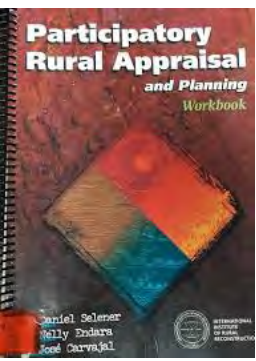


Touch Projectors





# Improving Community Interactions





# Imagine...

- Every smallholder farmer with free access to information for weather alerts, precision farming, yield estimation, market info and access, benchmarking, digital payments...
- Harnessing the “power of shame” to benchmark my area with other relevant areas...
- Instant access to global good practices and relevant stakeholder forums and expert advice...
- Leveraging the power of bright minds – working on new data-driven solutions for everything, everywhere, all at once...
- Moving to a culture of more information-based decision-making...

# What does AI mean for us?



- Improve awareness (us, our teams, our clients) on the benefits and risks
- Leverage benefits
- Plan for and mitigate risks
- Closely monitor trends and impacts
- ***Enables*** and ***Requires*** us to work as one Bank!



# Preparing for Generative AI

- **Awareness of the Tech**

- Dos (learn, experiment, document, discuss/collaborate...)
- Don'ts (uploading private or non-public info, using without verification, copyright violations...)

- **Explore Implications for Sector**

- Facilitating work (adapting as the tech evolves)
- Jobs (vulnerability, opportunities)

- **Initiate Cautious, Responsible Use**

- Helpdesks (incl. AI options, prompt engineering, case studies, training...)
- Dialogue/Studies (research, summaries, brainstorming, chatbots...)
- Operations/Investments
- Regulatory Framework

# World Bank Disruptive Tech Support Ecosystem

## *Alphabet Soup*

- ITS
- DEC
- FCV (GEMS)
- GFDRR Labs
- GCS (WBXR, ...)
- DD GP
- OLC
- Disruptive KIDS Helpdesk
- CoPs
- ...
- <DT Network>
- Proposed Digitalization VPU







Disruptive Technology

WORLD BANK GROUP

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

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



MC4 - 840



**Disruptive Development**  
An Interactive Primer on Disruptive Technology in Development

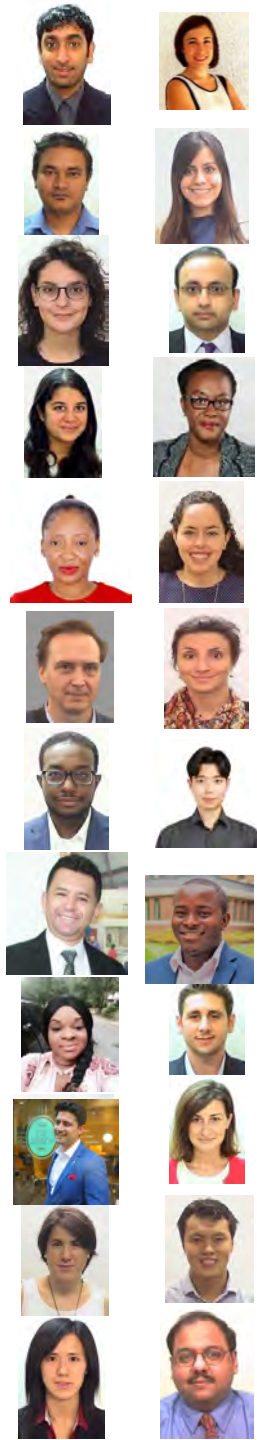
**Table of Contents**

- Introduction
- Key Development Challenges
  - Economic
  - Social
- Emerging Disruptive Technologies
  - Types of Disruptive Technology
  - Examples of Disruptive Technology
- Disruptive Tech in Development
  - Market Development
  - Overcoming Key Challenges
    - Enabling Enabling Environment of your Enterprise
    - Infrastructure, Tech Application Ecosystem
    - Government
    - Regulatory Environment
    - Marketplace
- Current Issues
- Next Steps

**ANALYSIS OF INTERNATIONAL FINANCING VISIBLE TO LOCAL POLICY MAKERS**

**INTERACTIVE TECHNOLOGY APPLICATION EXPLORER**

Use the following dropdown menu to explore a wealth of all data on technology access, access to mobile, information or communication technologies (ICT) available from various sources, by the World Bank Group. The Explorer for Digital Development is being used to illustrate how to use the tool to explore data on ICT.





# Happy Exploring in Retirement!!!



- 02145415646
- 584413452159
- 456129782132
- 3889114259744
- 294798234564
- 2677119918265

AAJ	HJA	WWE	PLD	EBR	DET	GR
1,822	20,389	890	4,350	10,995	665	6,8
(-27)	(+88)	(+25)	(+20)	(+58)	(+15)	(+1)
ABC	LBN	MJD	PON	NYS	USH	GM
3,605	9,542	2,609	7,854	6,522	1,632	3,4
(+21)	(+12)	(+35)	(+14)	(+12)	(+54)	(+1)
TRF	SHN	NMJ	BT	KLM	CCX	EM
3,204	5,271	7,100	7,190	782	1,921	3,2
(+8)	(+15)	(+8)	(+13)	(+7)	(+12)	(+1)
HBB	WFF	HUM	DLT	LSD	SDH	SP
3,320	712	134	2,822	631	6,287	12,
(+30)	(+12)	(+5)	(+1)	(+4)	(+2)	(+1)



# *Disrupt or Be Disrupted!*

## Thanks!



<http://www.worldbank.org/>

<https://www.worldbank.org/en/projects-operations/environmental-and-social-framework>

<https://maps.worldbank.org/>

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



*Disruptive Technology*

**WORLD BANK GROUP**

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