

# Remote Sensing & GIS in the service of sustainability

Alberto Meroni



# Our World Has Many Challenges

... Out of Balance with Nature

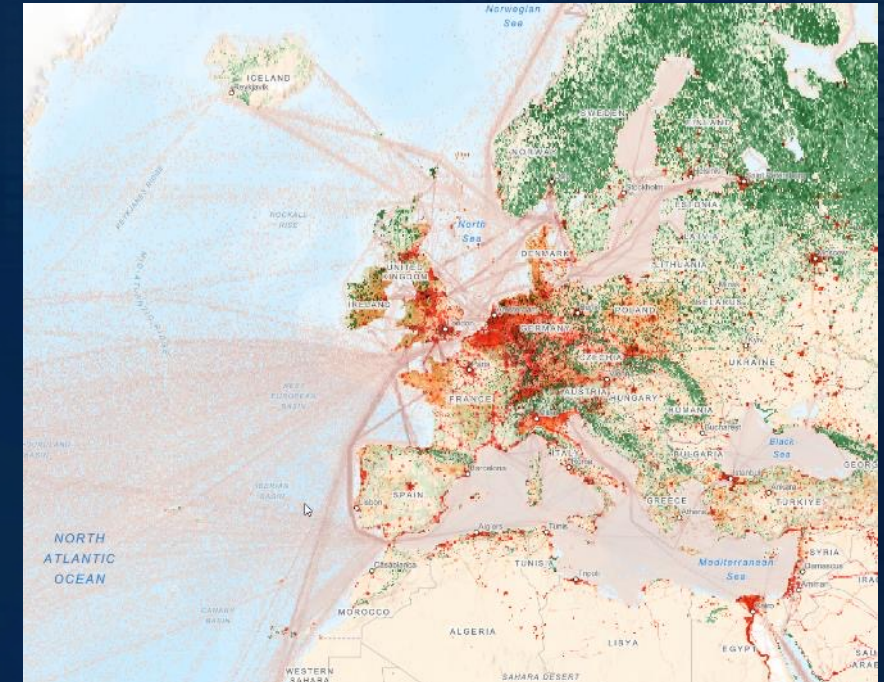
The image features a central globe of Earth, surrounded by a collage of smaller images and text labels. The labels are arranged in a roughly circular pattern around the globe, with lines connecting them to the central image. The labels include:

- Pollution
- Human-Induced Climate Changes
- Overpopulation
- Congested Cities
- Unconstrained Development
- Severe Droughts
- Wildfires
- Water Crises
- Natural Disasters
- Ecological Instability
- Food Shortages
- Pandemics
- Step Decline in Biodiversity
- Political Polarization
- Social Conflict

The background is dark blue with a grid pattern and some abstract light effects. The globe is the central focus, showing the Americas and parts of Europe and Africa.

Challenging Our Sustainability ...

# Carbon and Methane Gas Emissions and Natural Carbon Sinks



# Greenhouse Gas from Sentinel 5P

Sentinel 5P Dynamic Multispectral Imagery for Global Earth Observation

- Monitoring Earth's atmosphere

- Six Level-3 Analysis Ready data layers
- Global, Daily, ~7km, 2018 - Present

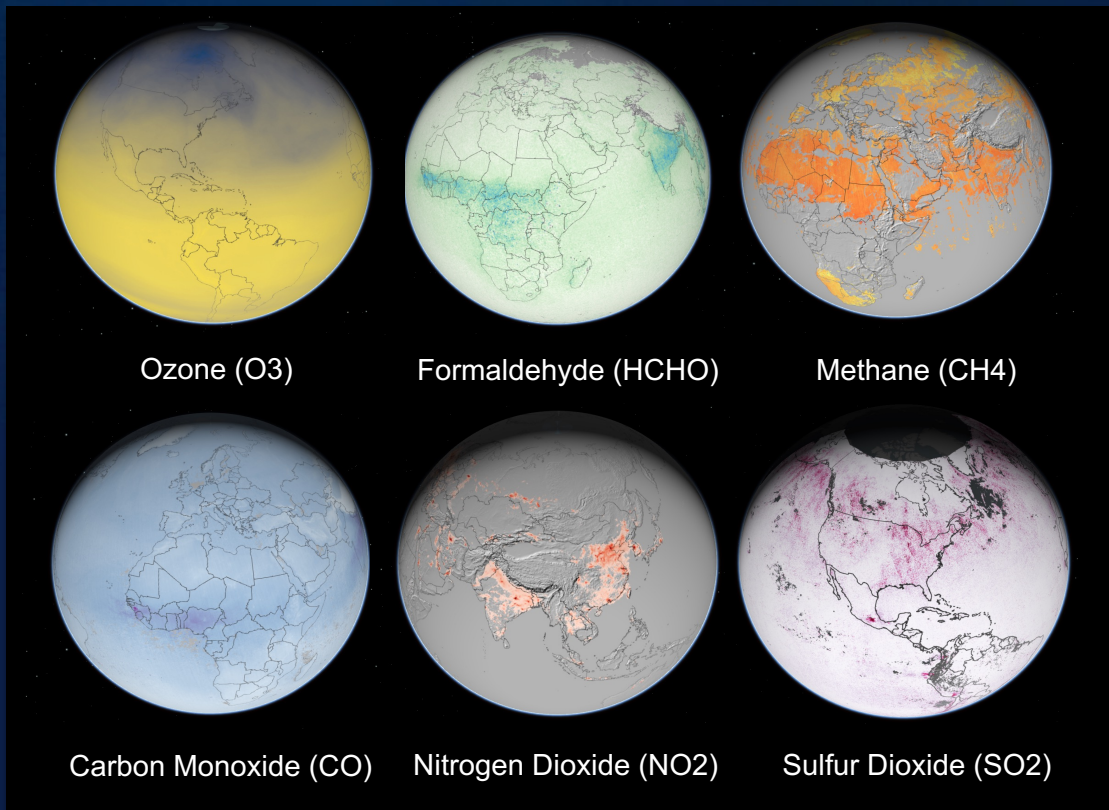
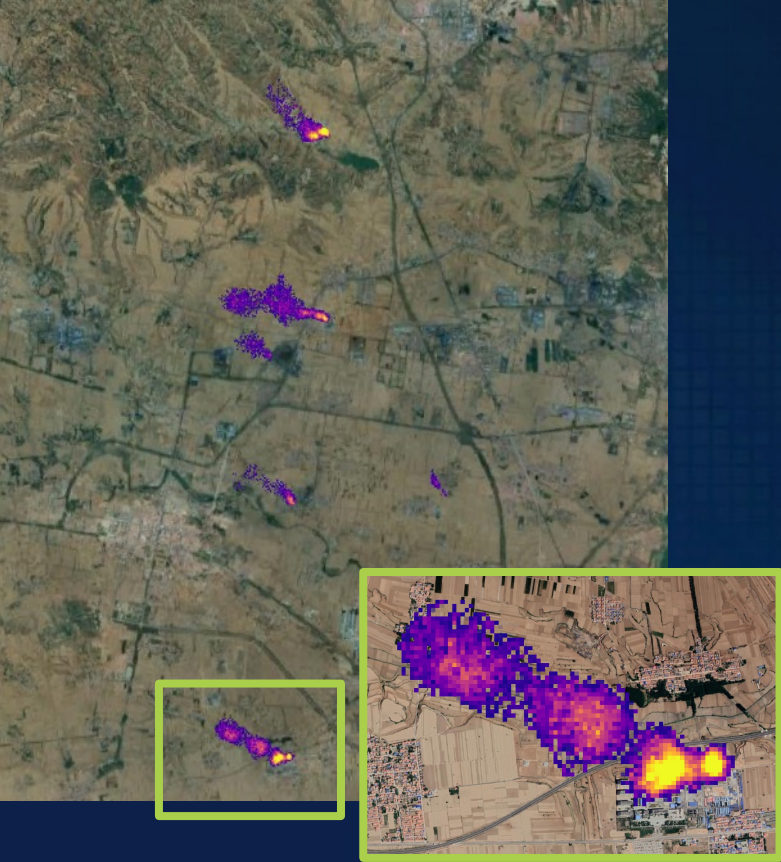


Figure showing a screenshot of the ArcGIS Living Atlas of the World search results for Tropomi. The search results display six items, each representing a different atmospheric gas or pollutant measured by Sentinel 5P:

- Sentinel-5P - Methane (CH<sub>4</sub>)
- Sentinel-5P - Nitrogen Dioxide (NO<sub>2</sub>)
- Sentinel-5P - Carbon Monoxide (CO)
- Sentinel-5P - Ozone (O<sub>3</sub>)
- Sentinel-5P - Formaldehyde (HCHO)
- Sentinel-5P - Sulfur Dioxide (SO<sub>2</sub>)

# GHG emissions (Methane)

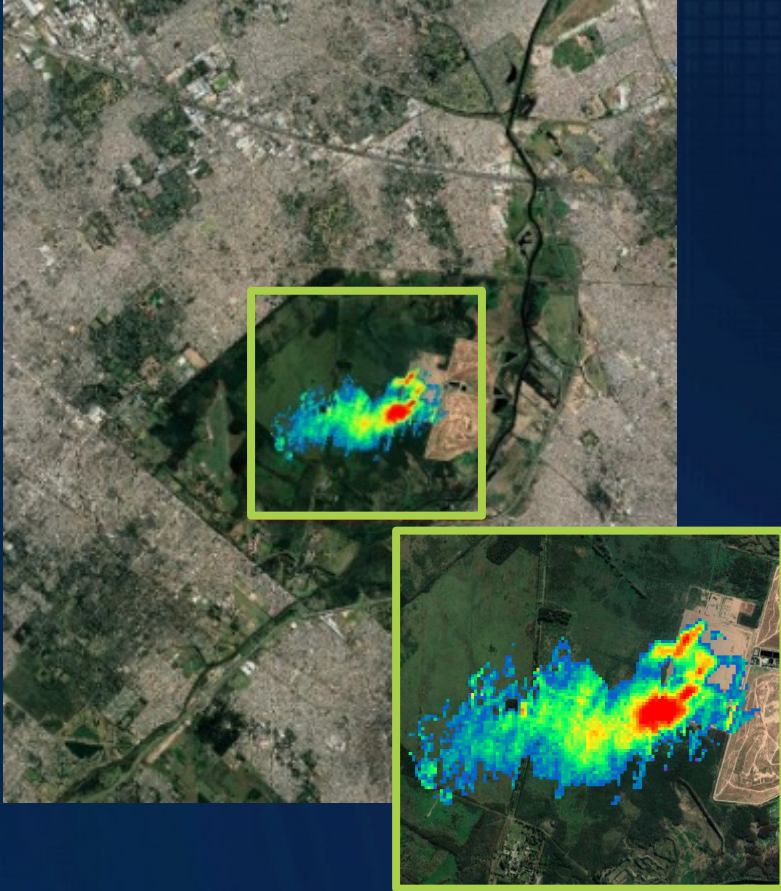
Underground coal mine  
Shanxi, China



Oil & Gas  
Permian Basin, NM, USA




Landfill  
Buenos Aires



Source, GHGSat Inc.

# Policies Motivate Climate Action Around the Globe

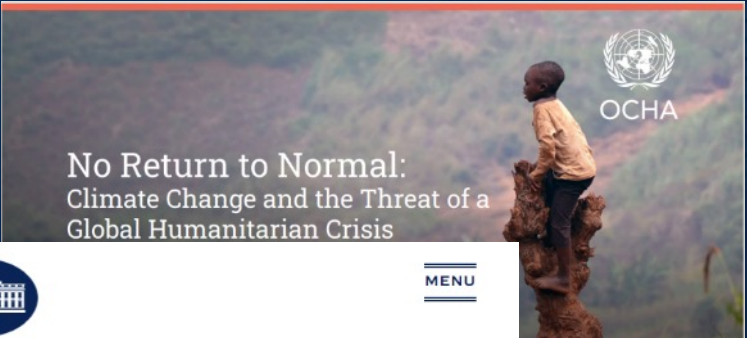


**IPCC Sixth Assessment Report**  
Impacts, Adaptation and Vulnerability

ipcc

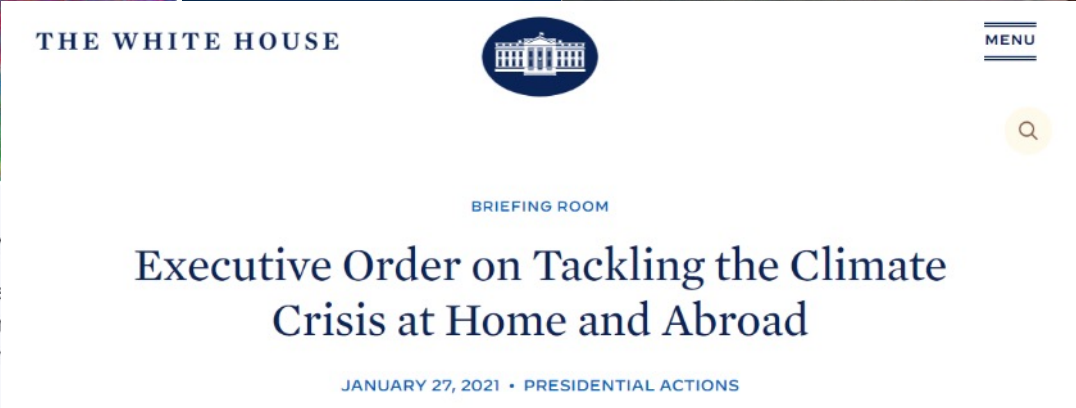
**Climate Change 2022: Impacts, Adaptation and Vulnerability**

The Working Group II contribution to the IPCC Sixth Assessment Report assesses impacts of climate change, looking at ecosystems, biodiversity, and human communities at global and regional levels. It also reviews vulnerabilities and the capacities and limitations of the natural world and human societies to adapt to climate change.



OCHA

No Return to Normal:  
Climate Change and the Threat of a  
Global Humanitarian Crisis

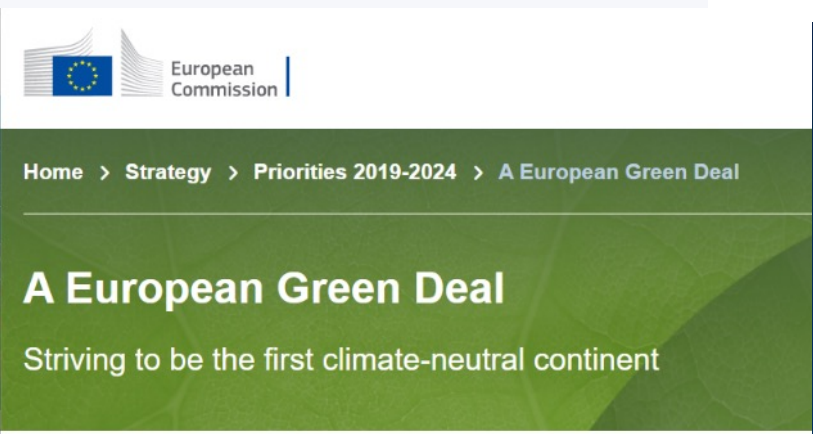


THE WHITE HOUSE

BRIEFING ROOM

**Executive Order on Tackling the Climate Crisis at Home and Abroad**

JANUARY 27, 2021 • PRESIDENTIAL ACTIONS



European Commission

Home > Strategy > Priorities 2019-2024 > A European Green Deal

**A European Green Deal**

Striving to be the first climate-neutral continent

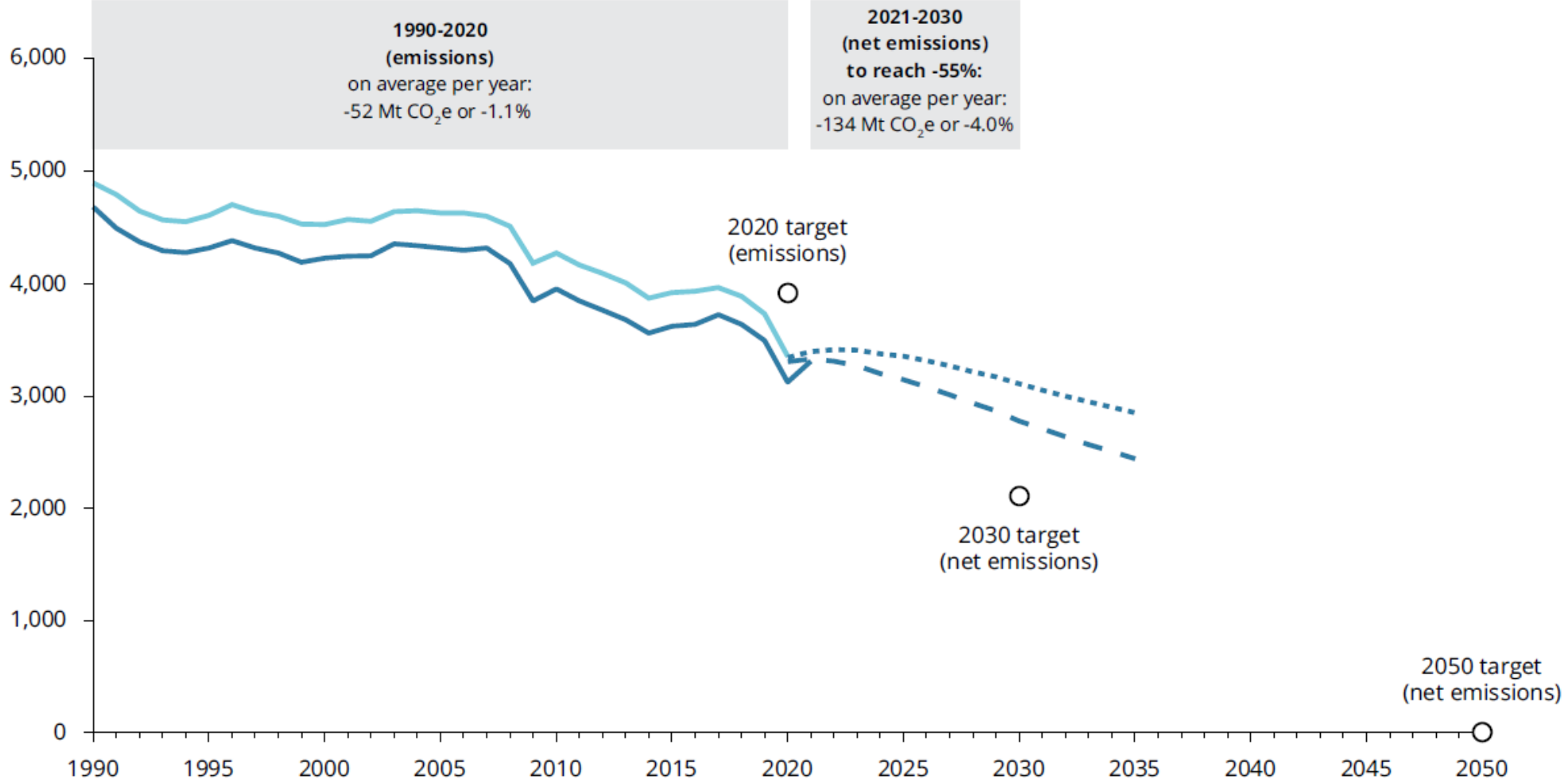


CLIMATE CHANGE IN AUSTRALIA

CLIMATE CHANGE IN AUSTRALIA

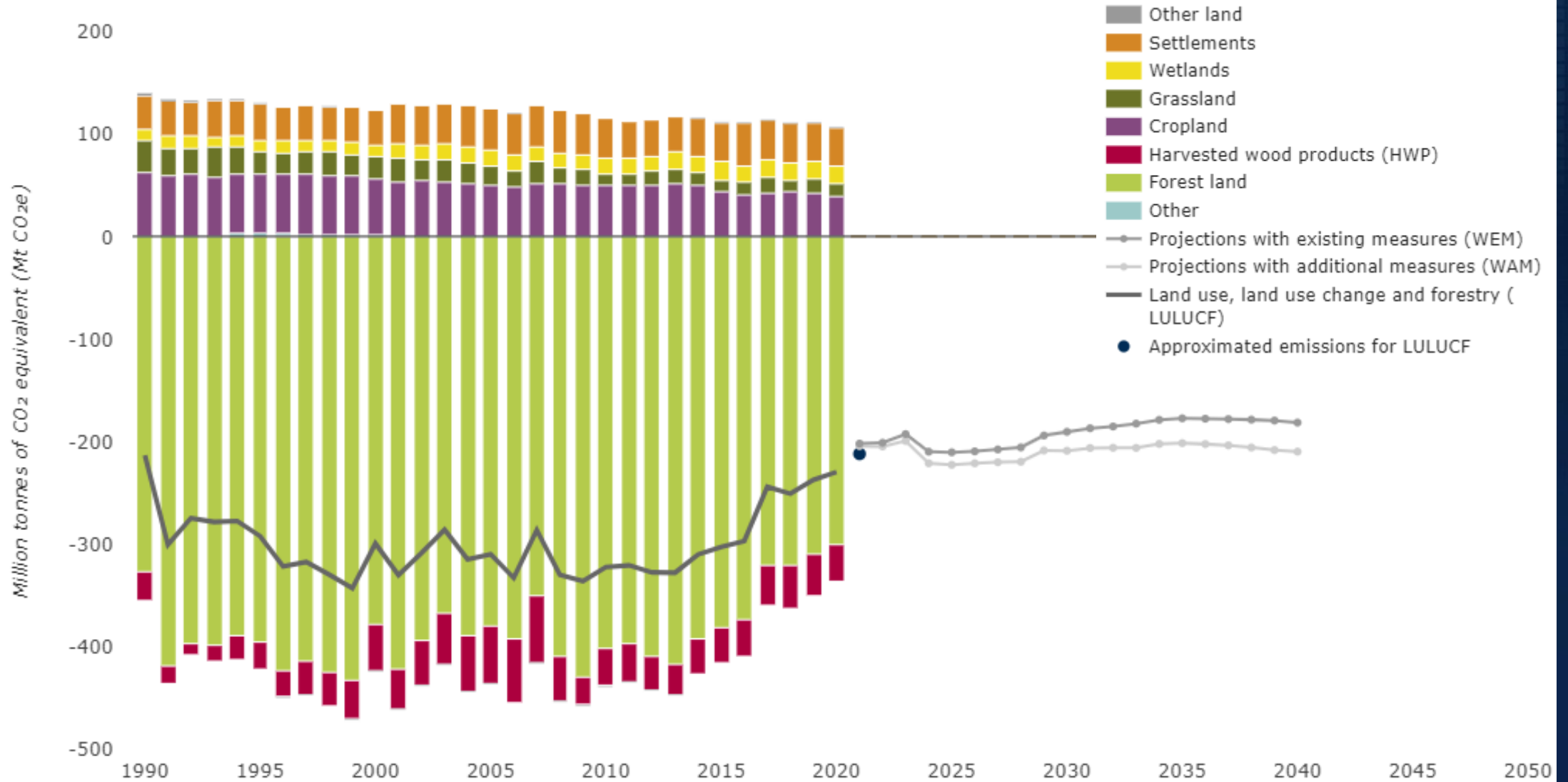
Climate information,

# EU - Trends and projections of greenhouse emission



- Historical greenhouse gas emissions without land use, land use change and forestry (LULUCF)
- Historical greenhouse gas emissions with LULUCF
- ... Projections with existing measures (WEM) with LULUCF
- - Projections with additional measures (WAM) with LULUCF

# EU - LULUCF sector emissions and removals, by main land use category





# Forest / Carbon removal

Prioritizing Urban Tree Planting



City of St. Louis Missouri

Forest Inventory



GI Geoinformatik Bavaria

Restoration of Forest Habitats



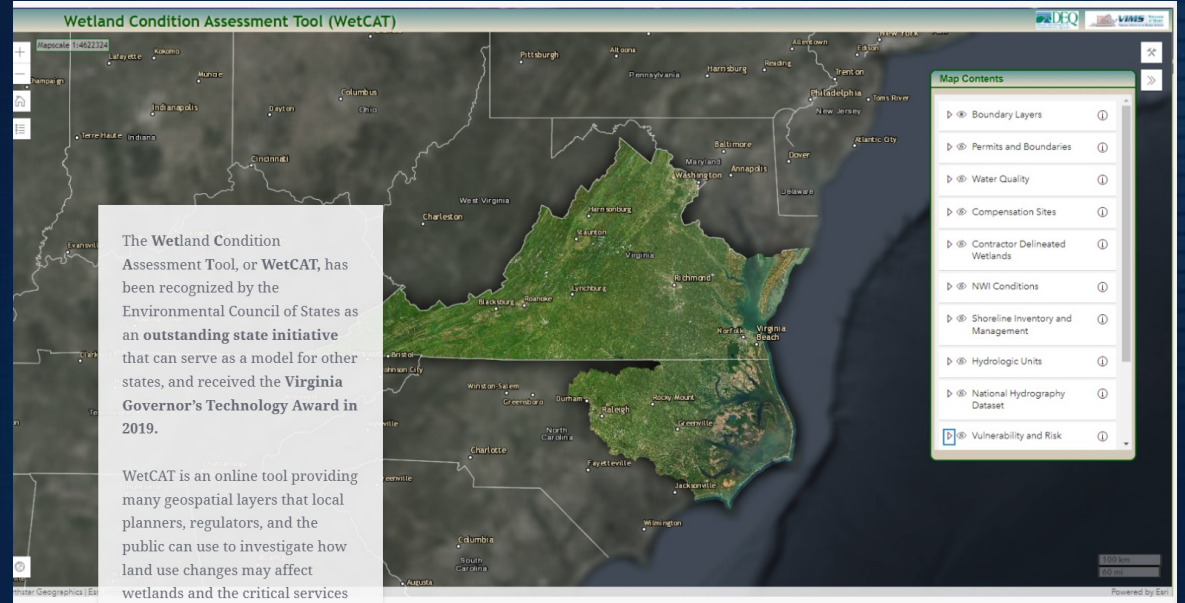
Université 20 Aout 1955 Skikda  
Foret Zouagha, Mila, Algeria

Field-Based Forestry Management

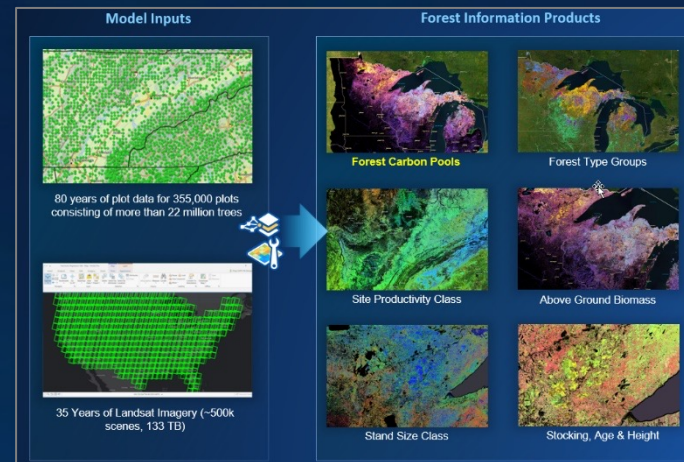


ARC-GREENLAB  
Lower Saxony, Germany

Wetland Condition and Assessment Tool



Center of Coastal Resources Management  
Virginia Institute of Marine Science

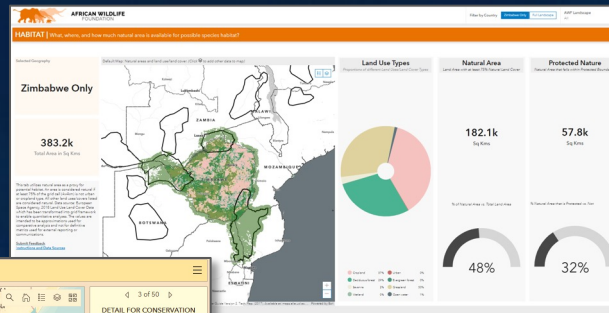


USDA  
Forest Service  
Carbon Mapping

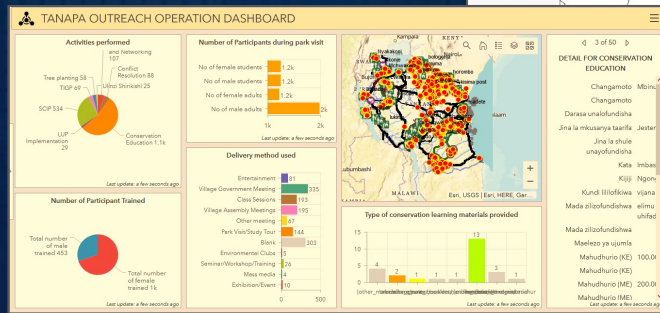
# Biodiversity / Protected Areas

## US Department of the Interior

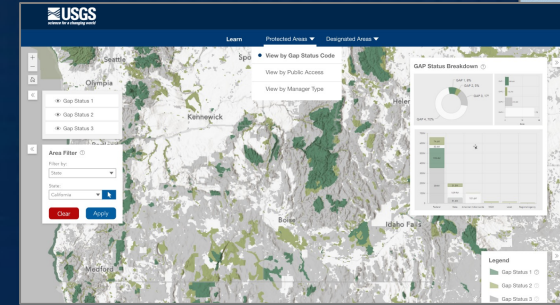
### Protected Areas in Africa Multiple Customers



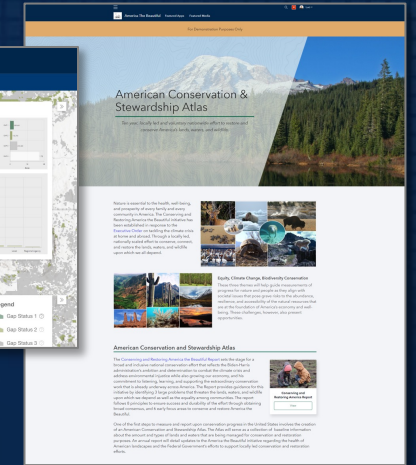
### African Wildlife Foundation Planning & Protected Area Operations



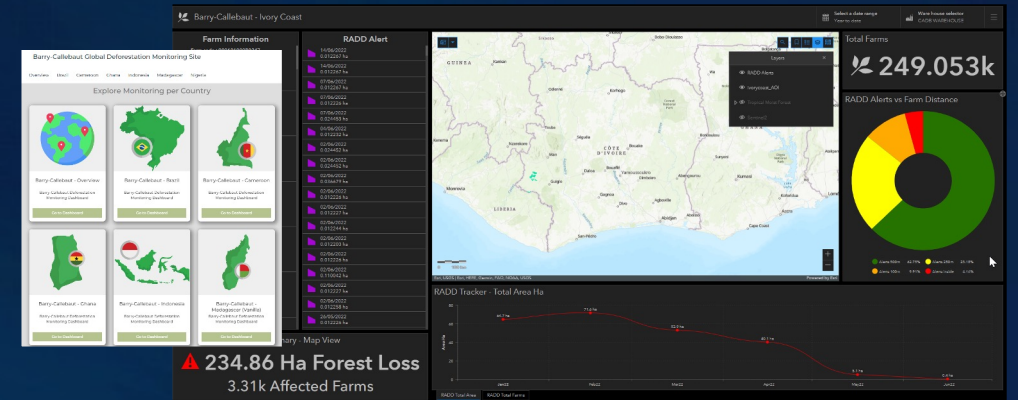
### Tanzania National Parks Management and Operations



### Protected Areas Database Atlas



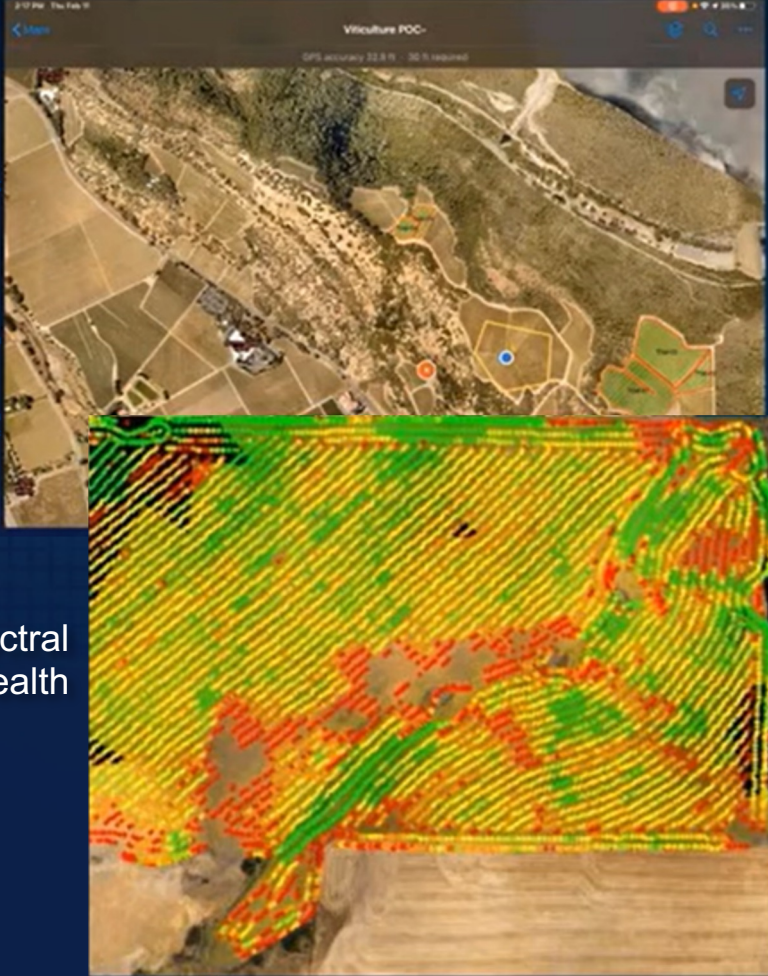
### America the Beautiful Portal



### Corporate Carbon Footprint Deforestation alerts monitoring

# Promote sustainable Agriculture

Field Operations



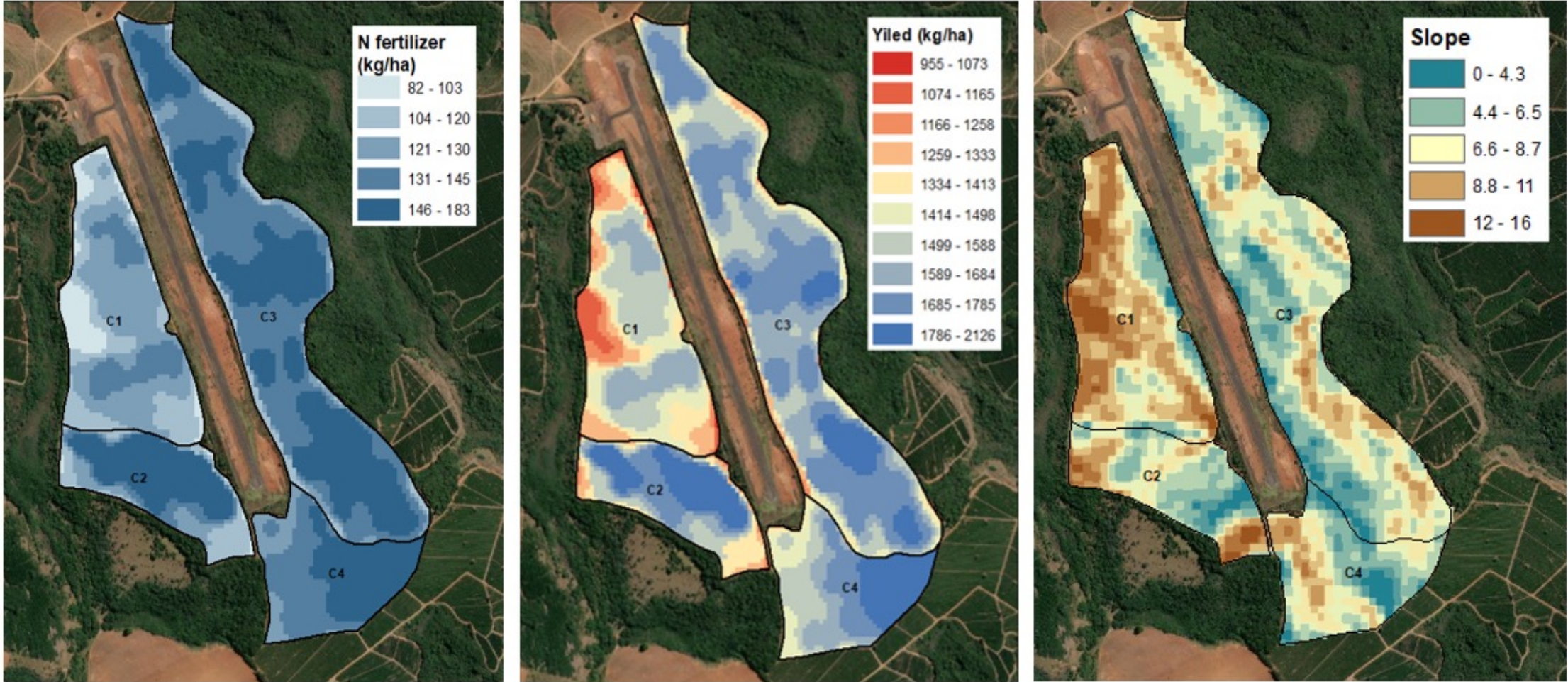
Multi-spectral  
crop health

Information Imagery Products



Vegetative Health Field Scouting

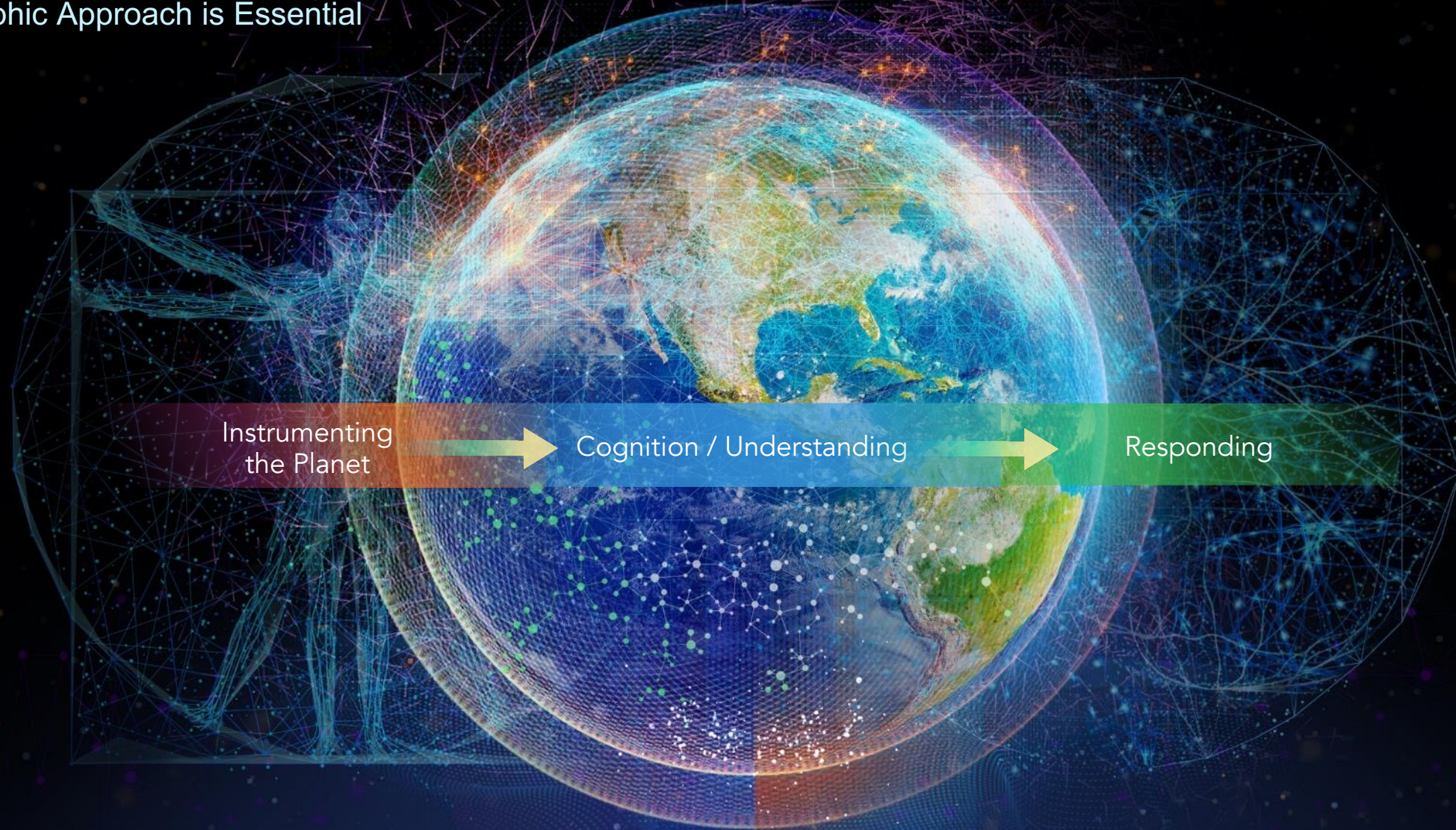
# Promote sustainable Agriculture



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# Our planet needs GIS & Remote Sensing

Geographic Approach is Essential



# Why us?

A comprehensive System for Managing and Exploiting Geographic Information

Provides the Framework . . .  
. . . And Process



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SCIENCE  
OF  
WHERE**



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