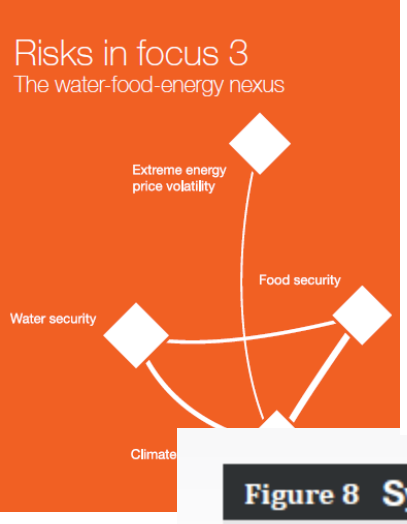
GROUP ON EARTH OBSERVATIONS

# Building GEOSS

***MEDGEO 2013***

**25-29 August 2013**
**Hilton Crystal City Hotel**
**Arlington, VA**

**Douglas Cripe**
**GEO Secretariat**

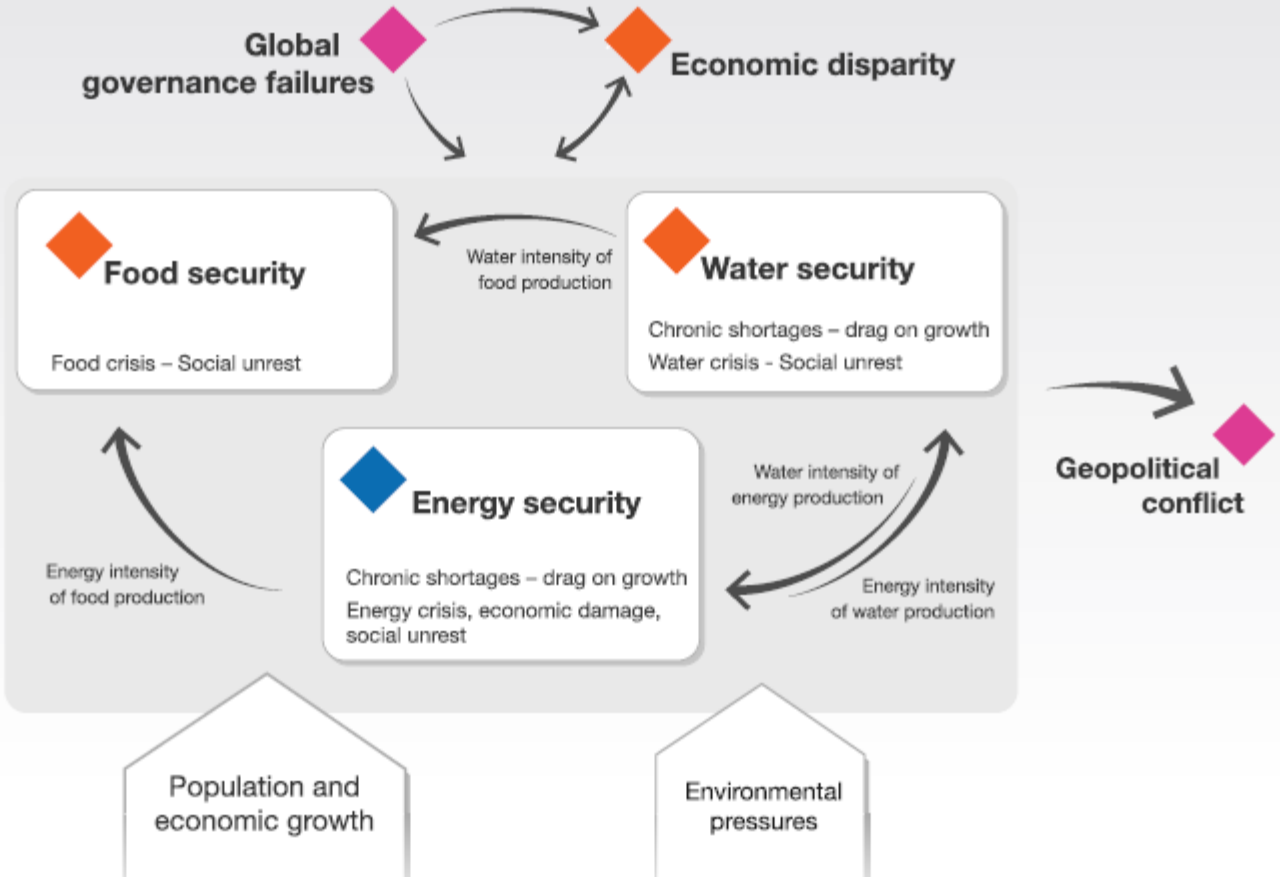



Three major risks for the global economy:

1. The macroeconomic balances nexus
2. The illegal economy nexus
3. **The water-food-energy nexus**

(2011 World Economic Forum)

**Figure 8 System diagram for risks associated with the water-food-energy nexus**



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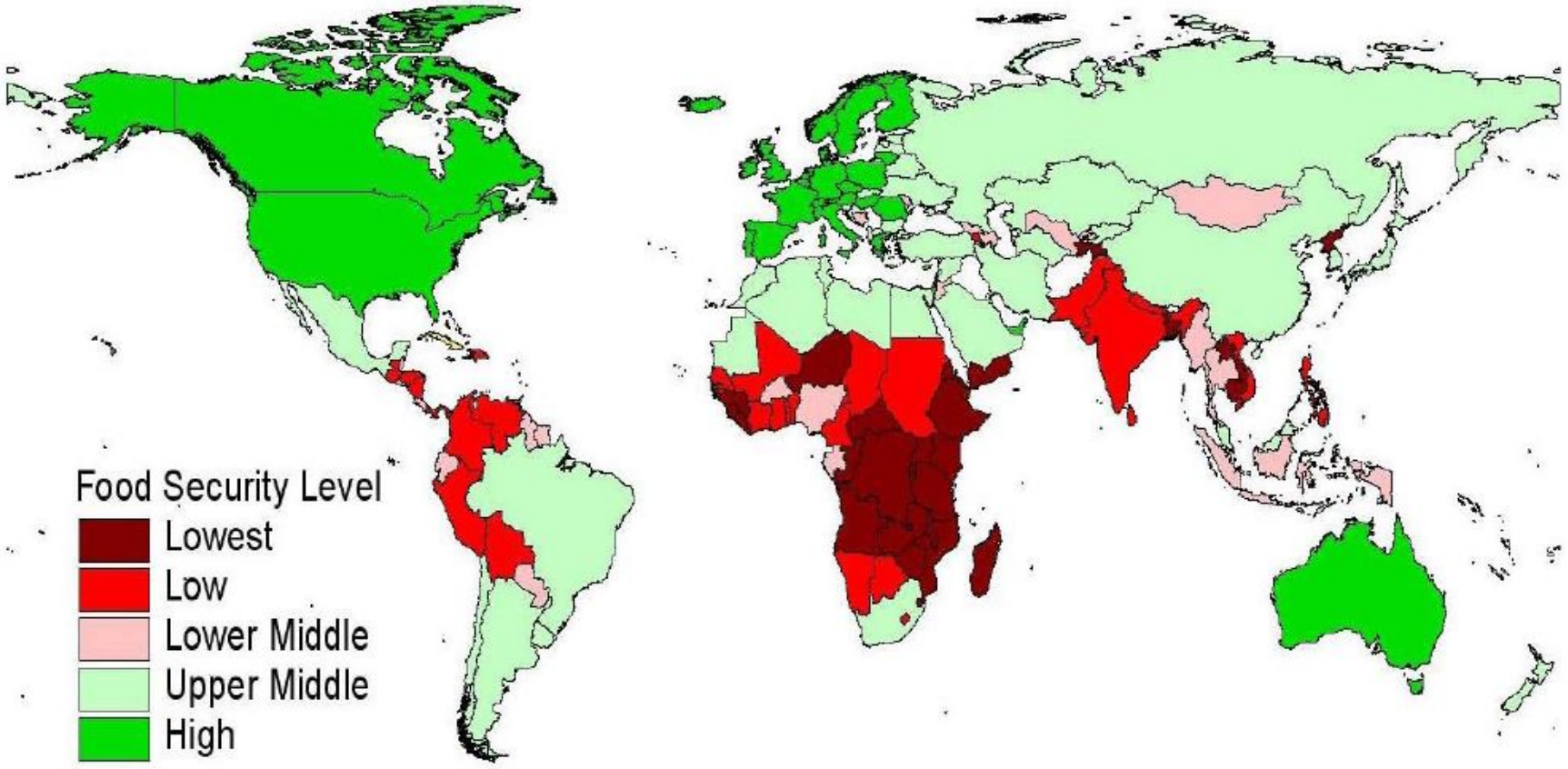
# Food Security

Food is dependent on local production, imports, sensitivity to price volatility, storage, etc.




(from Consumer Energy Report)

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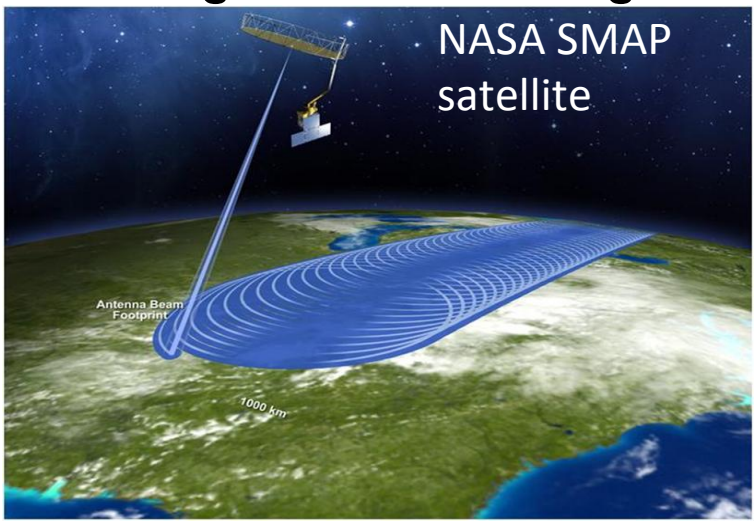
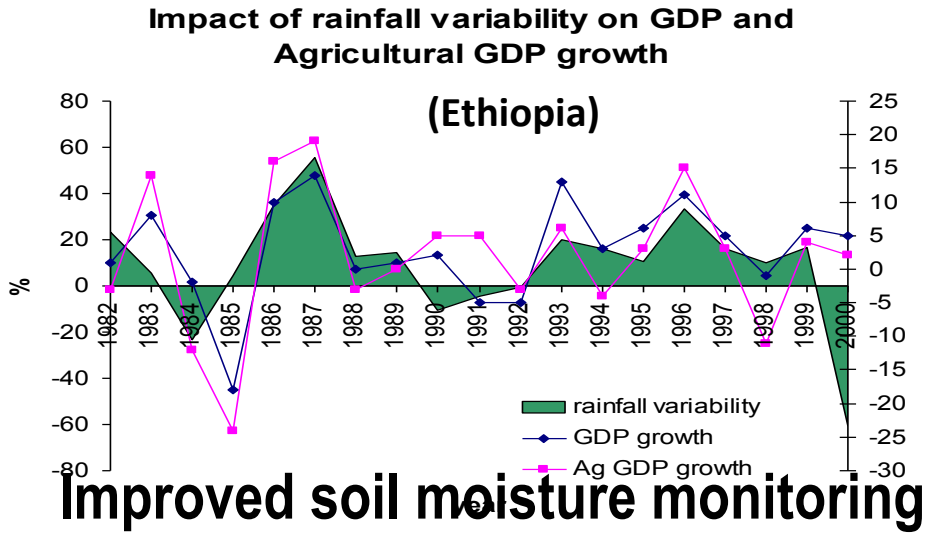
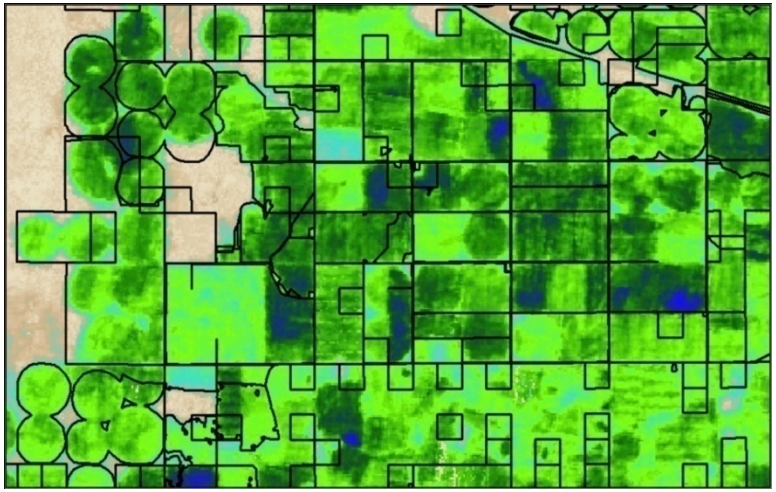
# Improved information leads to more effective irrigation

## Improved precipitation monitoring and forecasting




## Improved soil moisture monitoring to detect dry conditions and take appropriate action.



## Use of ET measurements to monitor the use of water over the growing season.

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# Space-based Assets


Source GEO Secretariat

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# In-situ systems










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# GEO, the Group on Earth Observations

## An Intergovernmental group with 90 Members and 67 Participating Organizations

U.S. Department of State, Washington DC
July 31, 2003

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# What is GEO?

- launched in response to calls for action by the 2002 World Summit on Sustainable Development, Earth Observation Summits, and by the G8 (Group of Eight) leading industrialized countries
- voluntary partnership of governments and international organizations
  - 80 member governments + EC
  - 67 Participating Organizations (PO)
- provides a framework within which these partners can develop new projects and coordinate their strategies and investments
- charged with developing GEOSS

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# What is GEOSS?

- Global Earth Observation System of Systems
- an integrating public infrastructure, interconnecting a diverse, growing array of Earth observing instruments and information systems for monitoring and forecasting changes in the global environment
- supports policymakers, resource managers, science researchers and other experts to support informed decision making for society
- 10-year implementation plan
- 2015: Global, Coordinated, Comprehensive and Sustained System of Observing Systems

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# GEOSS Targeted Gaps

1. Lack of access to data and associated benefits in developing world
2. Eroding technical infrastructure
3. Large spatial and temporal gaps in specific data sets
4. Inadequate data integration and interoperability
5. Uncertainty over continuity of observations
6. Inadequate user involvement
7. Lack of relevant processing systems to transform data into useful information

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# GEOSS: main objectives

- Improve and Coordinate Observation Systems (avoid duplications)
- Provide Easier & More Open Data Access
- Foster Use (Science, Applications)
- Building Capacity
- Identify gaps in observations (based on user requirements)

**…Earth Observation Systems should be coordinated and shared internationally**

**… to answer Society's need for informed decision making**

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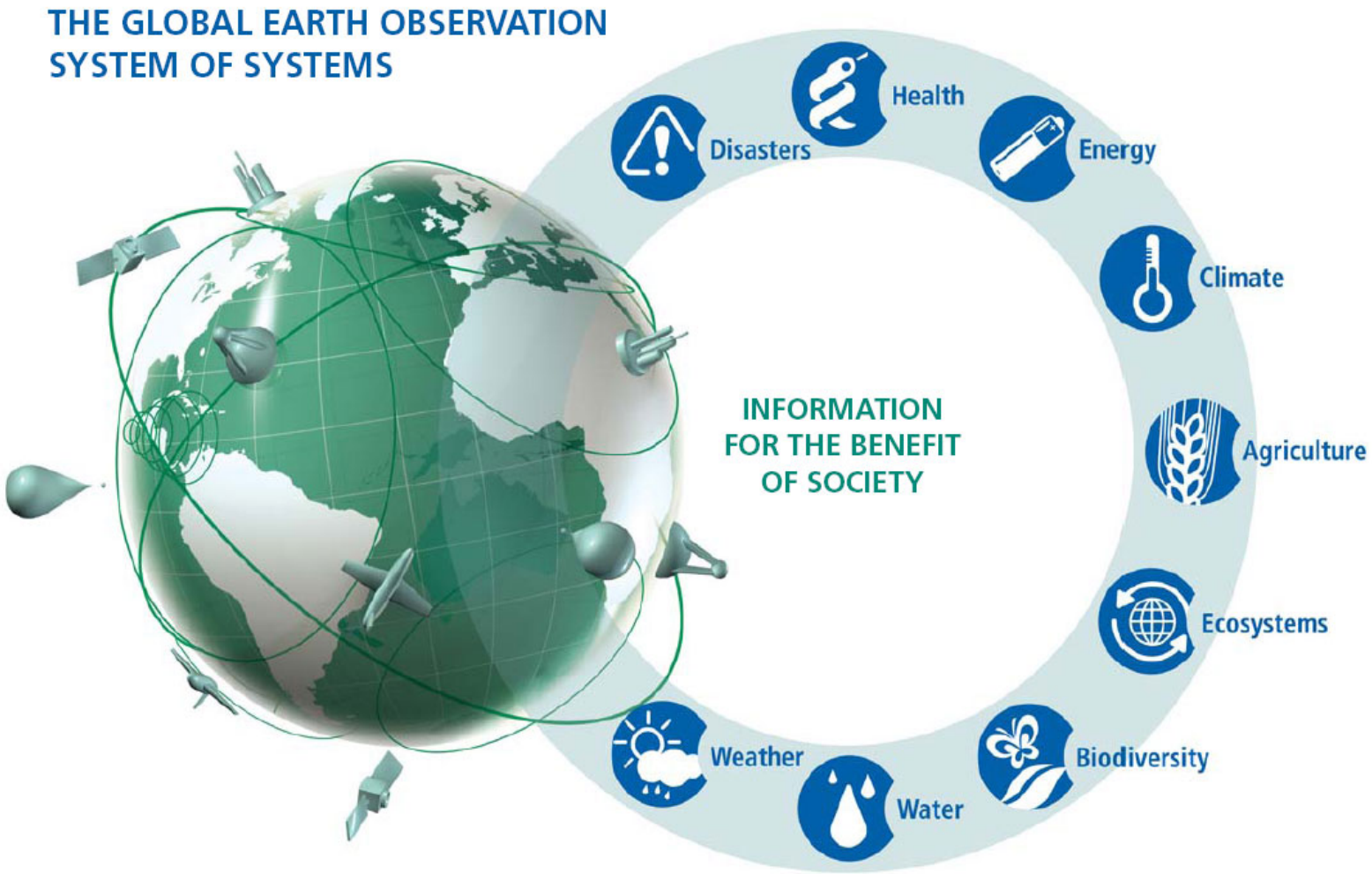
# GEOSS: A Global, Coordinated, Comprehensive and Sustained System of Observing Systems



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# GEOSS Implementation requires: *Data Sharing Principles*

- **Full and Open Exchange of Data…**
  - Recognizing Relevant International Instruments and National Policies and Legislation
- **Data and Products at Minimum Time delay and Minimum Cost**
- **Free of Charge or Cost of Reproduction for Research and Education**

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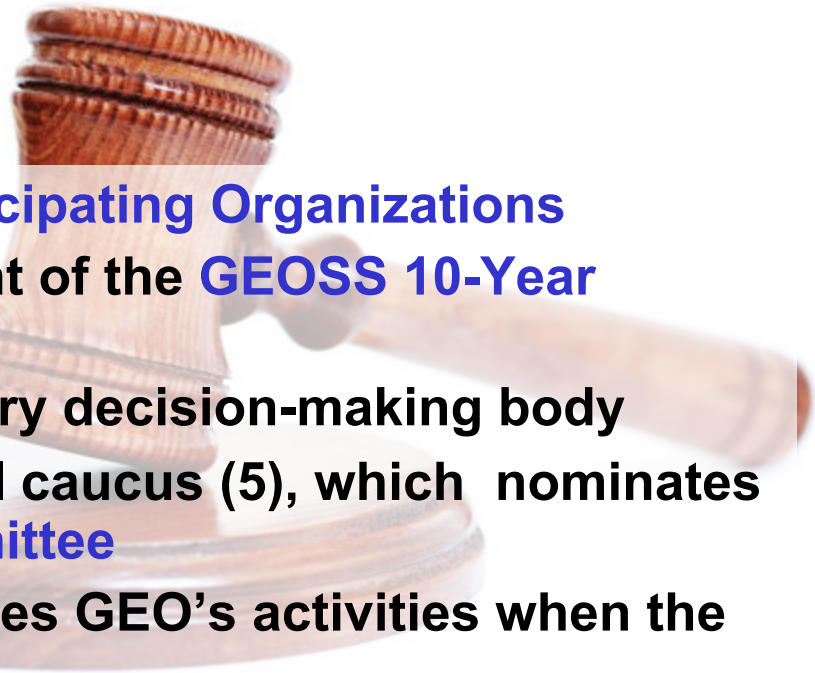
# Governance



- Members governments and Participating Organizations
- Membership: formal endorsement of the GEOSS 10-Year Implementation Plan
- The GEO Plenary is GEO's primary decision-making body
- All members belong to a regional caucus (5), which nominates members of the Executive Committee
- The Executive Committee oversees GEO's activities when the Plenary is not in session
  - consists of 13 representatives elected from the 5 GEO caucuses, including three each from the Americas, Asia and Europe, two from Africa, and one from the Commonwealth of Independent States
  - guides/oversees Secretariat

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# Health

**Before 2015, GEO aims to:**

**12. Substantially expand the availability, use, and application of environmental information for public health decision-making in areas of health that include allergens, toxins, infectious diseases, food-borne diseases, and chronic diseases, particularly with regard to the impact of climate and ecosystem changes.**

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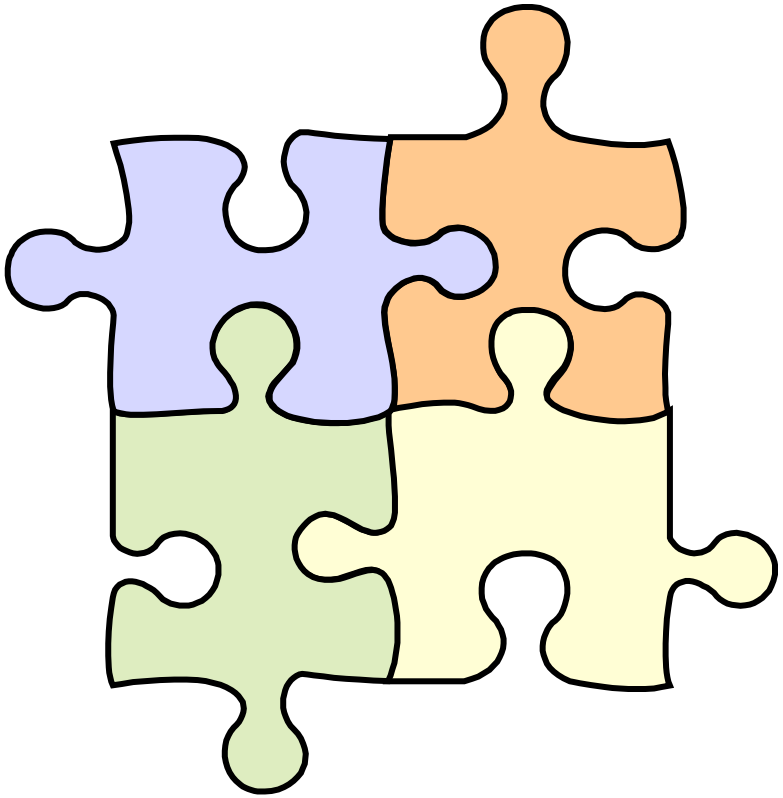
# HE-01: Tools and Information for Health Decision-Making

**C1: Air-borne Diseases, Air Quality and Aeroallergens**



**C3: Vector-borne Diseases**

**C2:Water-borne Diseases, Water Quality And Risk**

**C4: A Holistic Approach to Health: Transmission, Urban Health, Linkages, New Tech**

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# *HE-01 goals achieved through:*

- **Advance the application of observation, monitoring and forecasting**
- **Establish causality between media infecting populations and communicable diseases**
- **Foster the use of established/emerging observation systems**
- **Facilitate the integration public health, socioeconomic, and epidemiological data for health care planning and delivery.**
- **Provide free access to EO data, metadata and related products**
- **Allow historical data analysis and early warning**
- **Facilitate Earth observation training and capacity building**

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# *HE-01 achievements demonstrated by:*

- **Access to improved environmental information and tools to support the global community**
- **Increased use of environmental information and tools to support decision making in epidemics and/or disease management and planning**
- **Increased application of outcomes from other Societal Benefit Areas to improve health and well-being**

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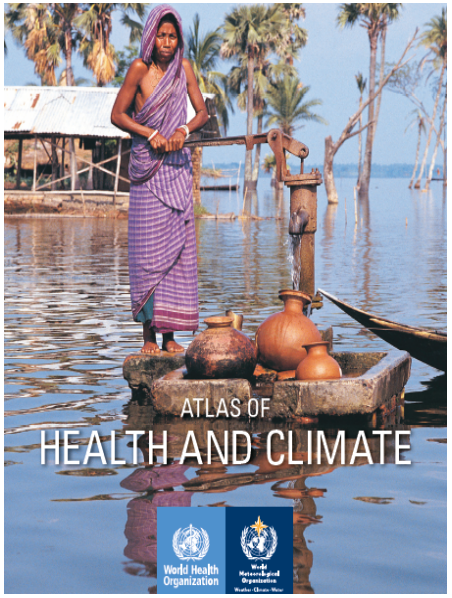
# *Some key achievements of HE01*

- A thriving **Air Quality Community of Practice** and **Health and Environment Community of Practice**
- **EO2Heaven project** produced a robust and transferrable model for Air Quality estimation from in-situ observations, based on land use regression.
- First maps on climate vulnerability to water and sanitation access and cholera for the **Atlas of Health and Climate developed by WHO and WMO** http://www.who.int/globalchange/publications/atlas/report/en/index.htm
- CSIR hosted EO2Heaven Symposium for **Cholera Early Warning System**
- Significantly better understanding of model parameters to predict **malaria and dengue** (C3)



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# HE-02 Tracking Pollutants

**C1: Global Mercury Observation System**

- development of a global observation system for mercury by harmonizing standard operating procedures for monitoring mercury and its compounds in air, precipitation samples, surface water, soil, sediments, vegetation and biota

**C2: Global Monitoring of Persistent Organic Pollutants, Emerging Contaminants and Global Change Indicators**

- establish an effective and sustainable global system for monitoring of persistent organic pollutants (POPs) concentrations in core media over time, and support the effectiveness evaluation of the Stockholm Convention.

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# *Recent Progress and Key Outputs for 2013*

| HE-02-C1: GMOS | HE-02-C1: POPs |
|---|---|
| • **Historical datasets+ metadata** completed<br>• **Monitoring network established**<br>• **Oceanographic and troposheric** field campaigns performed<br>• **Cyber(e)-infrastrucuture** is collecting near real-time data from ground-based sites<br>• **QA/QC system** implemented and under testing<br>• **Data policy** document which includes GEOSS Data Sharing principles under discussion<br>• **Data portal** established at **www.gmos.eu/sdi** | • **Data on POPs** collected in frames of the first Global Monitoring Report in 2008 were uploaded into a dBase.<br>• **Web portal** providing an access to this dB including visualization tools has been developed and made available at **www.pops-gmp.org** |

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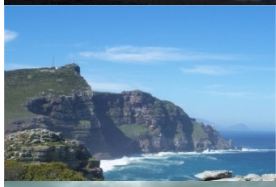
# GMOS: ground-based monitoring network

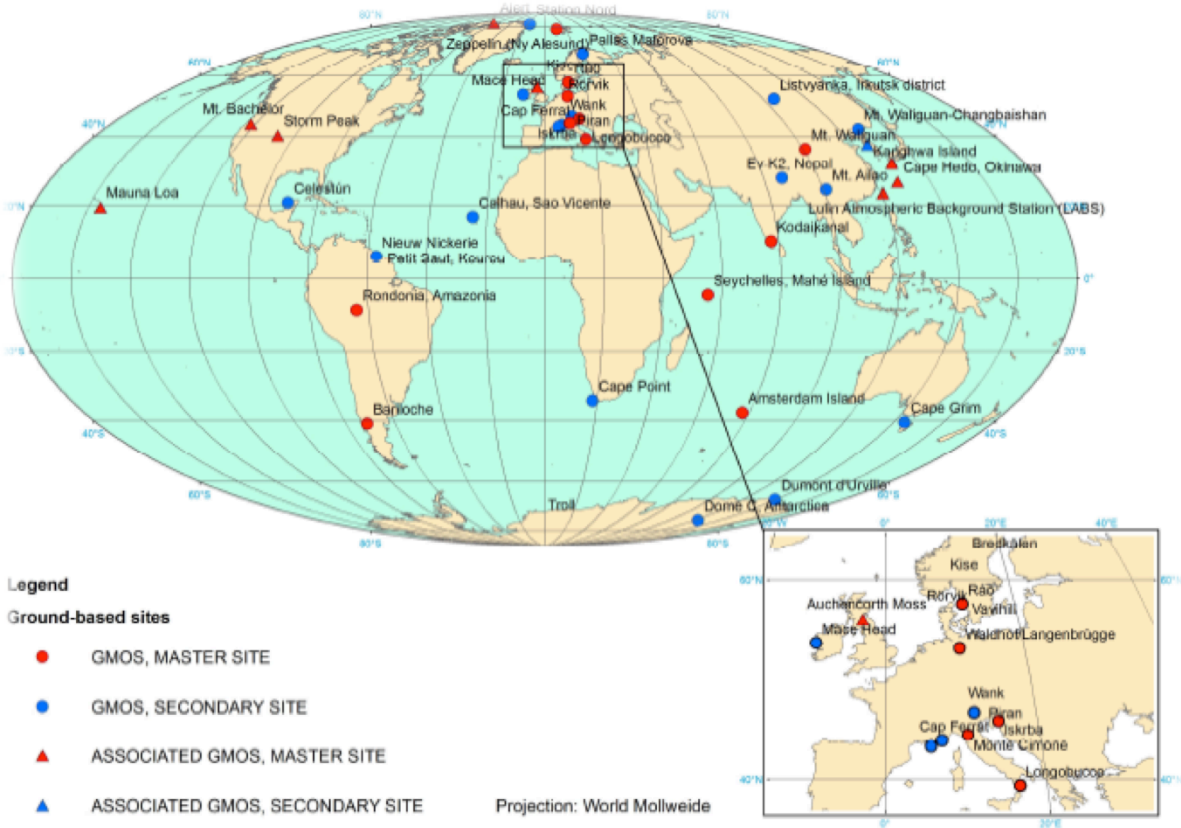






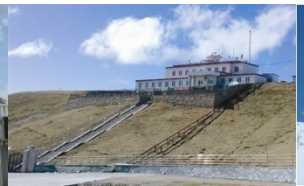








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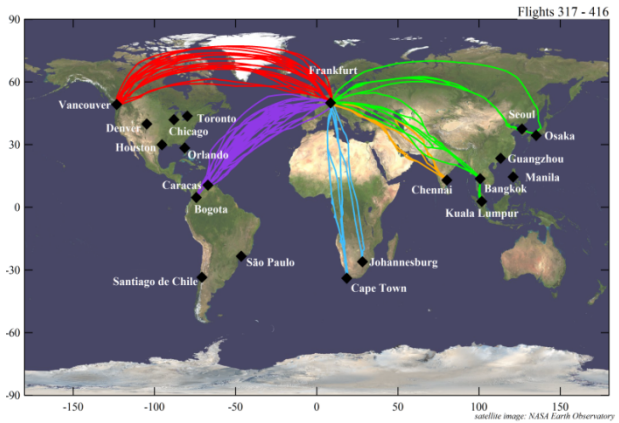
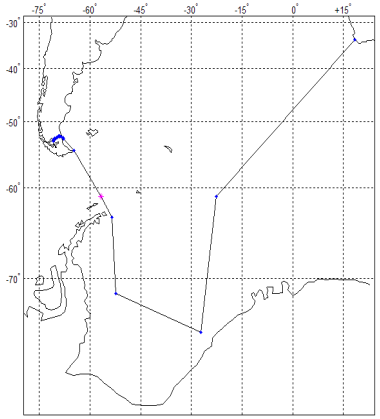
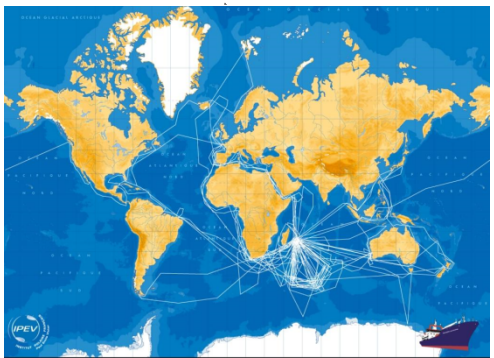
# GMOS: Troposperic & Oceanographic Campaigns







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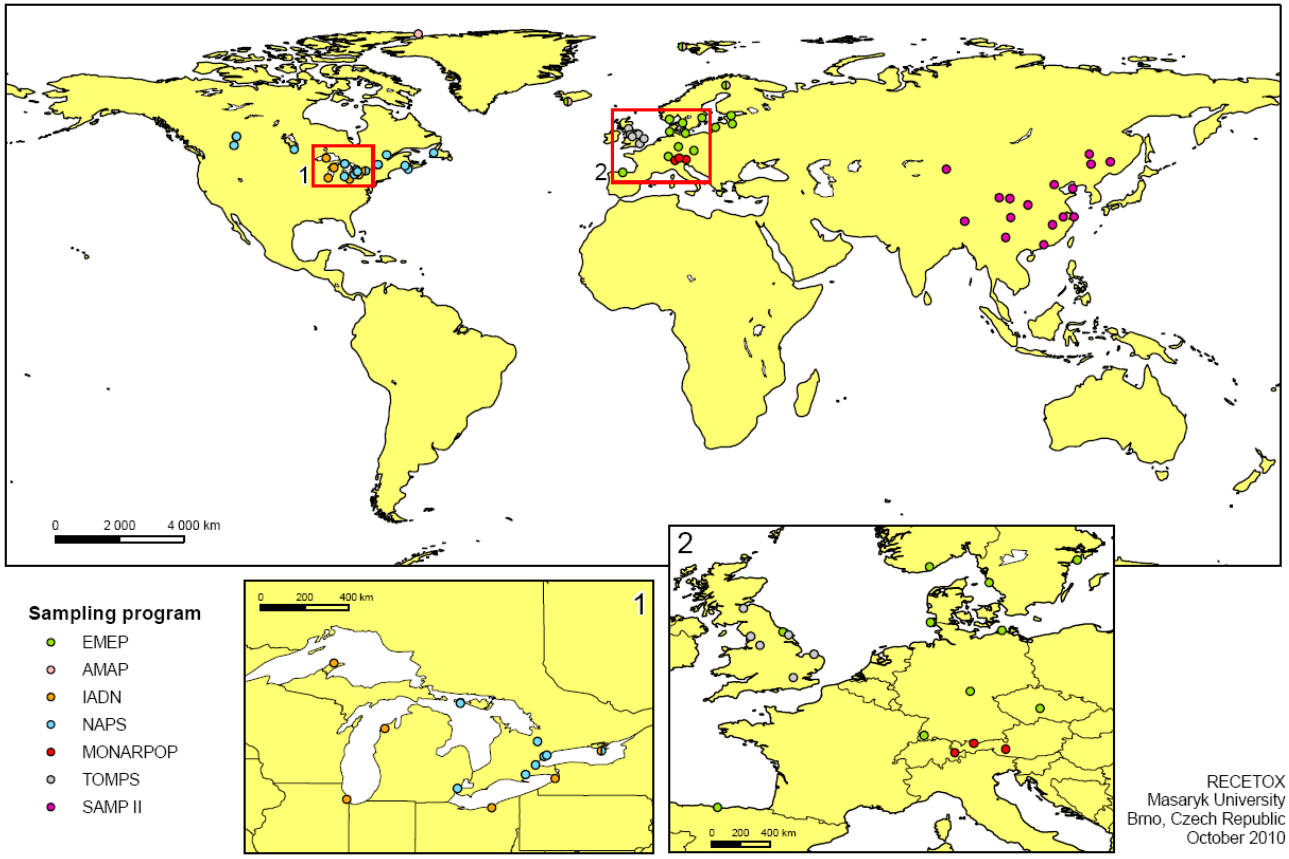
# POPs: long-term Active Air Monitoring Networks




**www.ebas.nilu.no operated by NILU**

**https://www.ec.gc.ca/rs-mn/default.asp?lang=En&n=BFE9D3A3-1Archiv**

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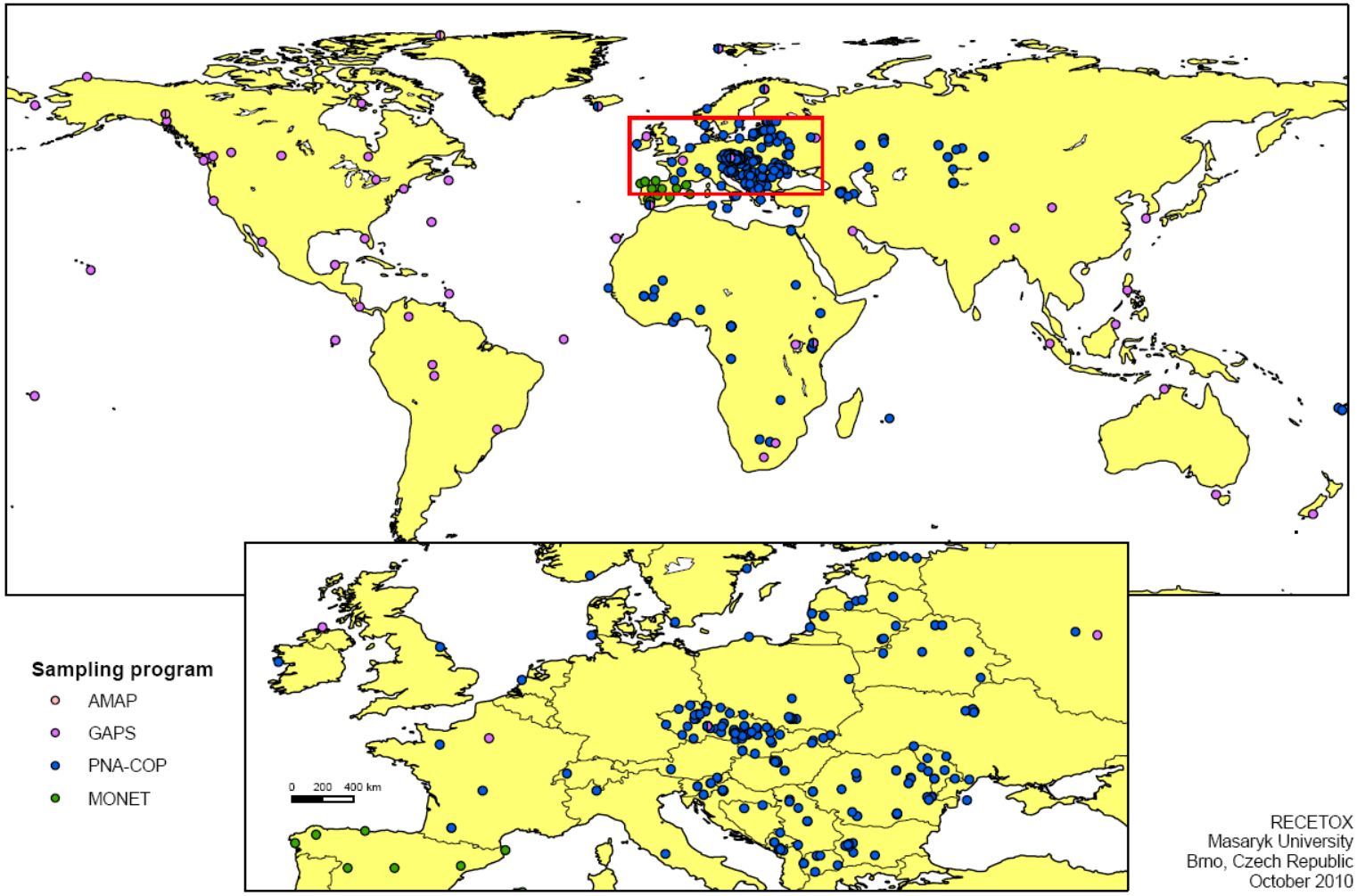
# POPs: Passive Air Monitoring Networks



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# Challenges

- Strengthen linkages between SBAs
- Establish best practices to use data to assess impact and optimize anthropogenic processes
- Exchange knowledge on models,
  - uncertainties & assumptions, degree of validation
- Continued focus on capacity building, esp. in developing countries
  - must exchange knowledge and not just data

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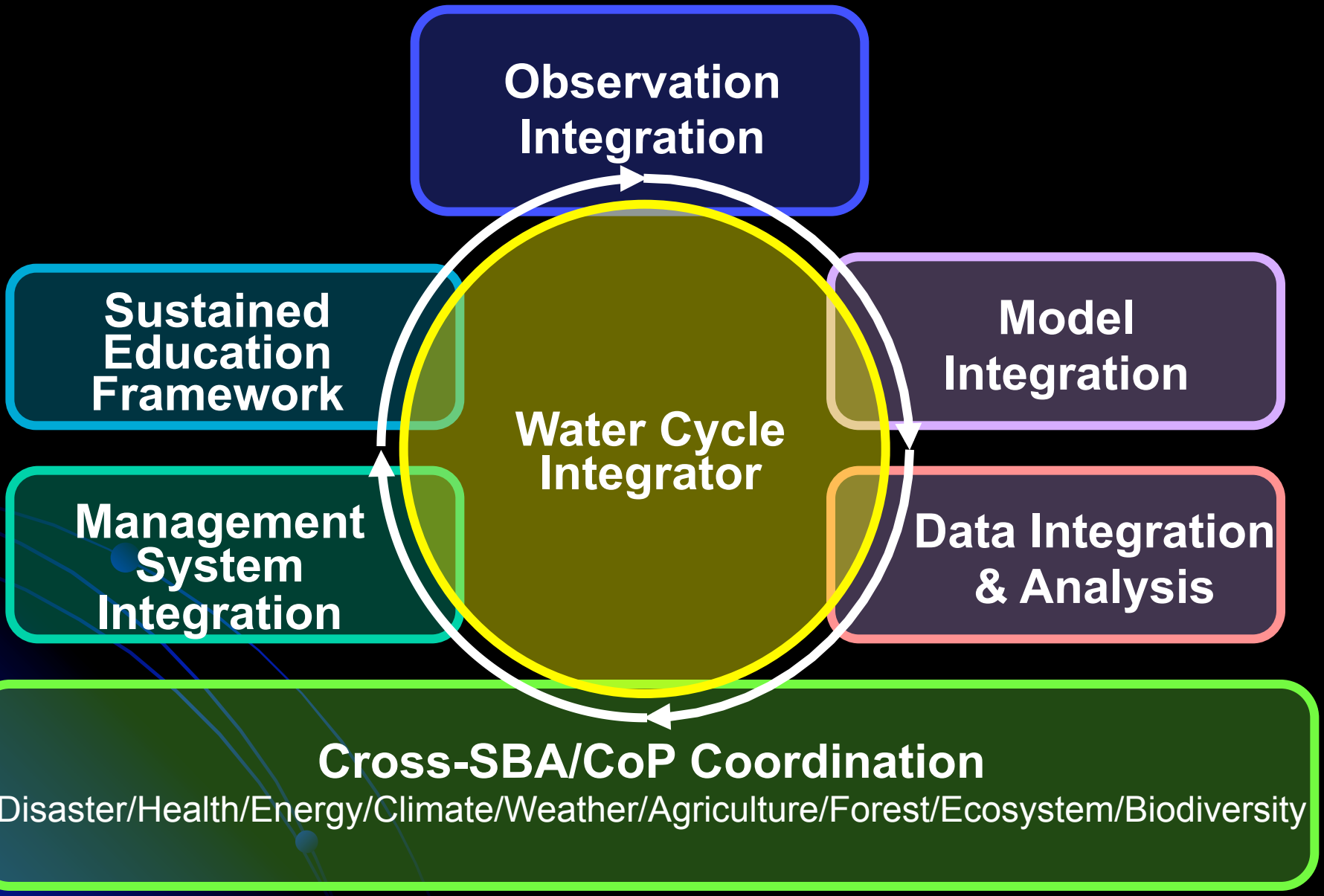
# WA-01-C4: Global Water-Quality Products and Services

- Develop improved Earth observation derived **water-quality datasets** through algorithm development, atmospheric correction and standardization of data processing and products
- Conduct demonstration projects on the value of Earth observations for **water quality management** (e.g. expanding the ChloroGIN project)
- Develop a **riverine water-quality data assimilation system** primarily based on in-situ water quality data from the GEMS archive and constituent transport models. Develop integrative hydrologic/water-quality models focused on sediment and nutrients
- Scope water-quality information systems to collate, manage and provide public access to **international water-quality datasets**.
- Coordinate efforts of the water-quality community, working with other GEO communities such as **Oceans, Health and Biodiversity** (related freshwater ecosystems)

# Integrated & Coordinated Approach



GEO-Portal - GEO-Portal Home - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.geoportal.org/web/guest/geo_home

BBC NYT SFC LAT DP wmo wmo-portal UNDSS GTN-R GTrans SDO WRS Wageningen La Mutuelle

Share Browser WebEx

GEO - Group on Earth Observations | G... | GEO-Portal - GEO-Portal Home

GROUP ON EARTH OBSERVATIONS | GEO Portal

provided by: esa

HOME | ABOUT GEOPORTAL | SEARCH GEOSS | go | MAP VIEWER | CONTACTS

GEO Portals Usability Survey

BROWSE RESOURCES BY SOCIETAL BENEFIT AREAS

- DISASTERS
- HEALTH
- ENERGY
- CLIMATE
- WATER
- WEATHER
- ECOSYSTEMS
- AGRICULTURE
- BIODIVERSITY

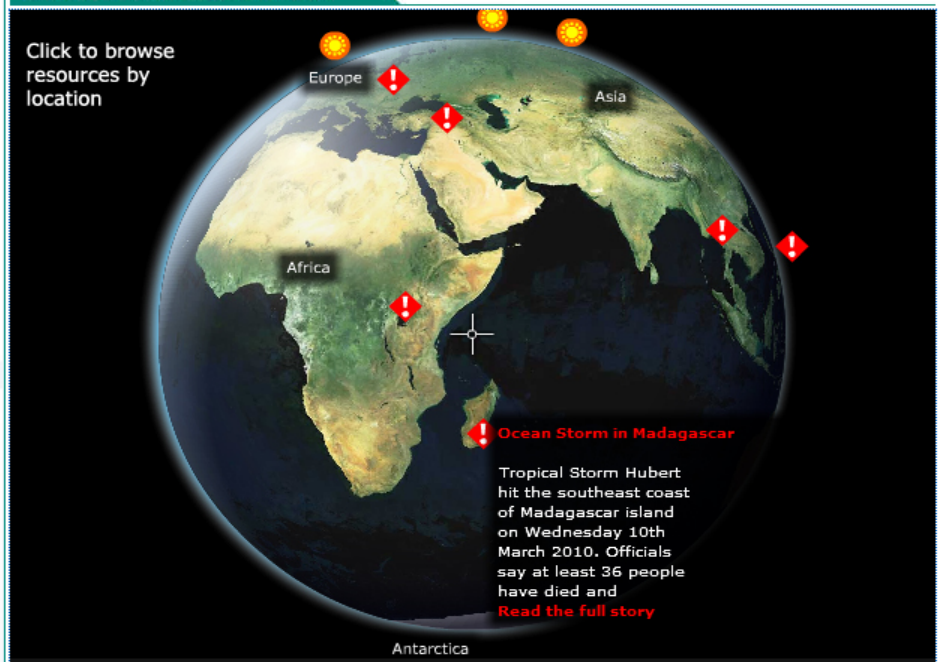
CAPACITY BUILDING

GEOSS Resources for Haiti Earthquake

## WELCOME TO GEOPORTAL

**The GEOportal provides an entry point to access remote sensing, geospatial static and in-situ data, information and services.** More ...

BROWSE RESOURCES BY LOCATION




zoom - | Change Surface Texture | Find a place | Key

GEONETCAST

GEOSS Common Infrastructure (GCI)

- About GCI
- REGISTER YOUR RESOURCES
- Standards and Interoperability Registry
- More about Registry System
- Best practices wiki
- GEO SECRETARIAT
- News

GEOSS AUGMENTATION

- Develop and Test your Services and Processing Components
- AIP-3
- GEOSS Clearinghouses Test Area

BREAKING NEWS

EO NEWS

javascript:getFlash();

Start | GEO-Portal - GEO-... | Novell GroupWise - ... | To_Do | 2nd Symposium | presentations | GEO_intro.ppt | GEOSS_water.ppt | 1:41 PM

# GCI Architecture

GEOSS User

Discovery & Access


GEOSS Common Infrastructure

GEOSS Registries:
- Standards & Interoperability
- User Requirements
- Best Practices Wiki

Discovery and Access Broker (DAB)

Semantic Component*

Service Monitoring

Clearinghouse (CH)

Integrated/Federated EO Discovery/Access Systems
e.g. GENESI, CWIC, FedEO*

Register

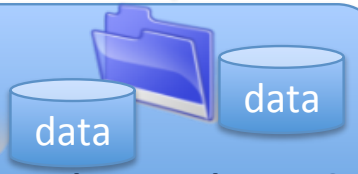
Component & Service Registry (CSR)

real-time search

Resources Providers

GEOSS Resources

harvest

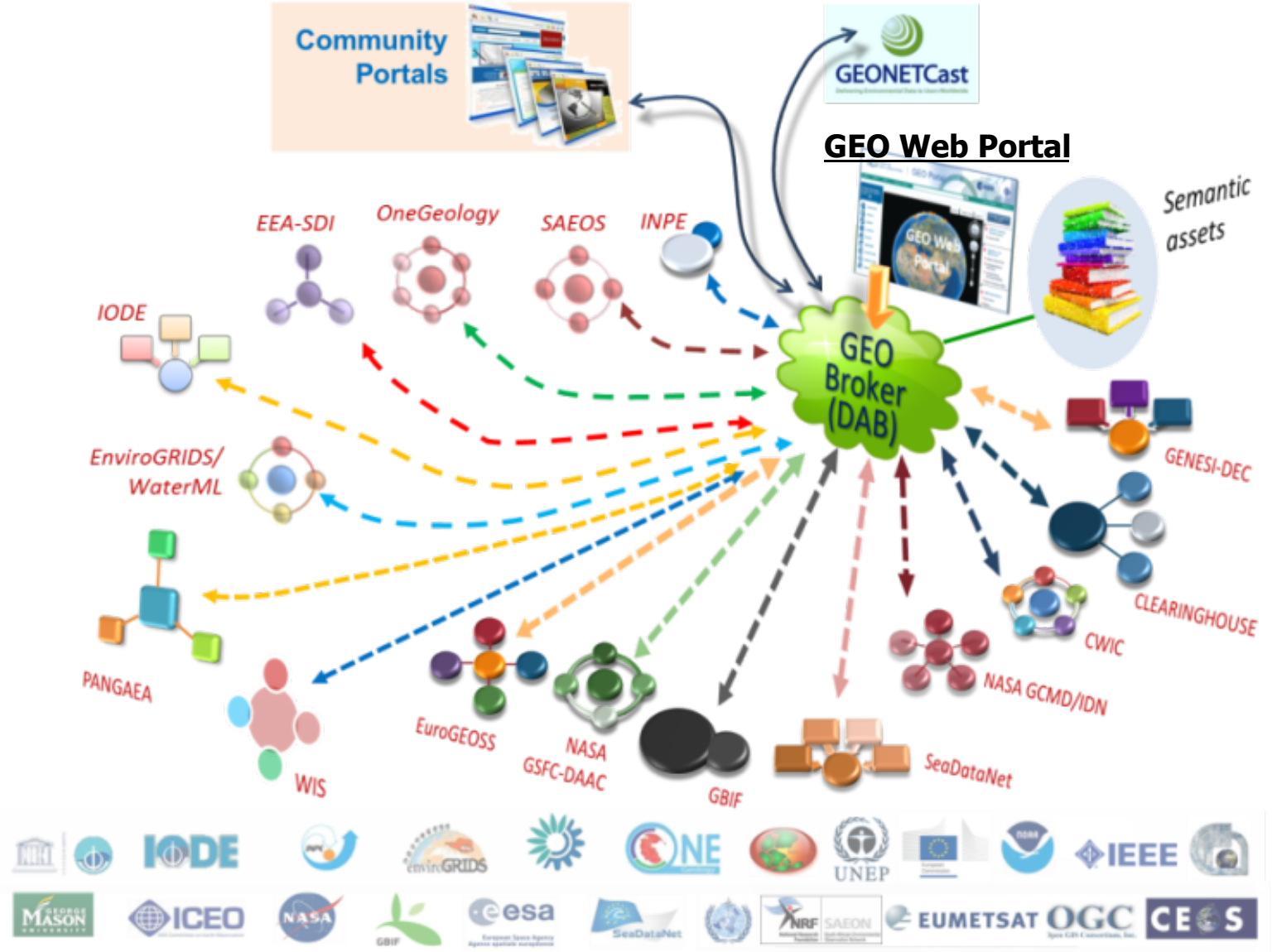



Services and SW Applications
e.g. Software, Data Access, Processing, Community Portals, Documents

EO data Catalogues & Repositories
e.g. IDN, INSPIRE, geo.data.gov

* Prototype capabilities

# GCI Brokering Framework



# Current GCI Services to users (1)

GEOSS resources search in GEO Web Portal through:

- Free text
- Browsing via Societal Benefit Areas (SBAs)
- Semantic search
- Refined search

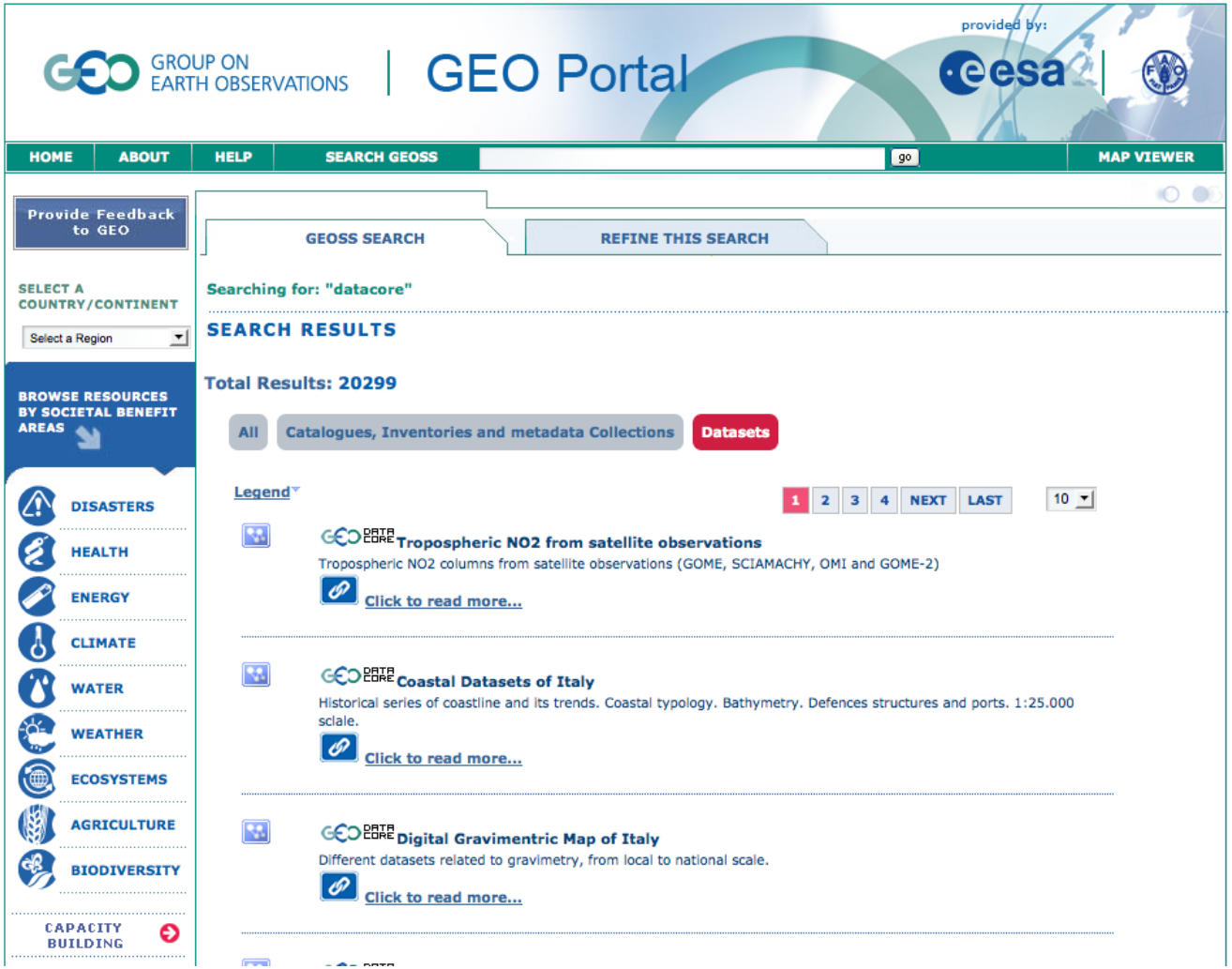
- Distributed search of catalogues and inventories via Data Access Broker
- Direct access to data & resources

# Current GCI Services to users (2)

Search results display according to resources categories.


Ranking from data Access Broker

Filtering Options



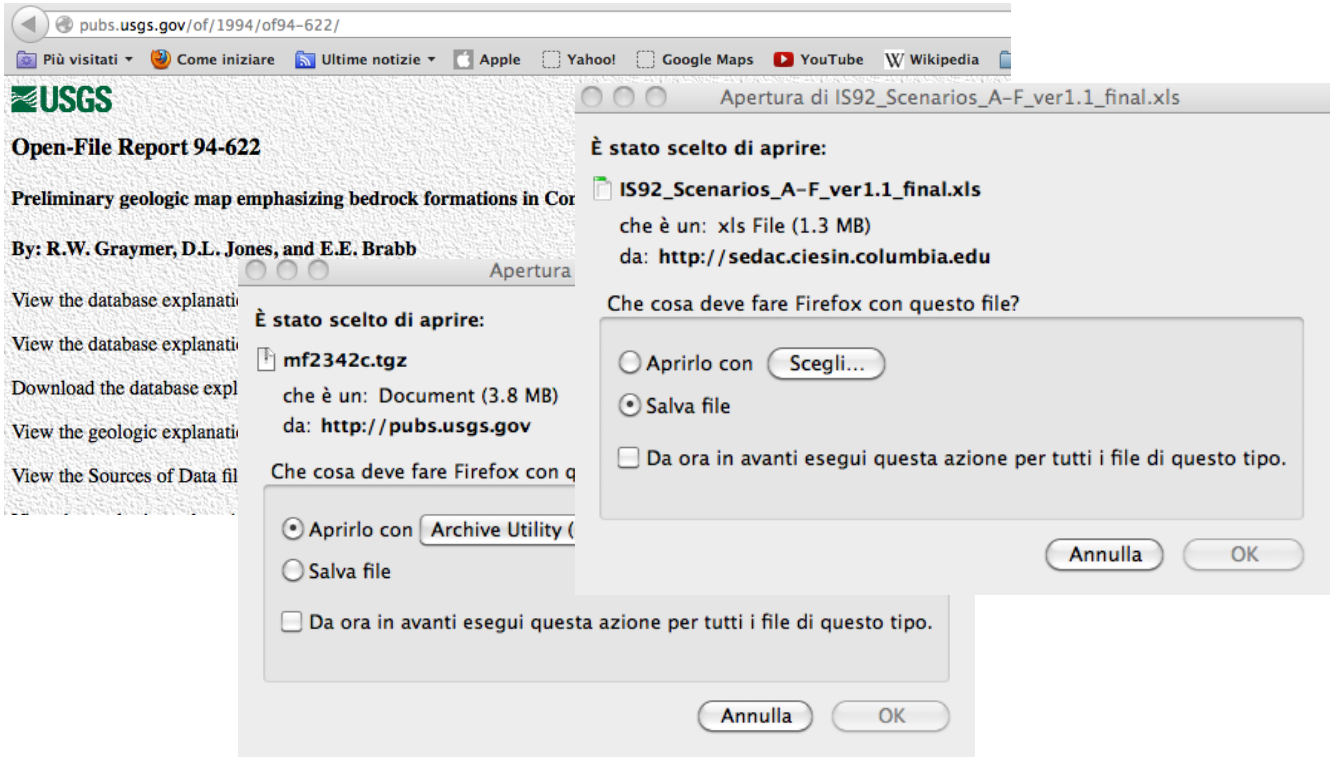
# Current GCI Services to users (3)

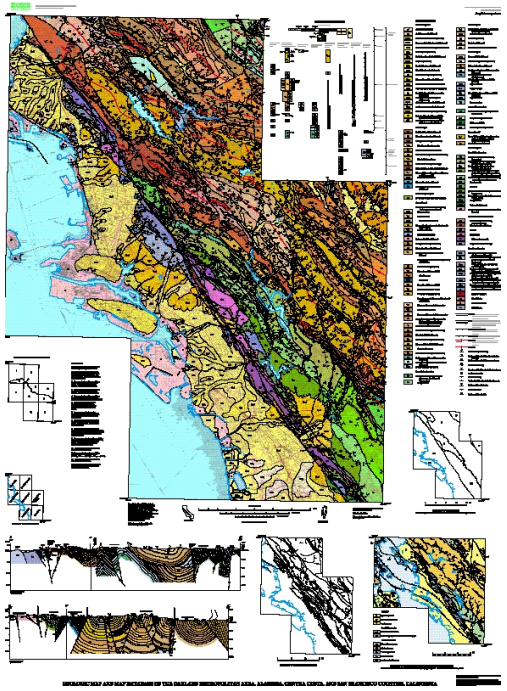
Search results providing: description of the resources, links to resources (e.g. Web pages, WMS/WFS), Google-Earth KML files, downloadable items, etc.

**Geologic map and map database of the Oakland metropolitan area, Alameda, Contra Costa, and San Francisco Counties, California**

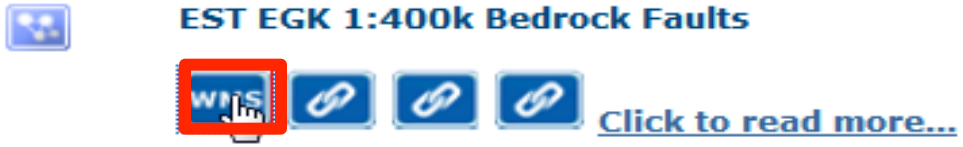
This database and accompanying plot files depict the distribution of geologicmaterials and structures at a regional (1:24,000) scale. The report isin ...

Web Link .zip file Pdf Image

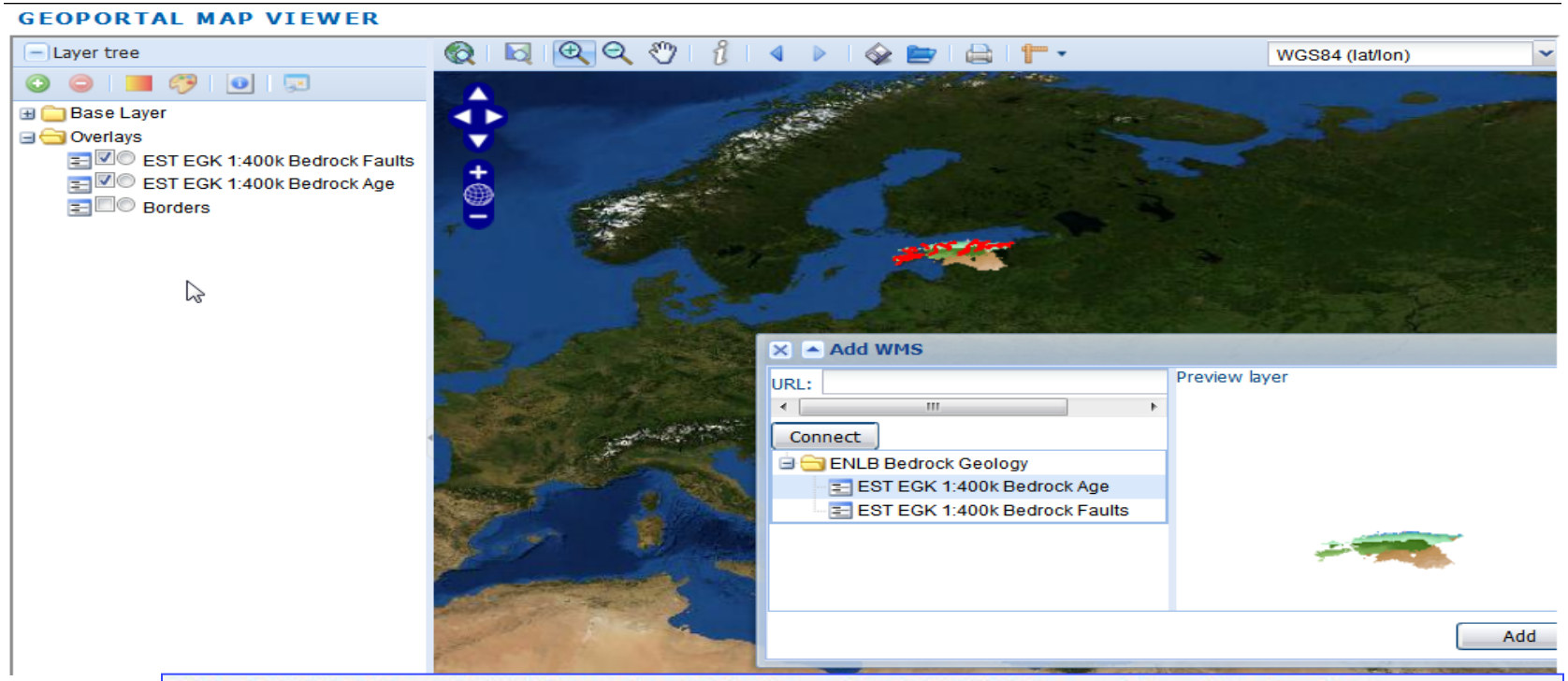


# Current GCI Services to users (4)




Web Map Service (WMS)
Web Feature Service (WFS)




ftp

# Achievements

| | Capacity | Total Records | Number of Granules | GEOSS Data Core Records | Notes |
|---|---|---|---|---|---|
| EEA S | | | | | |
| SeaDa | | | | | NET- |
| OneGe | | | | | |
| South A Network | | | | | |
| GEOSS | | | | | |
| Knossos | | | | | |
| NASA GI | | | | | |
| WMO Inf | | | | | |
| PANGAEA | | | | | |
| EGASKR | | | | | |
| Web-Servi | | | | | |
| Internation Informatio | | | | | |
| GENESI-DE | | | | | ED |
| NOAA Unifi | | | | | |
| EuroGEOSS | | | | | |
| Compusult C | | | | | |
| INPE Remote | | | | | vaiting for the st |
| GRAND TOTAL | | 15835428 | | 1231250 | |

- About 20 *brokerable* capacities/ systems/Communities
- More than 15 Million *potentially* Discoverable resources
- More than 1.2 million are GEOSS Data Core
- About 400,000 requests per year

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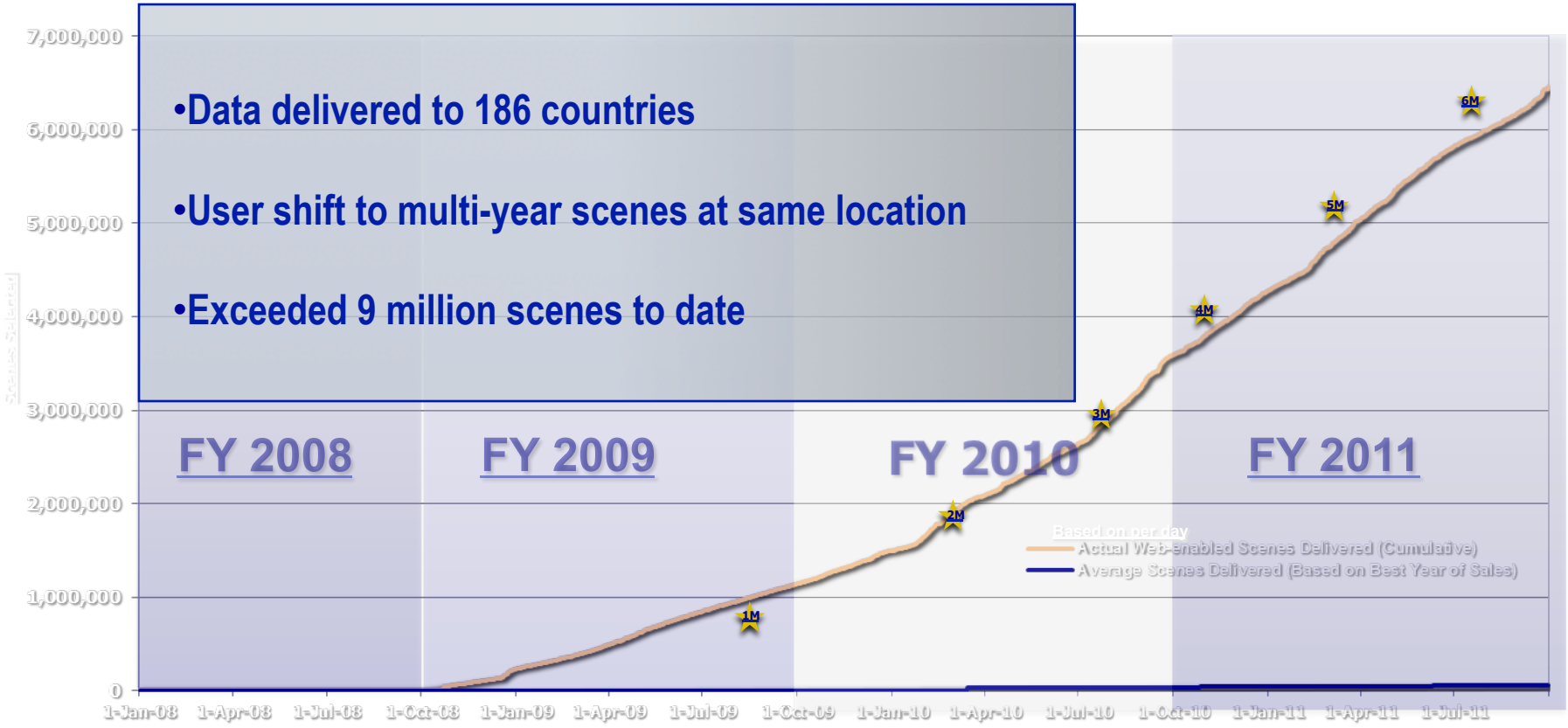
# Landsat Internet Data Distribution




Daily Average = 53 scenes for best year of sales (2001)

Daily Average ≅ 5,700 scenes of web-enabled data delivered

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# GEOSS: for scientists

- **GEO is a framework to promote international cooperation.**
  - **Earth observing systems of the future: built by scientists, informed by GEO.**
  - **bringing together data architecture experts, scientists, users, and capacity-building specialists.**
  - **visibility as data/networks/systems contributed to GEOSS.**
  - **potential support for research leading to GEOSS implementation.**
    - ***but GEO is not a funding mechanism!***

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# GEOSS: for scientists

**GEO has a niche in facilitating the delivery of global datasets to improve modeling.**

- GDEM
- Global land cover
- Digital geological map data
- Global meteorological and environmental data

- Virtual constellations
  - precipitation
  - land surface imaging
  - ocean surface topography
  - atmopheric chemistry
  - ocean colour radiometry
  - ocean surface vector winds

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# Rationale for Continuing GEO

## 1: Addressing urgent global challenges

***Humanity currently faces enormous and complex challenges that will only continue to grow over the next few decades***

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# Rationale for Continuing GEO

- **2: Support for Sustainable Development**

- ***"Rio+20" Outcome Document recognized a specific***
- ***role to be played by GEOSS in sustainable***
- ***development***

# Rationale for Continuing GEO

- **3: Building on Accomplishments of GEO**

- ***The flow of data from the various countries and international organizations involved in GEOSS implementation should not stop***




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# Added-value of GEO

- Access to EO data/information/services/products
- Data sharing and interoperability
- Networking and coordination
  - Regional/national coordination GEO
- Governance structure
  - Voluntary, best efforts
- Political dimension

- ***for informed decision-making***
- ***to address urgent global challenges***
- ***to support sustainable development***

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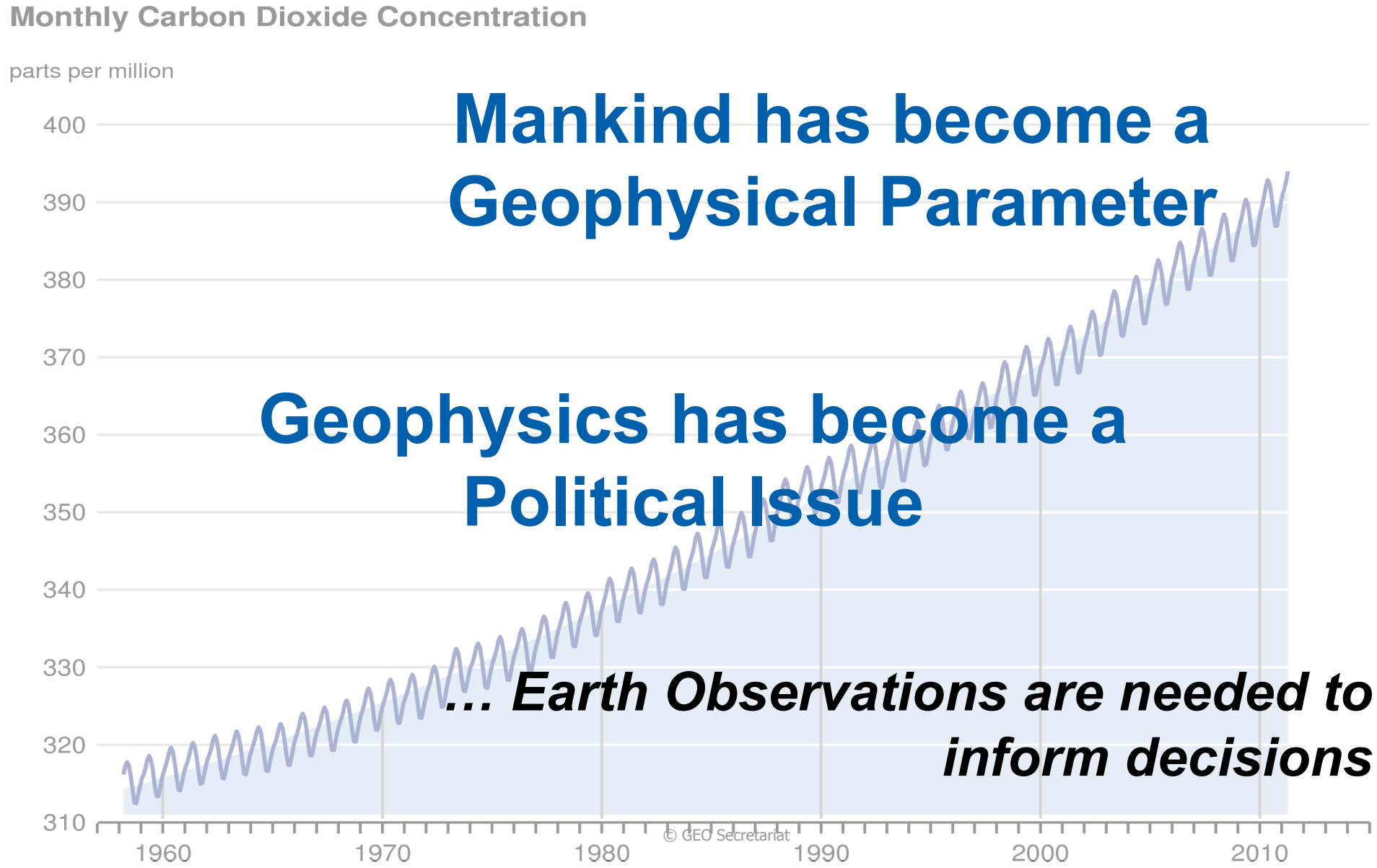


# Mankind has become a Geophysical Parameter

# Geophysics has become a Political Issue

***… Earth Observations are needed to inform decisions***

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**"The Global Earth Observation System of Systems (GEOSS) is a coordinating and integrating network of Earth observing and information systems, contributed on a voluntary basis by Members and Participating Organizations of the intergovernmental Group on Earth Observations (GEO)."**

- ***To support informed decision making for society, including the implementation of international environmental treaty obligations.***

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# Thank you!

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# *Key Outputs for C1*

- Meningitis Environmental Risk Information Technologies (MERIT) aims to align with WHO information needs for **reactive and preventive vaccination**. 5th MERIT meeting to conduct a five-year strategic review. A protocol for testing in Benin, Togo, Nigeria, and Chad.
- **Surveillance and Prediction on Seasonal Influenza:** NASA initiated mathematical model development and analysis for Publicly-available influenza data for European region
- **AIRNow-International** (AIRNow-I). currently managing and delivering real-time air quality information to 300 US cities, to be expanded to China and Brazil
- EPA with the European Environment Agency (EEA) to develop **"Eye on Earth" system**
- WMO **Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS)** continued (supporting MERIT) - Online dust model intercomparison and a median ensemble multi-model product is generated from different prediction models.
- **EO2HEAVEN**'s estimating of in-situ air pollution based geo-statistical inference data might prove valuable.

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# *Key Outputs for C2*

- NOAA actions: (i) Developing a Global Initiative for an Integrated Cholera Early-Warning System; (ii) Mapping environmental factors affecting the distribution of Leptospirosis; (iii) Determining the impact of climate variability, climate change and extreme events on the vulnerability of water sanitation systems (input for Atlas on Health and Env: GFCS connection); and (iv) Assessing coastal-ecosystem health and impact on vibrios, harmful algal blooms, and contaminants**.**
- The **Cholera Early-Warning System** initiative started with WHO by determining public-health needs: pilot to implement Global Information System (GIMS).
- US pilot project to build on existing operational NASA forecasts for cholera in the Gulf of Mexico.
- The **EO2HEAVEN** in Uganda to develop new methodological approaches and interdisciplinary tools to anticipate cholera epidemic outbreaks based on environmental, epidemiologic and microbiological information.

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# *Key Outputs for C3*

- Started initial phase in identifying priority diseases: dengue fever, malaria, Rift Valley fever and Lyme disease, each of the initial contributors
- (India (ICMR), Brazil (University of Parana), France (CNES), US (IRI, NASA) are identifying their priority disease, study area, duration of activity, the possible outcomes, and available resources and potential partners.
- Washington DC meeting (Feb 2012) to identify requirements for Earth observation products for vector control and public health policies.
- Participants also agreed to contribute to the CEOS Earth Observation Handbook by writing a "Health" chapter.

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# *Key Outputs for C4*

- EPA, Health and Climate Foundation (HCF) and ECJRC jointly to integrate transdisciplinary, holistic, Community of Practice approach linking two societal benefit areas
- **Global Leptospirosis Environmental Action Network (GLEAN)** - to improve prediction, prevention, detection and intervention
- Heat health forecasts, Met Services on Climate driven NCD in urban.
- ECJRC on **Cognitive Atmospheric Monitoring Systems (CAMs)** – in situ+earth observation for impact assessment in public health threats. Focus on two areas
  - reduction of adverse respiratory health outcomes among residents exposed to ambient pollution (urban health forecasting)
  - establishing an operational system of tools for meningitis outbreaks due to sub-Sahara dust storms (in the frame of MERIT).