Earth Observations & the Importance of Broad, Open Data Policies

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We came all this way to explore the moon, and the most important thing is that we discovered the Earth.

— William Anders (1968)  
Apollo 8 Astronaut
What Happens in the Arctic, Doesn’t Stay in the Arctic
Global Sea Surface Temperatures
NO$_2$ Images for 15 April 2004

Source: NASA
Lake Chad
Africa

“One Planet, Many People”

UNEP Atlas of Our Changing Environment
Urban Growth -- Las Vegas, Nevada

Population: 358,000  1,560,000
Land Subsidence

- More than 80% of the 17,000 mi$^2$ of land affected by subsidence in the US is a consequence of ground-water extraction. -- National Research Council, 1991

- Most of the ground-water related subsidence is caused by the compaction of susceptible alluvial aquifer systems that typically accompanies overdraft of these systems.
Fault-Controlled Ground-Water Subsidence
Las Vegas, Nevada
Tucson Arizona

90 mm of subsidence from November 1992 to January 1997
Global Atmospheric Concentrations of CO$_2$

Observations – In, On, and Around the Earth
To realize a future wherein decisions and actions, for the benefit of humankind, are informed by coordinated, comprehensive & sustained Earth observations & information.
Integrating Earth Observations Across Many Platforms to Benefit Society
8 Societal Benefit Areas

Biodiversity and Ecosystem Sustainability

Water Resources Management

Disaster Resilience

Sustainable Urban Development

Energy and Mineral Resources Management

Public Health Surveillance

Food Security and Sustainable Agriculture

Infrastructure and Transport Management
103 GEO Members

Number of Members (2016)

- Africa: 27
- Americas: 16
- Asia/Oceania: 19
- C.I.S.: 7
- Europe: 34

Total: 103

Number of Members by year
95 Participating Organizations
more than 100 Public Providers…
First half of 2016
More than 4 Million Queries
Brokering Organizations

UBER

GEO

airbnb
GEOSS Hypercube
Precipitation in Greece (1946-2013)
Global Precipitation (1946-2013)
Land Use change in Europe (1984-2010)
Major Floods in Europe (1984-2010)
Land Use change in Europe (1984-2010)
Demography in Europe (1984-2010)
West Africa drought observations (1995–2013)

East Africa drought observations (2010–2012)
West Africa crop prediction (2014-2015)

West Africa Land Use (1990-2005)

Space

Time

Themes
Precipitation in Africa (1992-2012)
Global water bodies (1998-2005)

Space

Faults monitoring in South America (1980-2014)

Major disasters in South Asia (1992-2005)

Precipitation in Asia (2005-2010)

Crops obs. Asia (2005-2010)

Ecosystems mapping in Europe (1987-2010)

West Africa Land Use (SB) (1990-2005)

Climate predictions (2012-2032)

GCI Searches

Themes

Time
GEOSS Implementation Requires: *Data Sharing Principles*

- Full and Open Exchange of Data -- Open by Default
- Data and Products at Minimum Time Delay and at Minimum Cost
- Free of Charge or Cost of Reproduction
The Value of Open Data Sharing

- Research & Innovation
- Education
- Capacity Development
- Effective Governance & Policy Making
- Social Welfare
- Economic Growth
Before Open-Data Policy:  53 scenes/day
After Open-Data Policy:  5,700 scenes/day
Annual Economic Benefit

USA $1.70 B
International $400 M
Global Total $2.1 B
Canada’s Experience

RADARSAT Images Acquired by the Government of Canada

[Bar chart showing the number of images acquired from 1996-97 to 2012-13, with R1 and R1 + R2 phases highlighted.]
Australian Data Cube

‘Cubing’ Landsat Images

Source: Geoscience Australia
Data Cube Application

National Flood Risk Information Portal Australia

Source: Geoscience Australia
Continental Surface Water

- Water detection
- 15 Years of data from LS5 & LS7 (1998-2012)
- 25m Nominal Pixel Resolution
- Approx. 133,000 individual scenes in ~12,400 passes
- Entire archive of 1,312,087 tiles => $21 \times 10^{12}$ pixels visited
- 3 hrs at NCI (elapsed time) to compute

Source: Geoscience Australia
Transforming Our World: The 2030 Plan for Global Action - Article 76: “We will promote transparent and accountable scaling-up of appropriate public-private cooperation to exploit the contribution to be made by a wide range of data, including Earth observation and geospatial information, while ensuring national ownership in supporting and tracking progress.”
AfriGEOSS
Implementing GEOSS in Africa
There are currently 15 Americas’ Caucus Member Countries:

- Argentina
- Bahamas
- Belize
- Brazil
- Canada
- Chile
- Colombia
- Costa Rica
- Ecuador
- Honduras
- Mexico
- Panama
- Paraguay
- Peru
- United States

Goal is to engage:

All Countries and Participating Organizations in North, Central, South America, and the Caribbean, and Global Partners working in the Americas.
Unleashing the Power of Earth Observations

• Broad, open data policies are needed for global monitoring and transparency

• Must leverage investments being made by all countries

• Citizens, globally, deserve more
Countries have borders; Earth observations don’t.

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