Space-Based Earth Observations to Support Sustainable Development:

Contributions from the Committee on Earth Observation Satellites (CEOS)

Dr. Stephen Briggs
European Space Agency

UNOOSA “Space for Sustainable Development” Seminar
Rio+20 Conference
19 June 2012

Global Trends Since Rio '92

- World population growth from 5 billion to 7 billion
- Increases in global CO_2, N_2O, and CH_4 concentrations
- World's Gross Domestic Product increased by 70%, with per capita GDP growth of 80% in Developing Countries
- Recent growth based on continued drawdown of resources
  - Rapid reduction in fossil fuel reserves and tropical forest areas
  - 27% per capita increase in natural resource use
  - 12 million hectares a year in lost land productivity
  - 50% global mangrove loss in coastal areas
  - More than half of all accessible freshwater (1% of total water on Earth) already used directly or indirectly by humankind
- Global warming - sea level rise, glacial melt, icecap shrinkage
- Rapidly accelerating species extinction rates
- Evidence of a new epoch: The "Anthropocene"

The Imperative for Sustainable Development is Greater than Ever

The Path toward Sustainable Development

- 1992 Rio Earth Summit and Subsequent international meetings galvanized governments to cooperate to address pressing environmental challenges
  - Climate change
  - Biological diversity
  - Desertification
  - Forest conservation and management
  - Pollution control and reduction
- Yet sustainable development policies can succeed only with ***accurate information on the Earth system, to gauge societal impacts***
  - "You must measure it in order to manage it"
  - Enable informed decision-making at all levels of society
  - Support confidence building for national and collective action
  - Provide a factual and scientific foundation for implementation of major Multilateral Environmental Agreements (MEAs)

Quantifiable Targets and Goal-Setting

- Goal setting for sustainable development can succeed only through the use of clear, quantifiable targets
  - Numerical
  - Time-bound
  - Well-understood and socially acceptable
- Satellite-based Earth observation (EO) enables goal-setting and analysis of progress through:
  - Authoritative evidence, objective, validated
  - Baseline data against which change can be measured
  - Unbiased information for monitoring/compliance regimes
  - New derived information applications for environmental prediction, change detection, management, and mitigation
  - Measurements at all geographic scales, from local to global

The Unique Benefits of Satellite EO

- Global coverage
- Repeatable, consistent, objective, uniform measurements
- Rapid coverage, and revisit capability
- Long time series of data/information
- Complements aerial and *in-situ* measurements (land and ocean-based)
- Broadly-based technological maturity and innovation in:
  - Satellite instrumentation
  - Computing power and modeling capabilities
  - Information product development
  - Day-to-day applications and information services

"Providing earthlings with a reliable, continuous record of their planet's condition would seem a **sensible** aim in any circumstances. With the state of the atmosphere and oceans upset in ways whose consequences are not easily foreseen, and may well prove catastrophic, it becomes an **imperative**.

"Without EO, the world will feel its way into the future blind and ill-prepared. .."

The Economist

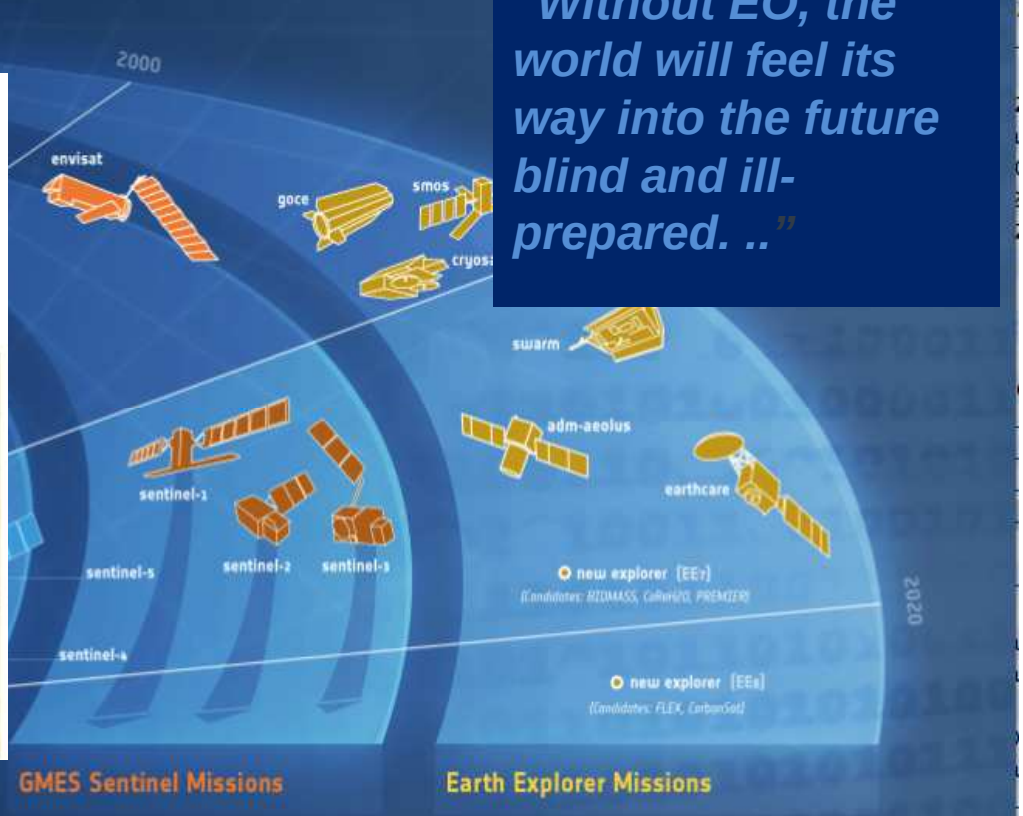
Earth-observation satellites

Something to watch over us

The Earth should be monitored more carefully

May 12th 2012 | from the print edition

ON APRIL 8th Envisat, Europe's largest Earth-



"A firm grasp of the basic **trends** is **a necessary pre-condition for understanding & informed policy**" .. "properly coordinated modest increases in the budget in America and the EU, and contributions from other powers .., could sort the problem out".

Coordination of Satellite Observations

- CEOS was established in 1984 under G-7 auspices
  - Focal point for international coordination of space-related EO activities
  - Optimize benefits through cooperation in mission planning, in development of compatible data products, formats, services, applications, and policies
- Operates through best efforts of its Agencies via voluntary contributions
- 30 Members (Space Agencies), 22 Associates (UN Agencies, Phase A programs or supporting ground facility programs)
  - 2012 Chair – the Indian Space Research Organisation
  - 2011-2013 Strategic Implementation Team Chair – NASA
- The space component of the Global Earth Observation System of Systems (GEOSS)
  - CEOS is implementing high priority actions in support of Group on Earth Observations (GEO) Tasks related to sustainable development
  - Expanded data access and capacity building are key CEOS priorities

CEOS Members and Associates

MEMBERS

Agenzia Spaziale Italiana (ASI)
Canadian Space Agency (CSA)
Centre National d'Etudes Spatiales (CNES), France
Centro para Desarrollo Tecnólogico Industrial (CDTI), Spain
China Center for Resources Satellite Data and Applications (CRESDA)
Chinese Academy of Space Technology (CAST)
Comisión Nacional de Actividades Espaciales (CONAE), Argentina
Commonwealth Scientific & Industrial Research Organisation (CSIRO), Australia
Deutsches Zentrum fürLuft-und Raumfahrt (DLR), Germany
European Commission (EC)
European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)
European Space Agency (ESA)
Geo-Informatics and Space Technology Development Agency (GISTDA), Thailand
Indian Space Research Organisation (ISRO) – **2012 Chair**
Instituto Nacional de Pesquisas Espaciais (INPE), Brazil
Japan Aerospace Exploration Agency/Ministry of Education, Culture, Sports, Science, and Technology (JAXA/MEXT)
Korea Aerospace Research Institute (KARI)
National Aeronautics and Space Administration (NASA), USA
National Oceanic and Atmospheric Administration (NOAA), USA
National Remote Sensing Center of China (NRSCC)
National Satellite Meteorological Center/Chinese Meteorological Administration (NSMC/CMA)
National Space Agency of Ukraine (NKAU)
National Space Research Agency of Nigeria (NASRDA)
Netherlands Space Office (NSO)
Russian Federal Space Agency (ROSKOSMOS)
Russian Federal Service for Hydrometeorology and Environmental Monitoring (ROSHYDROMET)
South African National Space Agency (SANSA)
Scientific and Technological Research Council of Turkey (TÜBITAK)
United Kingdom Space Agency (UKSA)
United States Geological Survey (USGS)

ASSOCIATES

Belgian Federal Science Policy Office (BELSPO)
Canada Centre for Remote Sensing (CCRS)
Council for Scientific and Industrial Research (CSIR)
Crown Research Institute (CRI), New Zealand
Global Climate Observing System (GCOS)
Global Geodetic Observing System (GGOS)
Global Ocean Observing System (GOOS)
Global Terrestrial Observing System (GTOS)
Intergovernmental Oceanographic Commission (IOC)
International Council for Science (ICSU)
International Geosphere-Biosphere Programme (IGBP)
International Ocean Colour Coordinating Group (IOCCG)
International Society of Photogrammetry and Remote Sensing (ISPRS)
Norwegian Space Center (NSC)
Swedish National Space Board (SNSB)
UN Economic and Social Commission for Asia and the Pacific (ESCAP)
UN Educational, Scientific and Cultural Organization (UNESCO)
UN Environment Programme (UNEP)
UN Food and Agriculture Organization (FAO)
UN Office for Outer Space Affairs (UNOOSA)
World Climate Research Programme (WCRP)
World Meteorological Organization (WMO)

**** UN organizations, specialized agencies, or their affiliates***

CEOS Focus Areas for Sustainable Development

- Climate
- Forests
- Agriculture/food security
- Disaster risk reduction
- Water
- Catalysts for sustainable development
  - Broad range of Earth observations
  - Full and open data sharing (“Data Democracy”)
  - Capacity building in underserved countries/regions

CEOS is committed to supporting the objectives of the 1992 Earth Summit, the 2002 WSSD, and Rio+20

Expected CEOS outcomes of 2012

1. **Improved Coordination of Space Agency Activities Related to Climate –** monitoring of Essential Climate Variables (ECVs), development of Fundamental Climate Data Records (FCDRs) etc.

2. **Progress Towards Established CEOS-GEO Priorities -** support to the GEO Forest Carbon Tracking Task, Global Forest Observations Initiative (GFOI), development of Strategy for Carbon Observations from Space, Geohazards Supersites initiative, etc.

3. **Considering CEOS Support to Further Key GEO Priority Initiatives -** dialogue on data requirements support to the G20/GEO Global Agricultural Monitoring (GLAM) initiative, contributions to integrated water cycle, GEO Biodiversity Observation Network, Satellite EO support to Disaster Risk Management, etc.

4. **Continued and Enhanced CEOS Outreach to Key Stakeholders: GEO, UNFCCC/SBSTA, G8/G20, and Others**

CEOS Partners

- Group on Earth Observations
- UN Organizations and their Secretariat staff
  - UN FCCC
  - UN CBD
  - UN ISDR
  - Others
- G-8 and G-20

For Further Reference

- CEOS Earth Observation Handbook: Rio+20 Edition (also at http://www.eohandbook.com)
- CEOS Rio+20 Fact Sheet: “Coordinating Space-Based Earth Observations for Sustainable Development and Societal Benefit”

www.ceos.org