

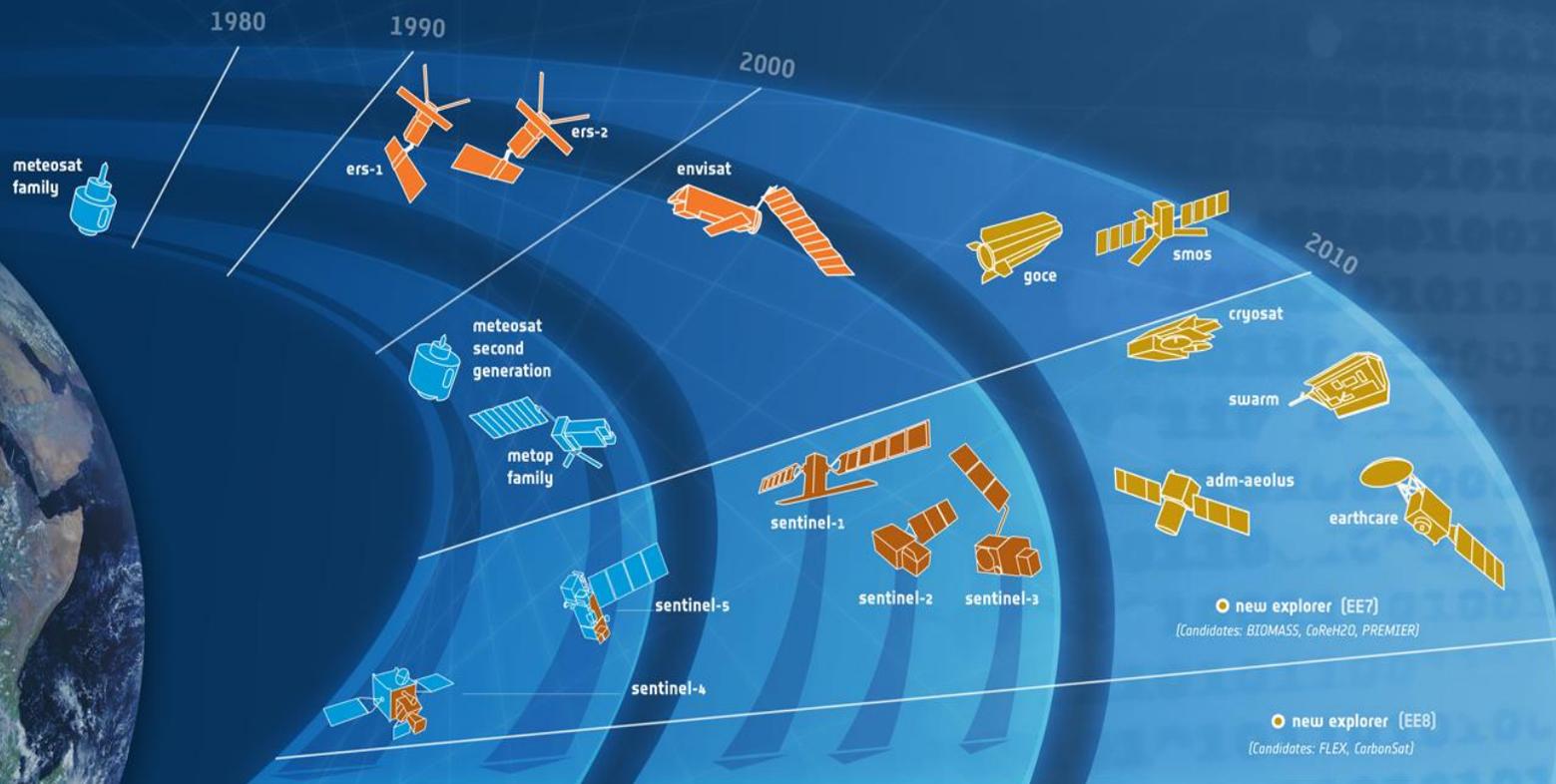


***SUSTAINABLE SPACE  
EXPLORATION***

Paul Cannock

04/12/2012

# Observing our Climate from Space



## Meteorological Missions

driven mainly by Weather forecasting and Climate monitoring needs. These missions developed in partnership with EUMETSAT include the Meteorological Operational satellite programme (MetOp), forming the space segment of EUMETSAT's Polar System (EPS), and the new generation of Geostationary Meteorosat satellites (MSG & MTG satellites).

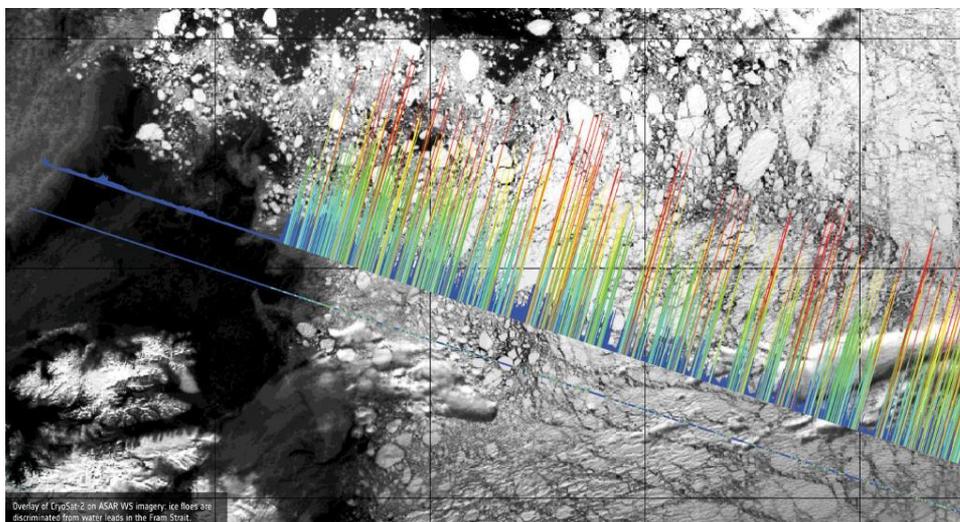
## GMES Sentinel Missions

driven by Users needs to contribute to the European **Global Monitoring of Environment & Security** (GMES) initiative. These satellite missions developed in partnership with the EC include C-band imaging radar (Sentinel-1), high-resolution optical (Sentinel-2), optical and infrared radiometer (Sentinel-3) and atmospheric composition monitoring capability (Sentinel-4 & Sentinel-5 on board Met missions MTG and EPS-SG respectively).

## Earth Explorer Missions

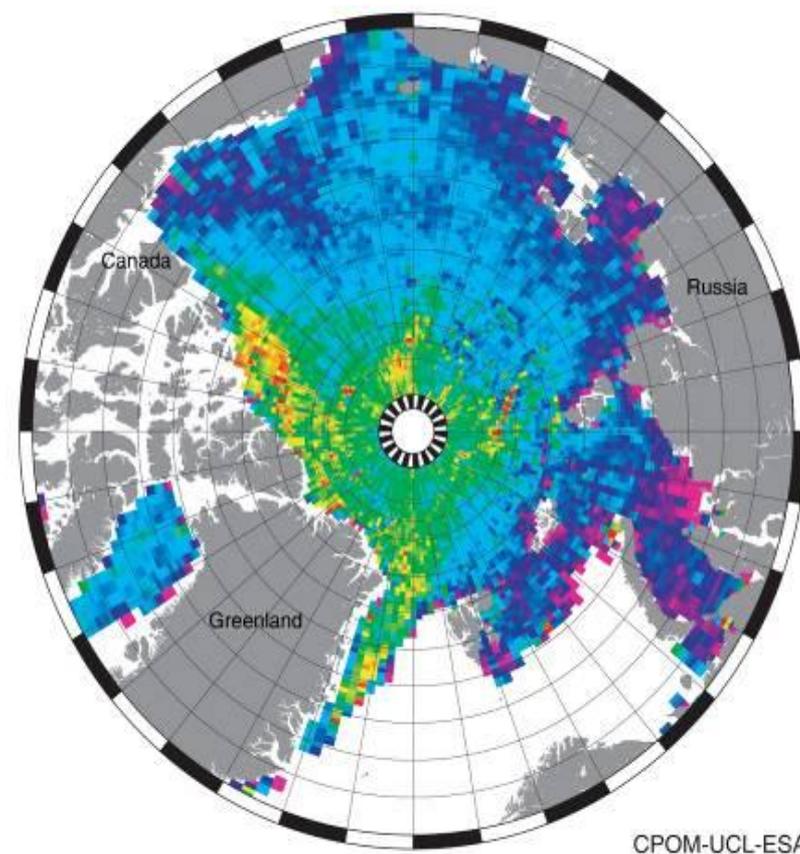
driven by Scientific needs to advance our understanding of how the ocean, atmosphere, hydrosphere, cryosphere and Earth's interior operate and interact as part of an interconnected system. These **Research** missions, exploiting Europe's excellence in technological innovation, pave the way towards new development of future EO applications.

- **1st map of sea-ice thickness** from ESA's CryoSat mission was revealed in June 2011
- **New understanding of the complex relationship between ice & climate**



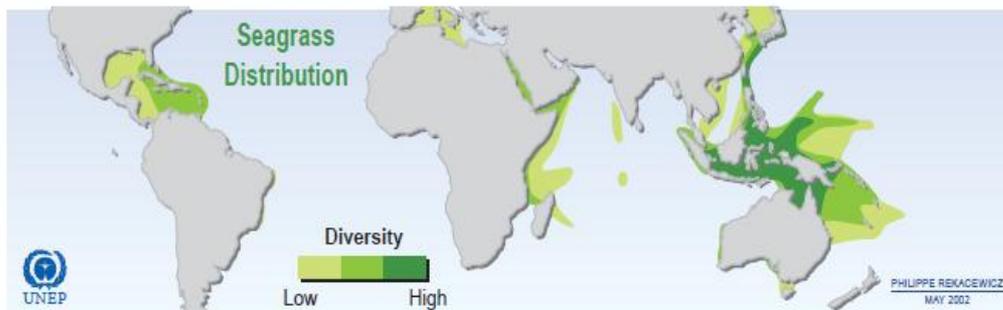
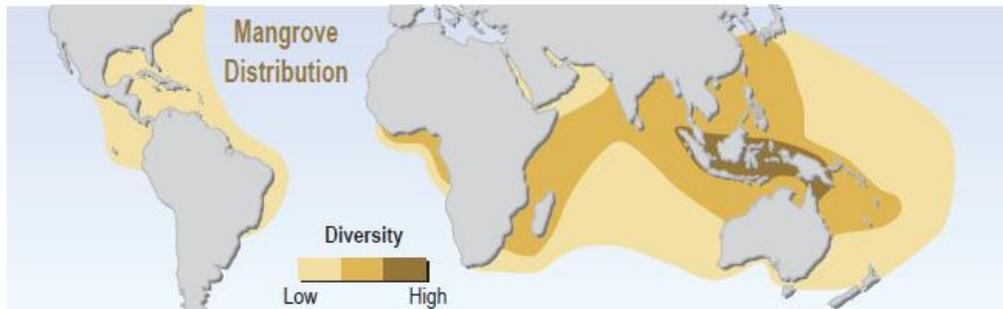
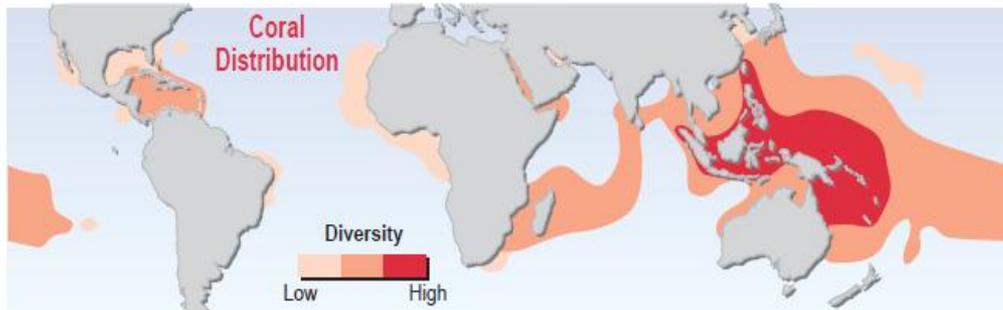
ESA UNCLASSIFIED – For Official Use

Sea ice thickness in the Arctic ocean  
(January/February 2011)



# Biodiversity loss from Space

## Global Distribution of Coral, Mangrove and Seagrass Diversity

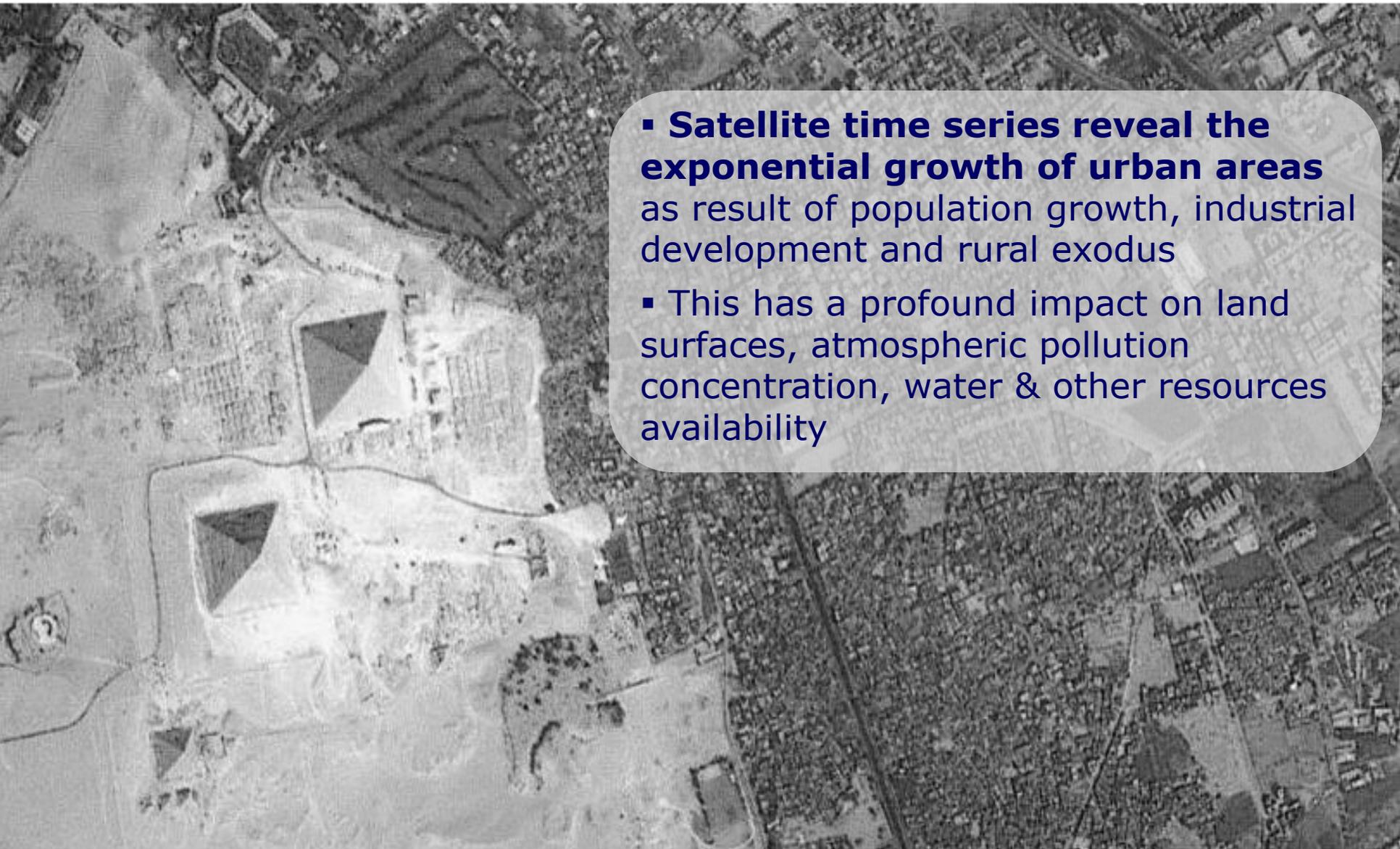


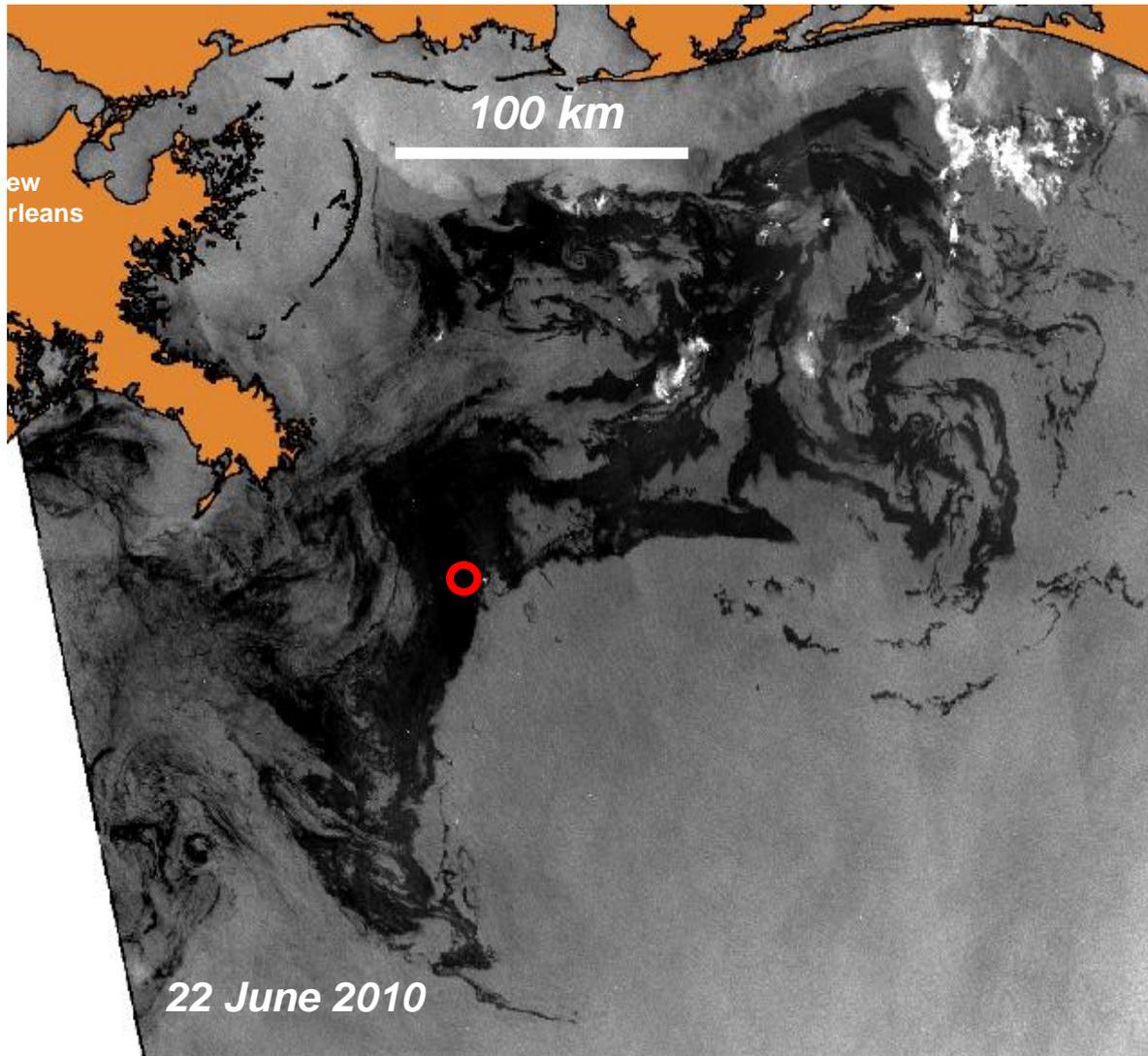
- One fifth of the world mangroves have been lost between 1980 and today



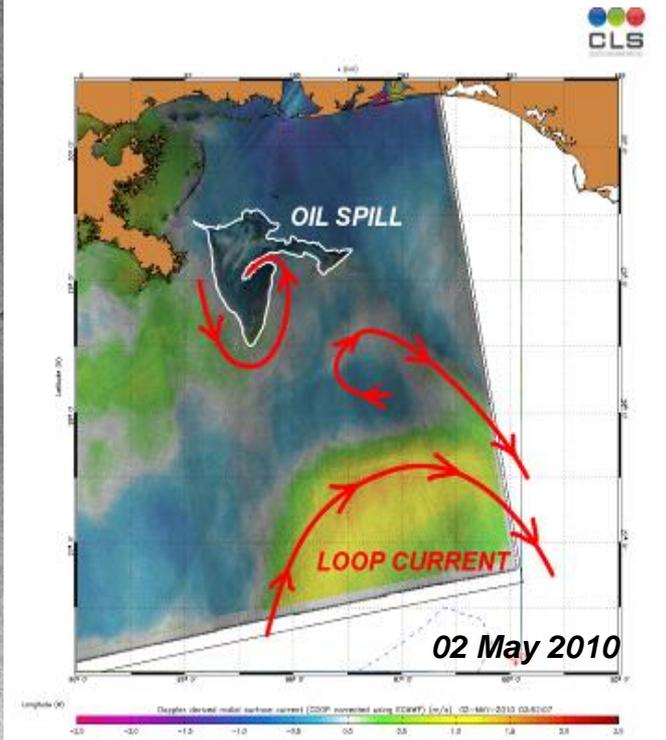
# Human Development and Land Use from Space



- 
- An aerial satellite image showing a dense urban area on the right and a desert landscape with several large pyramids on the left. The pyramids are arranged in a line, and the surrounding area is mostly flat and sandy. The urban area is characterized by a grid of streets and numerous buildings.
- **Satellite time series reveal the exponential growth of urban areas** as result of population growth, industrial development and rural exodus
  - This has a profound impact on land surfaces, atmospheric pollution concentration, water & other resources availability



## The Gulf of Mexico Oil Spill disaster from space (Envisat ASAR)



# Taking notice



BBC Home News Sport Weather TV Radio More...

NEWS

Watch ONE-MINUTE WORLD NEWS

## 'Tuned' images from Esa's Smos water mission

5.19.2010 12:22 pm

## BP Gulf Oil Spill Visible from Space (Pictures)

## Envisat keeping an eye on the Eyjafjallajökull volcano

21 April 2010

BBC NEWS 2 WEEKS AGO

## Cryosat-2 focuses on ice target

Cryosat has to be able to distinguish the floes from the leads The Cryosat-2 r its promise to make high-precision radar measurements of polar ice. The first spacecraft has been presented at... [FULL ARTICLE AT BBC NEWS](#)

## Science News

## Value Of Satellites Recognized For Conserving

ScienceDaily (Nov. 25, 2008) — Wetlands contribute to our lives in remarkable ways by

enlarge

## Glacier-melting debate highlights importance of satellites

1 Febru

The int Satellites help conserve Egypt's wildlife

FEATURES & SPECIAL REPORTS

Telegraph.co.uk

## Shocking new satellite images of Haiti show scale of earthquake devastation

7 March 2011 Last updated at 14:51 GMT

## Christchurch quake mapped from space

By Jonathan Amos  
Science correspondent, BBC

## Satellite Photos Show Devastation From Japan Quake

September 21, 2009 | 1 comments

## Ozone layer depletion levelling off

By merging more than a decade of atmospheric data from European satellites, scientists have compiled a homogeneous long-term ozone record that allows them to monitor total ozone trends on a global scale - and the findings look promising.

<http://www.scientificamerican.com/article.cfm?id=ozone-layer-depletion-leveling-off>

# ESA's commitment to Sustainability: 20/20/20



## 20|20|20

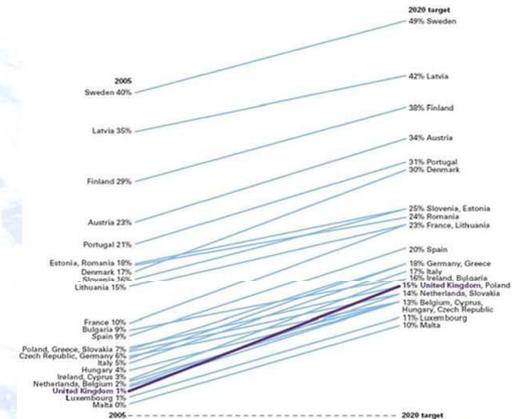


Agency commitment to mitigating environmental impacts, reducing CO2 emissions, promoting the use of renewable resources and improving efficiency.

The **20-20-20** targets:

-  20% reduction of CO2 emissions (T1)
-  20% improvement in energy efficiency (T2)
-  20% increase in use of renewable energy (T3)

....by the year 2020, referring to the baseline year 2007.



# Sustainable Development at ESA



ESA aims to become an environmentally, socially and ethically responsible organization, committed both as a corporate entity and as a space agency.



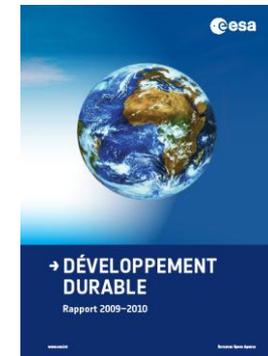
The Agency Framework Policy on Sustainable Development [ESA/C(2010)29] integrates dedicated commitments and goals for the future in three major areas of action:



**Program Activities**

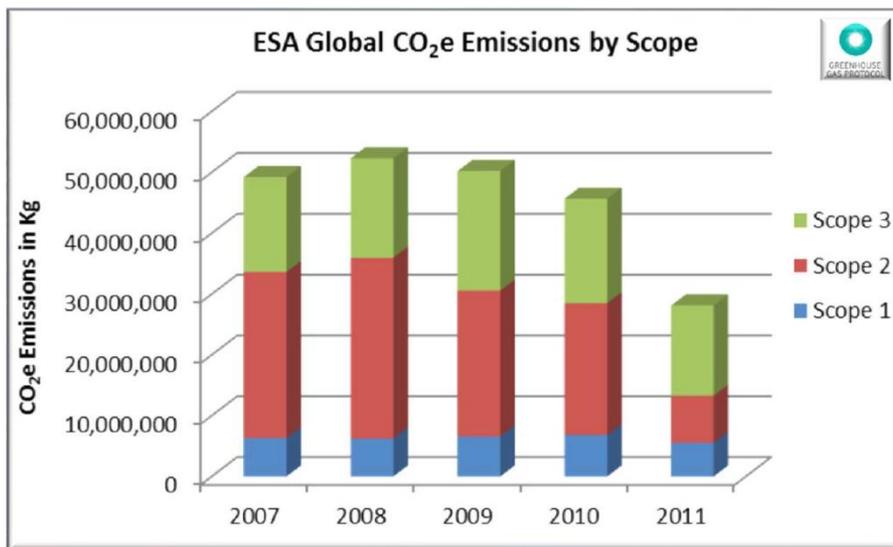


**Environment and Energy**



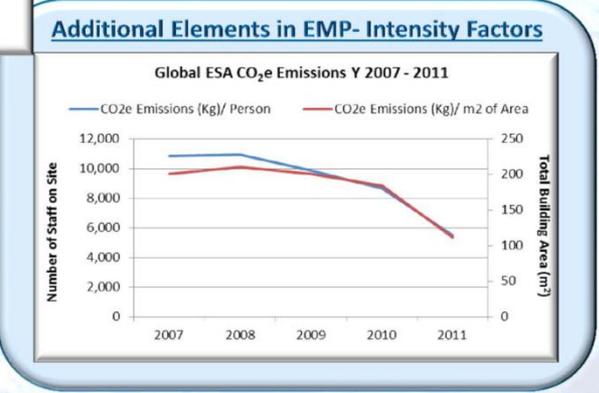
**Governance and Ethics**

# Sustainable Development at ESA: Global CO<sub>2</sub>e Emissions

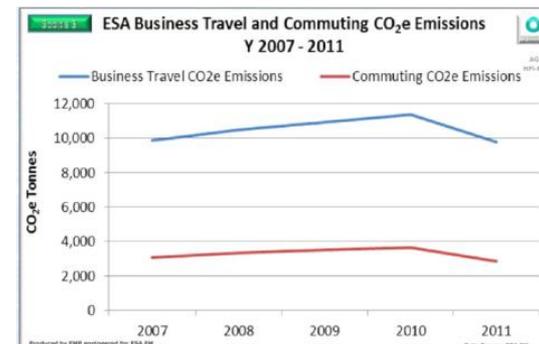
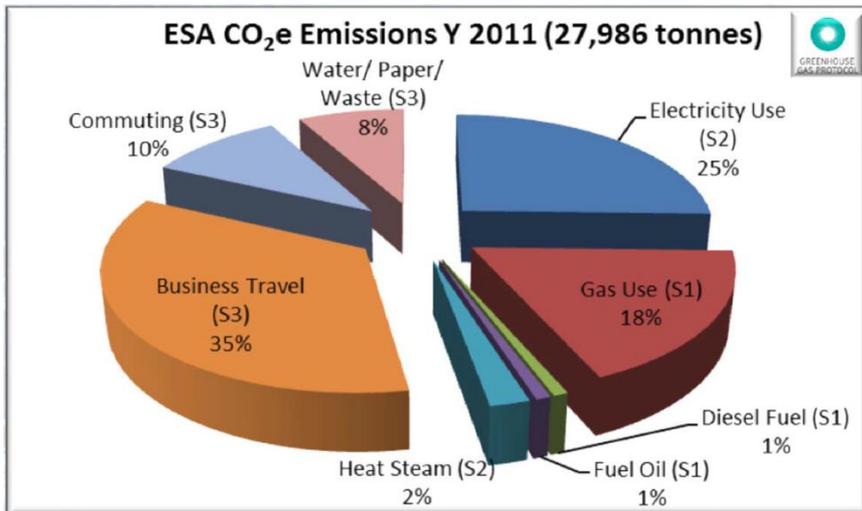
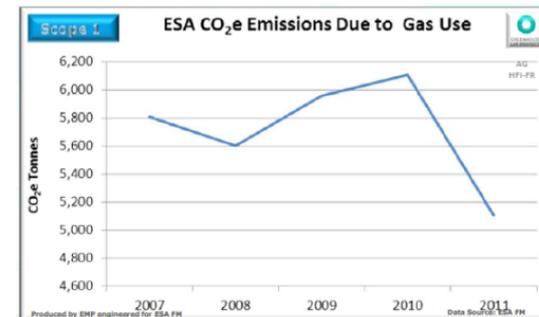
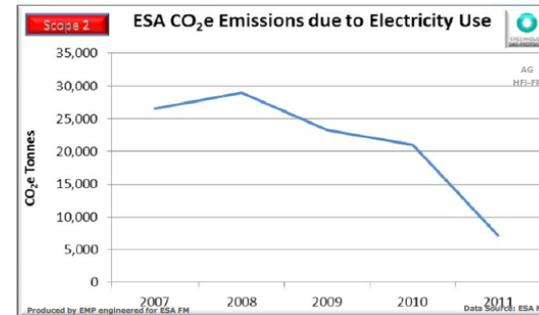
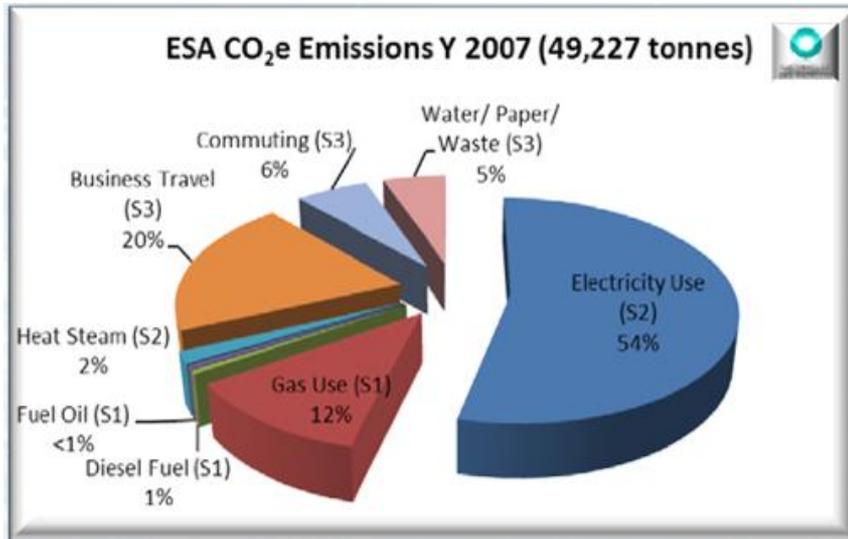


**ESA Global CO<sub>2</sub>e Emissions in Y 2011 are down 43% from the baseline year, due in large part to ongoing environmental impact mitigating projects, and the purchase of electricity produced from renewable resources.**

**Applicable GRI Reporting Indices: EN 16, 17**



# Sustainable Development at ESA: Global CO<sub>2</sub>e Emissions



# Sustainable Development at ESA: GHG reporting



The Y 2011 **Environmental Data Collection at ESA** followed the following process:

- ❑ Assessment of environmental data collected from the year 2007 to-date
- ❑ Creation of an **Environmental Impacts Inventory** and the **Environmental Management Platform (EMP)** software tool, integrated with the CIFM corporate web-based application (and including a data collection manual, conversion tables, performance monitoring graphs, projections, projects planning and management)
- ❑ Operational boundaries and the data reporting process were defined in accordance with:
  - the **GHG Standard Protocol** Scope 1- Scope 2- Scope 3 reporting format and
  - the **Global Reporting Initiative's** Environment Performance Indicator
  - 3.1 Protocol Set (EN1, EN2, EN3....EN 24)

**Scope 1** - GHG emissions from resources that are owned and controlled (Natural Gas, Diesel and fuel oil)

**Scope 2** – GHG emissions resulting from the generation of purchased electricity, heating/ cooling, and steam

**Scope 3** – GHG emissions from sources not directly owned and controlled, but related to Agency activities (Commuting, Business travel, paper, water, waste)

## 1. Organisational:

- a. EMS for all ESA sites (ISO14001)
- b. Extend/Develop Environmental policies and Plan Do Act Check processes
- c. Deploy operational management models (Breeam-in-use) which empowers and highlights responsibility:
  - Part 1 : Building owner (ESA owns 98% of its facilities)
  - Part 2 : Building manager (Outsourced FM services)
  - Part 3 : Building users (occupants)
- d. Define an environmental / sustainable purchasing policy
  - Chemicals : EU Eco-label products
  - FM Contractors accredited ISO14001.2004

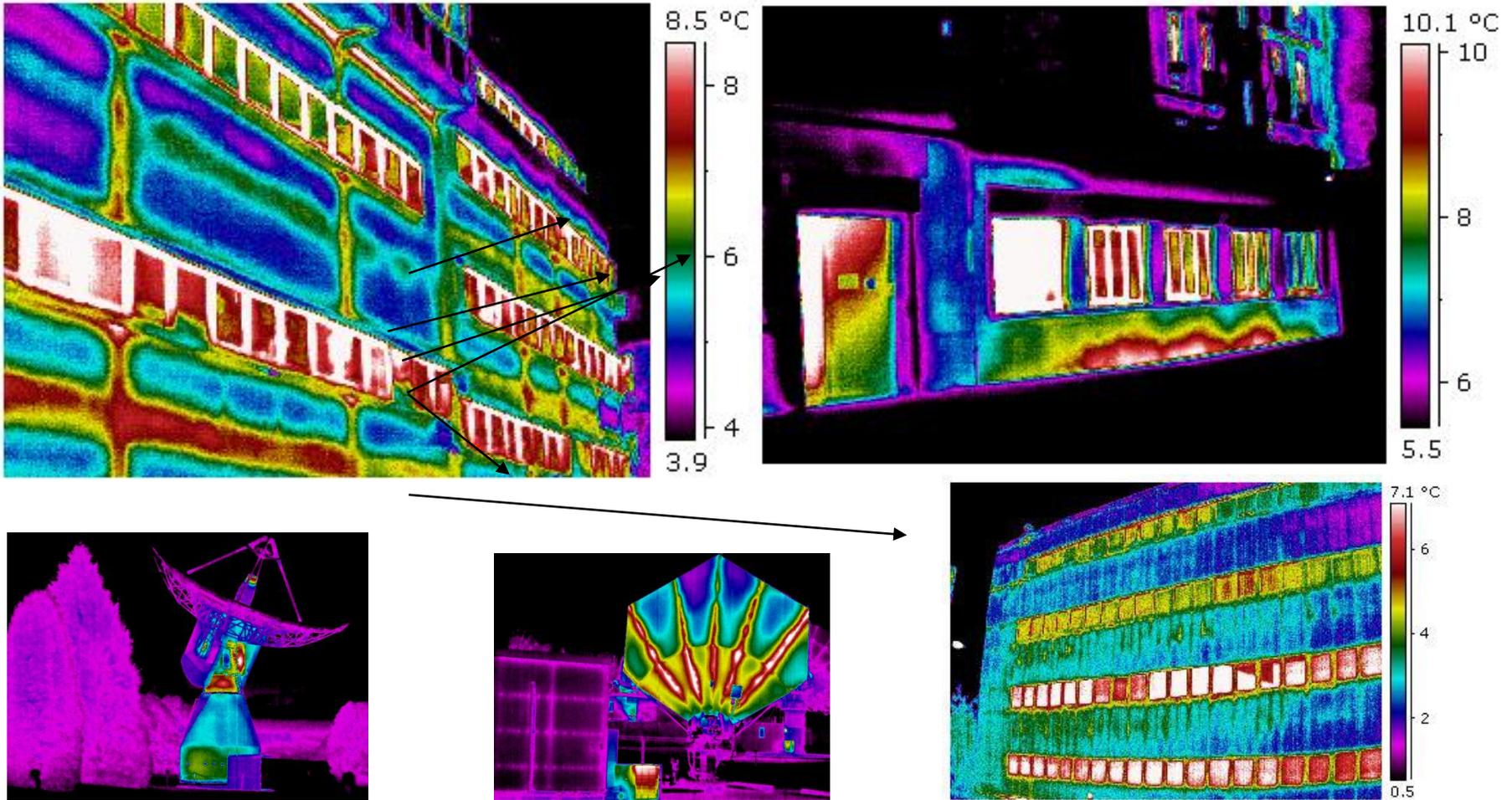
# Towards Sustainable Operations

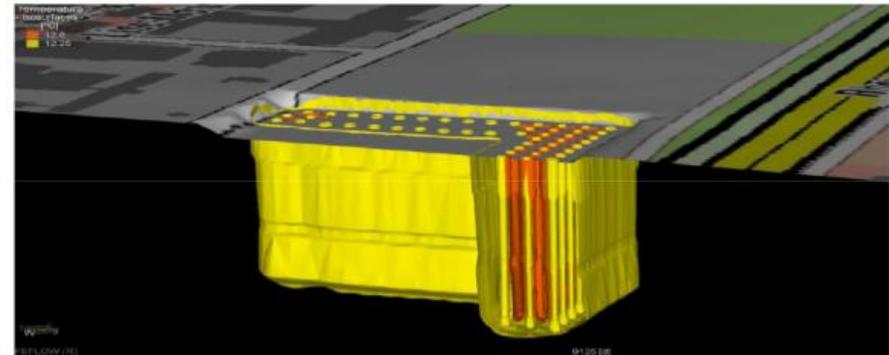


# Towards Sustainable Operations



# Towards Sustainable Operations





3D-Simulation of the whole system

## Geothermal System for new office buildings

- Cooling and heating energy for about 300 employees.
- Cooling energy for data centres.
- Without any additional heating system and only small chillers for peak load
- 400 kW cooling and heating power supplied by a geothermal system of about 50 drillings
- Drilling to 100m below ground
- Drilling through 3 ground water levels causes problems

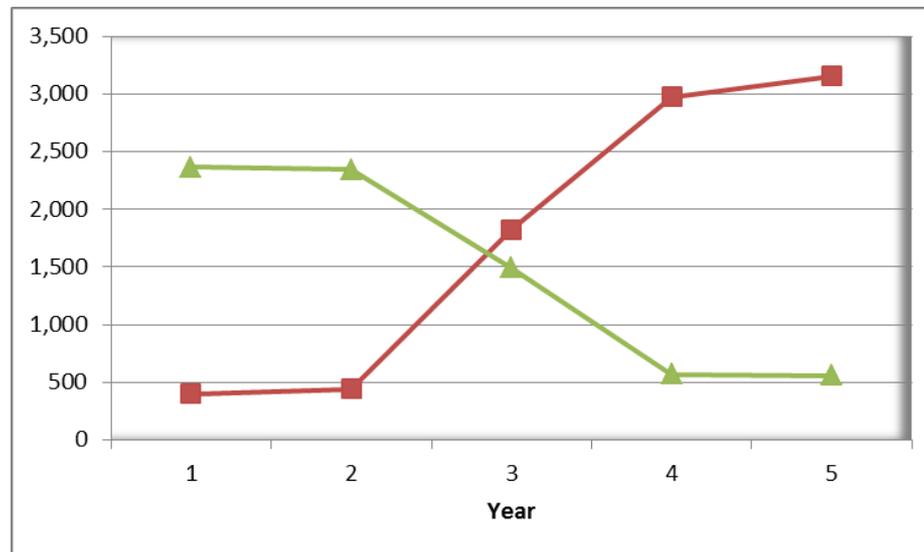
# Towards Sustainable Operations



# Towards Sustainable Operations



# Sustainability at ESA: CO2 footprint



## VC's by Year







## GREEN CERTIFICATE



Electrabel supplies

### Green Electricity®

Electrabel confirms the supply of Green Electricity to

### *European Space Agency*

Green Electricity is 100% generated from inexhaustible power sources. No fossil fuels that harm the environment or contribute to climate change are used for the generation of Green Electricity. Virtually no pollutants are released in the generation of Green Electricity. That is what makes Green Electricity sustainable.

Supply period **1 July 2011 to 31 March 2013**

Zwolle, 21 October 2011

Electrabel Netherlands N.V.



Vincent van Ditshuizen  
Director Business Market

Het is jouw energie. **Electrabel**  
GDF SUEZ

# Nudge: Waste Separation by Customers



# Nudge: Dedicated Parking Places for Electrically Charged Vehicles



# Nudge: Green Hotel Shuttle



# Nudge: Let the grass grow....







adm aeolus

cryosat 2

LIVING PLANET

ANY QUESTIONS?

swarm

earthcare

EARTH EXPLORERS

goce

smos

