The European EO Services Industry
- Perspective on EO Systems for Nation Building

Geoff Sawyer, EARSC Secretary General
Geospatial World Forum
23rd April 2012, Amsterdam
Introduction

• What is EARSC and what can we offer?
• EO Service Industry Capabilities
• GMES and Data Policy
What is EARSC?

- EARSC is a non-profit-making organisation created in 1989 as the voice of the European geo-information EO service industry.
- Mission & objectives:
  - to foster the development of the European Geo-Information Service Industry
  - to stimulate a sustainable market for Geo-information services using EO data, openly accessible to all members
- Today EARSC has 65 members in more than 22 countries, and is a recognized association worldwide.
- Represents European geo-information providers creating a sustainable network between industry, decision makers and users.
European EO Services Industry

- Offers a full range of services based on extensive experience serving government, industry and the citizen
- Includes data providers, downstream service providers, software and consultancy companies with a mastery of space-borne/airborne/in-situ systems and sensors technologies.
- Innovative / dynamic; many new companies, changing ownership
- Between 100 and 200 companies largely SME’s with strong partnership experience across European borders.
  - Estimated as €800m to €1b annual revenues.
  - Highly skilled workforce; interchange with other sectors
  - Last survey in 2006 identified 152 companies.
  - Full industry survey will be made by EARSC during 2012.
EO Services Value Chain

Satellite Observations → Data Analysis and Added Value Processing → In-Situ Measurements → Downstream Products

Satellite Operators → Ground Station & Data Providers → Downstream Service Provider
# European Commercial EO Data Sources

<table>
<thead>
<tr>
<th>Company</th>
<th>Data Source</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTRUM</td>
<td>SPOT-Pleiades</td>
<td>0.5m Optical</td>
</tr>
<tr>
<td></td>
<td>Rapideye</td>
<td>6.5m Optical constellation</td>
</tr>
<tr>
<td></td>
<td>DMCI</td>
<td>22m Optical</td>
</tr>
<tr>
<td></td>
<td>Deimos</td>
<td>22m Optical</td>
</tr>
<tr>
<td></td>
<td>Cosmo-Skymed</td>
<td>1m Radar</td>
</tr>
<tr>
<td></td>
<td>TerraSar-X</td>
<td>1m Radar</td>
</tr>
</tbody>
</table>
EO Services – Thematic Areas

Downstream Products

Marine

Security

Land

Thematic Areas

Built Environment

Atmosphere & Climate

Disasters & Geohazards

Legend:
- Gold: preparation in June
- Dark red: preparation in July
- Light red: preparation in Aug
- Green: preparation in Sept
- Yellow: used for plot
- Green: long-cycle crops or weeds
- Gray: burned vegetation
- Blue: irrigation infrastructure
- Dark green: pipelines
- Gray: secondary canal
- Green: wells

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The basic products are maps, made available on a daily, weekly, 10-days and monthly basis via the web server of each service provider. Other indicators, such as the Chlorophyll–a percentile 90 (P90) and algae bloom indicators, are produced on seasonal and annual timescales.

The Chl-a P90 is one of the metrics used together with a set of parameters, such as phytoplankton species, benthos species, etc, to set the coastal waters ecological classification as required by the Water Framework Directive.

The MARCOAST project includes products monitoring water quality in coastal waters.

Industrial Partners: Brockmann Consult, Planetek, Water Insight, Starlab, Acri.
This service chain supports **verification** that nuclear material and facilities in the selected sites are used for civil purposes, and the **assessment** of whether the initial declaration of material and facilities was complete and correct. The focus here is on operational nuclear facilities (as opposed to **decommissioned sites**).

The products use Very High Resolution (VHR) optical and Synthetic Aperture Radar (SAR) data and are integrated using a system which is able to manage multi-temporal and multi-type information.

The G-MOSAIC project is providing products linked to the surveillance of nuclear facilities.

**Left, DEM obtained from Ikonos stereo pair; Right, change detection map obtained from the differences of two DEMs taken at different times overlapped to an optical image. Added features are marked in green and removed ones in red**

EO Services – Example Land

Monitoring Forest Resources

The Forest Monitoring Services are demonstrating consistent pan-European-type products for European users (such as EEA and EC DG’s) and to serve various national applications with harmonised and validated basic forest information.

The Forest products comprise information on continuous degree of Forest Crown Cover Density and continuous Forest Type mixing ratio (Broadleaved vs. Coniferous Forest).

The services provide highly accurate and spatially detailed information on the state and development of forests while suiting different definitions of forest to be extended globally.

The Geoland and GSE Forest Monitoring project is providing services for forest monitoring in Europe.

The core user community of GMES Forest Services comprises international authorities like the European Environment Agency (EEA), national ministries responsible for reporting on UNFCCC, Kyoto Protocol and other international policies, as well as national to regional forest and environment agencies in charge of implementing national forest laws and programmes.

Industrial Partners: GAF, Joanneum, Geoapikonisis, Metria, VTT, Geosystems, NEO, Planetek, Remote Sensing solutions, e-geos, GMV, Prins, Luxspace..
EO Services – Example Built Environment

Monitoring Ground Movement

Pangeo provides a detailed geological hazard map for defined cities / areas. Pangeo maps will identify areas of instability, interpret a reason for this instability, and then relate this to the land cover classes in Urban Atlas. Using SAR interferometry technology to measure terrain motion, together with geological and geohazard information, an Inspire compliant layer of ground stability will be provided. Initially, 52 cities from the Urban Atlas will be covered to be extended later to other areas.

The Pangeo project builds upon the Urban Atlas to provide detailed geo-hazard information on Europe’s cities.

Persistent SAR Interferometry provides measurements of the extent and rate of movement of the ground. Underlying causes may be geological instability, ground water extraction, mining works, tunnelling etc.

Volcanic eruptions and activity can be detected and monitored. Products are:
- maps showing changes to the ground following or during eruptions
- ground movement showing the changes to the existing land surface as a result of swell or fissures
- smoke or ash plumes resulting from the eruption

The SAFER project providing the GMES Emergency Response Service offer a number of products. These are linked to the phases of the disaster:
- Preparedness, prevention and disaster risk reduction
- Emergency response
- Recovery

Many of the actual products are similar according to the phase but the delivery time and cycle differs.

Ash/SO2 content: This product has two possible origins: satellite data only, or an ash dispersion model based on numerical modelling. The ash content shows the total mass expressed in T/Km2.

EO Services – Example Disasters

Map Disaster Areas - Situation Awareness

Several projects are providing maps and situation awareness products for emergencies.

GEO-Pictures is providing map products integrating information from many sources and using a full range of space applications (EO, communications and positioning).

SAFER is providing products to map and assess flooding.

Rapid response is key in these emergency situations and robust operational processing and product delivery chains are essential.

Above: Map of flooding of the Elbe from January 2011.

Left: Integrated map of Abidjan showing areas of environmental threat.

What does EARSC do?

- To achieve our mission, we focus on:
  - Improving customer awareness and acceptance of Earth observation and remote sensing based solutions
  - Improving market access for our members
  - Promoting our members capabilities
  - Engaging with key organisations (ESA, the EC and others) to make the EO VA sector’s views known and acted upon.

- EARSC works with many partners to achieve these goals.
OGEO Portal

OGEO IS THE FORUM FOR INFORMATION EXCHANGE BETWEEN THE OIL AND GAS AND GEOINFORMATION COMMUNITIES.

FAST INFORMATION
The portal offers the advantage of rapid and direct information exchange across the range of activities undertaken in both marine sectors allowing users to pose questions related to information that is being sought.

BUILDING NETWORKS
Suppliers could co-ordinate and exchange expertise as well as building networks and partnerships to respond to demands and requests making commercial offers easier to put together and more targeted as a result of prior exchange.

PROBLEM SOLVING
At the online site members could find other members dedicated to helping each other solve business problems, find new suppliers, win new customers, share experiences and practical advice. Do you want to know more about registration?
How can EARSC help?

For Companies:
- Networking: meet and partner with other member companies
- Communications - website, newsletter, directorate, numerous events on both European and International stages.
- Information on the EO services industry and on potential markets.
- Exchange of best practice and common standards.

For Companies and Clients:
- **EOpages** is a web-based marketplace for users to find the services they need and suppliers to provide them.
- **OGEO Portal** is a web-based tool to enable Oil & Gas and EO service industries to work together.
EO PAGES

A MARKETPLACE BETWEEN EARTH OBSERVATION INDUSTRY & USERS
beta release

EOpages is a Marketplace between the Earth Observation Service Industry & Users. EOpages shows the capabilities of the geo-information industry in general and value-adding companies in particular. The objective of this project is to help potential customers explore the available value-added geo-information services of interest to them in an interactive and user-friendly manner.

More info about the project

Search & Find

Search & Find is an easy, three-step process, guided search to access our exhaustive information repository on the EO industry.

Address Book

Address Book contains the latest contact information of the EO industry. The online Address Book is easy to use, simply selecting and choosing the relevant categories or tags.

EOmarket

EOmarket is a customise section where Users contact directly Industry looking for products technical characteristics, applications, availability, resources, etc...

Success Stories

Some examples of recent success stories resulting from EO industry development activities.

News

The news section aims to provide quick access to the top stories. We provide information to stakeholders and users about the capabilities of the information value-added services.
**EO Services Taxonomy**

**List of Market Groups**
- Managed Resources
- Energy and Natural Resources
- Industry
- Services
- Public Authorities
- International Bodies

**Market Segments**
- Utilities
- Construction
- Transportation
- Maritime
- Communications

**Segment Examples**
- Power station operators, Water plants operators, Survey companies, Hydroelectric suppliers, Regulatory Bodies, Distribution companies, Landfill and waste, Regional planners / policy makers.

**List of Services**
- Monitor pollution in rivers and lakes
- Assess changes in the carbon balance
- Assess environmental impact of human activities
- Monitor land pollution
- Assess changes to urban and rural areas
- Assess and monitor water quality
- Assess ground water and run-off
# EO Services – Markets & Sectors

<table>
<thead>
<tr>
<th>Markets &amp; Sectors</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy &amp; Nat. Resources</strong></td>
<td><strong>Industry</strong></td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>Utilities</td>
</tr>
<tr>
<td>Alt. Energy</td>
<td>Construction</td>
</tr>
<tr>
<td>Mining</td>
<td>Transport</td>
</tr>
<tr>
<td><strong>Managed Living Resources</strong></td>
<td><strong>Services</strong></td>
</tr>
<tr>
<td>Agriculture</td>
<td>Insurance &amp; Finance</td>
</tr>
<tr>
<td>Forestry</td>
<td>Real-Estate Management</td>
</tr>
<tr>
<td>Fisheries</td>
<td>News &amp; Media</td>
</tr>
<tr>
<td><strong>International Bodies</strong></td>
<td><strong>Public Authorities</strong></td>
</tr>
<tr>
<td>Environment, Climate &amp; Pollution</td>
<td>Local Planners</td>
</tr>
<tr>
<td>Humanitarian Operations</td>
<td>Emergency Services</td>
</tr>
<tr>
<td></td>
<td>Research &amp; Education</td>
</tr>
<tr>
<td></td>
<td>Security &amp; Defence</td>
</tr>
</tbody>
</table>

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## EO Services Market Taxonomy

### Example of Energy and Natural Resources

<table>
<thead>
<tr>
<th>Energy &amp; Natural Resources</th>
<th>Description of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Client View</strong></td>
<td><strong>Supplier View</strong></td>
</tr>
<tr>
<td>4 Oil and Gas</td>
<td></td>
</tr>
<tr>
<td>Map water depth</td>
<td>charting / bathymetry</td>
</tr>
<tr>
<td>Forecast and map large waves</td>
<td>extreme waves / tsunami</td>
</tr>
<tr>
<td>Monitor oil rig flares</td>
<td>gas flares and oil rigs</td>
</tr>
<tr>
<td>Map geological features</td>
<td>geological mapping</td>
</tr>
<tr>
<td>Detect land movement, subsidence, heave</td>
<td>land movement</td>
</tr>
<tr>
<td>Detect natural oil seepage</td>
<td>oil seepage</td>
</tr>
<tr>
<td>Detect and monitor oil slicks</td>
<td>oil slicks</td>
</tr>
<tr>
<td>Detect and monitor ice risk at sea</td>
<td>sea-ice and icebergs</td>
</tr>
<tr>
<td>Assess dredging operation impacts</td>
<td>sediments and plumes</td>
</tr>
<tr>
<td>Map seismic survey operations</td>
<td>seismic survey</td>
</tr>
<tr>
<td>Forecast and monitor ocean movement and drift</td>
<td>tides and ocean currents</td>
</tr>
<tr>
<td>Forecast and monitor ocean winds and waves</td>
<td>metocean; winds (speed, direction, stress) and waves</td>
</tr>
<tr>
<td>5 Alternative Energy</td>
<td></td>
</tr>
<tr>
<td>Assess changes in the carbon balance</td>
<td>carbon monitoring</td>
</tr>
<tr>
<td>Map and monitor solar energy (solar farms)</td>
<td>solar energy (design and operation)</td>
</tr>
<tr>
<td>Forecast and monitor ocean movement and drift</td>
<td>tides and ocean currents</td>
</tr>
<tr>
<td>Map and monitor of wind energy (wind farms)</td>
<td>wind energy (design and operation)</td>
</tr>
<tr>
<td>Forecast and monitor ocean winds and waves</td>
<td>metocean; winds (speed, direction, stress) and waves</td>
</tr>
<tr>
<td>6 Minerals and Mining</td>
<td></td>
</tr>
<tr>
<td>Assess environmental impact of human activities</td>
<td>environmental assessment</td>
</tr>
<tr>
<td>Map geological features</td>
<td>geological mapping</td>
</tr>
<tr>
<td>Detect land movement, subsidence, heave</td>
<td>land movement</td>
</tr>
<tr>
<td>Measure land use statistics</td>
<td>landuse studies</td>
</tr>
<tr>
<td>Monitor of land pollution</td>
<td>pollution monitoring</td>
</tr>
<tr>
<td>Monitor Mineral extraction</td>
<td>mineral workings / ground surface</td>
</tr>
</tbody>
</table>
## EO Services Thematic Taxonomy

### Example of Thematic Taxonomy for Ocean / Marine

<table>
<thead>
<tr>
<th>Ocean / Marine</th>
<th>Description of Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>marine ecosystem pollution</strong></td>
<td></td>
</tr>
<tr>
<td>Monitor quality / productivity</td>
<td>algal bloom (phytoplankton)</td>
</tr>
<tr>
<td>Monitor pollution at sea</td>
<td>turbidity &amp; pollutants</td>
</tr>
<tr>
<td>Detect natural oil seepage</td>
<td>oil seepage</td>
</tr>
<tr>
<td>Detect and monitor oil slicks</td>
<td>oil slicks</td>
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<tr>
<td>Monitor oil rig flares</td>
<td>gas flares and oil rigs</td>
</tr>
<tr>
<td>Assess dredging operation impacts</td>
<td>sediments and plumes</td>
</tr>
<tr>
<td><strong>Coastal</strong></td>
<td></td>
</tr>
<tr>
<td>Map water depth</td>
<td>charting /bathymetry</td>
</tr>
<tr>
<td>Monitor ocean level and surface</td>
<td>Operational Oceanology</td>
</tr>
<tr>
<td><strong>Metocean</strong></td>
<td></td>
</tr>
<tr>
<td>Forecast and monitor ocean movement and drift</td>
<td>tides and ocean currents</td>
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<tr>
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<td>extreme waves / tsunami</td>
</tr>
<tr>
<td><strong>Fisheries</strong></td>
<td></td>
</tr>
<tr>
<td>Map fish shoals</td>
<td>fish-shoal location</td>
</tr>
<tr>
<td>Detect and monitor illegal fishing</td>
<td>illegal fishing</td>
</tr>
<tr>
<td><strong>Ships</strong></td>
<td></td>
</tr>
<tr>
<td>Monitor ice-free passages for shipping</td>
<td>ship routing</td>
</tr>
<tr>
<td>Detect ships in critical areas</td>
<td>shipping monitoring</td>
</tr>
<tr>
<td>Monitor ship movements</td>
<td>Ship Monitoring</td>
</tr>
<tr>
<td><strong>sea-ice and icebergs</strong></td>
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</table>
EARSC and GMES

- GMES is a key European public programme to provide space-derived information on environment and security to European policy makers and citizens.

- GMES provides a strong opportunity as a market driver for EO Services.
  - Industry has invested quite heavily with the goal to exploit opportunities using GMES products & services in other markets eg. commercial, export and non-EU government.

- Hence, EARSC has a strong interest in the way GMES will be implemented:
  - 3 Position papers available on EARSC web-site.
Development of the market is best supported by raw data being made available at low or zero cost:

- Raw data from Sentinels should be free and open.
- Data from commercial satellite operators should be procured under appropriate license conditions.
- Core services to be freely and unconditionally available to all European users.
- Downstream services should be procured commercially on a fair and competitive basis.
- A registration system for GMES users should be put in place to ensure that basic quality conditions are met and licensing conditions are respected as well as achieving fair competition (reciprocity) on the international market.
Open Data Policy

Significant work is being carried out into the impacts of government data policies:

- European Commission directive in 2003 encouraged PSB’s (Public Sector Bodies) to make information available at marginal cost.
- Currently being reviewed with possible stronger legislation in 2012 – 2013.
- POPSIS (Pricing of Public Sector Information Study) report has shown strong evidence of the benefits of an open data policy (Public Sector Information Reuse or PSI Re-use)
- Examples apply to cartographic information, meteorological data, industry registers (databases), Geographic Information.
- Many countries are starting to move towards a marginal cost model for PSI Re-use (Finland, Netherlands, Spain, Australia, UK........etc).
PSB Funding Models

Traditional European Model

- EU / National Treasuries
- Originating Agency
- Other Agencies
- Users
- Data & Information

Marginal Cost Model

- EU / National Treasuries
- Originating Agency
- Users & Other Agencies
- Data & Information
  - Wealth / Jobs = taxes = €
PSI Re-use and EO Data

There are few links between the policy evolution for PSI Re-use and Satellite Earth Observation data.

- Most government EO data has been charged for under a cost-recovery model (similar to most meteorological charging models).
- Exception in the US where Landsat data has been freely available since 2008 (and CBERS).
- Landsat data policy has changed dramatically over the years from fully scientific (free) to fully commercial (high charges) and back to free.
- Impact on the use has been significant:
  - 53 scenes per day average in 2001 (highest year)
  - 5776 scenes per day average in early 2012 (100 fold increase)
- Similar story to many examples of PSI Re-use
  - Spanish cadaster, Netherlands map, Norwegian met. data etc etc.
- EARSC goal to bring EO into PSI Re-use discussions,
Summary

- EARSC provides stakeholders with an effective interface to the EU EO services industry
  - Neutral support to find suppliers and obtain contractual services
  - Eopages will provide a first entry point to the full range of services being offered.
  - OGEO-Portal provides an example of a link to a specific client community
- EARSC is ready to provide assistance to clients and suppliers alike to develop the EO services market.