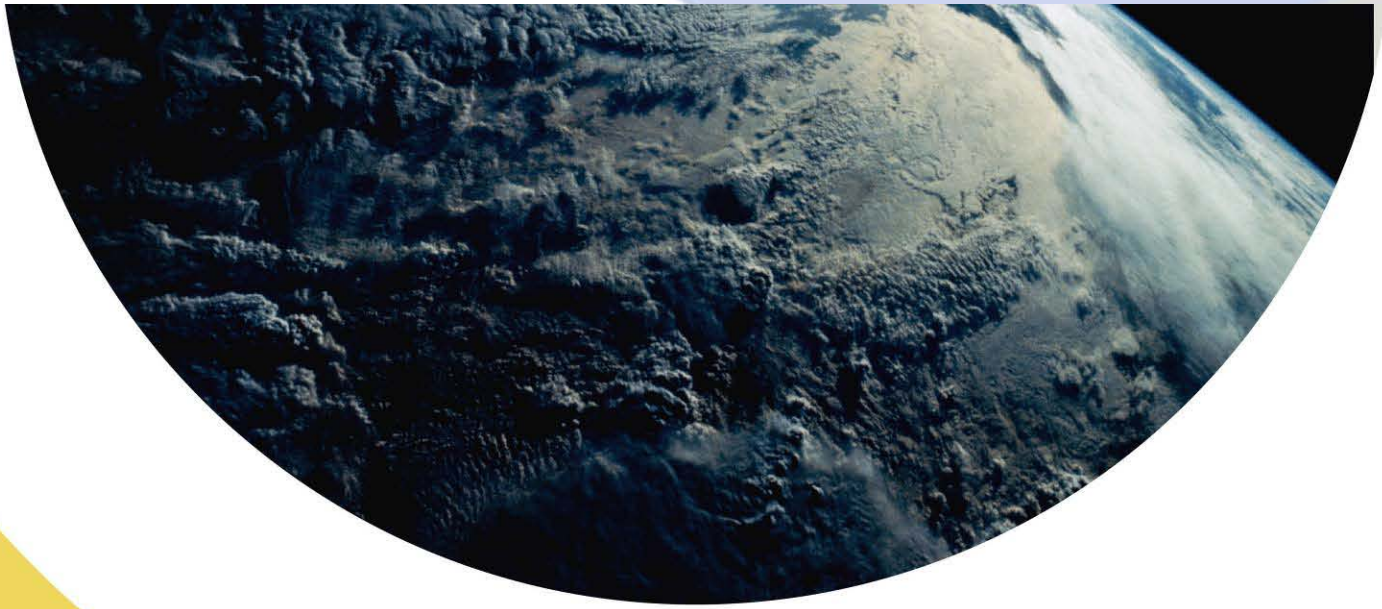


Global Monitoring for Environment and Security

Rudy Aernoudt
Principal administrator - economist
Warsaw – 23 November 2011
http://www.gmes.info/pages-principales/overview

European Commission

GMES
Observing our planet for a safer world

A quote to start ….

Those things which I am saying now may be obscure, yet they will be made clearer in their proper place.

Nicolaus Copernicus

Structure

I. GMES
II. Space component
III. In situ component
IV. Services
V. Cost – benefit
VI. SME relevence
VII. Conclusion

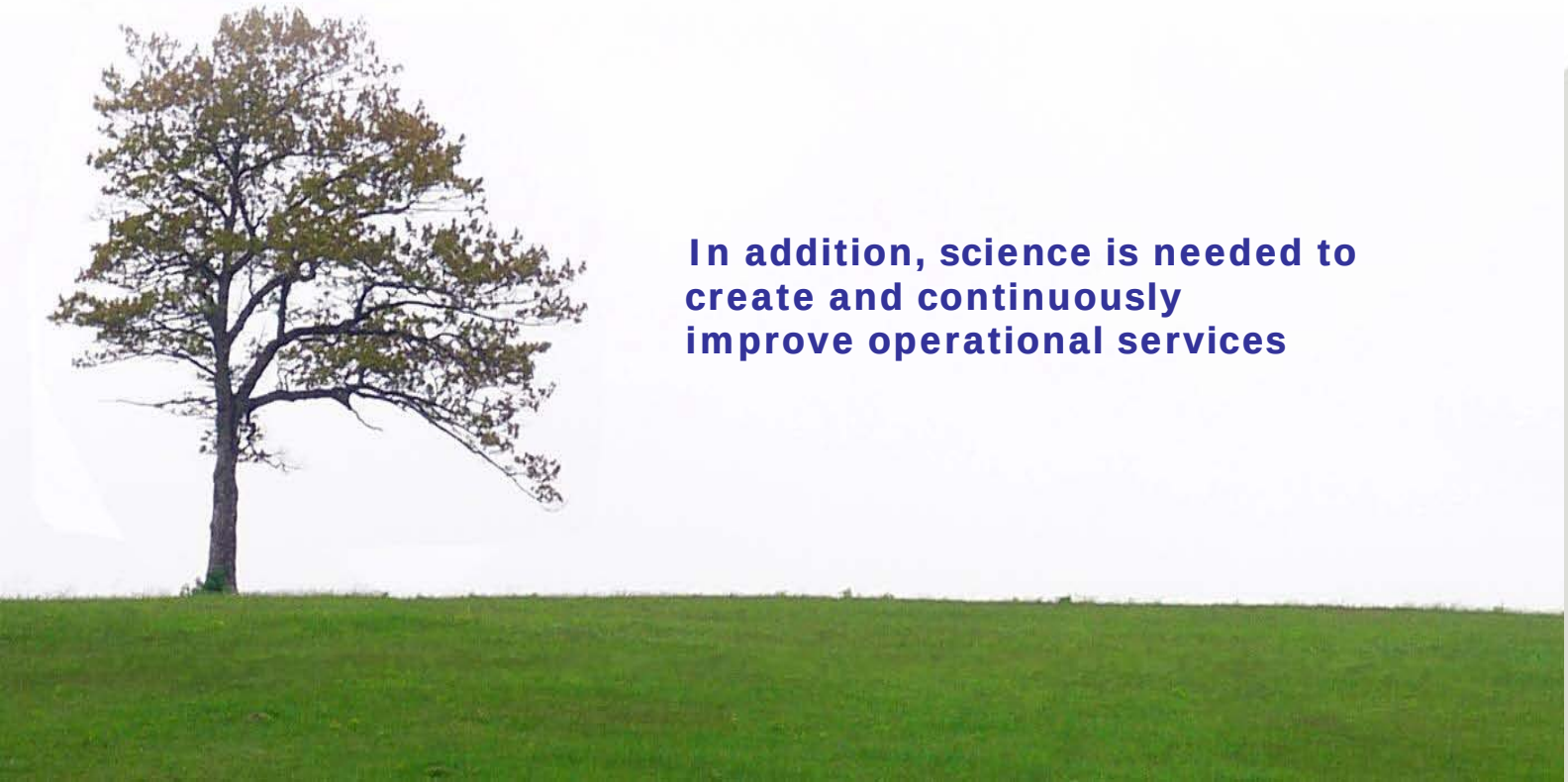
What is GMES?

1. An *autonomous Earth Observation system*
2. The largest fleet of satellites and earth-based monitoring instruments in the world
3. An end user-focused programme of services for environment and security
4. Joined-up information for policymakers, scientists, businesses and the public
5. Europe's response to the global need for environment and climate monitoring

Philosophy of GMES

GMES aims at developing operational services, following the example of meteorology, but for other domains such as:

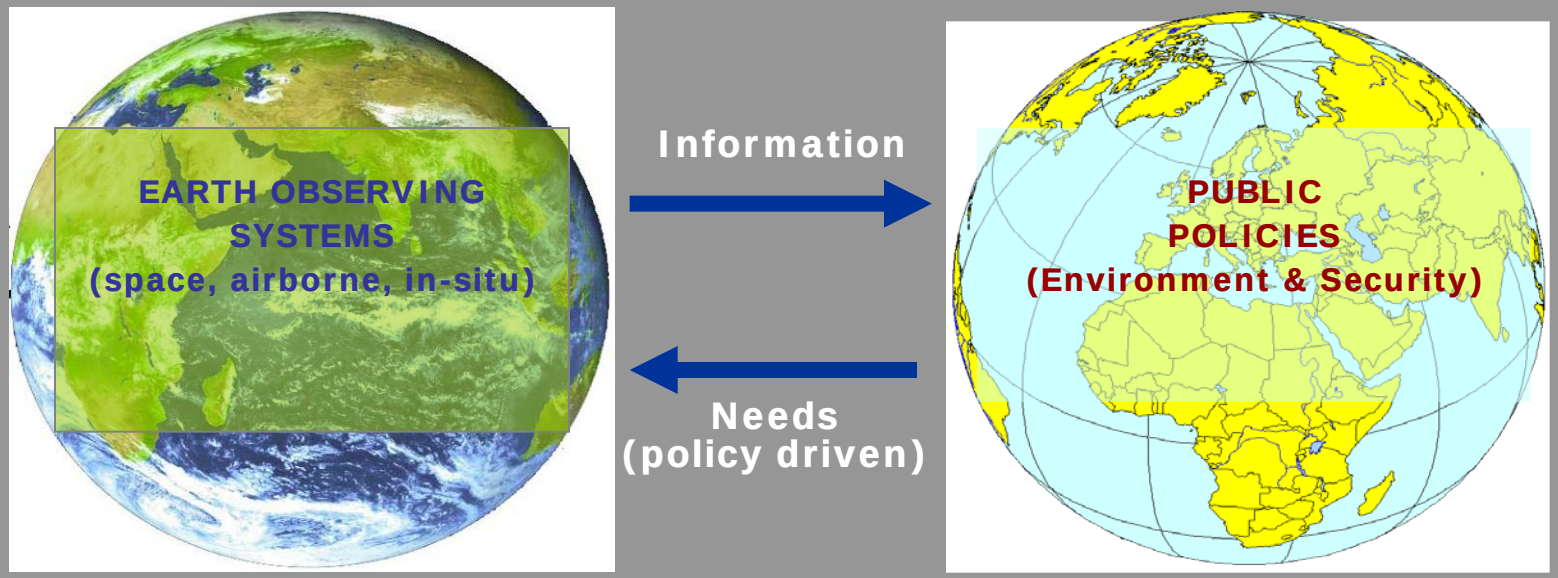
- **emergency management**
- **air quality monitoring**
- **land monitoring**
- **ocean & sea ice monitoring etc…**



In addition, science is needed to create and continuously improve operational services

What is the objective?

...to provide information services to policy-makers and other users



Space Agencies
In-situ Observing systems
Scientific Community
EO Value Adding Industry

National Governments and Agencies
European Union InstitutionsInter Governmental Organisations (IGOs)
Non Governmental Organisations (NGOs)

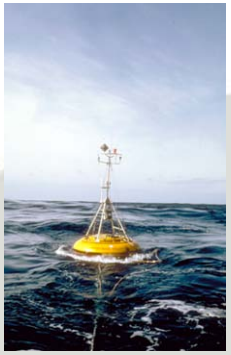
GMES Components

Space Component – coordinated by ESA

- Sentinels - EO missions developed specifically for GMES:
- Contributing Missions - EO missions built for purposes other than GMES but offering part of their capacity to GMES (EU/ESA MSs, EUMETSAT, commercial, international)

In-situ component – coordinated by EEA

- Observations mostly within national responsibility, with coordination at European level
- air, sea- and ground-based systems and instruments



Service component – coordinated by GMES bureau

- Land
- Marine
- Atmosphere
- Emergency

GMES Components

Space Component

Sentinels, Contributing Missions and related Ground Segment

GMES

Services Component

Information services for marine, atmosphere, climate change, land,

emergency, security and

In-situ Component Land, air and water monitoring sensors

Communication

- The commission is proposing to finance GMES outside the Multiannual Financial Framework and the budget.

- Communication on GMES will be published on the 30th November
- Discussion will begin between the European institutions in order to decide the adopted budget

II. Space Component

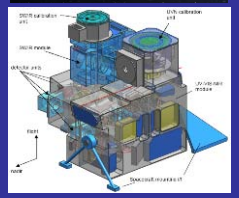
GMES dedicated missions: Sentinels

Sentinel 1 – SAR imaging
All weather, day/night applications, interferometry

Sentinel 2 – Multispectral imaging
Land applications: urban, forest, agriculture,..
Continuity of Landsat, SPOT

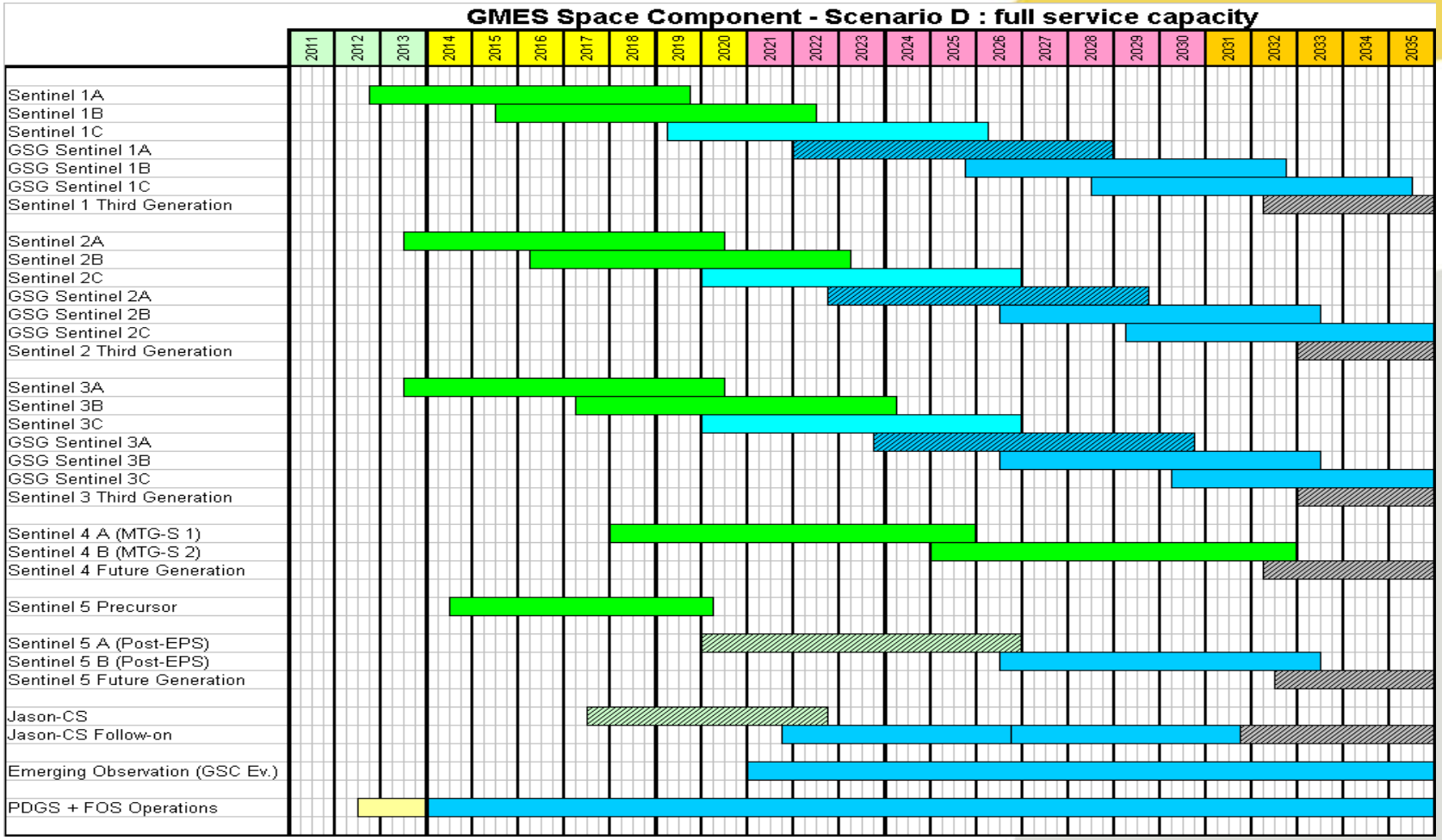
Sentinel 3 – Ocean and global land monitoring
Wide-swath ocean color, vegetation, sea/land surface temperature, altimetry

Sentinel 4 – Geostationary atmospheric
Atmospheric composition monitoring, trans-boundary pollution



Sentinel 5 – Low-orbit atmospheric
Atmospheric composition monitoring
(S5 Precursor launch in 2014)

Space component 2014 - 2030



Examples of contributing Missions

SPOT (VGT)

PROBA-V

DMC

Pléiades

SeoSat

RapidEye

SPOT (HRS)

METOP

MSG

COSMO-Skymed

TerraSAR–X

Tandem-X

Radarsat

Cryosat

Jason

Available today or planned at European, national and international level

Developed for other purposes but making important data available for GMES

And many more …

III. In Situ Component

ARGO

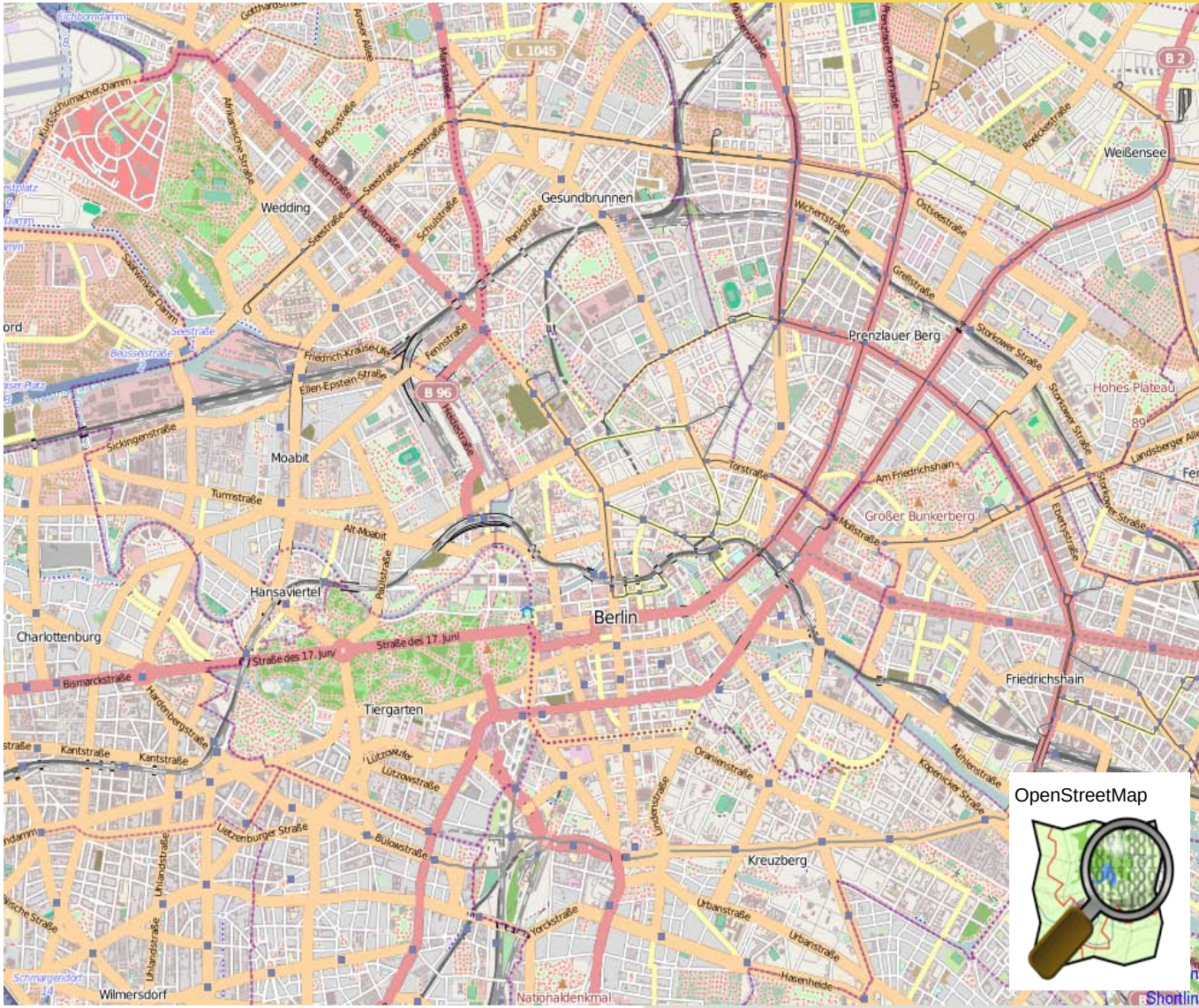
- Data for ***ocean*** forecasting models, ***climate*** monitoring
- Monitors heat and salt transport and storage, ocean circulation and global overturning changes to a depth of 2000m.
- Running 3000 autonomous buoys.

IAGOS

- Plan to equip 10-20 long-range in-service aircraft of internationally operating airlines until 2020.
- Infrastructure for long-term observations of atmospheric composition, aerosol and cloud particles on a global scale.
- Collection of highly relevant observations on a scale and in numbers impossible to achieve using research aircraft or other measurement methods

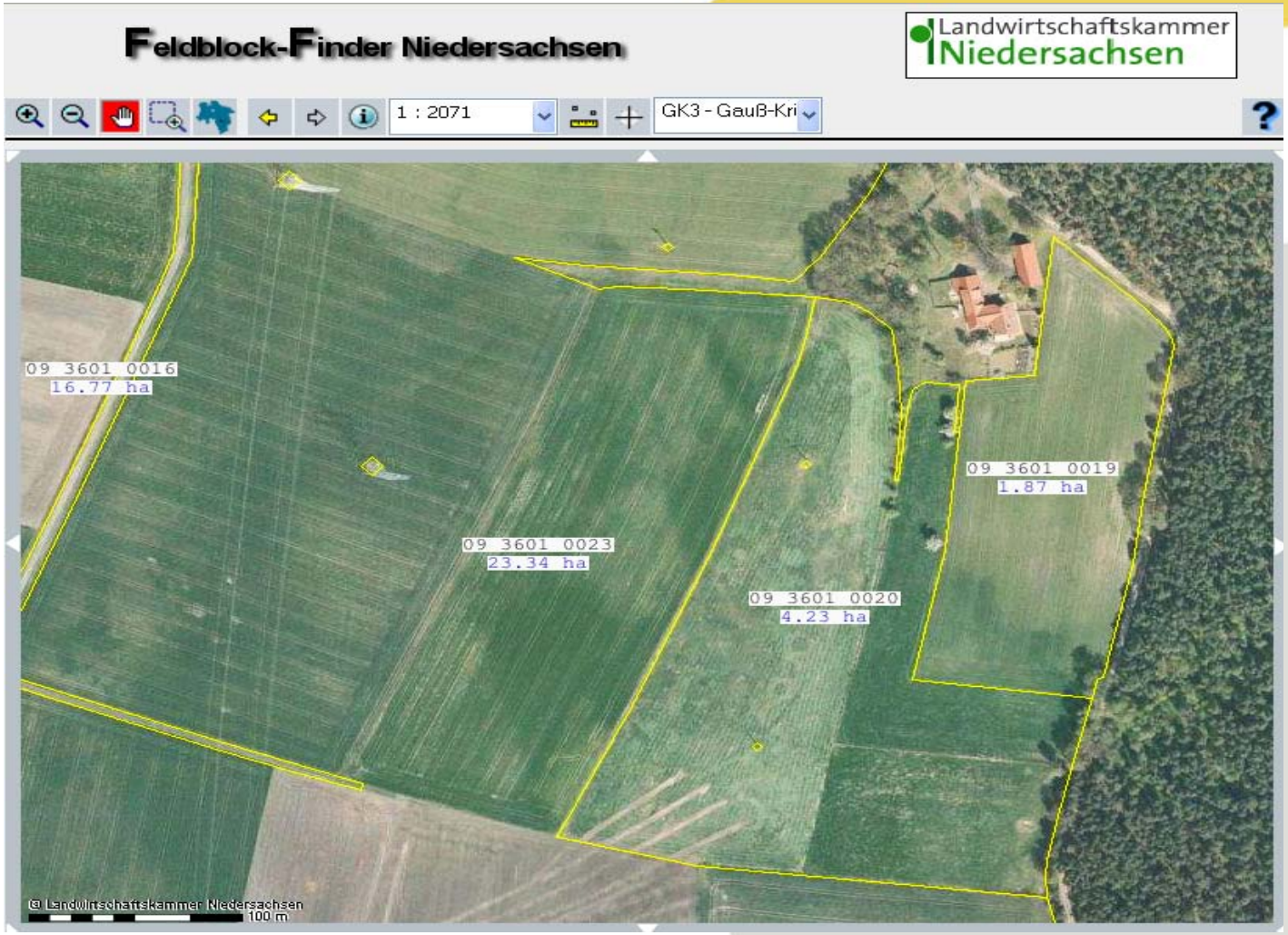
Topographic Maps

- ***Land and Emergency***
- The maps are required for validation purposes as well for pre-processing of satellite imagery.
- The Emergency Response Service uses information about the transport networks and critical infrastructures for the map making.



Land Parcel Identification System (LPIS)

- The LPIS: input for products of the GMES ***Land*** service.
- The data supports the production of Land cover maps
- The LPIS is part of the European Integrated Administration and Control System.



IV. Service Component

GMES Services

Monitoring of Earth systems

Land

Marine

Atmosphere

Horizontal applications

Security

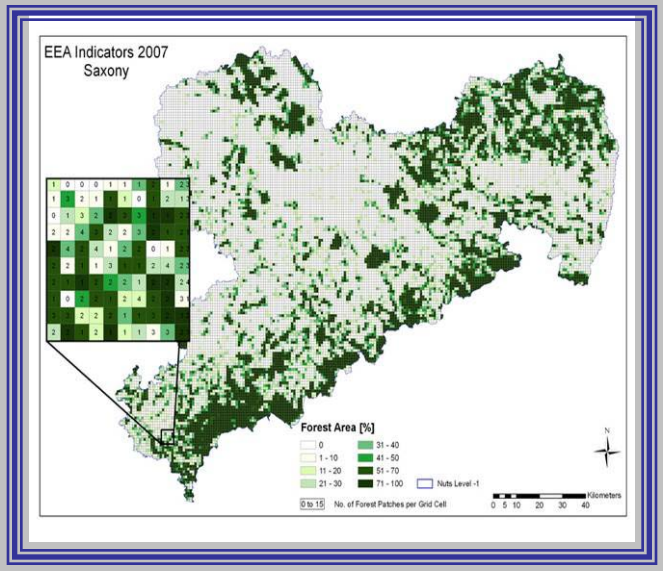
Emergency

Climate Change

GMES Services

Land

- Land use
- Forests
- Urban planning
- Water quality
- Crop production
- …



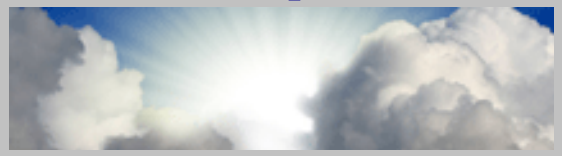
GMES Services

Marine

- Maritime transport
- Ocean resources
- Sea temperature
- Sea level rise
- Oil spill monitoring
- ...

GMES Services

Atmosphere



- UV monitoring
- Solar radiation
- Air quality
- Aerosols
- Ozone
- ....

GMES Services

Emergency

- Floods
- Fires
- Earthquakes
- Tsunamis
- Land slides
- ...

GMES Services

Security

- Maritime surveillance
- Border control
- External actions
- Civil security
- ...

GMES Services

Climate Change

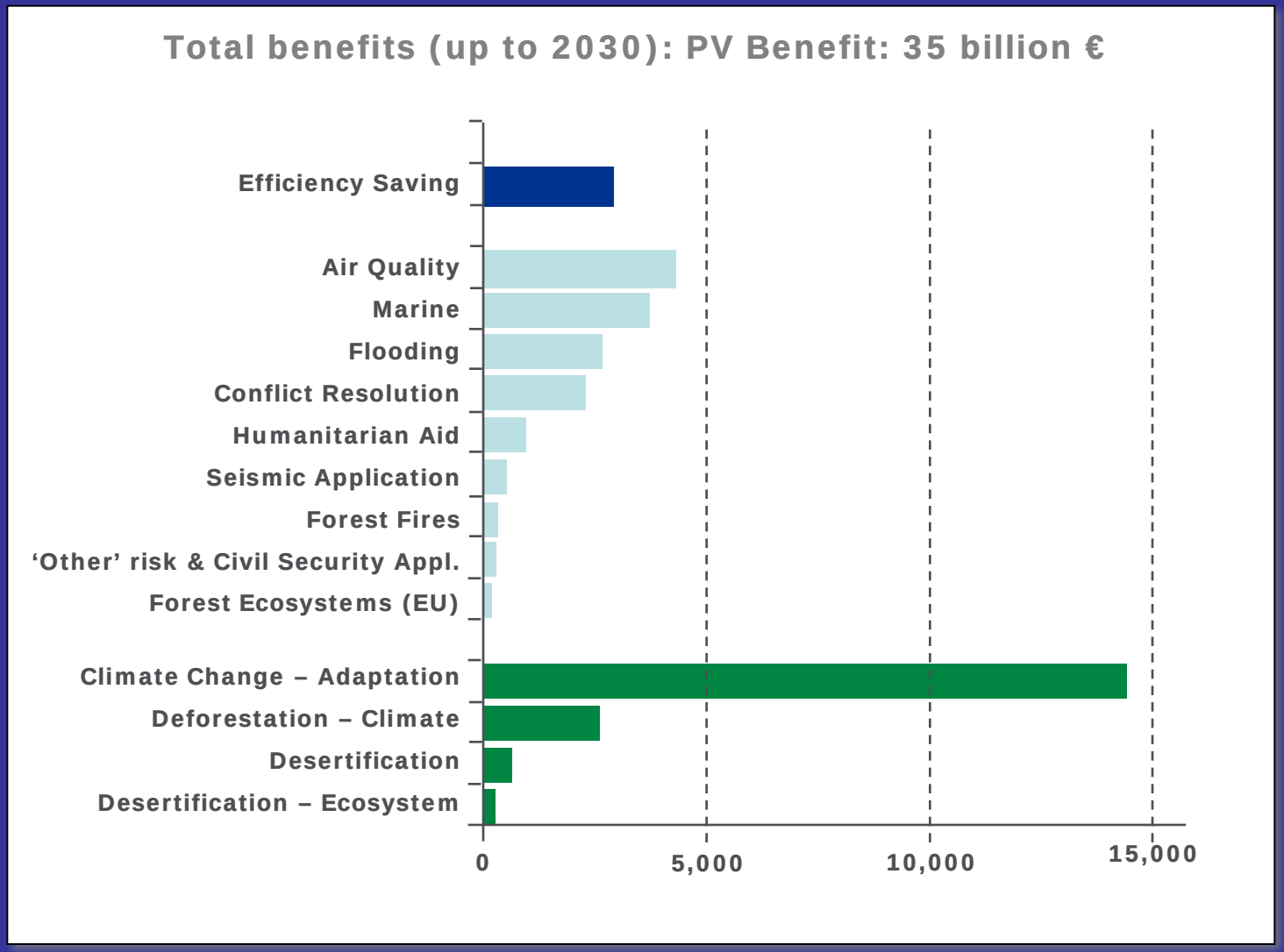
- Adaptation
- Mitigation
- Simulation
- Enforcement
- Tracking
- ...

V. Cost benefit of GMES

Expected benefits

- Value of GMES = f(HOW THE INFORMATION IS USED)
- What is the value of information?
- Benefits:
  - Short term: support to the implementation of running policies and legislation
  - Medium Term: support to the definition and formulation of new policies//downstream services
  - Longer Term: impacting the formulation and implementation of policies with a global reach//downstream services

Socio-economic benefits



Cat.1 (Efficiency Benefits): 2786 M€

Cat.2 (European Policy Formulation Benefits): 14582 M€

Cat. 3 (Global Action Benefits): 17298 M€

Based on PWC study

C/B analysis (2011)

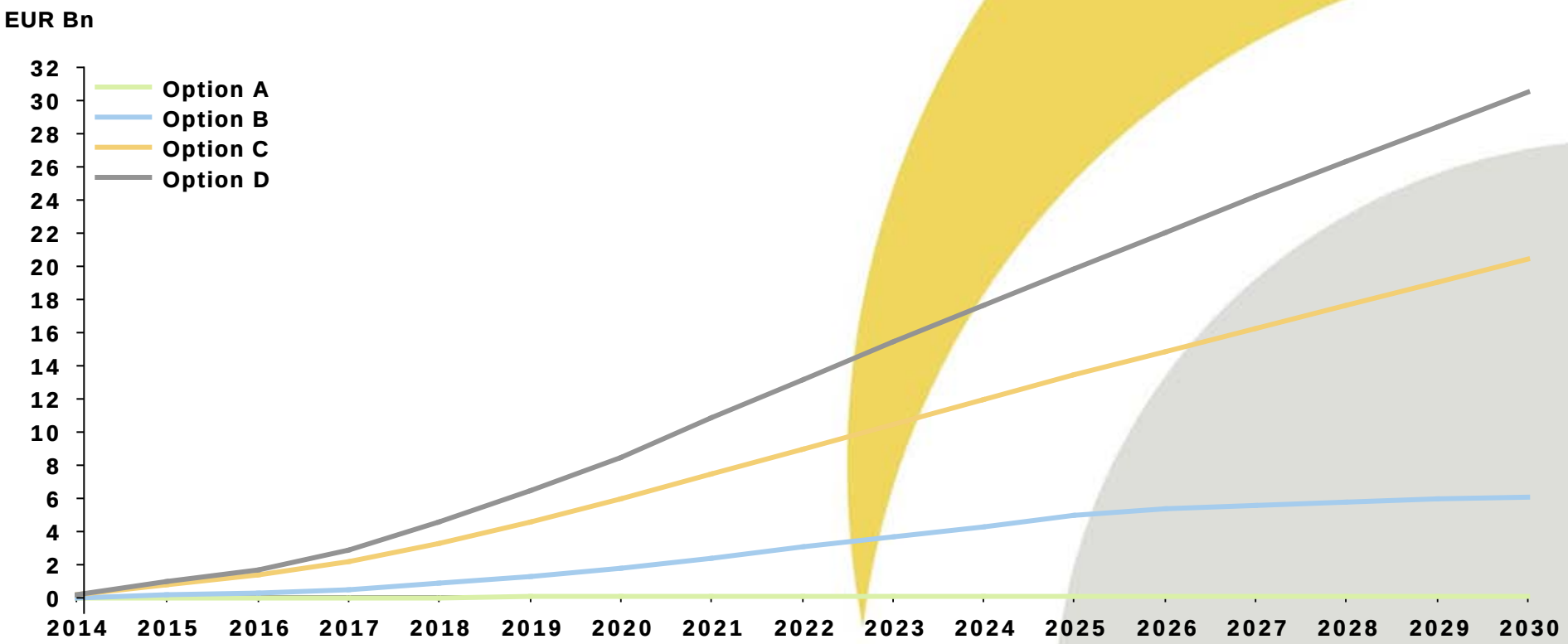
- Will be basis for MFF 2014 – 2020
- BCR = f (scenario)

1. Degraded service limited in time
2. Basic service limited in time
3. Full service without upgrading capacity
4. Full sercice with upgrading capacity

Options A, B, C & D

Options A, B, C and D – Cumulative Net Benefits

- EUR Bn, 2010 prices, 4% real discount rate -



Source: Booz & Company analysis

VI. SME relevance

Data policy

- **GMES: a public good**

  Overriding goal is to provide **free and open** access data and information with minimum restrictions

- **Science** is also recognised as key community to use and evolve GMES

- Need to distinguish between data policy for **Sentinels**, **contributing missions**, **GMES service products & information**

- **Security restrictions** may apply

GMES Overall View

USERS

Policy makers & Public & Private, commercial

What is their need?






Examples provided

Farming | Oil Spill Tracking | Air quality | Flood | Surveillance | Climate Change

Land | Marine | Atmosphere | Emergency | Security | Climate

Information services

Space Infrastructure & In Situ Infrastructure

Sustainable information

OBSERVATION

SME Market

- Companies that offer added value based on EO data (raw data free and open)
- Sector: Telecom, Navigation, Earth observation
- Segments: Meteorology, Defence & security, Oceanography, Natural resource Monitoring, Land Monitoring
- 150 companies defined (VEGA)

SME Market

- Calls by EC + Subcontracting
- Operational: land, emergency
- Concrete examples:
  - Urban planning: French company (SIRS)
  - Use of EO data for new shipping routes (Danish company: Aker Arctic)
  - Adaptation of maps to be user friendly to communal authorities eg snow density maps (eg Finnish company: DHI)

Conclusion

GMES offers:

- Good value for public money
- A direct market for space related companies
- An unique opportunity for non-space SMES's

A quote to end …

To know that we know what we know, and to know that we do not know what we do not know,
that is true knowledge.

Nicolaus Copernicus