Earth Observation for Climate Change

International trends & developments

Earth observation applications

Business development

Capacity building

0. Introduction

Mark Noort, consultant, project manager

HCP international:
consulting, marketing of earth observation

Project director EOPOWER:
project for promotion & capacity building of earth observation applications

Sequence:

- General assessment of the state-of-the-art of earth observation
- Major trends and developments in the application field
- Description of earth observation solutions
- Assessment of market potential for earth observation solutions and marketing instruments
- Capacity building for successful application of earth observation solutions

Earth Observation helps you:

save money

save lives

save the environment

Earth observation applications

- On the verge of reaching new user communities
- These new user communities need to be involved
- Weakest link / last mile aspects are important
- Marketing needed: promotion & capacity building

Life cycle of products & services

Initialization

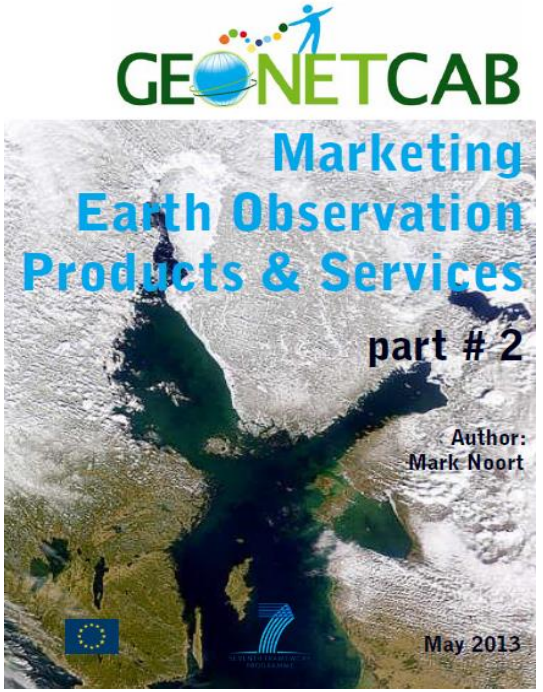
System analysis & design

Rapid prototyping

System development

Implementation

Post-implementation



Scope

Definition of **climate:** **a measure of the average pattern of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological variables in a given region over long periods of time**

Climate change refers to **a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer**

IPCC refers to any change in climate over time, whether due to natural variability or as a result of human activity; UNFCCC refers to climate change in terms of (direct or indirect) human activity

Scope (2)

Climate change adaptation: **managing the unavoidable**

Climate change mitigation: **avoiding the unmanageable**

Source: Holden, Harvard University

Assessment of business & funding opportunities

- Categories of climate change products & services
- Life cycle phase of product or service
- Regional context, level of technological & economic development
- Optimum marketing mix

1. International trends & developments in climate change

Issues & trends in climate change

- Increased **resilience of communities** with respect to climate variability
- Increased **adaptive capacity of natural and managed systems** under current and predicted climate variability
- **Role of science** in improving modelling, predictions and effects of climate change
- Search for establishment of global coping mechanisms, such as **carbon accounting**

Drivers

- Rise of CO2 concentrations and emissions
- Rising global mean temperature
- Increasing ocean heat storage
- Rising sea levels
- Increasing loss of ice from Greenland and Antarctica + loss of sea ice
- Ocean acidification
- Heat waves and extreme temperatures
- Increasing drought spells and aridity
- Increasing occurrence of heavy rain and flooding

Resilience of communities

- Choose **entry points** such as **food security or risk management**;
- **Identify champions** = most appropriate counterpart;
- Show **vulnerability patterns** & **socio-economic impact**;
- **Addressing short-term vulnerabilities** is the best strategy for preparing for long-term impacts;
- **Important role for communities and private sector** in climate risk management (involve in planning and implementation of adaptation).

More information:

Social vulnerability and adaptation in fragile states (UNU-EHS; 2012) *policy options, developing adaptation strategies in fragile states and building resilience and peace among socially vulnerable groups*

Climate knowledge for action, a global framework for action – empowering the most vulnerable (WMO; 2011) *advocating a global framework for action, consisting of a user interface platform, climate services information system and three components: observations and planning, research modelling and prediction, capacity building*

Acting on climate change: the UN system delivering as one (UN; 2008) *overall description of UN strategy*

More information (2):

REDD+ and community forestry (WB, FCP, GEF; 2012)
lessons learned from an exchange of Brazilian experiences with Africa

Capacity development on integration of science and local knowledge for climate change impacts and vulnerability assessments (APN; 2010)
SimCLIM and impact models for climate change preparedness at the local level

Adaptive capacity of natural & managed systems

- Analysis of different levels of possible regret (no, low, high) -> **aim at no regret, high impact**;
- Climate change needs to be treated as a **major social and economic risk** to national economies (not just environmental);
- Adaptation should primarily look at **policy changes to reduce vulnerability** and at **"soft" technologies** rather than site-specific structural protection measures, unless they cost-effectively address current hazards;
- Many adaptation investments involve strengthening or enforcing existing regulations and therefore require full **buy-in from regulatory agencies;**
- Types of **response** strategies: **reactive & anticipatory**.

Example agriculture

Adaptation at the farm level

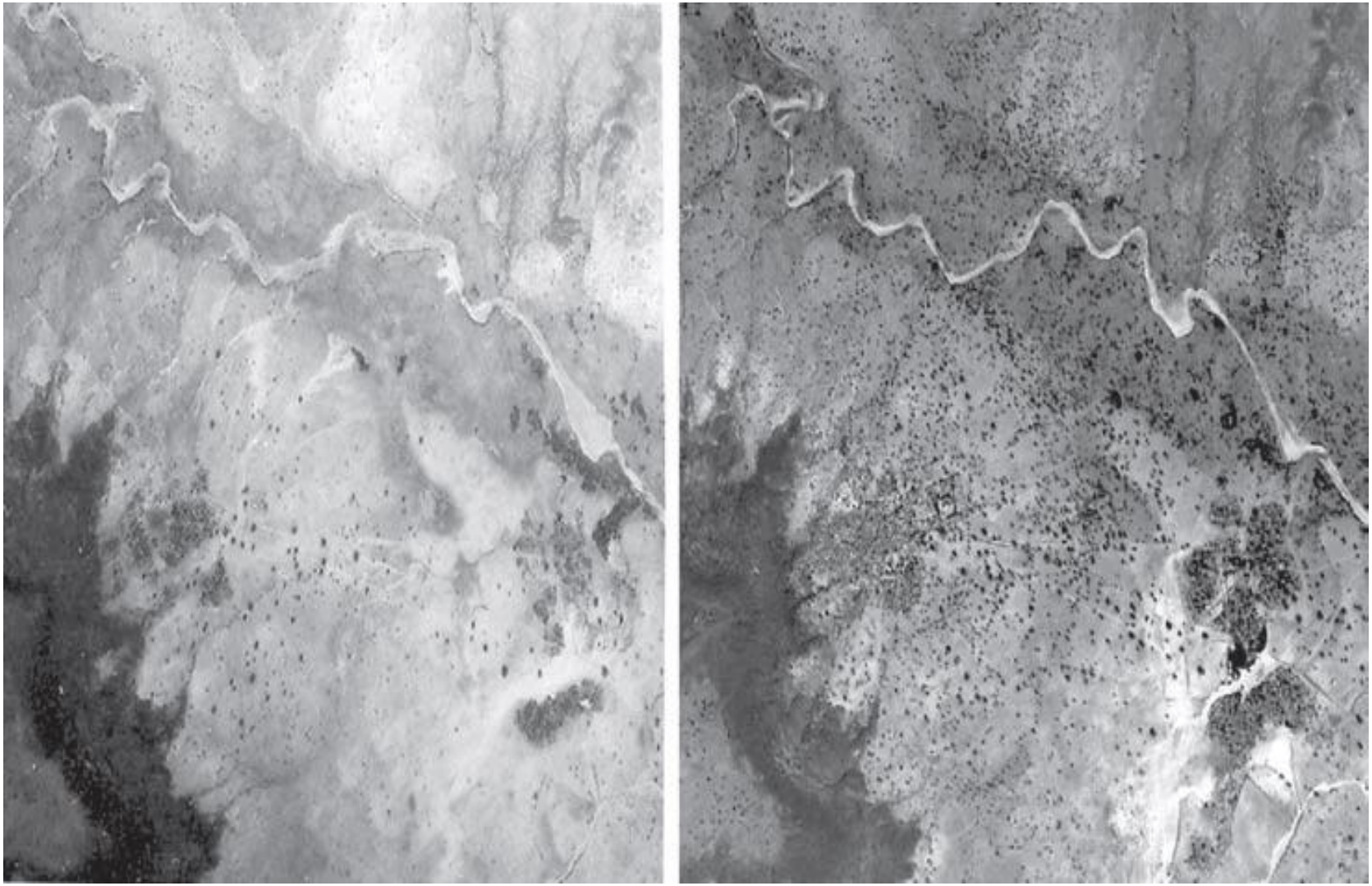
- Crop calendar shifts and crop changes
- Soil and water management changes
- Fertilizer use / land use decisions
- Water, labour, capital use (intensive or not, efficiency)

Needed:

Climate information, seasonal climate forecasts, early warning, infrastructure, insurance, technology development (crop varieties, irrigation technology)

Source: Mainstreaming adaptation to climate change in agriculture and natural resources projects (World Bank; 2011)

It can be simple



Trees planted in Niger for soil conservation (left 1975, right 2003)

Example response strategies

Response strategy water resources

- **Reactive adaptation**: protection of groundwater resources, improved management and maintenance of existing water supply systems, protection of water catchment areas, improved water supply, groundwater and rainwater harvesting and desalination.
- **Anticipatory adaptation**: better use of recycled water, conservation of water catchment areas; improved system of water management, water policy reform including pricing and irrigation policies, development of flood controls and drought monitoring

Climate change: impacts, vulnerabilities and adaptation in developing countries (UNFCCC; 2007)

Expected climate effects developing countries

- **Africa:** temperature ↑, rainfall ↓, droughts ↑, floods ↑
- **Asia:** temperature ↑, rainfall ↓ (except Central Asia), droughts ↑, cyclones ↑, heat waves ↑
- **Latin America:** temperature ↑, rainfall ?, glaciers ↓, landslides ↑, floods ↑, hurricanes (Caribbean) ↑, heat waves ↑
- **Small island developing states:** temperature ↑, rainfall ↑ or ↓ (depending on region), cyclones ↑

Climate change: impacts, vulnerabilities and adaptation in developing countries (UNFCCC; 2007)

More information:

The policy climate (Climate Policy Initiative; 2013)
overview of policies and description of initiatives to counter the effects of climate change in Brazil, China, European Union, India and the United States

Developing a climate-smart agriculture strategy at the country level: lessons from recent experience (FAO; 2012)
assessment of existing policies and institutions with recommendations for, and examples of, cost-effective adaptation

Climate-smart agriculture strategy at the country level: lessons from recent experience (World Bank; 2011)
description of adaptation measures, directed at increased productivity and food security, enhanced resilience and reduced carbon emissions for sustainable development; with country examples

More information (2):

Recent trends in EU external action in the fields of climate, environment, development and security (IES; 2011)
description of international and EU climate action on climate change, forests, biodiversity, natural resources, agriculture and food, water, disasters, waste, migration and peace and security

Managing the risks of extreme events and disasters to advance climate change adaptation (IPCC; 2012) *description of risks and adaptation options for decision making*

Comparative assessment of the vulnerability and resilience of 10 deltas (Delta Alliance; 2010) *study comparing climate aspects of the Nile, Incomati, Ganges-Brahmaputra-Meghna, Yangtze, Ciliwung, Mekong, Rhine-Meuse, Danube, California Bay and Mississippi River deltas*

More information (3):

Seizing the global opportunity – Partnerships for better growth and a better climate (Global Commission on the Economy and Climate; 2015) *the 2015 new climate economy report*

Climate change 2014: Impacts, adaptation and vulnerability (IPCC; 2014) *summary for policy makers*

Being prepared for climate change (EPA; 2014) *a workbook for developing risk-based adaptation plans*

Role of science

- **Improved projections, predictions and monitoring** of multi-decadal global to regional climate changes
- **Stronger scientific foundation** for adaptation and mitigation
- **Improved predictions** of high-impact weather and climate
- Science-based support to **responses and planning**
- **Developing national and international climate services**
- **Education and capacity building**

More information:

Turn down the heat: why a 4ºC warmer world must be avoided (World Bank; 2012) *overview of climate projections and possible impact*

Guidelines on analysis of extremes in a changing climate in support of informed decisions for adaptation (WMO; 2009) *guide on datasets, observations, analysis and toolkit(s)*

WCRP (GEWEX, CliC, CLIVAR, SPARC) documents *reports on clouds, implementation plan and achievements, fact sheets on sea level rise and monsoons*

Climate change science compendium (UNEP; 2009) *comprehensive popular overview of climate science*

Carbon accounting

- Importance of MRV: **measurement, reporting, verification**
- **Control of emissions leakage** (displaced emissions): reduction in one place leads to higher emission in another area
- Translation to **payment for ecosystem services** (PES)
- Communication with and **involvement of stakeholders**
- Approved methodologies for **verified carbon standard** (VCS)
- Establishment of **land use / land cover baseline**, using GIS and remote sensing
- Carbon accounting is complemented by (other) **multiple benefit assessments**

More information:

Climate smart development (World Bank; 2014)
overview and case studies of multiple benefit assessments of climate smart initiatives

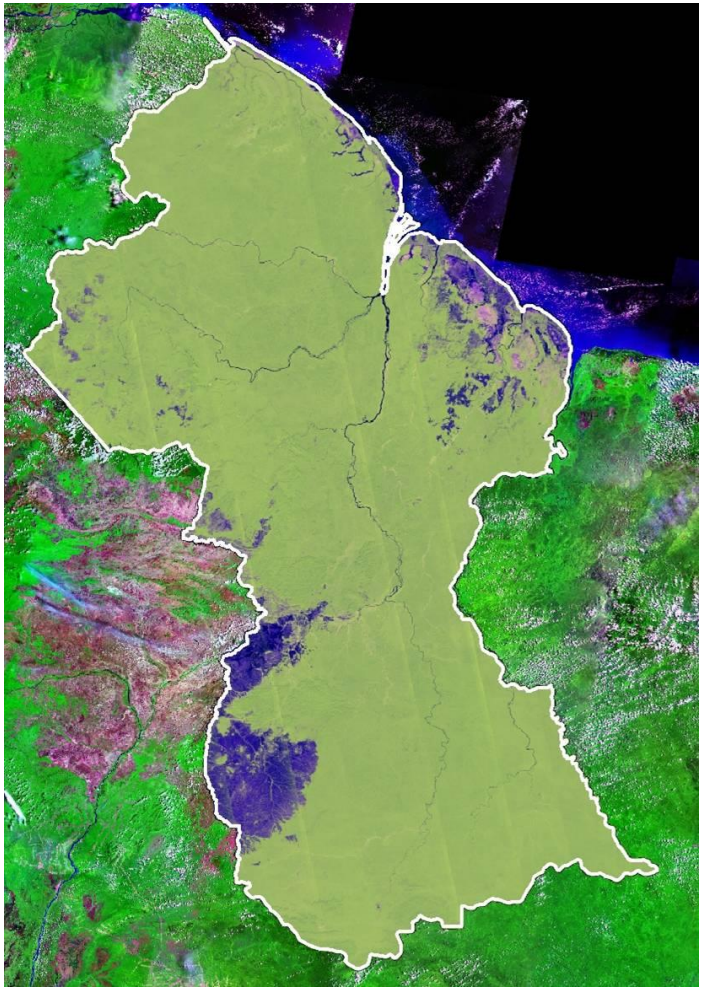
Analysing REDD+, challenges and choices (CIFOR; 2012)
detailed overview of approach, methodology, guidelines and performance indicators

Forest carbon accounting, overview and principles (UNEP, UNDP) *general guidelines, stresses importance of remote sensing*

REDD+ measurement, reporting and verification (MRV) manual (USAID, FCMC; 2014) *review of the data, models, techniques and accounting methods that could be part of an MRV system for reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks*

2. Earth observation applications

Earth observation for climate change

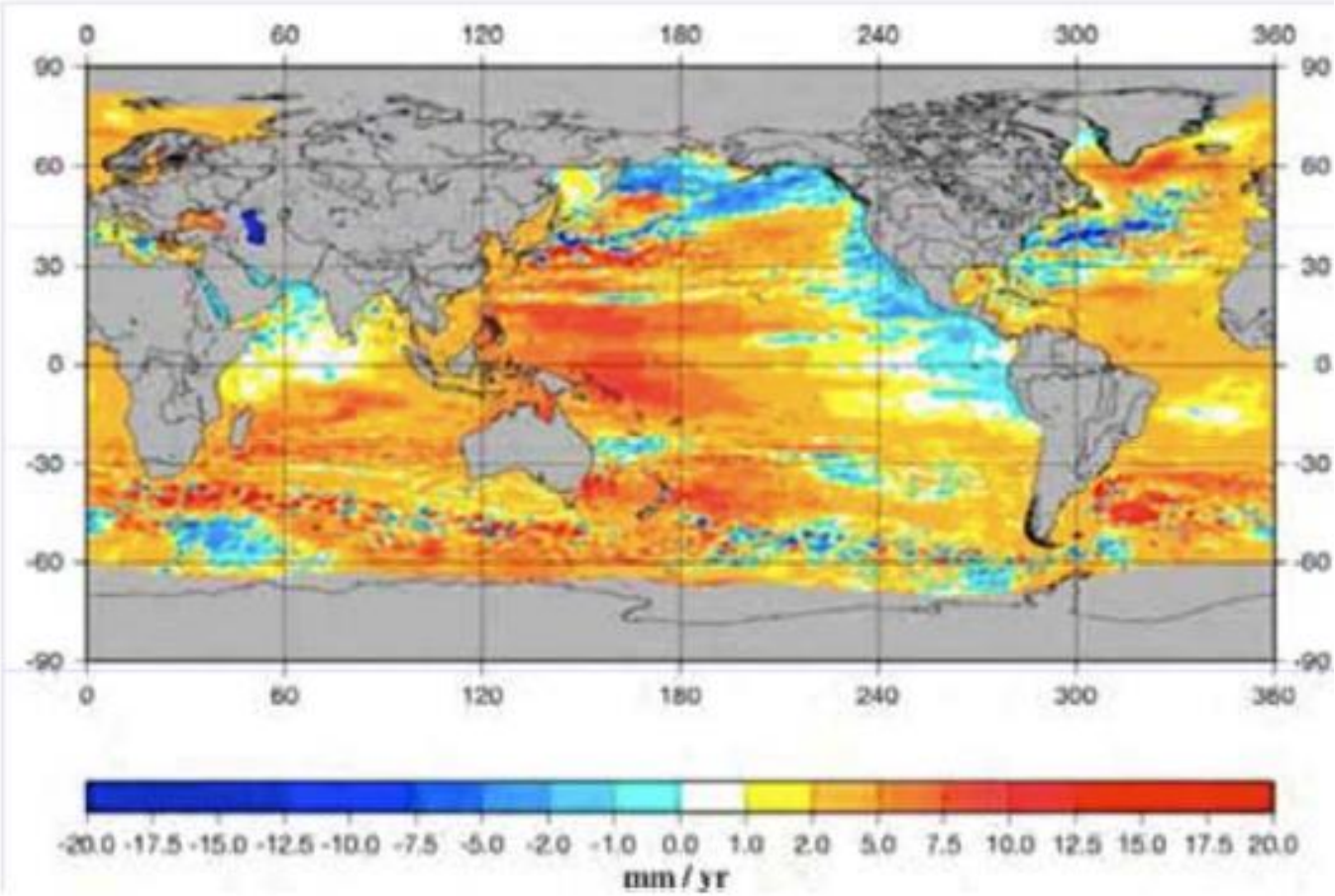


ALOS PALSAR mosaic of Guyana with 50 m resolution to enable carbon assessment for REDD+. (Source: SarVision; 2010)

Earth observation contribution

- Climate **monitoring and modelling**
- **Carbon accounting** schemes
- **Prediction and mitigation** of the effects of climate change

Example monitoring and modelling



Regional trend in sea level rise (Source: ESA)

Monitoring and modelling

- Earth observation facilitates year-round data collection for climate monitoring and modelling, also when field data collection is not possible (arctic, tropical rainforests);
- Reduced costs when compared to traditional field data collection methods in remote environments;
- Remote sensing systems can capture a synoptic view of the landscape and oceans, to more adequately characterise dynamics;
- Remote sensing provides additional information that can supplement more intensive sampling efforts and help extrapolate findings;
- Cost estimate: on case-by-case basis, mainly scientific activity
- Main challenges: cost, complexity.

Examples:

Space technologies and climate change (OECD; 2008)
general overview of state-of-the-art with emphasis on implications for water management, marine resources and maritime transport

GEO Carbon showcase:
http://www.youtube.com/watch?v=cmS3RergtP4

Copernicus climate change:
http://www.youtube.com/watch?v=ujDU6hyn-vg

General climate change: http://preview.grid.unep.org

Essential climate variables reports:
www.fao.org/gtos/topcECV.html
Global Climate Observation System (GCOS)

More examples:

State of play of climate change research with earth observation from space (ESA; 2012) *presentation showing the relevance of earth observation for climate monitoring and modelling*

Global biophysical datasets from NASA missions (Univ. of Montana; 2011) *overview of measurements of ECVs, global fire, global net primary production, evapotranspiration, groundwater withdrawal, soil moisture, atmospheric CO_2 and biomass and carbon storage estimates*

MeteoSat derived planetary temperature trend 1982 – 2006 (EARS; 2013) *analysis of MeteoSat data shows that overall mean temperature has slightly dropped (!) over the last 35 years, mainly due to cloudiness (with some small exceptions)*

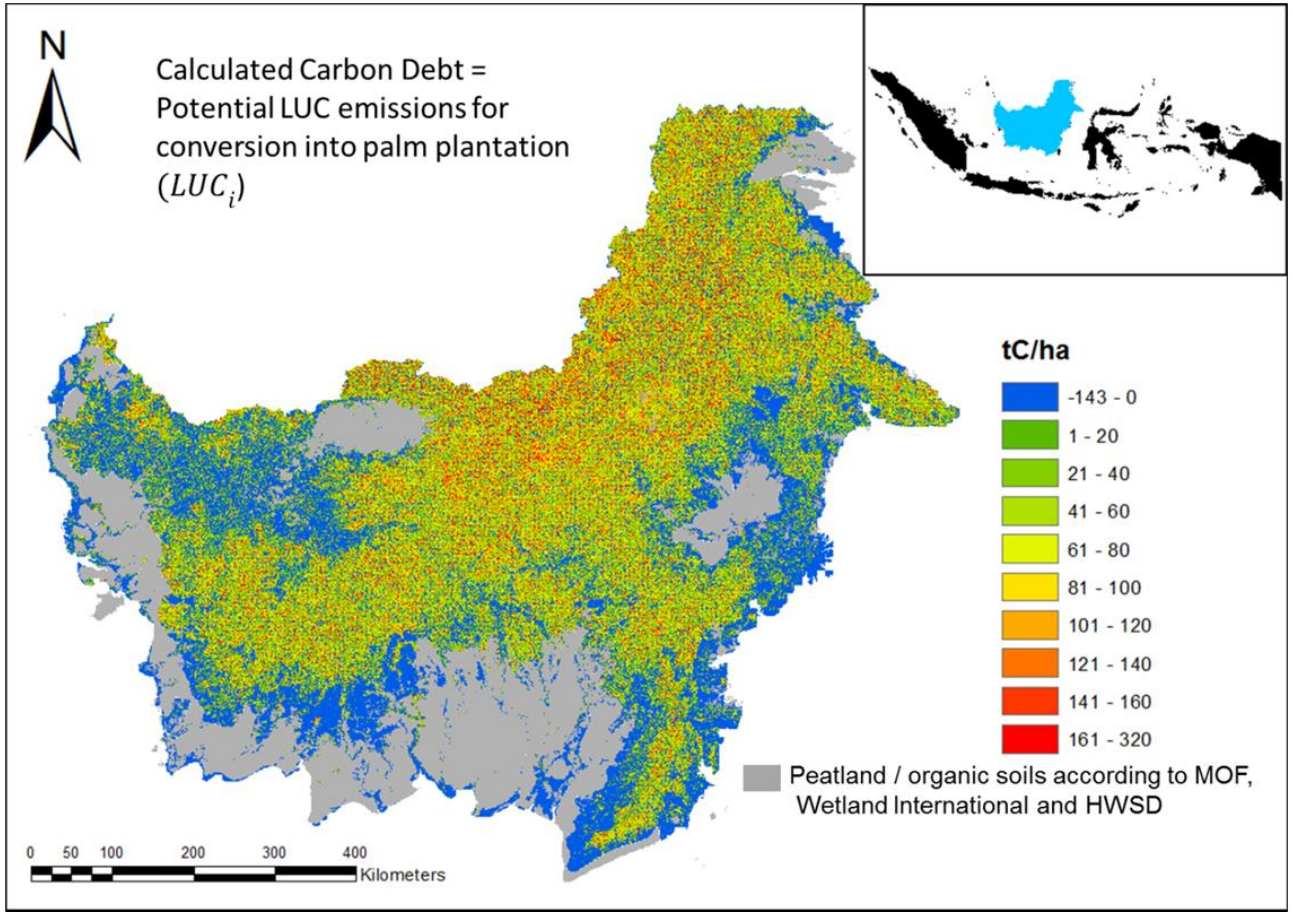
More examples (2):

Challenges of a sustained climate observing system (Trenberth et al.; 2013) *article dealing with datasets, methodologies and scope of satellite observations for climate studies*

Climate change research beyond limits (Copernicus; 2015) *brochure on the use of EO for sea ice monitoring*

El Niño – Tracking a global climate phenomenon (Copernicus; 2015) *brochure on the use of EO for detecting and tracking the course of El Niño and to improve the predictability of El Niño events*

Example carbon accounting



Potential calculated carbon debt for conversion into palm plantation in Kalimantan, Indonesia (source: IfW; 2013, SarVision; 2008)

Carbon accounting

- Earth observation provides information on detecting forest cover and land cover change (optical), also in areas where cloudiness is a problem (radar);
- Earth observation helps measuring global biophysical variables related to the status of vegetation, such as leaf area index;
- Earth observation supports the measurement, reporting and verification process;
- Cost estimate: on case-by-case basis;
- Main challenges: cost, complexity, capacity, business model.

Examples:

EU biofuel policies in practice - a carbon map for Kalimantan and Sumatra (IfW; 2013)
calculation of the (potential) carbon effects of conversion of forest and peatland into palm plantation in Indonesia

Integrating remote-sensing and ground-based observations for estimation of emissions and removals of greenhouse gases in forests (GFOI; 2013) *methods and guidance for estimating emissions and removals from the broader land use, land-use change and forestry sector with remote sensing and how this can be used for reporting and policy advice*

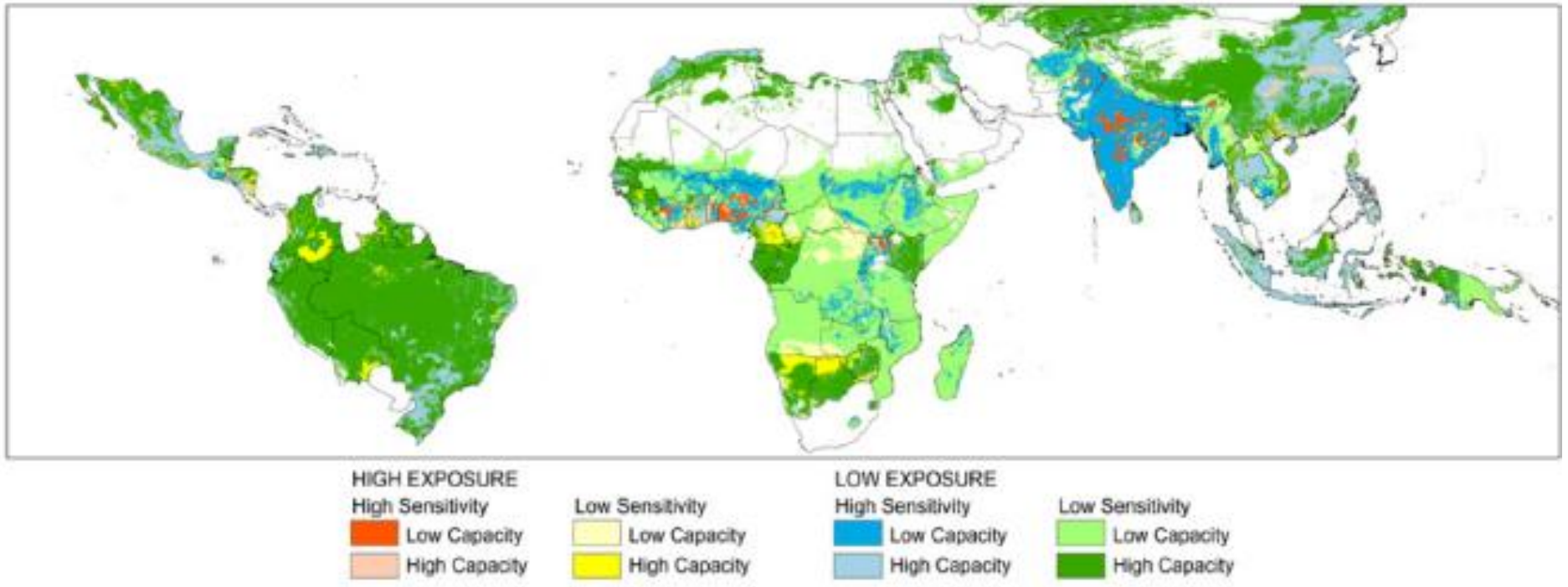
Monitoring of tropical forests and agricultural areas with radar (SarVision; 2011) *presentation on REDD+ examples from Guyana and Surinam and oil palm example from Malaysia*

More examples:

Integrating remote-sensing and ground-based observations for estimation of emissions and removals of greenhouse gases in forests (GFOI; 2014)

methodological advice on the use of remotely sensed data together with ground-based observations to estimate and report greenhouse gas emissions and removals associated with forests in a manner consistent with the greenhouse gas inventory guidance from the Intergovernmental Panel on Climate Change

Example prediction and mitigation



Vulnerability to maximum daily growing season temperature exceeding 30 °C (Source: CIESIN; 2013, CGIAR; 2011)

Prediction and mitigation

- Prediction and mitigation products and services use the output of climate monitoring and modelling (and carbon accounting) as input;
- Earth observation is used to provide more detailed information that is relevant for local decision-making, such as subsidence measurements for urban coastal areas, hotspot mapping, detailed change detection, extreme weather, renewable energy;
- Earth observation provides a good basis for visualization in support of decision-making;
- Cost estimate: on case-by-case basis;
- Main challenges: cost, cost-benefit, acceptance, business model, knowledge transfer.

Examples:

Climate change hotspots mapping (CIESIN; 2013)
presentation on climate change hotspots mapping for vulnerability assessment and improved targeting of adaptation and mitigation efforts

Critical datasets & potential new tools for detection of climate impact on the water cycle (CSIRO; 2011) *presentation with the description of the use of remote sensing and visualization tools to show the potential impact of climate change, with the aim to improve decision making*

North African coastal cities address natural disasters and climate change (World Bank, ESA; 2011)
studies on adaptation to climate change with respect to natural disasters for Alexandria, Tunis, Casablanca and the Bouregreg area

Climate change projections and adaptation strategies for multi-objective resource management at Kennedy Space Center, Florida (NASA; 2011) *presentation on future projection of climate change and measures for protection of the Kennedy Space Centre and ecosystem preservation*

Growth potential for earth observation

- **Measurement, reporting and verification for carbon accounting**.
  Main clients: government, NGOs.
- **Prediction and mitigation at various levels for decision-making.**
  Main clients: governments, NGOs.

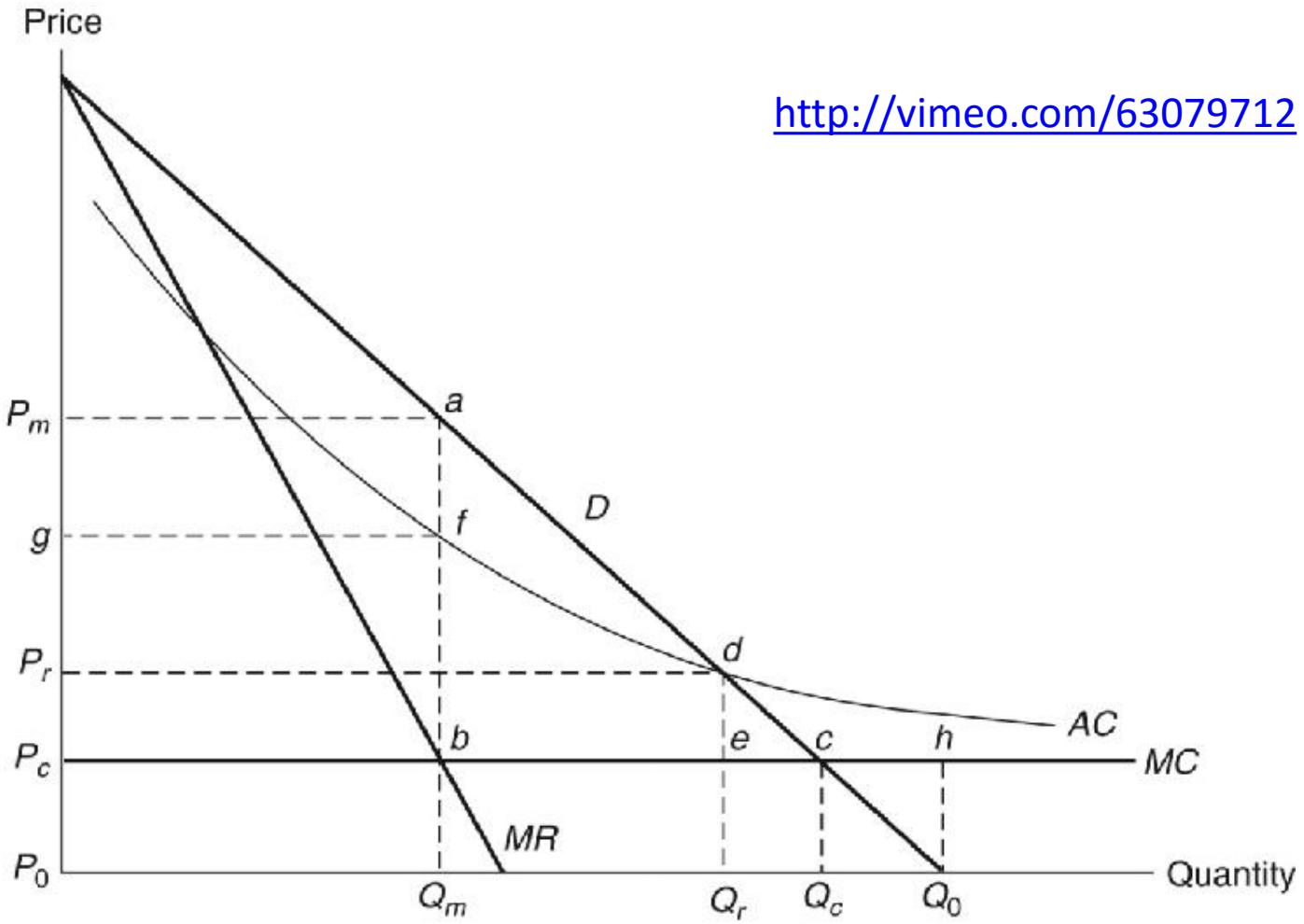
3. Business development

Why is marketing / promotion of earth observation needed?

- Public sector information (PSI)
- Externalities (environmental accounting & payment for ecosystem services)
- Global datasets, open access, data sharing, compatibility (GEO)

If public sector information is made available free-of-charge, demand will increase and, in the end, government revenue also, as companies will derive income from value-added products and services, and consequently pay more taxes (see figures in following slides).

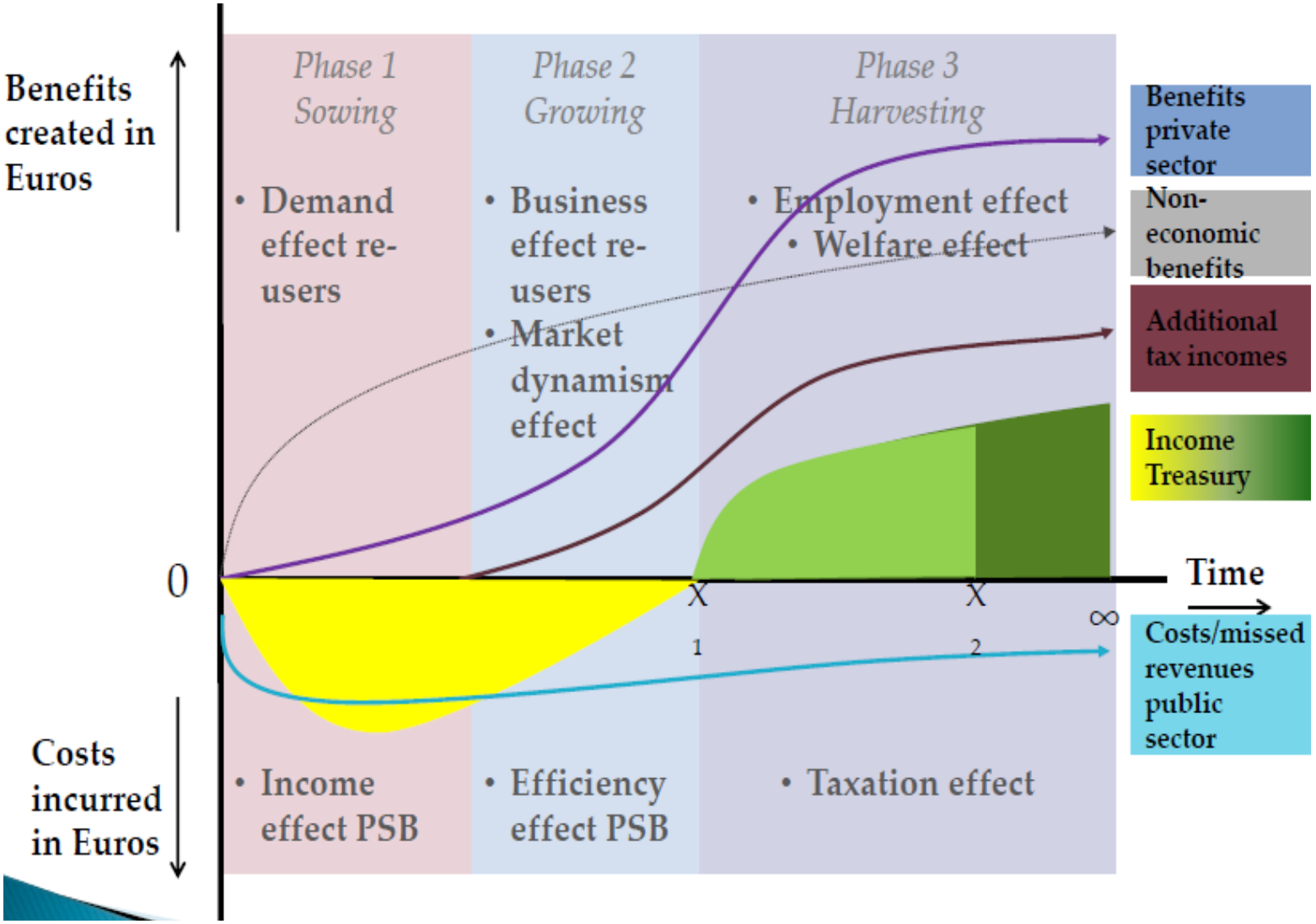
Supply & Demand Public Sector Information



http://vimeo.com/63079712

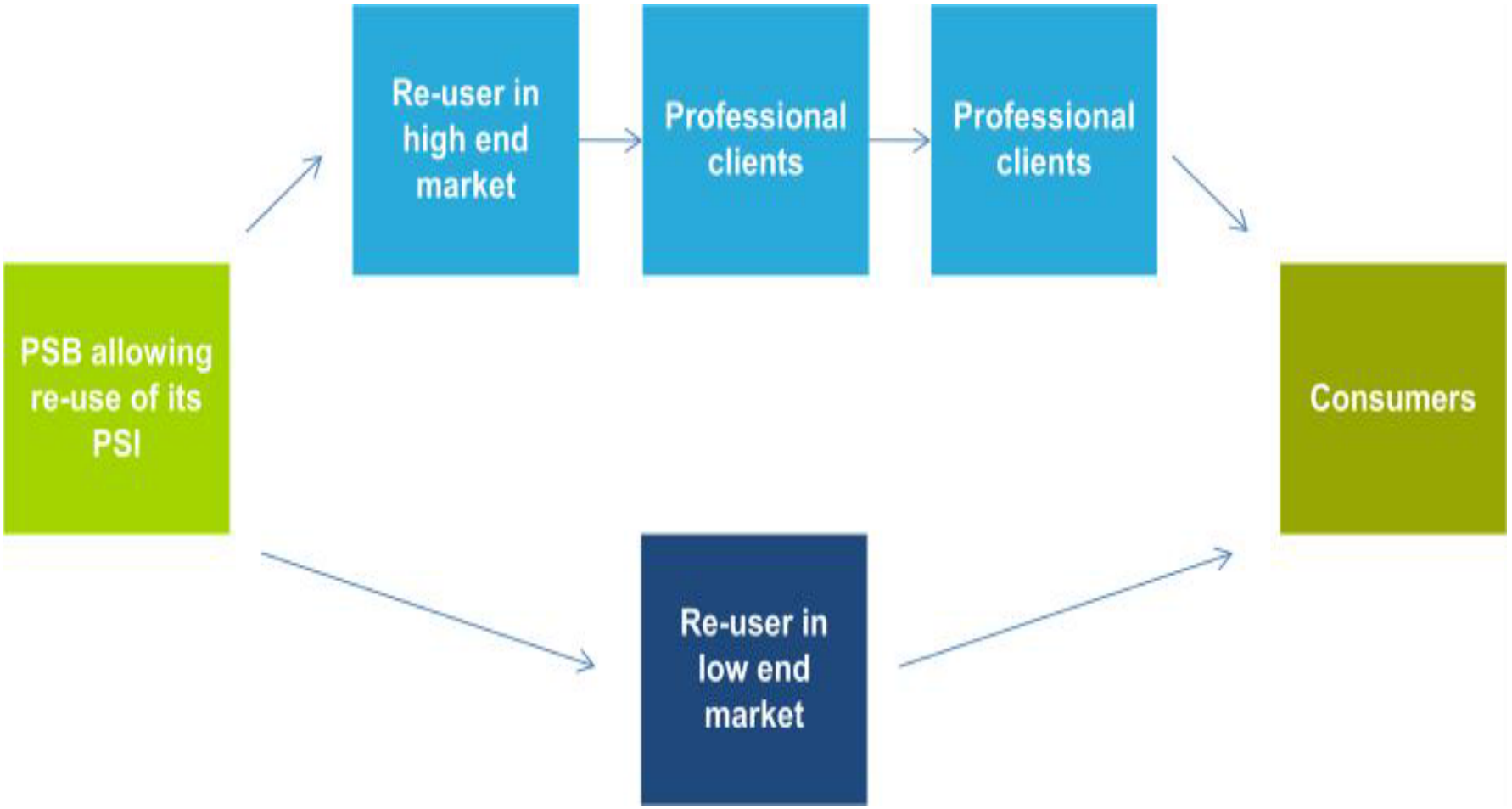
Source: About GMES and data: geese and golden eggs (Sawyer, de Vries 2012)

Cost-benefit Public Sector Information



Source: About GMES and data: geese and golden eggs (Sawyer, de Vries 2012)

Re-use of Public Sector Information



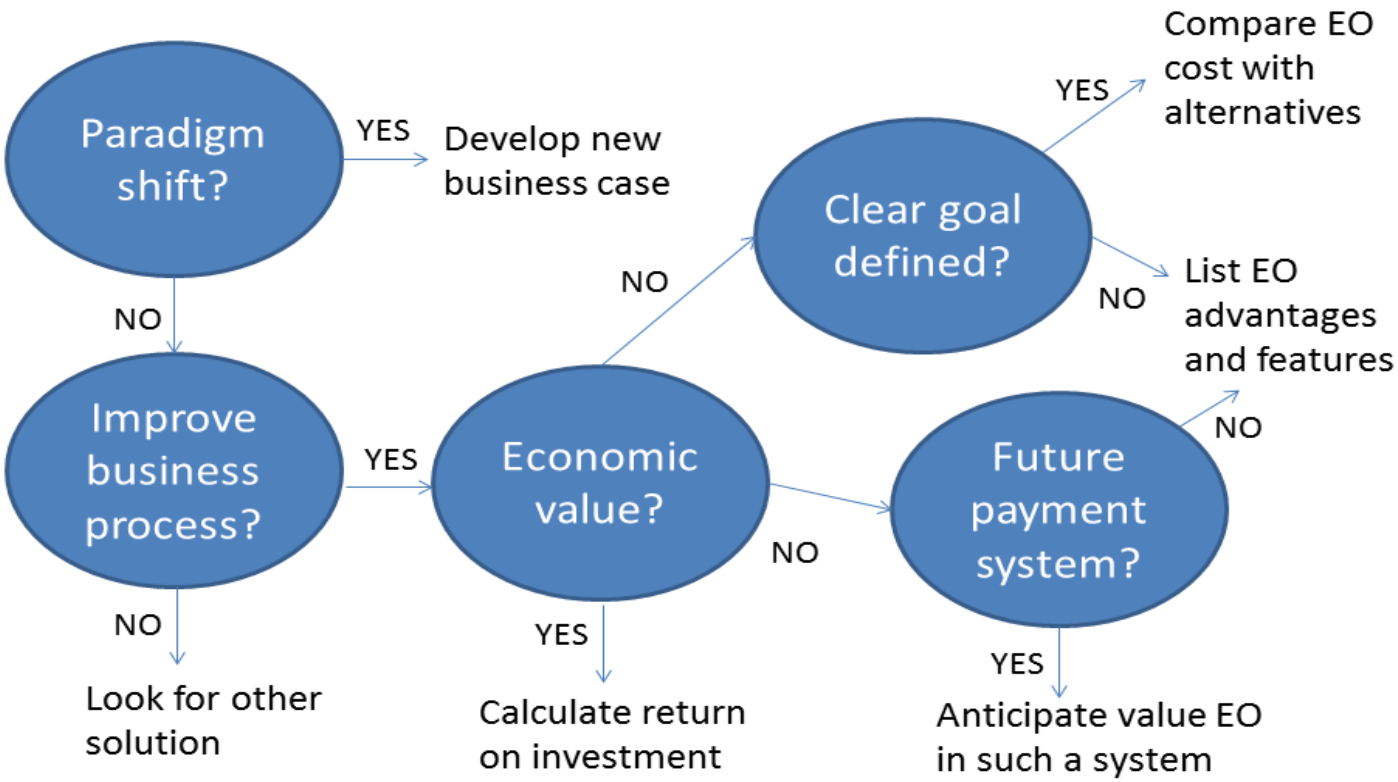
Source: About GMES and data: geese and golden eggs (Sawyer, de Vries 2012)

Most earth observation applications deal with so-called externalities, such as impact on the environment.
It is difficult to capture these in terms of conventional cost-benefit models.

To tackle this, the following framework for analysis of earth observation applications is developed:

Framework for analysis

Step-by-step benefit EO



Step-by-step analysis of the benefits of earth observation (source: GEONetCab, 2013)

Key questions

- Does the new application cause a paradigm shift?
- Is the current business or organization process improved?
- Does the application provide economic value that can be quantified?
- Is a clear measurable goal defined to which the earth observation application contributes?
- Is a future payment scheme or other economic mechanism foreseen in which the earth observation application fits?

Assessment of geospatial solutions

Rating of **characteristics** of geospatial solutions:

- fit-for-purpose
- comparative advantage
- complexity to user / ease- of-use
- elegance
- cost-benefit,
- sustainability
- resilience
- reproduction capacity / flexibility
- acceptance
- level of knowledge transfer required
- ethics, transparency, public accountability, objectivity & impartiality

Rating of **business environment**:

- **Willingness to pay** (by clients)
- **Embedding** (in organizational processes)
- **Openness** (transparency and ease of doing business, access to markets)
- **Institutions** (is the institutional environment conducive to doing business, acceptance of new solutions?)

Fit-for-purpose

An important, but often forgotten requirement:
Does the product or service do what it is supposed to do to solve a certain problem?

In other words: is it really a solution or just an attempt towards a solution?

- Quantitative: not applicable
- Qualitative (on scale of 1 to 5): based on description of what the EO solution actually does

Comparative advantage

What it does significantly better than other solutions to the same problem.

For earth observation usually the comparative advantages of greater accuracy, better resolution in time and space, comprehensive overview of large areas and near real-time information provision are mentioned as comparative advantages.

- Quantitative: calculation of degree in which the EO solution is better than alternatives
- Qualitative (on scale of 1 to 5): based on listing of comparative advantages

Complexity (to user) / ease-of-use

At all levels in the value chain the users (professionals and end-users) are able to work with the product or service.

- Quantitative: not applicable
- Qualitative (on scale of 1 to 5): based on user testimonials and user surveys

Elegance

Once you get the idea behind this product or service, you want to be part of the community that uses it.

This sense of belonging facilitates the formation of user groups that provide valuable feedback.

- Quantitative: none, or it should be the size of the user community
- Qualitative (on scale of 1 to 5): based on user testimonials and user surveys

Cost-benefit

The cost-benefit of the product or service is quantified and sufficiently attractive, also in the long-term.

- Quantitative: cost-benefit calculation
- Qualitative (on scale of 1 to 5): based on quantitative assessment

Sustainability

The product or service can be delivered when it is needed.
There is a long-term perspective that guarantees delivery.

Sustainability concerns the following aspects:

- ✓ Long-term data availability
- ✓ Availability of finance/funds to provide the solution continuously for present and future use
- ✓ Long-term institutional / governmental interest and support
- ✓ Long-term user interest for a solution that addresses real needs

- Quantitative: not applicable
- Qualitative (on scale of 1 to 5): based on sensitivity analysis of the EO solution

Resilience

In case of extremes or breakdown in the value chain, the product or service can still be delivered at an acceptable level. Alternatives (plan B) are available (and developed).

- Quantitative: cost-benefit calculation of plan B
- Qualitative (on scale of 1 to 5): based on risk analysis of the EO solution

Reproduction capacity / flexibility

The product or service can be easily applied or adapted for use in another region or another situation, while still providing the solution without (too much) extra cost.

- Quantitative: calculation of reproduction costs for application in other regions or situations; measurement of spreading of actual use
- Qualitative (on scale of 1 to 5): based on quantitative assessment and description of EO solution

Acceptance

The users intuitively get what the product or service is about and are interested. They accept it as a solution to their problem.

- Quantitative: none, or survey results about acceptance. After introduction of the solution: number of clients and/or users
- Qualitative (on scale of 1 to 5): based on user testimonials and user surveys

Level of knowledge transfer required

The training requirements for professionals and other users along the value chain are clear and associated costs and efforts are acceptable.

- Quantitative: cost and time required to get the users at the desired knowledge and skill level
- Qualitative (on scale of 1 to 5): based on knowledge transfer plans and evaluation of training activities

Ethics, transparency, public accountability, objectivity & impartiality

Application of Earth observation increases the level of objectivity and impartiality in decision-making processes, including conflict resolution. The application improves transparency and public accountability. It raises no ethical issues or if it does, as in the case of privacy concerns, these are resolved in a satisfactory way for all parties concerned.

- Quantitative: not applicable
- Qualitative (on scale of 1 to 5): based on user testimonials and user surveys

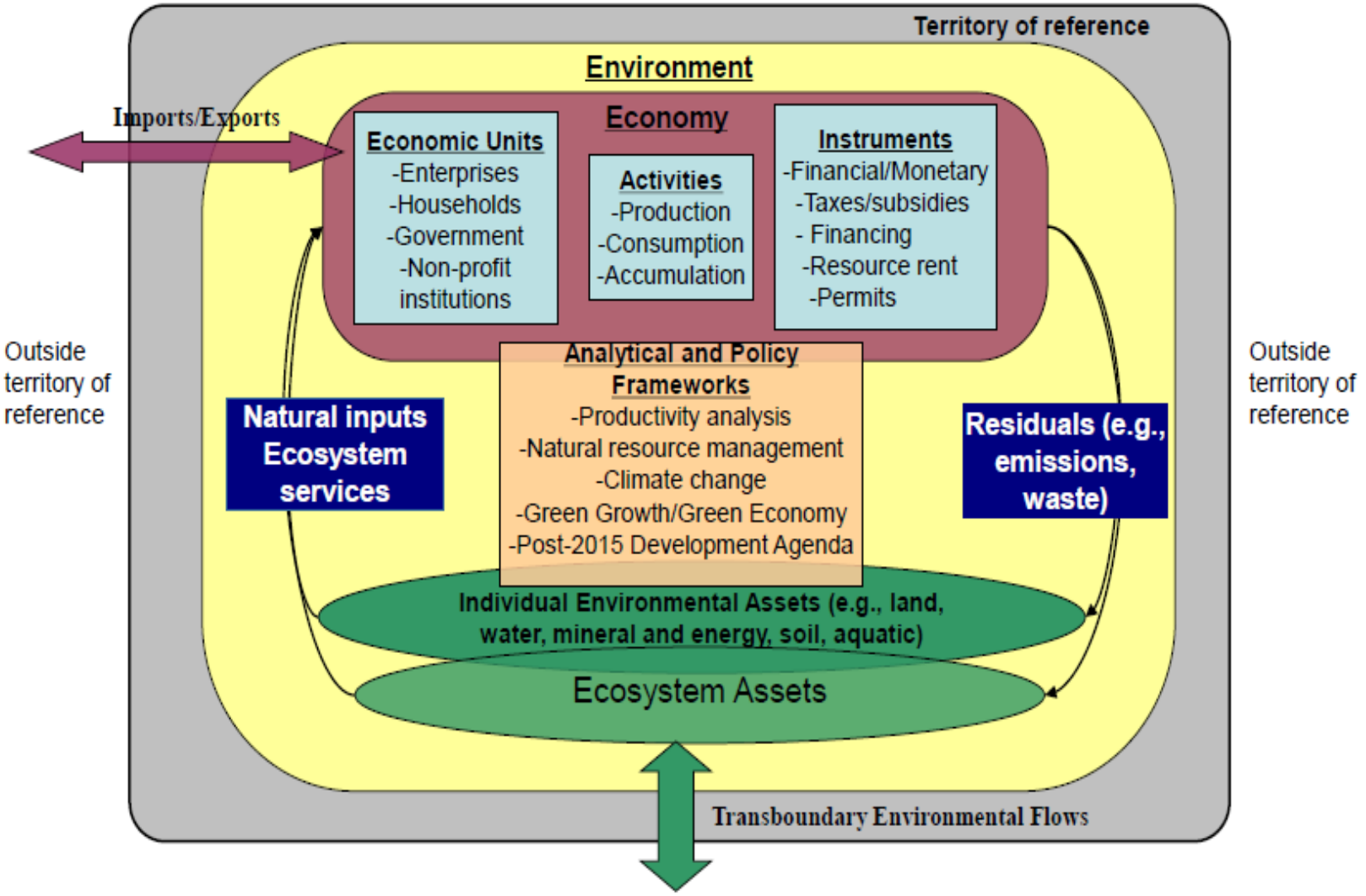
Several attempts have been made to introduce environmental accounting and to enlarge the sphere of the conventional economy to include and quantify impact on ecosystems.

The following slides give some examples:

Environmental accounting & payment for ecosystem services

- **SEEA:**
  System of Environmental-Economic Accounts
  (EC, FAO, IMF, OECD, UN, WB)
- **WAVES:**
  Wealth Accounting and the Valuation of Ecosystem Services (global partnership, led by World Bank)
- **TEEB:**
  The Economics of Ecosystems and Biodiversity
  (group led by UNEP)

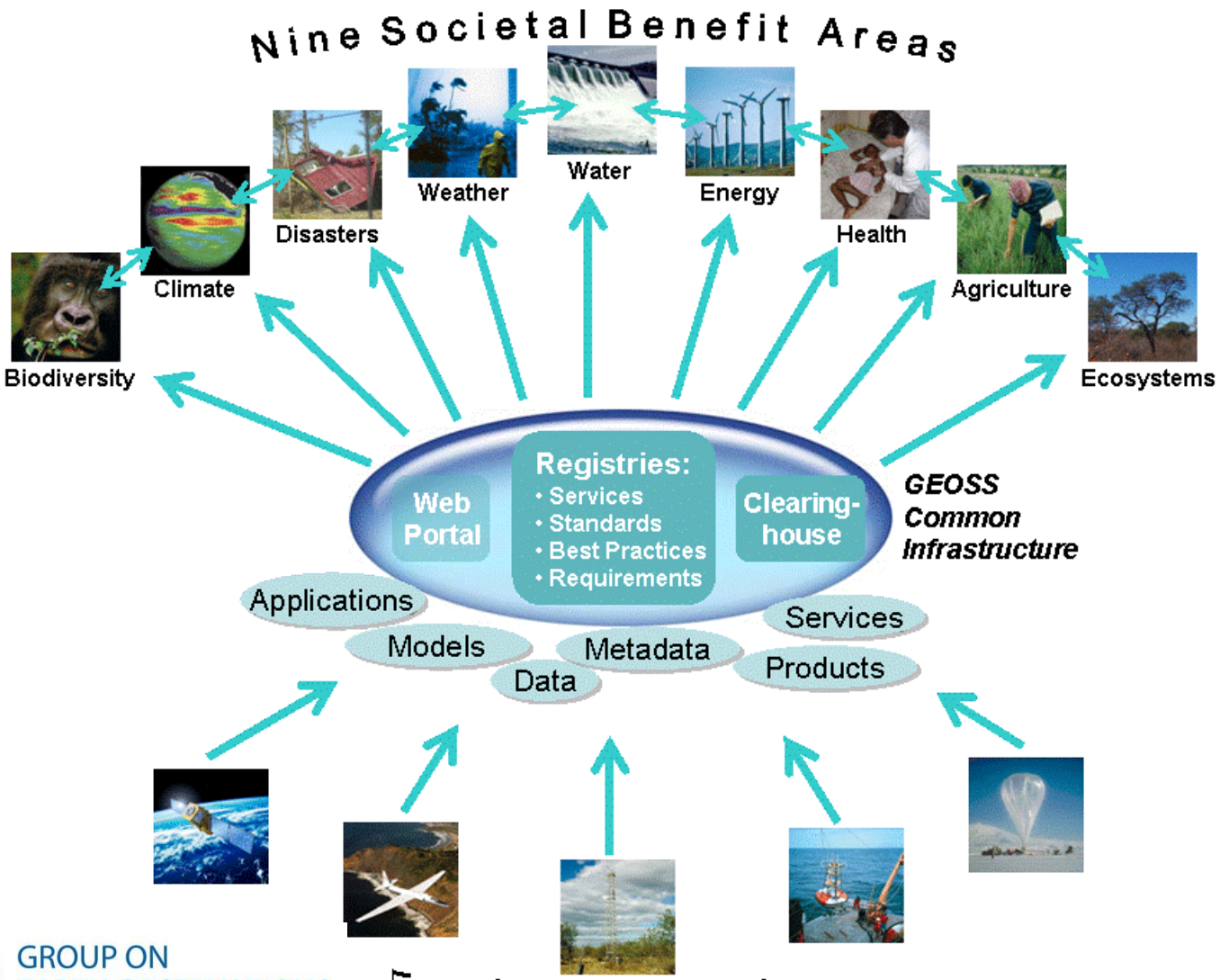
SEEA Conceptual Framework



Source: SEEA conceptual framework report (EC, FAO, IMF, OECD, UN, WB 2012)

For earth observation the work of the Group on Earth Observations (GEO) is essential to achieve the goal of a Global Earth Observations System of Systems (GEOSS), resulting in the shared GEO common infrastructure (GCI):

Group on Earth Observations



GROUP ON EARTH OBSERVATIONS

Marketing elements

- Customer value propositions
- Crossing the technology chasm
- Creating shared value
- Promotion tools

Customer value propositions capture the unique value of a product or services as perceived and appreciated by the customer.

Interestingly, they can differ completely from the features that the provider considers most important:

Customer Value Propositions

VALUE PROPOSITION	ALL BENEFITS	FAVOURABLE POINTS OF DIFFERENCE	RESONATING FOCUS
Consists of:	All benefits customers receive from a market offering	All favourable points of difference a market offering has relative to the next best alternative	The one or two points of difference whose improvement will deliver the greatest value to the customer
Answers the customer question:	"Why should our firm purchase your offering?"	"Why should our firm purchase your offering instead of your competitor's?"	"What is *most* worthwhile for our firm to keep in mind about your offering?"
Requires:	Knowledge of own market offering	Knowledge of own market offering and next best alternative	Knowledge of how own marketing offering delivers value to customers, compared with next best alternative
Has the potential pitfall:	Benefit assertion	Value presumption	Requires customer value research

Source: Customer value propositions in business markets (HBR 2006)

Buyer behaviour & motivation

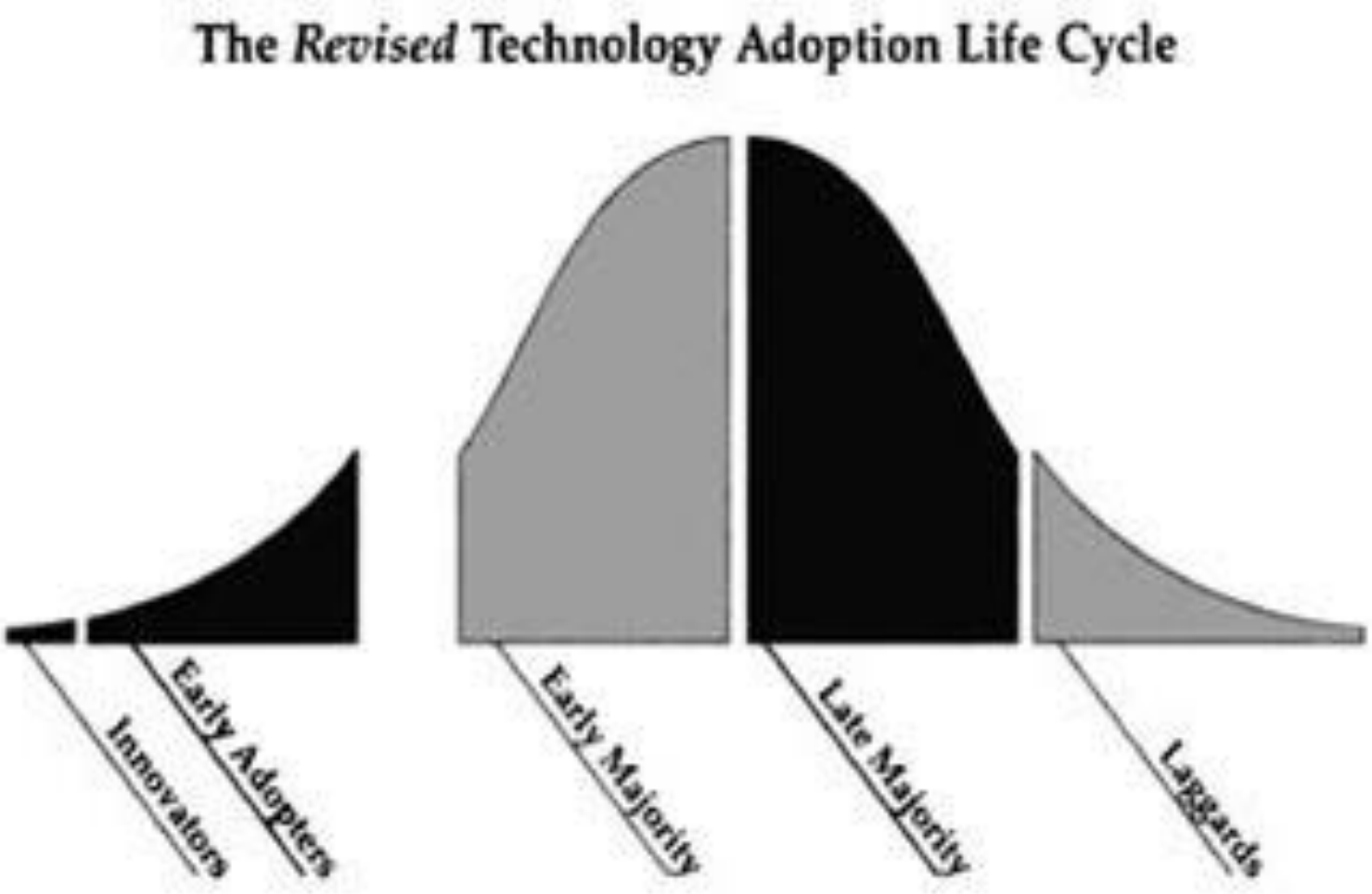
Type	Buyer behaviour	Motivation
Transactional sales	Intrinsic value buyers: “keep it cheap and easy to do business”	Understands the product Perceives it as substitutable Cost focus Resents time ‘wasted’ with sales people
Consultative sales	Extrinsic value buyers: “I don’t know the answer: help me analyse and solve the issue	Focus on how the product is used Interested in solutions and applications Values advice and help Needs the sales person

Source: Rethinking the sales force (Rackham, de Vincentis 1999)

Even when customer value propositions are well captured and formulated, introduction of solutions that involve new technology will have to overcome some hurdles.

This is called “crossing the technology chasm”:

Crossing the technology chasm



Source: Crossing the chasm (Moore 1991)

Crossing the technology chasm

- Most clients of EO products and services belong to the early and late majority.
- They are pragmatists and are not prepared or willing to take substantial risk: the solution should work and be reliable.
- Once convinced, the pragmatists will be long-term clients.

Source: Crossing the chasm (Moore 1991)

More information:

Creating & delivering your value proposition
– managing customer experience for profit
(Barnes, Blake, Pinder; 2009)

Customer value propositions in business markets
(Anderson, Narus, van Rossum [Harvard Business Review]**; 2006)**

Rethinking the sales force:
refining selling to create and capture customer value
(Rackham, de Vicentis; 1999)

Crossing the chasm
– marketing and selling high-tech products to mainstream customers
(Moore; 1991)

Creating shared value is a key element of successful implementation of earth observation solutions.

To achieve this, in most cases earth observation applications have to be integrated into more general (business or organizational) processes:

Create shared value

Involves cooperation between:

- **Public sector**
- **Private sector**
- **Social sector**

Opportunity for earth observation (integrated) solutions:

- Integrate EO in general business / organizational process
- Integrate different EO (and GIS and navigation) functionalities

Based on all considerations dealt with in the previous slides, there are some practical approaches that can be applied in combination to promote earth observation applications:

Tools for earth observation marketing:

- Success stories (in non-technical language, feasible, replication capacity, sustainable)
- Marketing toolkits (international trends, earth observation examples, references)
- Pilot projects, innovation funds, quick-wins (demonstration that EO actually works)
- Promotion outside EO community (fairs, seminars, lunch-bag meetings, magazines)
- Resource facilities for reference and capacity building (distributed, but connected, in different languages)

Source: Marketing earth observation products and services (Noort 2013)

Business elements

Business elements:

- **Proposal writing**
- **Business procedures**

Proposal writing is an art in itself.

During the GEONetCab and EOPOWER projects templates have been developed for writing successful proposals:

Proposal outline

1. Introduction / relevance
2. Objective(s)
3. Activities
4. Output
5. Management & evaluation
6. Risk assessment
7. Time schedule
8. Budget

Annexes

(more detailed version in separate document,
see www.eopower.eu or www.hcpinternational.com)

Other guides that may be useful:

- Civicus: writing a funding proposal
- Michigan State University: guide for writing a funding proposal
- ESRI: writing a competitive GRANT application
- REC: project proposal writing

If you run a company, compete for assignments and manage projects, a structured approach towards responsibilities, tasks, implementation and documentation is needed.

The following business procedures may be helpful:

Business procedures

1. On acquisition
2. On offers
3. On negotiation
4. On contracts
5. On project management
6. On travel & deployment
7. On deficiencies & complaints
8. On internal organization
9. On finance

(more detailed version in separate document,
see www.eopower.eu or www.hcpinternational.com)

Again:

- **SHARED PROBLEM**
- **SHARED LANGUAGE**
- **SHARED SOLUTION**

4. Capacity Building

General

Marketing is promotion + capacity building.

Especially for the introduction of new technologies capacity building is important at all levels.

Capacity building is the instrument to increase self-sufficiency and make solutions work.

General references for capacity building, open data and success stories

GEO Portal: www.earthobservations.org

Capacity building resource facility www.geocab.org
compilation of tutorials, references, open-source software, etc.

Satellites going local: *share good practice* **(Eurisy handbooks)**
www.eurisy.org

Earth observation for green growth (ESA; 2013)

General references for capacity building, open data (2)

Bringing GEOSS services into practice:
how to use data from the GEO portal and how to provide input
www.envirogrids.net

Science education through earth observation for high schools:
basic tutorials on all kind of subjects
www.seos-project.eu

Copernicus briefs:
information on satellite applications for different topics
http://www.copernicus.eu/main/copernicus-briefs

MetEd
tutorials and courses on meteorology and related subjects
https://www.meted.ucar.edu/training_detail.php

More references open data

Open data for sustainable development (World Bank; 2015)
description of the benefits of open data for a wide range of development goals, including the SDGs
http://pubdocs.worldbank.org/pubdocs/publicdoc/2015/8/904051440717425994/Open-Data-for-Sustainable-development-Final-New.pdf

Terms and conditions for the use and distribution of Sentinel data (European Parliament and European Commission; 2014)
standard stipulations related to free and open access to Sentinel data
http://www.demarine.de/lr/c/document_library/get_file?uuid=c5067655-b7ad-4d71-b07b-6111808f4abd&groupId=13521

Towards a thriving data-driven economy (European Commission; 2014) *policy document on the use of (open) data for a knowledge economy and society*
http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=6210

Knowledge data portals for climate change:

Climate change explorer
http://weadapt.org/knowledge-base/using-climate-information/the-climate-change-explorer-tool

Climate wizard
http://www.climatewizard.org/

UNDP adaptation learning net
http://www.adaptationlearning.net/

IPCC data distribution center
http://www.ipcc-data.org/

Earth System Grid
http://www.earthsystemgrid.org/home.htm;jsessionid=92341D76DB0CDDB7EE13A2D59C9B80D5

Capacity building resources for climate change:

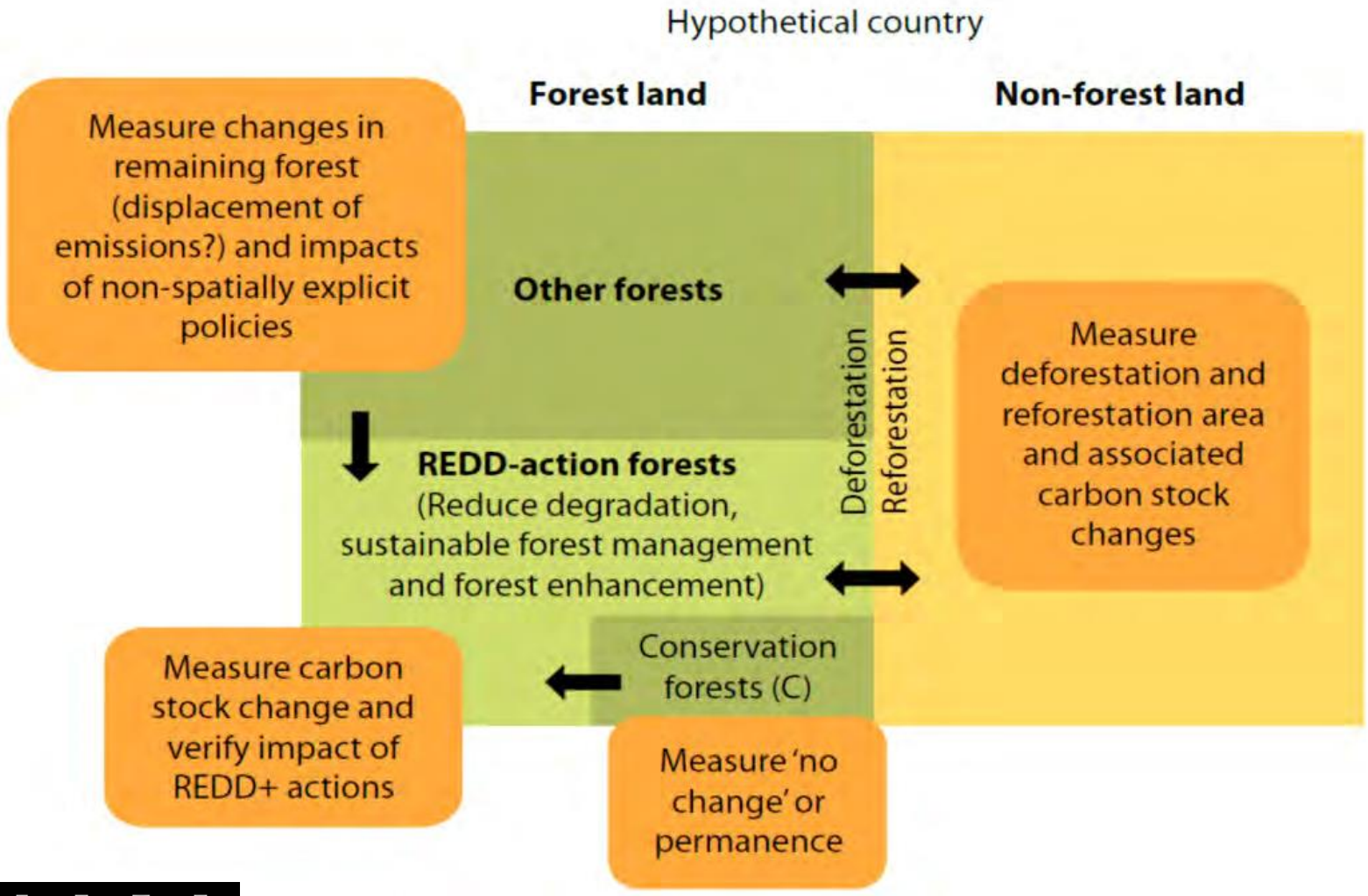
global change SysTem for Analysis, Research & Training: START

provides guidelines and training opportunities related to climate change issues

Tearfund CEDRA toolkit

step-by-step guide to define community climate adaptation activities in developing countries

START: biodiversity and climate change training



http://start.org/

Capacity building resources for climate change (2):

Kick the habit (UN; 2010)
general introduction on climate change and what you can do as an individual

Climate change science compendium
comprehensive popular overview of climate science

GIS for climate change (ESRI; 2010)

Climate change is a geographic problem (ESRI; 2010)
practical examples and approach

Capacity building resources for climate change (3):

Adapting to climate variability and change (USAID; 2007)
guidance manual for development planning

GOFC-GOLD sourcebook (2009) *exhaustive overview of assessing carbon stocks and emissions, detailed description of methodology*

Mainstreaming adaptation to climate change in agriculture and natural resources management projects (World Bank; 2010)
guidance notes on stakeholder engagement, climate risk assessment, policies and institutions, investing in adaptation, implementation, supervision and evaluation

Mainstreaming climate change adaptation into development planning: a guide for practitioners (UNDP/UNEP; 2011)
guide for policy formulation, including adaptation indicators

Capacity building resources for climate change (4):

Earth observation for forest biomass and carbon mapping
Case study: Afram Headwaters Forest Reserve, Ghana **(ITC; 2015)**
3-day EOPOWER (self-study) course for professionals
http://menhir.itc.utwente.nl:5000/fbsharing/KGKOZXKU/

Being prepared for climate change
A workbook for developing risk-based adaptation plans **(EPA; 2015)**

EPA tutorials DPSIR http://www.epa.gov/ged/tutorial/index.htm

Climate change and coastal watersheds (EPA; 2012)
Climate ready estuaries

Further details:

Contact: Mark Noort
m.noort@hcpinternational.com

www.eopower.eu
www.hcpinternational.com