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EUROPEAN GEO WORKSHOP

EuroGEOSS: Shaping
the European contribution
to GEOSS

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#EGW2017



FINNISH
METEOROLOGICAL
INSTITUTE



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Methodological aspects for assessing regional maturity

EARSC

European Association
of Remote Sensing
Companies



EARSC



EARSC is a trade association (non-profit Belgian), founded in 1989, dedicated to helping European companies: *providing services (including consultancy) or supplying equipment in the field of remote sensing.*

Our mission is:

- to foster the development of the European Geo-Information Service Industry
- to represent European geospatial-information providers, creating a sustainable network between industry, decision makers and users

Today: 93 members (83 full and 10 observers) from 22 countries in Europe



Outline topics

methodology

Objectives & timeline

Methodology plan

Benefits & Constraints

Definition maturity
indicators

- Capacities
- Cooperation
- National uptake & awareness

draft assessment

Maturity card

Maturity level

Indicator ranges

final assessment

Examples

Validation & future



Objectives

methodology

Present the **Maturity Indicators** that will allow to capture the **level and measure the progress** of each country's involvement in the implementation of GEO and Copernicus vision.

1st phase: focusses on the establishment of a robust **methodology** and some preliminary assessment of few countries as model for the maturity indicators

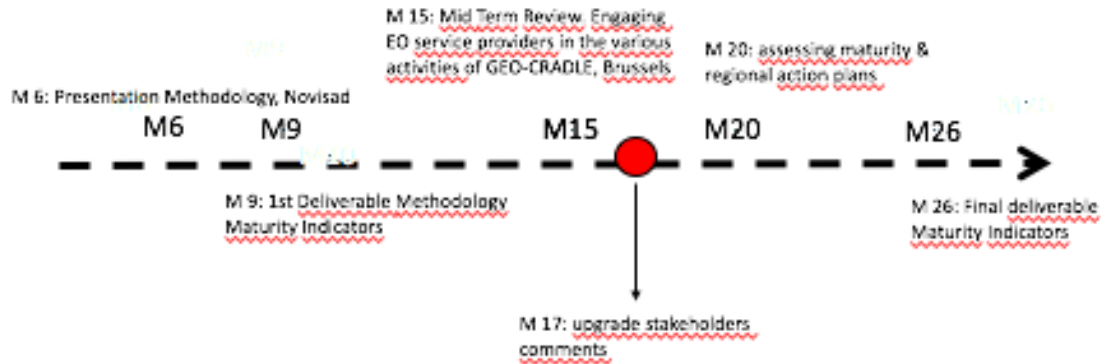
2nd phase: devoted to the **analysis of all the countries and its presentation in a maturity card.**

lessons learned from the application of the proposed methodology and proposals for further improvements in the future.



Timeline

methodology



Methodology plan

methodology

- (i) Integration of project to **ongoing**
 - evaluate and interpret country capacities from the **1st phase: done**
 - review the gap analysis to help tie the maturity indicators with the rest of the GEOSS **ongoing**
CRADLE project **1st phase: done** **continue next phase**
- (ii) Desk research by country partners: based on available literature and publications
1st phase: done **continue next phase**
- (iii) Comparative assessment: based on the desk research
critical - appropriate to select a reference country?
- (iv) benchmarking (other country)
distort country level comparisons
- (v) Normalisation
1st phase: done **continue next phase**
- (vi) Semi-structured interviews with country partners & organizations
- (vii) Validation **next phase** by experts: assure overall quality of the report and to avoid inclusion of incorrect findings. feedback rounds
ongoing
- (viii) Action on incomplete data or N/A

Definition maturity indicators

methodology

Parameters by which the maturity of the country related to Earth Observation and geo-information capabilities will be **measured and monitored**

Help to understand where the capabilities of the country are and which way is the country going (projection and prospects).

Grouped by:

- **Capacities** (including national or regional capacities)
- **Cooperation** (including international cooperation)
- **Uptake** (including national uptake and awareness)

For each indicator a table has been produced:

description, parameters, constraints, gap analysis, comments

Indicators table

[methodology](#)

Ref.	Indicators	Description	Parameters	Constraints	Q / R	Gaps analysis (Task T3.1) Check-list for inventorying: additional inputs & Qs to complement	Maturity indicators (T.3.2.) Data required to assess each indicator at country level	Comments
1.1.	National Infrastructure	<p>It will understand the Earth Observation Strategy by country. The goal here is to get a wide picture of the engagement in the area of Earth observations, the number and geographical distribution of EO service public and private organizations within the GEO-CRADLE region. Additional information will be provided by looking for the total n. employees for each country (public/private) and where possible classifying the companies by size. It will help to identify the collaborative EO projects and if there is partnerships for implementing EO tasks and activities. It will answer Qs as where does sit the data discovery, access, and interoperability in the countries. This component focuses on supporting willing national and regional institutions to develop monitoring capacities through the use of Earth observation and modelling.</p> <p>Until recent years, EO satellites used to be built and operated by the governmental organizations. However, launching of the private sector owned commercial remote sensing satellites, which are capable of capturing high resolution imagery, not just started a new era but also encouraged some countries to have their own remote sensing satellites. New generation of small satellites are also part of the scene.</p> <p>Developing a space programme including EO satellites</p>						
1.1.1.	Own space-borne capacity	Get a wide picture if countries are operating their space borne capacities (EO satellites, ground segments)	-N. of satellites operated by the country. -Type of mission	Lack of response at country level	Q / R	Requested additional inputs. for each sat capacities, it has been requested (i) title (ii) geographic coverage (region) (iii) catalogues (iv) web server (year collection of data (v) temporal resolution of data acquisition (vi) data availability policy	Request to country representative space borne capacity operated by the country.	It will provide information on the space -borne infrastructure: number of organizations but most important the type of satellites and how those are operated up to date.

Benefits & Constraints

methodology

Benefits

- 1) providing **quality feedback** to drive direction of involvement in the EO per country
- 2) supporting **decision-making** in future and focusing attention on what matters most
- 3) providing a **common language for communication** and helping understand performance
- 4) providing a way to **see if the investment** in the EO sector is working
- 5) serving as risk triggers and **early warning signs**



Constraints

- 1) **availability of data** and literature for selected indicators
- 2) necessary to limit the sample of the number of **interviews**
- 3) **comparison** of countries is challenging

Capacities

methodology

- **National Infrastructure:** Own space-borne capacity, access to 3rd party missions, ground base/ in-situ monitoring networks, modelling & computing , EO data exploitation platforms
- **Critical mass of EO researchers:** N. of public organizations, courses offered by universities, diversity & maturity courses, N. of researchers, papers published
- **Industry base:** N. companies, scale companies, employment numbers, resellers, existence clusters
- **Space authority:** Space policy, organization chart
- **Capacity building:** National R&D investment, EO focus actions



Cooperation

methodology

Impact of GEO

Participation in GEO, designated Office, actions on SBA's, provision of data to GEOSS

Impact of Copernicus

Project using copernicus, organisations involved, copernicus relays

Participation to international efforts

ESA, WMO, EUMETSAT, GEOSS, UN-system, INSPIRE, OGC

Funding

R&D participation



National Uptake & Awareness

methodology

Events

Events networking, thematic workshops

Dissemination activities

Networking, data portals

National policy implementation

Policy, budget

Penetration

Use (awareness, adoption, R&D uptake...)



Maturity Card

methodology

- will **characterize the EO capacity** in the countries providing concrete information on its activities.
- will identify the **content's relative maturity** of indicator per country
- provide a framework to **semi-objectively classify** each of the indicators and ensure metrics usage to be comparable in country regions but also over time.
- aim is to assign each of the information provided by country partners into a **set of boundaries**, to ensure comparison with other countries.



Maturity Car



Country

methodology

Country Maturity card examples:

1st Draft evaluating maturity.

Information to be updated in the coming months

Score card

maturity indicators	indicators	level	maturity indicators	indicators	level	maturity indicators	indicators	level
CAPACITY	infrastructure		COOPERATION	impact GEO		UPTAKE	events	
	eo reserach			impact Copernicus			dissemination	
	industry base			international			policy	
	space authority			funding			penetration	
	capacity building							

Detail assessment

capacity	indicator	level	cooperation	indicator	level	
infrastructure	space borne		impact GEO	participation GEO		
	access 3rd party missions			designated GEO office		
	ground based/ in-situ		actions on SBA's			
	modelling & computing		provision data to GEOSS			
eo research	eo data exploitation		impact Copernicus	projects		
	n. public organizations			organizations involved		
	univ. courses offered		international	ESA		
	diversity/maturity courses			meteorological		
industry base	n. researchers		funding	CEOS		
	papers published			INSPIRE		
	n. companies		Int. agreements			
	scale companies		R&D participation			
space authority	employment		uptake	indicator	level	
	resellers, partnership			events	networking	
	clusters			dissemination	thematic workshops	
	space organization			networking		
capacity building	national R&D		dissemination	data portals		
	eo focus actions		policy	policy implementation		
			budget			
			penetration	use		

LEGEND eo maturity card

○ initial ▲ basic ▲ intermediate ● advanced ● optimized



Maturity Card

draft assessment

1. Capacities

Focus on country and regional EO activities. How the sector using EO in Geo-Cradle area look like?

Ref.	Indicators	Maturity indicators (T.3.2.)	Country partner answer
1.1.	National Infrastructure: It will understand the Earth Observation Strategy by country.		
1.1.1.	Own space-borne capacity	Request to country representative information on space borne capacity operated by the country. (N. of satellites operated by the country and the type of mission)	satellites, 2 commercial photogrammetric satellites, 3 military satellites, 3 research and telescopes.
1.1.2.	Access to 3rd party missions (own ground stations)	Request to country representative and thematic experts in the country but also in the region if he knows who operates the ground station (satellite operator or 3rdparty mission).	ISA - Israel Space Agency
1.1.3.	Ground-based / in-situ monitoring networks and facilities	Requested additional inputs on the number of organizations operating the equipment necessary to control and to acquire data from EO satellites and in-situ (active or passive remote sensors, meteo /atmospheric/water sensors, etc.) (Total number of Organizations with ground based/in-situ capacities. Number of stations, location & roles)	At least 13 organizations operate either portable or static equipments for water, soil, veg, weather or spectra monitoring, the total number of measurement points is over 3300
1.1.4.	Modelling and computing capacities	If organizations do have the modelling and computing processing capacities (high-performance computer (HPC)) then they are asked to provide a short description of what it is used for. It is important to have an overview on the number of models (ie. models for atmospheric modelling, what those are, what is the status and the research owner (Total number of Organizations with modelling & processing capacities and Total number of models)	All organizations have sufficient computing and processing capacities for their needs (18 organizations), they used different models and algorithms depend on their needs. In general I would say that the number of models and algorithms exceeds 100.
1.1.5.	EO data exploitation platforms (provision of VA services and products)	Request about coordinating monitoring networks, integrated analysis & modeling capacity. -Names of organizations with data exploitation products (Type pf organization according to classification system)	
1.2.	Critical Mass of EO researchers: Identification of the different groups of researchers both in research institutions & universities/academia and how big these groups are.		
1.2.1.	Number of public organizations	Country partners should be able to provide the names of the organizations and what they do (the classification - information of those institutions activity and areas). It is assumed that these organizations do not go beyond in the value chain. So any public organization that represents more than user they will appear in section 1.1.	spectrum of requirements in space, air, land, sea and cyber. A world leader in all of its main areas of activity: Satellites and Space Systems Defense Systems, Missiles and Littering Weapons
		Request to country representative & desk research on the number of courses offered: Information about the quantity of courses and the investment in the future. The country partner	Sensing and Image Processing (2h), Spectroscopy of Soil and Vegetation (2h), Remote Sensing to monitor air

Maturity Card

draft assessment

guidance

- **Level 0: initial:** The indicator provides **guidance** to think about the country approach. The intention is to raise awareness and aid to country partners in thinking about the status of the indicator and its performance. The content may also describe promising research results that may have been demonstrated in a constrained setting.

early pilot

- **Level 1: basic:** The indicator describes country **practices** that are in **early pilot** use and are demonstrating some successful results.

limited use

- **Level 2: intermediate:** The indicator describes country practices that are in **limited use** in industry or government organizations for the EO sector.

deployed

- **Level 3: advanced:** The indicator describes country practices that have been **successfully deployed** and are in widespread use. Experience reports and case studies are typically available to evaluate this level.

integrated

- **Level 4: optimized:** The indicator describes practices that have been **fully integrated** and optimized by the country.

Indicator boundaries

draft assessment

- **assess the country maturity** of a given set of indicators
- **boundaries** will relate to the degree of formality and optimization of the group of indicators (capacities, cooperation and uptake)

(0) no commitment to perform space-borne capacity

(1) ability to perform the capacity

(2) capacity performed; at least 1 satellite operated by the country

(3) more than 1 mission, future mission planning with improvement degree

(4) well developed capacity in a full integrated structure



Indicator boundaries (space borne craft assessment)

Example: **Space borne capacity operated by the country**

- ISRAEL:** Israel has an advanced space-borne capacities. 5 communication satellites, 2 commercial photogrammetric satellites, 3 military satellites, 3 research and telescopes, 4 university/students satellites, 2 probes. Launching capacity (4) well developed capacity in a full integrated structure
- ROMANIA:** Since 2011 research institutes and private companies are contributing to ESA missions. Several satellites have been building up to now: microsatellite Goliat (2012), launched into orbit by the European Vega rocket, on its first operational flight. Goliat has been developed by Romanian Space Agency, Institute of Space Science, BITNET and ELPROF artificial nanosatellites RoBiSAT, part of the QB50 constellation. Robisat 1 and Robisat 2 will be sent to the ISS at the end of 2016 on the Cygnus CRS OA-7. being developed by the Institute of Space Science. (3) more than 1

Indicator boundaries (space borne craft assessment)

Example: **Space borne capacity operated by the country**

- **EGYPT:** There was a LEO satellite that deorbited since October 2010, it is in the process of developing new satellites (2) **capacity performed; at least 1 satellite operated by the country**
- **ALBANIA:** This activity is not in function in Albania. None of the public institutions or private institution has contributed in satellite building or launching in space. It is come from the lack of knowledge in using these data or in lack of financial support. (0) **no commitment to perform space-borne capacity**



Indicator boundaries (companies) draft assessment

Example: N. of companies

GREECE: There are 59 companies in total: (i) Satellite operator: 1 (ii) Data reception and distribution: 0 (iii) Data reseller: 0 (iv) Value-adding services: 11 (v) Downstream / GIS services: 1 (vi) Consultancy - studies: 12 (vii) Hardware / software provision: 34 (see tab 1.3)

N°	Company Name	EARSC classification	Scale	Employment	Reseller
1	Adamant Composites	(vii) Hardware / software prov	micro	9	no
2	Advanced Microwave Systems	(vii) Hardware / software prov	micro	6	no
3	Advent Technologies	(vii) Hardware / software prov	small	14	no
4	AeroPhoto	(vi) Consultancy - studies	micro	1	no
5	Alma Technologies	(vii) Hardware / software prov	micro	6	no
6	Althom Engineering	(vi) Consultancy - studies	mediu	51	no
7	Analogies	(vii) Hardware / software prov	micro	9	no
8	Aratos Technologies	(iv) Value-adding services	small	10	no
9	Attisat	(vii) Hardware / software prov	micro	6	no
10	Creative Systems Engineering	(vii) Hardware / software prov	micro	2	no
11	Datalabs	(vii) Hardware / software prov	small	10	no
12	Dedalos	(vii) Hardware / software prov	micro	3	no
13	Draxis environmental	(v) Downstream / GIS services	small	10	no
14	EKBY	(vi) Consultancy - studies	mediu	53	no
15	ELFON LTD	(vii) Hardware / software prov	mediu	70	no
16	Emtech	(vii) Hardware / software prov	micro	7	no
17	Epsilon	(vi) Consultancy - studies	mediu	51	no
18	Eulambia Advanced Technologies	(vii) Hardware / software prov	micro	4	no
19	European Sensor Systems	(vii) Hardware / software prov	small	15	no
20	Fasmetrics	(vii) Hardware / software prov	small	20	no
21	Feac Engineering	(vi) Consultancy - studies	micro	1	no
22	Geonapikosisis	(iv) Value-adding services	small	13	no
23	Geoset	(vi) Consultancy - studies	small	12	no
24	Geosfaira	(iv) Value-adding services	micro	7	no
25	Geosystems hellas	(iv) Value-adding services	micro	7	yes
26	Geotopos	(vi) Consultancy - studies	small	32	no
27	Hellas Sat	(i) Satellite Operator	mediu	60	no
28	Hellenic Aerospace Industr	(vii) Hardware / software prov	large	1380	no

Level 4: the country has more

4.20

Indicator boundaries (companies) draft assessment

- Level 0: no private companies in the EO domain
- Level 1: between 1-5 companies in the country serving any category in the EO value chain (i) satellite operator: defined as the owner of a satellite system (ii) data reception and distribution: owner or operator of a ground station (EO) (iii) data reseller: satellite or other data from non-EU sources (iv) value- adding services: company using EO data to produce products (v) downstream / GIS services: but with a satellite data element. (vi) consultancy - studies / analyses not VA services. (vii) hardware / software provision. **FYROM, Egypt, Morocco, Cyprus, Bulgaria**
- Level 2: the country has between 5-10 companies serving at least 3 categories covering the EO value chain. **Turkey, Serbia, Tunisia**
- Level 3: the country has between 10-20 companies. **Romania**
- Level 4: the country has more than 20 companies representing all the



Indicator boundaries (companies) draft assessment



Israel

Score card

maturity indicators	indicators	level	maturity indicators	indicators	level	maturity indicators	indicators	level
CAPACITY	infrastructure	●	COOPERATION	Impact GEO	➔	UPTAKE	events	●
	eo research	○		Impact Copernicus	○		dissemination	●
	industry base	●		International	▲		policy	●
	space authority	●		funding	➔		penetration	➔
	capacity building	●						

Detail assessment

capacity	indicator	level	cooperation	indicator	level	
infrastructure	space borne	●	Impact GEO	participation GEO	○	
	access 3rd party missions	●		designated GEO office	➔	
	ground based/ in-situ	●		actions on SBA's	●	
	modelling & computing	●		provision data to GEOSS	○	
eo research	eo data exploitation	N/A	Impact Copernicus	projects	○	
	n. public organizations	➔		organizations involved	○	
	univ. courses offered	➔		international	ESA	➔
	diversity/maturity courses	➔		meteorological	●	
industry base	n. researchers	➔	CEOS	○		
	papers published	●	INSPIRE	○		
	n. companies	●	Int. agreements	N/A		
	scale companies	●	funding	R&D participation	➔	
space authority	employment	●	uptake	Indicator	level	
	resellers, partnership	●		events	networking	➔
	clusters	N/A		thematic workshops	●	
	capacity building	national R&D		●	dissemination	networking
eo focus actions		●		data portals	○	
		●		policy implementation	●	
		●		budget	●	
		●		penetration	use	➔

LEGEND eo maturity card ○ initial ▲ basic ◀ intermediate ➔ advanced ● optimized



Albania

Score card

maturity indicators	indicators	level	maturity indicators	indicators	level	maturity indicators	indicators	level
CAPACITY	infrastructure	▲	COOPERATION	Impact GEO	▲	UPTAKE	events	▲
	eo research	N/A		Impact Copernicus	○		dissemination	N/A
	industry base	N/A		International	○		policy	▲
	space authority	○		funding	▲		penetration	▲
	capacity building	○						

Detail assessment

capacity	indicator	level	cooperation	indicator	level	
infrastructure	space borne	○	Impact GEO	participation GEO	○	
	access 3rd party missions	N/A		designated GEO office	▲	
	ground based/ in-situ	➔		actions on SBA's	N/A	
	modelling & computing	▲		provision data to GEOSS	▲	
eo research	eo data exploitation	N/A	Impact Copernicus	projects	○	
	n. public organizations	N/A		organizations involved	○	
	univ. courses offered	N/A		international	ESA	○
	diversity/maturity courses	N/A		meteorological	●	
industry base	n. researchers	▲	CEOS	○		
	papers published	N/A	INSPIRE	➔		
	n. companies	N/A	Int. agreements	N/A		
	scale companies	N/A	funding	R&D participation	▲	
space authority	employment	N/A	uptake	Indicator	level	
	resellers, partnership	N/A		events	networking	▲
	clusters	N/A		thematic workshops	N/A	
	capacity building	national R&D		○	dissemination	networking
eo focus actions		○		data portals	▲	
		○		policy implementation	➔	
		○		budget	▲	
		○		penetration	use	▲

LEGEND eo maturity card ○ initial ▲ basic ◀ intermediate ➔ advanced ● optimized

-Level 0: initial (Albania, FYROM)

-Level 1: basic (Bulgaria)

-Level 2: intermediate (Marocco, Cyprus, Egypt, Tunisia, Serbia)

-Level 3: advanced (Greece, Romania, Turkey)

-Level 4: optimized (Israel) (N/A)



Validation (discussion stakeholders) final assessment

- difficulty in quantifying many of the individual indicators
- define specific metrics for indicators & areas of assessments (parameters)
- highest level of the index “optimized” seems perhaps “overstated”
- near-exclusive focus on space-based observations
- re-definition of indicators, duplications, mergers:
 - Capacities
 - separate ground-based /in -situ
 - combine: number public organizations (staff), courses & diversity offered
 - remove indicator: EO data exploitation platforms, combination, scale of companies
 - refine: papers published, clusters , reseller (too specific)
 - pace policy organization - integrated into capacities, remove organization chart,
 - national R&D investment not necessarily comparable, EO focus actions, indicator - capacity building
 - Cooperation with GEO, update through strategic plan, revise provision of data to GEOSS
 - Uptake
 - merge networking events/initiatives



Validation (interim discussion GEO final assessment)

- useful contribution to understanding and measuring EO capacity at the country level
- novel, relevant to GEO activities
- Further steps to seek quantitative measures & to state the levels in quantitative terms
- keen to follow up the methodology and probably test implementation as part of GEO activities beyond the end of the project
- mobilise the GEO offices network to implement the methodology beyond the region covered by GEO-CRADLE (revision of Europe-centred focus)
- motivate regional initiatives (AfriGEOSS, AmeriGEOSS) to see the benefit of this approach
- endorse the idea of publishing a paper



Future

final assessment

- implementation of a maturity matrix will allow a country to gain insight into the current situation of the implementation of EO country capacities
- highlight the critical factors to lead to successful EO strategy implementation
- explore on the implementation of strategic plans:
 - leading initiatives
 - direct financial support to GEO/Copernicus activities
 - follow up actions.

A single set of indicators is not and cannot be used to uniquely decide the maturity of a country.

assessment provides the basis to decide upon a "defensible" level of maturity, and provides a chain of semi-quantitative evidence that can be used to support the assignment of given "scores" against the different indicators