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Methodological aspects for assessing regional EO maturity

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EARSC

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

- Foster the development of the European Geo-Information Service Industry

- Represent European geospatial-information providers, creating a sustainable network between industry, decision makers & users

99 members from **22 countries** in Europe

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GEO-CRADLE project

Objectives

- ✓ Promote the uptake of EO services and data in response to regional needs.
- ✓ Support the effective integration of existing Earth Observation Capacities in the region.
- ✓ Facilitate the engagement of the complete ecosystem of EO stakeholders in the region.
- ✓ Enhance the participation in and contribution to the implementation of GEOSS and Copernicus in North Africa, Middle East and the Balkans.

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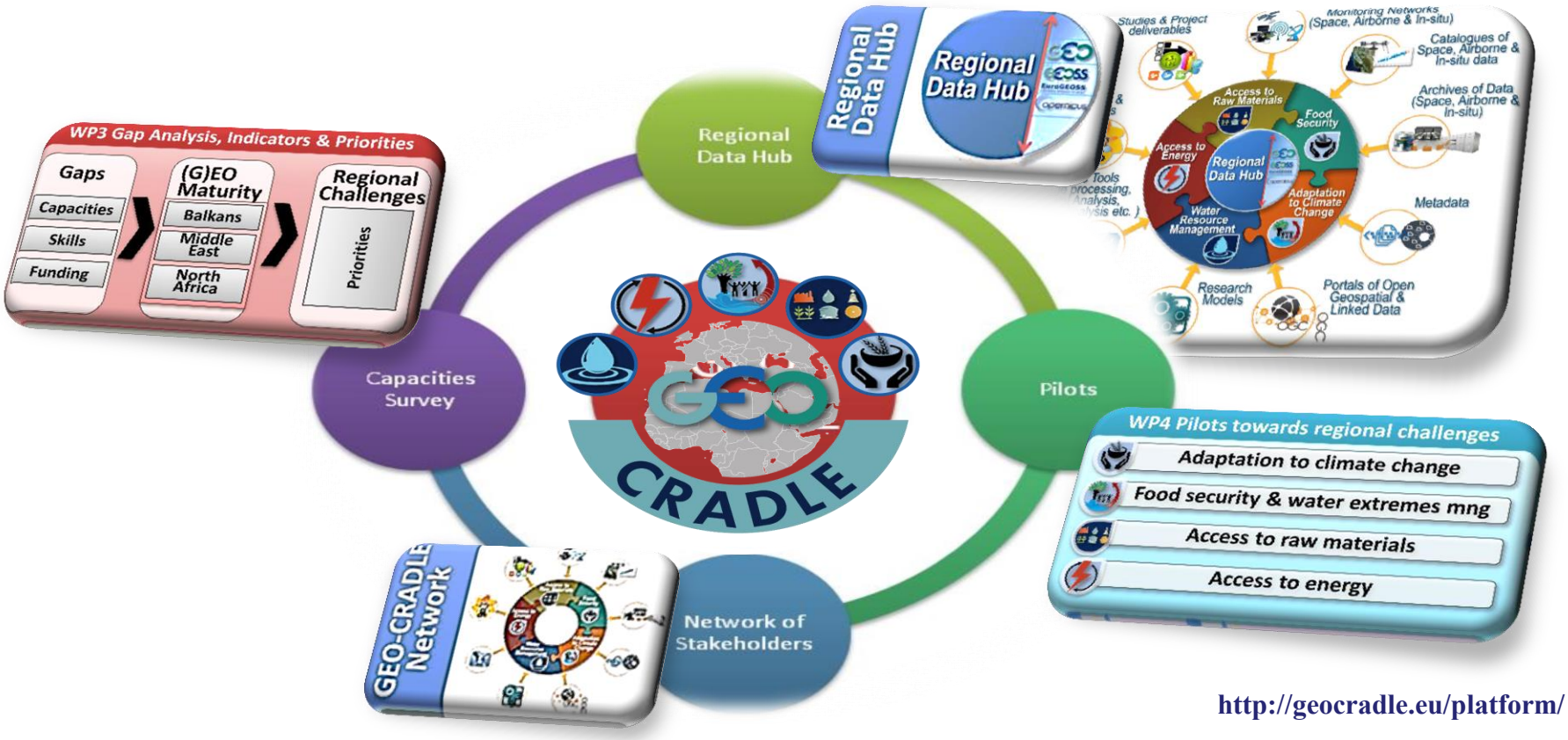
Major pillars in GEO-CRADLE



http://geocradle.eu/platform/

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Outline topics

methodology

Objectives & timeline

Methodology plan

Definition maturity indicators

- Capacities
- Cooperation
- National uptake & awareness

draft assessment

Maturity card

Maturity level

Indicator ranges

Examples

Benchmarking

lessons learnt

Benefits & Constraints

Validation

Future

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Objectives

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

methodology

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

draft assessment

devoted to the **analysis of all the countries and its presentation in a maturity card**

lessons learnt

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

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Methodology plan

methodology

- Integration of project tasks: ongoing
  - evaluate and interpret country capacities from the inventory 1st phase: done
  - review gap analysis: help tie maturity indicators with rest of the GEO-CRADLE project In process
- Desk research by country partners: based on available literature and publications 1st phase: done In process
- Comparative assessment: based on the desk research 1st phase: done In process
- Benchmarking (other country) critical – appropriate to select a reference country / indicator - ongoing
- Normalisation distort country level comparisons – recommendation: not considered
- Semi-structured interviews with country partners & organizations 1st phase: done continue next phase
- Validation of findings by experts: assure overall quality of the report and to avoid inclusion of incorrect findings. feedback rounds next phase
- Action on incomplete data or N/A ongoing

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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**
- **Cooperation**
- **Uptake/awareness**

For each indicator a table has been produced: description, parameteres, constrains, gap analysis, comments

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Indicators table – (guide for country partners)

methodology

Ref	Indicator	Description	Parameters	Constrains	Q	Gap analysis	indicators	Comments
1.1.2.	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 (vii) data policy applied	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.
1.1.3.	Access to 3rd party missions (own ground stations)	Operating under contract to a satellite operator or other 3rd party.	-Total number of space missions	Lack of response at country level	Q	Requested additional inputs	Request to country representative and thematic experts in the country but also in the region if he knows who operates the ground station	
1.1.4.	Ground-based facilities	It will give information on the number of organizations operating the equipment necessary to control and to acquire data from EO satellites enabling the control of the spacecraft, and	-Total number of Organizations with ground based/in-situ capacities -Number of stations	Lack of response at country level	Q	-Requested additional inputs & details such as: (i) Additional capacity in number of meteo stations, more details provided for water quality stations		-The questionnaire also provides information on (i) Meteorological Facilities (ii) Atmospheric Composition Facilities (iii) Hydrometric Facilities (iv) Soil

Capacities pillar

methodology

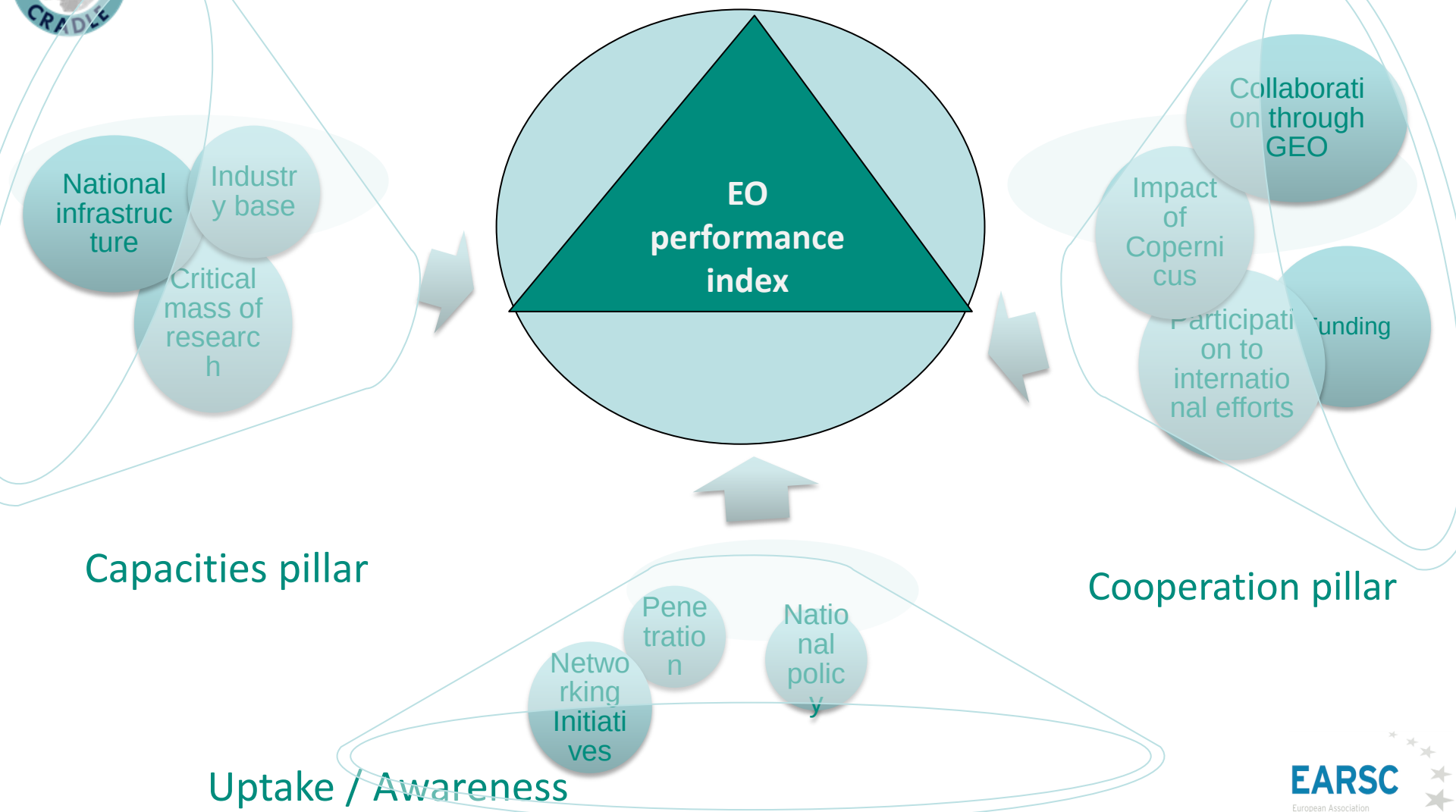
- **National Infrastructure:** Space authority (agency)/policy, Own space-borne capacity, access to 3rd party missions, ground base/ in-situ monitoring networks, modelling & computing , EO data exploitation platforms
- **Critical mass of EO researchers:** N. of public organizations, N. of researchers, courses offered by universities, diversity & maturity courses, relevant publications
- **Industry base:** N. companies, scale companies (?), employment numbers, resellers, existence clusters

- **Collaboration through GEO**: Participation in GEO, designated Office, Specific actions on SDG´s, designated GEO office, provision of data to GEOSS
- **Impact of Copernicus**: organisations involved in projects linked to cCopernicus (Relays, Academia…)
- **Participation to international efforts**: ESA, Meteo, UN-system, INSPIRE, Standardization
- **Funding:** R&D participation

- **Networking initiatives:** Networking (events, workshops, dissemination…), data portals
- **National policy implementation:** Policy, budget & investment
- **Penetration:** Use of geoinformation(awareness, adoption, R&D uptake...) and **Capacity building**: National R&D investment, EO focus actions

EO performance index - components

methodology



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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.

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Vizzualization

- **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)

Country

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
infrastructure	space borne	
	access 3rd party missions	
	ground based/ in-situ	
	modelling & computing	
	eo data exploitation	
eo research	n. public organizations	
	univ. courses offered	
	diversity/maturity courses	
	n. researchers	
	papers published	
industry base	n. companies	
	scale companies	
	employment	
	resellers, partnership	
	clusters	
space authority	space organization	
capacity building	national R&D	
	eo focus actions	

cooperation	indicator	level
impact GEO	participation GEO	
	designated GEO office	
	actions on SBA´s	
	provision data to GEOSS	
impact Copernicus	projects	
	organizations involved	
international	ESA	
	meteorological	
	CEOS	
	INSPIRE	
	Int. agreements	
funding	R&D participation	

uptake	indicator	level
events	networking	
	thematic workshops	
dissemination	networking	
	data portals	
policy	policy implementation	
	budget	
penetration	use	

LEGEND eo maturity card ○ initial ◣ basic ◓ intermediate ◕ advanced ● optimized

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Maturity Card - boundaries

draft assessment

The intention is to raise awareness and aid to country partners in thinking about the status of the indicator and its performance

-

guidance	**Level 0: initial**: The indicator provides **guidance** to think about the country approach.
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

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Maturity Card – guidance for country

draft assessment

		level 0	level 1	level 2	level 3	level 4
1.1.	National Infrastructure					
1.1.1.	Space agency or designated Space Authority	no organization, nor government ministry leading the space activity	at least one ministry leading and coordinating with space activities	one ministry leading and few ministries interconnected to the space activities in the country	a governmental space agency is in charge of coordinating the space activities in the country and other stakeholder's relations which are equally active in the EO domain	a governmental space agency coordinating the space activities in the country and different ministries involved in EO activities as: education, defence & intelligence, foreign affairs, agriculture and rural development, interior affairs (ie. research institutes and private companies which are contributing to ESA missions)
1.1.2	Own space-borne capacity	no commitment towards space-borne capacity	Existing technical ability to possess this capacity but no actual activities	at least one satellite operated by the country	more than one mission, future mission planning with improvement degree	Well-developed capacity in a full integrated structure (programmes fully providing continuity of operational systems)
1.1.3.	Access to 3rd party missions (own ground stations)	no access to other missions	access to one 3rd party mission (not owned nor operated by the country) - country has ground stations for EO satellites . country has ground stations for EO satellites. example of party missions: ie. Deimos, QuickBird, GeoEye, Worlwide, Oceansat, WorldView, IKONOS, …	access to more than one 3rd party missions with capability for downlinked data from various Remote Sensing Satellites with (at least one) medium, high and very high resolution imagery. - n. of institutions operating the party mission	access to several (between 2- 10) ground stations for EO satellites with capability for downlinked data from various Remote Sensing Satellites with (all) medium, high and very high resolution imagery (meteo, active or passive sensors)	strategic access to own stations for country missions but also access to other third party missions (more than 10) with advanced capability of reception antennas for RS. satellite telemetry &image archiving in the last 10 years

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Indicator Boundaries (space borne)

draft assessment

ISRAEL: Israel has an advanced space-borne capacities. 5 communication satellitles, 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 mission, future mission planning with improvement degree
EGYPT: There was a LEO satellite that deorbited scince 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

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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)

Level 4: the country has more than 20 companies representing all the categories covering the EO value chain.

Nº	Company Name	EARSC classification	Scale	Employmer	Reselle
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	mediur	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	mediur	53	no
15	ELFON LTD	(vii) Hardware / software prov	mediur	70	no
16	Emtech	(vii) Hardware / software prov	micro	7	no
17	Epsilon	(vi) Consultancy - studies	mediur	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	Geoapikonisis	(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	mediur	60	no
28	Hellenic Aerospace Industry	(vii) Hardware / software prov	large	1380	no

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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, Marocco, 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 categories covering the EO value chain. Israel, Greece

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Indicator Boundaries (set of indicators)

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 reserach	◔		impact Copernicus	○		dissemination	◓
	industry base	●		international	◓		policy	●
	space authority	●		funding	◔		penetration	◔
	capacity building	●						

Detail assessment

capacity	indicator	level
infrastructure	space borne	●
	access 3rd party missions	●
	ground based/ in-situ	●
	modelling & computing	●
	eo data exploitation	N/A
eo research	n. public organizations	◔
	univ. courses offered	◔
	diversity/maturity courses	◔
	n. researchers	◔
	papers published	●
industry base	n. companies	●
	scale companies	●
	employment	●
	resellers, partnership	●
	clusters	N/A
space authority	space organization	●
capacity building	national R&D	●
	eo focus actions	●

cooperation	indicator	level
impact GEO	participation GEO	●
	designated GEO office	◔
	actions on SBA's	●
	provision data to GEOSS	○
impact Copernicus	projects	○
	organizations involved	○
international	ESA	◔
	meteorological	●
	CEOS	○
	INSPIRE	○
	Int. agreements	N/A
funding	R&D participation	◔

uptake	indicator	level
events	networking	◔
	thematic workshops	●
dissemination	networking	◔
	data portals	○
policy	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 N/A	infrastructure	◣	COOPERATION	impact GEO	◣	UPTAKE N/A	events	◣
	eo reserach	N/A		impact Copernicus	○		dissemination	N/A
	industry base	N/A		international	○		policy	◓
	space authority	○		funding	◣		penetration	◓
	capacity building	○						

Detail assessment

capacity	indicator	level
infrastructure	space borne	○
	access 3rd party missions	N/A
	ground based/ in-situ	◔
	modelling & computing	◓
	eo data exploitation	N/A
eo research	n. public organizations	N/A
	univ. courses offered	N/A
	diversity/maturity courses	N/A
	n. researchers	◣
	papers published	N/A
industry base	n. companies	N/A
	scale companies	N/A
	employment	N/A
	resellers, partnership	N/A
	clusters	N/A
space authority	space organization	○
capacity building	national R&D	◣
	eo focus actions	○

cooperation	indicator	level
impact GEO	participation GEO	○
	designated GEO office	◣
	actions on SBA's	N/A
	provision data to GEOSS	◓
impact Copernicus	projects	○
	organizations involved	○
international	ESA	○
	meteorological	●
	CEOS	○
	INSPIRE	◔
	Int. agreements	N/A
funding	R&D participation	◣

uptake	indicator	level
events	networking	◓
	thematic workshops	N/A
dissemination	networking	N/A
	data portals	◣
policy	policy implementation	◔
	budget	◣
penetration	use	◓

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-Level 0: initial (Albania, FYROM)

-Level 1: basic (Bulgaria)

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

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

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

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Benchmarking - What is all about?

methodology | draft assessment

- **planning** and selection of the maturity indicators
- **collection and compilation** of data from countries of the RoI
- selection of **references** (where possible…)
- **comparison and evaluation** of data collected
- **assess performance** and see evolution of countries, prioritization
- measurements and instruments
- **monitoring** of the evolution of the maturity of each indicators
- **implementation** of improvements --- for future activities

Where does this country stand with regards to this indicator in comparison to the best-performing country / index?

no single method for comparing country to country performance currently exists

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Indicator weight – benchmarking performance (test)

lessons learnt

- composite indicator
- modest basis for comparison across nations
- state the levels in quantitative terms

Pillars	Measure of	Indicator name	Indicator Weight
Capacities	1.1. National Infrastructure	1.1.1. Space agency or designated Space Authority	0,1
		1.1.2. Own space-borne capacity	0,1
		1.1.3. Access to 3rd party missions (own ground stations)	0,05
		1.1.4. Ground-based facilities	0,05
		1.1.5. In-situ monitoring networks	0,05
		1.1.6. Modelling and computing capacities	0,05
		1.1.7. EO data exploitation platforms (provision of VA services and products)	
	1.2 Critical Mass of EO researchers	1.2.1. Number of public organizations	0,1
		1.2.2. Number of researchers (in Univ. & R&D labs)	0,1
		1.2.3. Courses being offered in universities, its diversity and maturity offered	0,05
		1.2.4. Relevant Publications	0,05
	1.3. Industry Base	1.3.1. Number of companies	0,1
		1.3.2. Scale of companies (large/medium/small/micro)	
		1.3.3. Employment numbers, levels and changes	0,1
		1.3.4. Resellers or local representatives of European companies	0,05
		1.3.5. Existence of Clusters	0,05
			1
Cooperation	2.1. Collaboration through GEO	2.1.1. Participation in GEO or to projects/initiatives which are linked to GEOSS	0,2
		2.1.2. Specific actions on Sustainable Development Goals (SDG´s)	0,1
		2.1.3. Designated GEO office	0,1
		2.1.4. Provision of data to GEOSS	0,05
	2.2. Impact of Copernicus	2.2.1. Organisations involved in projects linked to Copernicus	0,1
	2.3. Participation to other	2.3.1 ESA	0,1
		2.3.2. Meteorological: WMO, EUMETSAT, ...	0,1
		2.3.3. UN system as UN-GGIM, ...	0,05
		2.3.4 Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)	0,05
		2.3.5. Participation in Standardization organizations i.e. as OGC...	0,05
	2.4. Availability of EU funding	2.4.1. R&D participation or other EU programmes	0,1
			1
Uptake	3.1. Networking initiatives	3.1.1. Networking initiatives (events and thematic workshops)	0,2
		3.1.2. Data Portals	0,2
	3.2. National Policies	3.2.1. Policy	0,2
		3.2.2. Budget & investment (internal to the country)	
	3.3. Penetration	3.3.1. Use of Geo-information	0,2
		3.3.2. Capacity building EO focused actions	0,2
			1

Outcome – Implementation Indicators

lessons learnt

- **allow a country to gain insight into the current situation of the EO capacity and its strategic plans**: leading initiatives, direct financial support to EO activities, follow up actions
- important focus **assessment and goal-setting performance** tool because it provides both short-term possibilities with long-term sustainable potential, such as:
  - stakeholders provide buy-in and understanding of what are the **indicators/processes** necessary to be sustainable
  - demonstrate **effectiveness** of efforts toward National EO objectives
  - highlight the **critical indicators** to lead to successful EO strategy implementation

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Benefits & Constraints

lessons learnt

Benefits

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

Constraints

- **availability and reliability of data** and literature for selected indicators
- **representative** sample of collected information
- **comparison** of countries is challenging
- **sustainable** collection of data
- **reusability:** sourcing of data from same providers / temporal basis

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Implications in other Regions

lessons learnt

- useful contribution to understand and **measure the EO capacity** at the country level
- open access to the **methodology, metadata and sources** used in a transparent manner
- GEO discussions:
  - 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-centered focus)
  - motivate **regional initiatives** (AfriGEOSS, AmeriGEOSS) to see the benefit of this approach

maturity indicators could provide a framework to assess the effectiveness of capacity building as they could help measure how far a country has gone in terms of capacity in a given dimension

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Thank you!

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Discussion issues with panel?

future

- quantifying some individual indicators (level of the index)
  - Indicator weight
- definition of specific metrics for indicators & areas of assessments (parameters)
- how to ensure the index produces policy-relevant insights and rankings
- no normalization methods applied
- cannot be assumed comparison- need to set in context in order to generate a better understanding of country situations

methodology review

EARSC
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