Earth Observations Maturity Indicator Assessment

Assessing the Maturity of EO Activities at the Country Level

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Overview

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2. Training objectives
3. Importance of Monitoring EO Activities
4. EO Maturity Indicators – Overview
5. Thematic Pillars and Indicators
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Group on Earth Observations (GEO)

- A unique **global network of governments and organizations** dedicated to creating innovative solutions to environmental challenges.

- A community producing **Earth Observation (EO) data, tools and services** open to all.

- An **inclusive organization** that welcomes multi-stakeholder partnerships.

Number of Members: 2024

Africa	31
Europe	35
Americas	21
Asia/Oceania	23
CIS	6
Total:	**116**
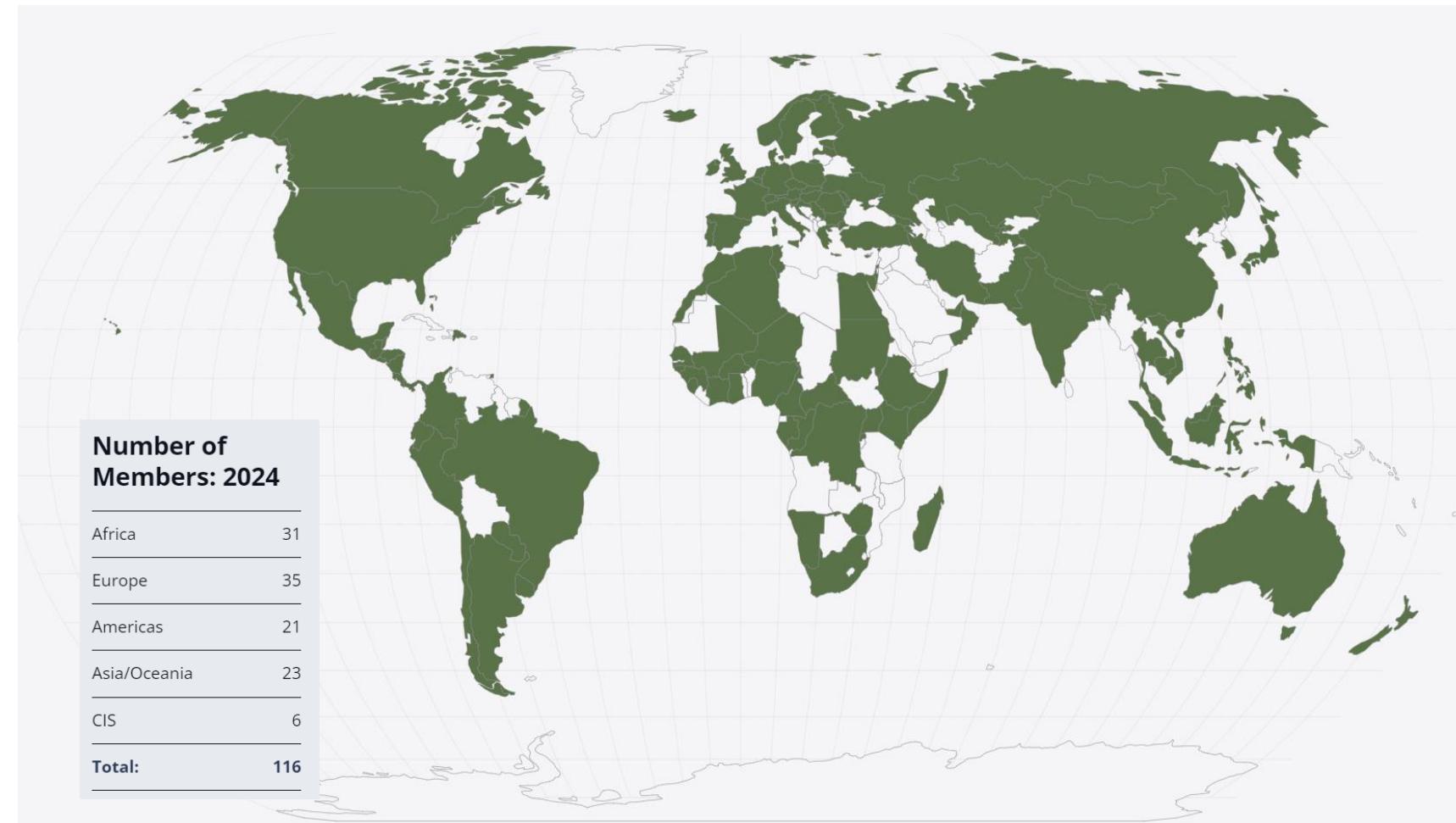
GEO Post-2025 and National Coordination Mechanism

- To unlock access to Earth intelligence, countries must be adequately prepared to tap into this opportunity.

- Countries must know their capabilities and maturity level of their EO landscape.

- Assessing EO capabilities and maturities are integral to establishing a formidable national coordination mechanism.

- GEO is supporting countries to undertake EO maturity assessments and to develop a robust national coordination mechanism.
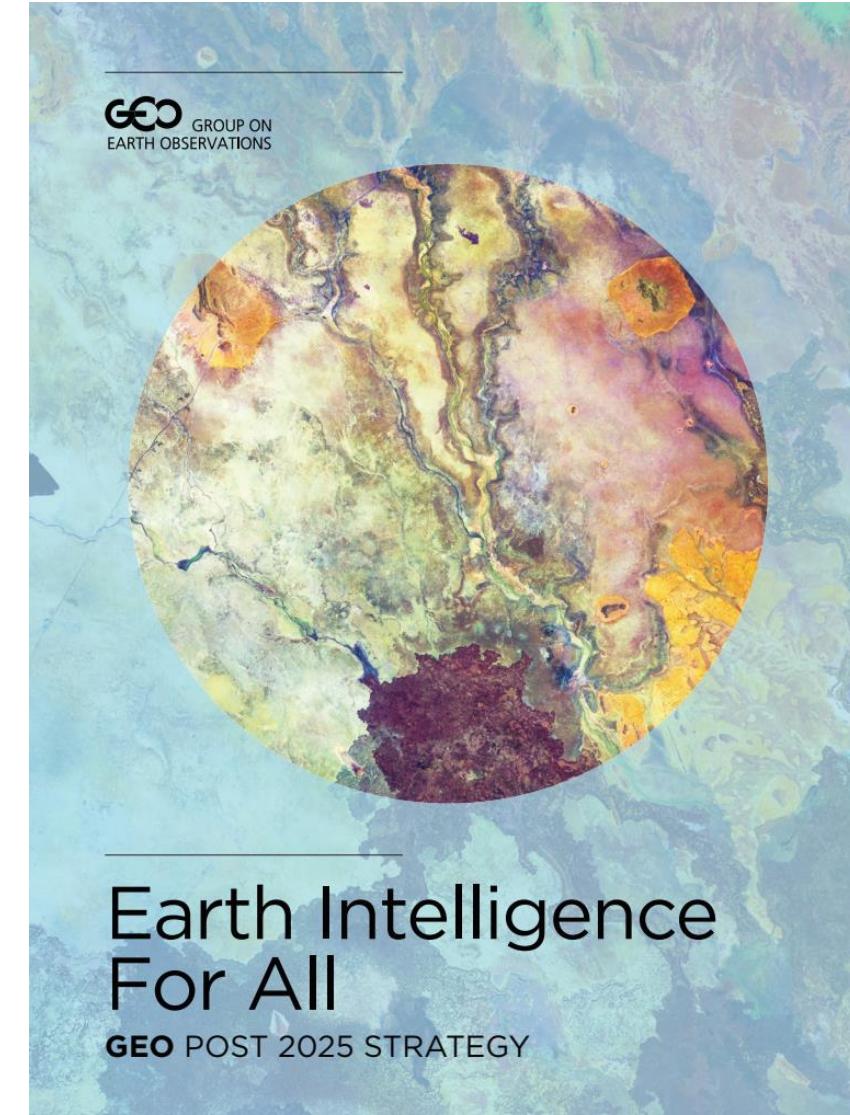
Challenges and Opportunity

Challenges

- **Hindrances for GEO Member Countries**: Difficulty in providing a comprehensive picture of the EO activity landscape.

- **Lack of Clarity**: Hard to quantify investments, impacts, coordinate EO activities and develop well-informed policies.

Why do we need EOMI Assessment?

- The current state of EO activities is not systematically assessed.

- Decision makers and stakeholders benefit from understanding the country's status and identifying areas for potential progress.

- They can direct investment where needed (gaps) or suitable (strengths).

The EOMI Methodology

- Developed under the European Union's (EU) Horizon 2020 funded GEO-CRADLE and built on under the e-Shape project.

- The methodology allows to **assess the maturity level of EO-related activities** within the country.

- It consists of **multiple indicators** organized into **5 pillars** – **stakeholder ecosystem, infrastructure, uptake, partnership and innovation**.

- The methodology is **modular**, so that the assessment of a given does not normally affect the assessment for another.

- The EOMI is **not** aimed at comparing between countries. Instead, it helps understand where a country stands today and in which direction it should go.

Five (5) Pillars of EO Maturity Indicator Methodology
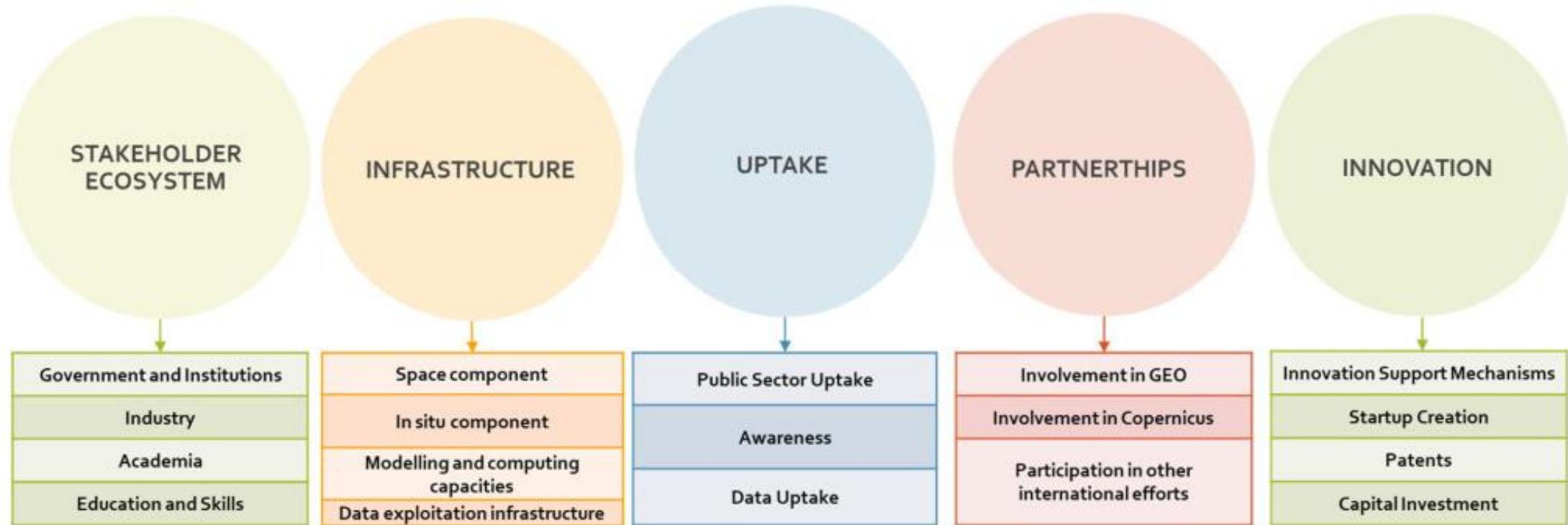
Domuzova et al, 2020

Stakeholder Ecosystem

Pillar	Group of indicators	#	Indicators	Description
Stakeholders Ecosystem	Government and Institutions	1	Governance	Maturity and strength of the governance model at country level
		2	Public Service Bodies	Number of entities at national, regional, local level using or producing EO data
		3	Staff	Employment numbers of people working on EO-tasks in governmental agencies and associated institutions
		4	Budget	Volume of annual investment in EO-related activities (upstream, downstream, mid)
	Industry	5	Companies (number)	Number of companies active in acquiring and supplying EO data and/or delivering geo-information services/products suitable
		6	Companies (scale)	Composition of industry base with regards to company size:(micro <10, small<50, medium <250)
		7	Companies (employment)	Estimated total employment among industry
		8	Resellers	Percentage of companies who operate only as resellers of international companies
		9	Sales	Volume of sales (as documented in their annual revenues) by companies incorporated in the country
	Academia	10	Researchers	Number of researchers working on Earth Observation topics
		11	Publications	Number and impact of relevant scientific publications within the last 5 years *(e.g.: indexed in Elsevier's Scopus and Compendex, publications in journals ranked in JRC among the top 30% of journals in the (G)EO field)*
	Education and Skills	12	University courses	Dedicated or tightly linked to EO courses offered at university level
		13	Training programmes	Training programmes focussed on the development of EO-related skills

National EO Infrastructure

Pillar	Group of indicators	#	Indicators	Description
National infrastructure	Space component	14	Operation of own satellites	If the country itself operates own satellite missions (public and private)
		15	Access to third party missions	Not owned nor operated by the country. Either a satellite operator or 3rd party mission/ including meteo.
		16	Ground-based facilities	Number of stations.
	In situ component	17	In situ monitoring networks	Number of in situ networks within the country or providing data to international networks.
	Modelling and computing capacities	18	Modelling	Measuring both number and quality of models (i.e. models for atmospheric modelling, what those are, what is the status).
		19	Computing	Availability of computing processing capacities (high-performance computers: HPC), assessing who these belong to (i.e. total number of organizations with computing capacities) and how advanced they are.
	Data exploitation infrastructure	20	Data portals and gateways (data access)	Number of data portals originating from the country.
		21	Data handling (incl. data cubes)	Tools for data-handling available through portals in the country
		22	Value-added services exploitation platforms (services/advanced products level)	Number of existing VAS exploitation platforms (access to thematic products or services)

EO Uptake

Pillar	Group of indicators	#	Indicators	Description
Uptake	Public Sector Uptake	23	EO for policy making	Exploitation of EO as a policy making and policy monitoring tool
		24	EO for operational public activities	Use of EO in operational activities of governmental agencies (including local and regional, excl. policy)
		25	EO Data Sharing	Level of adoption of data sharing practices
	Awareness	26	EO focussed events	Occurrence of events allowing both awareness (for general audiences) and networking (for specialised audiences) around EO
	Data Uptake	27	Uptake of Copernicus data (or equivalent)	Volume of Copernicus/Sentinel (or equivalent) number of product downloads per year

Partnerships

| Pillar	Group of indicators	#	Indicators	Description
Partnerships	Involvement in GEO	28	Financial Contribution	Financial contribution to GEO or to projects/initiatives which are linked to GEOSS
		29	GEO Flagships	Involvement in GEO Flagships
		30	GEO Initiatives	Involvement in GEO Initiatives
	Involvement in Copernicus	31	Provision of data to GEOSS	Volume and quality of datasets contributed to GEOSS
		32	Financial contribution	Financial contribution to the Copernicus programme
		33	Contribution for Copernicus Services Provision	We look into involvement into Copernicus Services for services provision as carried out by public or private organisations within the specific country.
		34	Copernicus-related R&D projects	Participation into Copernicus-related R&D projects (*within the past 3 years*)
	Participation in other international efforts	35	Involvement in ESA activities or equivalent	Level of involvement implied by the status of ESA member state or ESA cooperating state, and the information beyond these terms.
		36	Involvement in SDG Reporting	Exploitation of EO as a tool to support SDG reporting (*within the past 3 years*)
		37	Involvement in other Global Agenda Initiatives	Exploitation of EO as a tool in relevant Global Agenda initiatives and conventions (other than SDGs)
		38	Involvement in UN Ecosystem activities	Country participation to UN EO-focused programmes and relations with UN institutions (UNITAR, UNOSAT, UN-OOSA, UN-SPIDER, UNEP, etc.).
		39	Involvement in Spatial Data Infrastructure Efforts	Involvement with Infrastructure for Spatial Information (INSPIRE or other. Possibly monitoring of n. of reports about the implementation and use of their infrastructures for spatial information)
		40	Involvement in Standardisation and Interoperability Efforts	Country participation in other international organisations dealing with interoperability, standards, e.g. such as OGC

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Innovation

Pillar	Group of indicators	#	Indicators	Description
Innovation	Innovation Support Mechanisms	43	Clusters or Innovation Hubs	Number of clusters and innovation hubs in a country
		44	Funding for startups	Amount of available funding for startups
	Startup Creation	45	Total number of EO startups	Number of existing startups (*created within the last 3 years*)
		46	Creation Rate	Creation rate of startups (*for the past year*)
		47	Annual Revenue	Average annual revenue of startups
	Patents	48	Hardware	Number of patents registered for hardware innovation
		49	Software	Number of patents registered for software innovation
	Capital Investment	50	Venture Funds	Existence of available venture funds
		51	Capital raised	Amount of investment raised by national players in the space sector

How does the EOMI Framework work?

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
Stakeholders Ecosystem	**Government and Institutions**	1	Governance	Maturity and strength of the governance model at the country level	Unspecified governance model	Formally designated authority.	Formally designated authority, with geospatial departments present in other ministries as well.	A clear agenda is implemented between authority and ministries- without International involvement and impact.	Clear agenda is implemented between authority and ministries - with international involvement and impact.
		2	Public Service Bodies	Number of entities at national, regional, local level using or producing EO data	Less than 5	6 - 20	21-50	51- 100	Over 100.
		3	Staff	Employment numbers of people working on EO-tasks in governmental agencies and associated institutions	Less than 25	26-200	201- 500	501- 1000	Over 1000
		4	Budget	Volume of annual public investment in EO-related activities (upstream, downstream, mid)	Less than EUR 10 M	EUR 10-50M	EUR 50-100 M	EUR 100-300 M	Over EUR 300 M
	Industry	5	Companies (number)	Number of companies active in acquiring and supplying EO data and/or delivering geoinformation services /products suitable	No private companies in the EO domain [no companies on EO]	1-5 companies in the country serving any category in the EO value chain [between 1- 5 companies]	6-25 companies serving at least 3 categories covering the EO value chain [between 6-25 companies]	26-50 companies serving at least 3 categories covering the EO value chain	Over 50 companies representing all the categories covering the EO
		6	Companies (scale)	Composition of industry base with regards to company size:(micro <10, small<50, medium <250)	[no comparable]	Micro companies only	Micro and small companies	Micro, small and medium companies [SMEs]	All types of companies spread all over the country. Note: usually the EO companies are the small size ones. They have around 2-10 employees [all types industry]

Full framework at Annex 1

Domuzova et al, 2020

EOMI Implementation Process

Domuzova et al, 2020
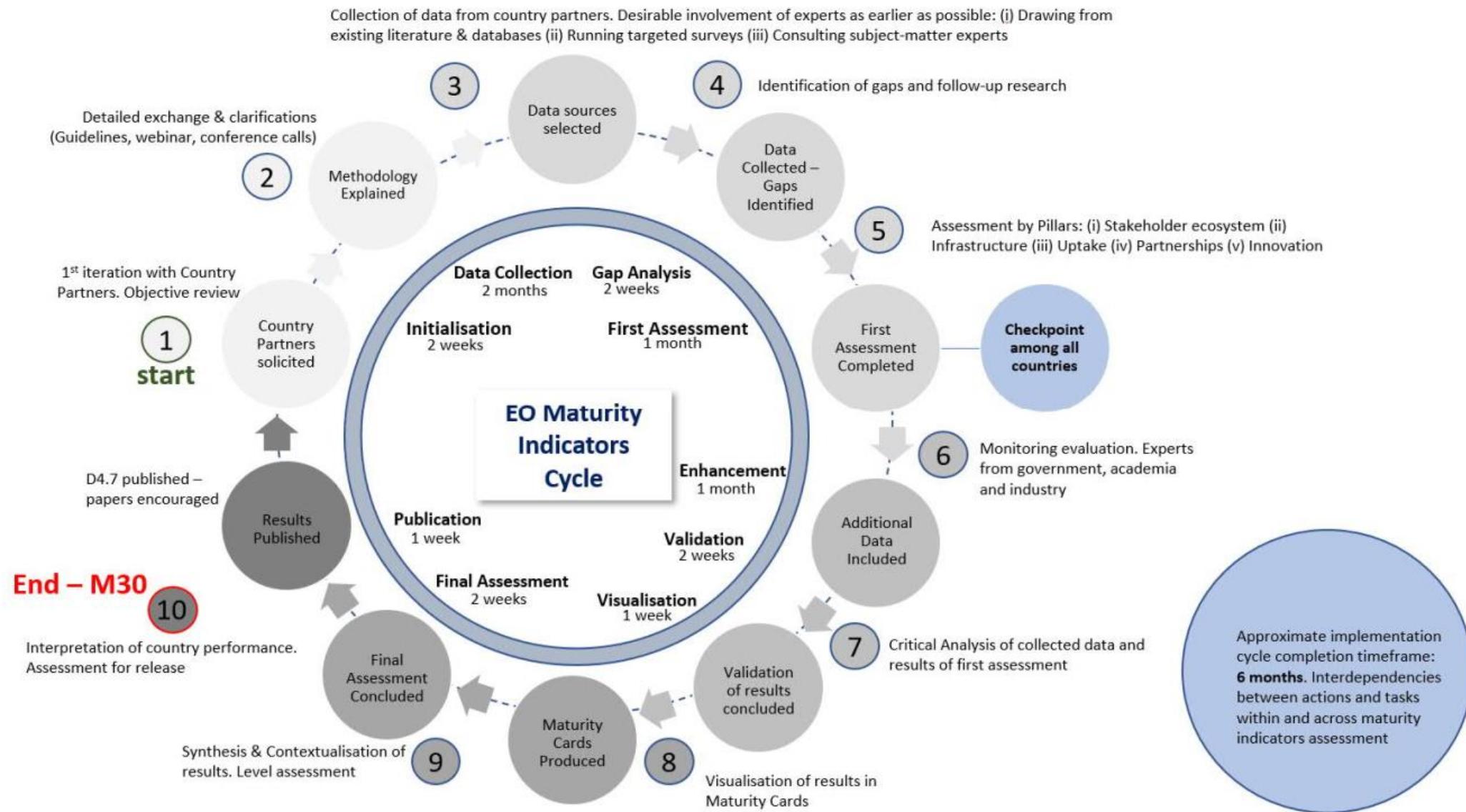
EOMI Methodology Overview

Defining Maturity Levels and assigning values

L0 – Initial: Very weak performance indicates the need for significant guidance and support to improve the country's performance

L1 - Basic: Country practices at **early pilot stage** and are demonstrating some successful results

L2 - Intermediate: Country practices in limited use in industry or government organizations for the (G)EO sector

L3 - Advanced: Country practices successfully deployed. Case studies are typically available to evaluate this level

L4 - Optimized: Practices that have been fully integrated and optimized by the country

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EOMI Methodology Cycle

Initiation

- Solicit country partners.

- EOMI Methodology introduced and explained to country partners:

- Guidance, meeting and exchanges.

- Implementation principles explained - provision of tools (e.g excel sheet, presentation illustrating the methodology and implementation).

Tips:

- Involvement of country national experts and EO maturity team.

- Split the work between partners (if more than one country partner from the same country).

- Solicit external partners making sure you have one from academic, government, industry.

- Involve actors representing the full spectrum of the EO community (e.g. National Space Office contact points, GEO Focal Point, etc...).

Data Collection

- Design data collection approach that incorporates the methods that work for you (desktop research, surveys, interviews, workshop, etc.).

Tips:

- Data collection best practices:
    - Make sure the information provided is meaningful, complete and ready to use.
    - A well-organized database provides good traceability and reference for further implementation.
    - Leverage recent surveys and sources.
    - After initial setup: regular discussion and reporting on the progress.

Gap Analysis

- Identify **potential gaps** across the 5 pillars and the associated groups.

- This is an important step that will guide in subsequent efforts.

- Seek support from EOMI team and national experts where needed.

Tips:

- **Beware!** There are actual gaps and information gaps – make sure not to confuse the former with the latter.

- Gap analysis is the first step for the analysis of the current state (looks for the needs) but it is not the assessment.

- Prepare your gap analysis based on the EOMI Grid/Framework.

- Types of gaps may include geographic, observational, structural (connectivity/ ability), quality/ quantity (frequency, availability) or capacity gaps.

Enhancement and Validation

Addressing Gaps:

- Develop strategies to fill data gaps identified during the gap analysis. This may involve reaching out to additional stakeholders, conducting follow-up interviews, or utilizing alternative data sources.

Expert Consultation

- Engage external experts to review the assessments and provide third-party validation. Organize expert panels or focus groups to discuss specific indicators and gather diverse perspectives.

Refinement of Data:

- Based on expert feedback, refine the collected data and reassess the indicators if necessary. Ensure that the final data set is robust and comprehensive.

Finalization and Visualization

Final Evaluation

Compile the **assessments from all indicators** and validate them through expert reviews and stakeholder feedback. Ensure that the final ratings are accurate and reflect the true state of EO activities.

Maturity Cards and Reports

Create detailed **reports and visual maturity cards** that depict the current state of EO maturity across all pillars. Use clear and concise language, supported by data visualizations, to communicate findings effectively.

Stakeholder Review

Share the reports and maturity cards with **key stakeholders for final review**. Incorporate their feedback to ensure the reports are comprehensive and actionable.
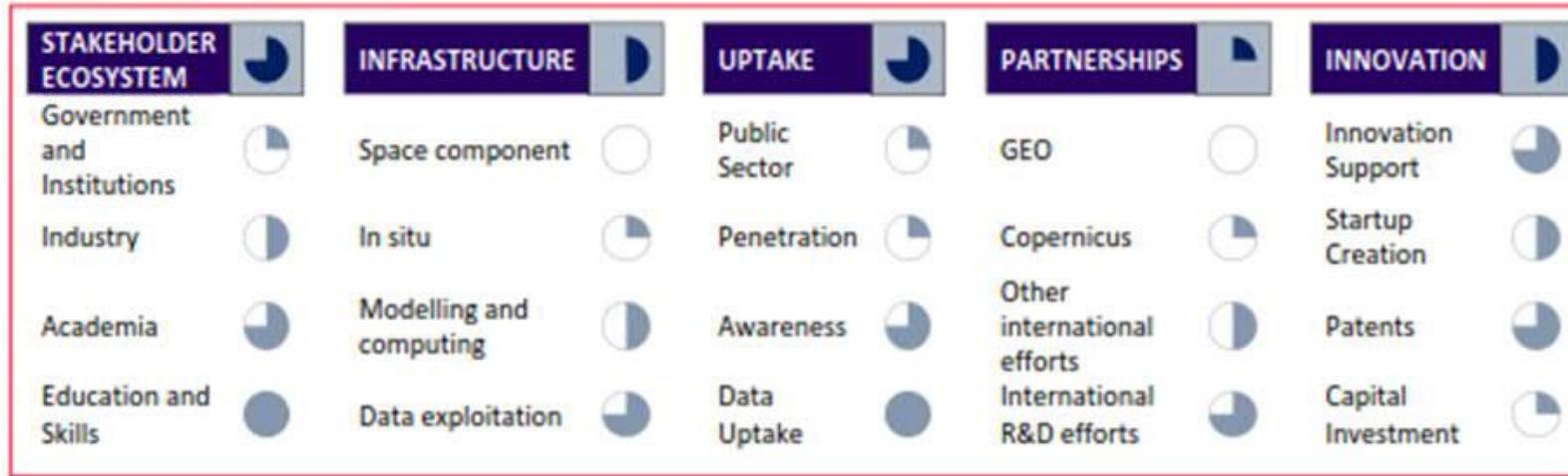
Maturity Cards (Indicators)

PARTNERSHIPS	INDICATORS	Maturity
Involvement in GEO	Financial Contribution	
	GEO Flagships	
	GEO Initiatives	
	Provision of data to GEOSS	
Involvement in Copernicus	Financial contribution	
	Copernicus Services Contribution	
	Copernicus-related R&D projects	
Other international efforts	ESA activities or equivalent	
	SDG Reporting	
	Other Global Agenda Initiatives	
	UN Ecosystem activities	
	Spatial Data Infrastructure Efforts	
	Standardisation and Interoperability	
international R&D efforts	EU FPs (or equivalent)	
	Other EU Funding[maybe optional]	
	IFIs	

INFRASTRUCTURE	INDICATORS	Maturity
Space component	Own satellites	
	Third party missions	
	Ground-based	
In situ component	In situ	
Modelling and computing	Modelling	
	Computing	
Data exploitation infrastructure	Data access	
	Data handling	
	VAS platforms	

STAKEHOLDER ECOSYSTEM	INDICATORS	Maturity
Government and Institutions	Governance	
	Public Service Bodies	
	Staff	
	Budget	
Industry	Companies (number)	
	Companies (scale)	
	Companies (employment)	
	Resellers	
	Sales	
Academia	Researchers	
	Publications	
Education and Skills	University courses	
	Training programmes	

UPTAKE	INDICATORS	Maturity
Public Sector Uptake	Policy	
	Other governmental activities	
	EO Data Sharing	
Penetration	In key economic sectors [optional]	
Awareness	EO focussed events	
Data Uptake	Copernicus data (or equivalent)	

INNOVATION	INDICATORS	Maturity
Innovation Support	Clusters or Innovation Hubs	
	Funding for startups	
Startup Creation	Total number of startups	
	Creation Rate	
	Annual Revenue	
Patents	Hardware	
	Software	
Capital Investment	Venture Funds	
	Capital raised	

Publication of Results

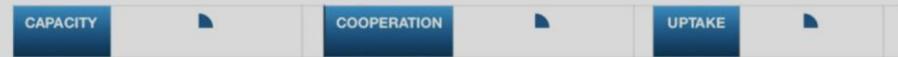| Phase	Step	Activity	Involvement by					
			Country Partner		National Experts		e-shape Maturity Team	
Initialisation	1	Solicit Country Partners		NA		NA		Based on report D4.3
	2	Explain Methodology		Read guidelines		Participate in 1-1 conference if agreed		Using guidelines, webinar, 1-1 conference
Data collection & Gap analysis	3	Select Data Sources		Decide data gathering method		Consult country partners wrt to available info		Support country partners where needed (e.g. surveys)
	4	Collect Data and identify gaps		Perform data collection		Assist in gap identification		Provide guidance where needed
First Assessment	5	Complete first assessment		Carry out first assessment		Consult country partners and eMT		Assist country partners in concluding first assessment
Enhancement	6	Provide additional data		Carry out data gathering where enhancement is needed		Direct country partners to additional sources		Suggest areas for enhancement
Validation	7	Validate results		Provide feedback to experts and eMT for validation		Carry out validation of results		Perform ad hoc validations with desk research/critically review process
Visualisation	8	Produce Maturity Cards		Provide inputs for the generation of maturity cards		NA		Generate maturity cards
Final Assessment	9	Conclude final assessment		Carry out final assessment with assignment of levels per indicator		Provide final views on final assessment		Contextualise results and propose small fine-tuning where needed
Publication	10	Publish results		Support the production of deliverable		NA		Produce e-shape deliverable with all results for all countries

Legend
- Leading activity
- Supporting activity
- Providing assistance
- No involvement

Recap

Country Cases

Western Balkan Countries: Albania, Macedonia, Serbia	EU Member States in the RoI: Bulgaria, Cyprus, Greece, Romania	Independent Space Programs: Egypt, Tunisia, Turkey	Upstart EO Countries: United Arab Emirates, Saudi Arabia	Advanced Ecosystem: Israel
• **Current State:** Basic space-borne capacities, weather data receiving antennae. • **Gaps:** Underdeveloped in-situ networks, unsatisfactory information sharing, low cooperation. • **Opportunities:** EU financial instruments and other support	• **Current State:** Varying levels of space capacities, satellite receiving stations. • **Gaps:** Structural gaps similar to Western Balkans, fiscal consolidation impacts. • **Advancements:** EU membership benefits (Structural Funds, integration with EU organizations).	• **Current State:** Long-term efforts led by defined space strategy. • **Gaps:** Bureaucratic obstacles, insufficient personnel and expertise. • **Advancements:** Turkey's high local and international cooperation, Egypt's large capacities.	• **Current State:** Rapid development due to government investment. • **Gaps:** Political/economic context impacts, reliance on foreign experts.	• **Current State:** Most advanced capacities, specialized in micro-/nano-satellite market. • **Gaps:** Minimal, advanced commercial exploitation of EO.

RoI-Region of Interest

Egypt

Assessment (ranged)

CAPACITY		COOPERATION		UPTAKE	

Score card

maturity indicators	indicators	level	maturity indicators	indicators	level	maturity indicators	indicators	level
capacity	infrastructure	◗	cooperation	collaboration GEO	○	uptake	networking	◗
	eo reserach	◗		impact Copernicus	◗		policy	◗
	industry base	◗		international	◗		penetration	◗
				funding	◗			

Detail evaluation

capacity	indicator	level
infrastructure	space authority	◗
	space borne	◗
	access 3rd party missions	◗
	ground based	◗
	in-situ	◗
	modelling & computing	◗
	eo data exploitation	◗
eo research	n. public organizations	◗
	n. researchers	◗
	courses offered	◗
	publications	◗
industry base	n. companies	◗
	employment	◗
	resellers, partnerships	◗
	clusters	◗

cooperation	indicator	level
collaboration GEO	participation GEO	◗
	specific actions on SDG's	○
	designated GEO office	◗
	provision data to GEOSS	○
impact Copernicus	projects	◗
international	ESA	◗
	meteorological	◗
	UN / Int. agreements	◗
	INSPIRE	○
	standardization	○
funding	R&D participation	◗

uptake	indicator	level
networking	networking	◗
	data portals	◗
policy	policy	◗
	budget & investment	◗
penetration	use	◗
	capacity building	◗

LEGEND eo maturity card

○ initial ◗ basic ◗ intermediate ◗ advanced ● optimized

Maturity Card - Egypt

GEO-CRADLE Project

Current EOMI Implementation

Nine (9) Sub-Saharan African Countries

- South Africa led by **Department of Science and Innovation (DSI)**
- Nigeria led by **National Space Research & Development Agency (NASRDA)**
- Rwanda led by **Rwanda Space Agency**.
- Botswana led by **Botswana International University of Science and Technology**
- Ivory Coast led by **the Geographic and Digital Information Centre**
- Gabon led by **Agence Gabonaise d'Etude et d'Observation spatiales (AGEOS)**
- Kenya led by **Kenya Space Agency**
- Namibia
- Tanzania

Future Actions

Review and Refine:

- **Periodically review** the methodology and refine the indicators and processes based on new insights and changes in the EO landscape. Solicit feedback from all involved parties to identify areas for improvement.

Reassessment:

- **Conduct reassessments** at regular intervals (e.g., annually or biennially) to monitor progress and update strategies as necessary. Compare new assessments with previous ones to track changes and trends over time.

Knowledge Sharing:

- **Foster a culture of continuous improvement** by sharing best practices, lessons learned, and successful strategies with other countries and stakeholders. Use platforms like workshops, webinars, and conferences to facilitate this exchange.

Reference Materials

D4.4 Capacity Building Best Practice Guide: Assessing the maturity of EO activities at country level. e-Shape https://e-shape.eu/images/capacity-building/e-shape_WP4-D4.4_Capacity_Building_Best_Practice_Guide_EVF_Module_for_web.pdf

D3.4 – Maturity Indicators and country (G)EO Profile (II), GEO-CRADLE: http://geocradle.eu/wpcontent/uploads/2016/07/D3.4.pdf

M. Miguel-Lago, L. Mamais, H. Kontoes, A. Tsouni - Assessing the maturity of EO activities at national level Based on the GEO-CRADLE Maturity Indicators Methodology:
http://earsc.org/file_download/509/IAF2018+Assessing+the+maturity+of+EO+capacities+at+national+level_vf.p

Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS
http://geocradle.eu/wp-content/uploads/2017/03/D3.1.pdf

D4.7 - Maturity Indicators Implementation Report: https://e-shape.eu/images/resources/5.%20e-shape_WP4-D4.7%20Maturity%20Indicators%20Implementation%20Report.pdf

Thank you!

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Annex 1 EOMI Assessment Grid/Framework

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
Stakeholders Ecosystem	Government and Institutions	1	Governance	Maturity and strength of the governance model at country level	Unspecified governance model.	Formally designated authority.	Formally designated authority, with geospatial departments present in in other ministries as well.	Clear agenda is implemented between authority and ministries-without international involvement and impact.	Clear agenda is implemented between authority and ministries - with international involvement and impact.
		2	Public Service Bodies	Number of entities at national, regional, local level using or producing EO data	Less than 5.	6 - 20	21-50	51- 100	Over 100.
		3	Staff	Employment numbers of people working on EO-tasks in governmental agencies and associated institutions	Less than 25.	26-200	201- 500	501- 1000	Over 1000.
		4	Budget	Volume of annual public investment in EO-related activities (upstream, downstream, mid)	Less than EUR 10 M	EUR 10-50M	EUR 50-100 M	EUR 100-300 M	Over EUR 300 M
	Industry	5	Companies (number)	Number of companies active in acquiring and supplying EO data and/or delivering geo-information	No private companies in the EO domain [no companies on EO]	1-5 companies in the country serving any category in the EO value chain [between 1-5 companies]	6-25 companies serving at least 3 categories covering the EO value chain [between 6-25 companies]	26-50 companies serving at least 3 categories covering the EO value chain	Over 50 companies representing all the categories covering the EO

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
				services/products suitable				[between 26-50 companies]	value chain. [> 51 companies]
		6	Companies (scale)	Composition of industry base with regards to company size:(micro <10, small<50, medium <250)	[no comparable]	Micro companies only	Micro and small companies	Micro, small and medium companies [SMEs]	All types of companies spread all over the country. Note: usually the EO companies are the small size ones. They have around 2-10 employees [all types industry]
		7	Companies (employment)	Estimated total employment among industry	Private sector employment up to 10 employees [up to 10 employees]	Private workforce between 10-50 employees. Note: usually the EO companies are the small size ones. They have around 2-10 employees/company [10-50 employees]	Private task force between 51-150 employees [51-150 employees]	Private task force between 151-300 employees [151-300 employees]	Private task force more than 300 employees [>300 employees]
		8	Resellers	Percentage of companies who operate only as resellers of international companies	Only resellers, not companies members of international specialised groups. [only resellers]	Over 60% resellers	Between 60% and 30% and resellers	Between 30% and 10% resellers.	Less then 10% resellers only

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
		9	Sales	Volume of sales (as documented in their annual revenues) by companies incorporated in the country	Less than EUR 1 M	EUR 1-5 M	EUR 5-50 M	EUR 51-100 M	Over EUR 100 M.
	Academia	10	Researchers	Number of researchers working on Earth Observation topics	No significant number of researches in the EO domain [no significant EO staff]	Less than 50 EO researchers	50-250 EO researchers	250-500 EO researchers	> 500 EO researchers
		11	Publications	Number and impact of relevant scientific publications within the last 5 years *(e.g.: indexed in Elsevier's Scopus and Compendex, publications in journals ranked in JRC among the top 30% of journals in the (G)EO field)*	no papers published [no EO publications]	1-25 papers published at department level (from those at least 10 paper citations who have an impact factor)[1-25 papers]	25-100 papers published that will provide some excellence of the research resulting from national projects related to EO funded by Government or other EU funding (from those at least 25 paper citations who have an impact) [25-100 papers]	100-500 scientific papers (+ thesis research) produced by research organizations and universities on innovative topics (from those at least 50 paper citations who have an impact. [100-500 papers]	Over 500 between number of theses and scientific papers produced by research organizations and universities with impact in prestigious magazines or presented in high level conferences; [>500 papers]
	Education and Skills	12	University courses	Dedicated or tightly linked to EO courses offered at university level	No specific EO courses.	Sporadic EO dedicated courses within various curricula.	Multiple EO dedicated courses within various curricula with proven impact and peer recognition.	At least one EO dedicated recognised and renowned curriculum.	More than one EO dedicated recognised and renowned curricula.

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
		13	Training programmes	Training programmes focussed on the development of EO-related skills	No known EO training programmes.	Rare instances of EO training programmes by local and international actors. (e.g. summer schools, seminars)	Sporadic EO training programmes by local actors.	Periodic EO training programmes by local and international actors.	Systematic (i.e. multiple annual) EO training programmes by local and international actors, serving coherent agenda (s)
National infrastructure	Space component	14	Operation of own satellites	If the country itself operates own satellite missions (public and private)	No missions, no technical readiness.	Technical readiness but no EO mission in course	At least one EO mission.	1-5 EO missions	> 5 EO missions
		15	Access to third party missions	Not owned nor operated by the country. Either a satellite operator or 3rd party mission/ including meteo.	No access to other missions [no access missions]	Access to less than 5 third party missions.	Access to 5-10 third party missions.	Access to 11-25 third party missions.	Access to over 25 third party missions.
		16	Ground-based facilities	Number of stations.	No capacity for ground-based control elements of EO spacecraft system [no ground-based capacity]	1 ground station	2-5 ground stations	6-10 ground stations	>11 ground stations
	In situ component	17	In situ monitoring networks	Number of in situ networks within the country or providing data to international networks.	0 in situ networks.	Up to 5 in situ networks.	Up to 10 in situ networks.	Up to 20 in situ networks.	Over 20 in situ networks.

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
	Modelling and computing capacities	18	Modelling	Measuring both number and quality of models (i.e. models for atmospheric modelling, what those are, what is the status).	No modelling capacities	TBD	TBD	TBD	TBD OR internationally renowned/ standardized models have been developed within the country.
		19	Computing	Availability of computing processing capacities (high-performance computers: HPC), assessing who these belong to (i.e. total number of organizations with computing capacities) and how advanced they are.	No HPC [no computing capacities]	One institution with HPC facilities for their executions with multiprocessing systems and large external memory units. [one HPC]	Multiple computing resources for the processing and exploitation of EO data for one or more institutions. [between 2 to 10 modelling capacities]	TBD	TBD
	Data exploitation infrastructure	20	EO Data portals and gateways (data access)	Number of data portals originating from the country.	No data portals.	One generic data portal.	Up to 5 (including thematic ones).	Between 6 and 20 (including thematic ones-some serving different communities).	Over 20 (including thematic ones- some serving different communities).
		21	Data handling (incl. data cubes)	Tools for data-handling available through portals in the country	Raw data only. (level 0-1A*)	Capability to query and gather various types of data. (level 0-1B*)	Capability to query and gather various types of data and additional tools to ingest additional data. (level 2*)	Capability to do develop services on the portal. (level 2*)	Capability to do develop services on the portal. (level 2*). Data cubes available as well.

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		22	Value-added services exploitation platforms (services/advanced products level)	Number of existing VAS exploitation platforms (access to thematic products or services)	No existing platforms.	Up to 5 existing platforms.	6-15 existing platforms.	16-30 existing platforms.	Over 30 existing platforms.
Uptake	Public Sector Uptake	23	EO for policy making	Exploitation of EO as a policy making and policy monitoring tool	EO not used for policy-making and policy-monitoring.	One public service body using EO data for the monitoring status of policies.	2-5 public service bodies using EO data for the monitoring status of policies.	6-10 public service bodies using EO data for the monitoring status of policies.	Over 10 public service bodies using EO data for the monitoring status of policies. EO explicitly mentioned in legislation.
		24	EO for operational public activities	Use of EO in operational activities of governmental agencies (including local and regional, excl. policy)	EO not used for public operational activities.	At least two public service bodies using EO data for operational activities.	5-10 public service bodies using EO data for operational activities.	11-20 public service bodies using EO data for operational activities.	Over 20 public service bodies using EO data for operational activities.
		25	EO Data Sharing	Level of adoption of data sharing practices	Not adopted.	Intra-ministry.	Inter-ministry.	Data sharing between central and regional.	Between any public and private.
	Awareness	26	EO focused events	Occurrence of events allowing both awareness (for general audiences) and networking (for specialised audiences) around EO	No data for organised EO events.	Sporadic EO events without clear link or overall agenda.	EO events organised in a focused way to promote specific agendas.	One renowned (at least regionally) periodic EO event.	More than one renowned (at least regionally) periodic EO events.

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	Data Uptake	27	Uptake of Copernicus data (or equivalent)	Volume of Copernicus/Sentinel (or equivalent) number of product downloads per year	Less than 1000 products.	Between 1000 and 10 000 products	Between 10k and 500k products	500k-1 million products	Over 1 million products.
Partner ships	Involvement in GEO	28	Financial Contribution	Financial contribution to GEO or to projects/initiatives which are linked to GEOSS	0	<EUR 1k	EUR 1-25k	EUR 26-100k	Over EUR 100k
		29	GEO Flagships	Involvement in GEO Flagships	No involvement in Flagships.	Involvement in 1 flagship.	Involvement in 2 flagships.	Involvement in 3 flagships.	Involvement in 4 flagships.
		30	GEO Initiatives	Involvement in GEO Initiatives	No involvement in GEO initiatives.	Involvement in 1 or 2 initiatives.	Involvement in 3-8 initiatives.	Involvement in more than 8 initiatives.	Leading at least one initiative (and involvement in at least 3 other initiatives)
		31	Provision of data to GEOSS	Volume and quality of datasets contributed to GEOSS	No provision of data to GEOSS.	Plans for provision of data to GEOSS at country level (plans for sharing metadata brokered directly through the GEODAB) [plans for data to GEOSS]	Provision of one to five metadata types brokered directly through GEODAB [1-5 datasets to GEOSS]	Provision of 5 to 15 metadata types brokered directly through GEODAB [6-15 datasets to GEOSS]	Provision of more than 15 metadata types brokered directly through GEODAB and ideally [provision >15 datasets to GEOSS]
	Involvement in Copernicus	32	Financial contribution	Financial contribution to the Copernicus programme	None.	Agreement in place.	EU Member State, not contributing through ESA.	EU Member State, and contributing less than EUR 200 M per year through ESA as well.	EU Member State, and contributing over EUR 200 M per year through ESA as well.

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		33	Contribution for Copernicus Services Provision	We look into involvement into Copernicus Services for services provision as carried out by public or private organisations within the specific country.	No organisations from the country is involved in provision to Copernicus service component(s).	Less than 5 companies from the country are involved in provision to Copernicus service component(s).	Over 5 companies from the country are involved in provision to Copernicus service component(s).	Over 5/10? companies from the country are involved in provision to Copernicus service component(s), with a clear focus on one of the components.	At least one company from the country is leading the provision for at least one service component.
		34	Copernicus-related R&D projects	Participation into Copernicus-related R&D projects (*within the past 3 years*)	No projects using data from Copernicus [0 projects using Copernicus data]	1-5 projects using data from Copernicus [1-5 projects using Copernicus data]	6-25 projects using data from Copernicus [6-25 projects using Copernicus data]	26-50 projects using data from Copernicus [25-50 projects using Copernicus data]	Over 50 projects using data from Copernicus. [< 50 projects using Copernicus data]
	Participation in other international efforts	35	Involvement in ESA activities or equivalent	Level of involvement implied by the status of ESA member state or ESA cooperating state, and the information beyond these terms.	No involvement.	Involvement through a general Cooperation Agreement.	European Cooperating State.	ESA Member State contributing less than EUR 500 million/year.	ESA Member State contributing more than EUR 500 million/year.
		36	Involvement in SDG Reporting	Exploitation of EO as a tool to support SDG reporting (*within the past 3 years*)	No use of EO in monitoring/reporting of SDG´s [no SDGs actions]	Use of EO in reporting on at least in one SDG´s [1 SDGs action]	Use of EO in reporting on more than one action in SDG´s [2-10 SDGs actions]	Active use of EO for reporting on to different actions in SDG´s [11-25 SDGs actions]	Active use of EO for reporting on different actions in SDG´s in the last 3 years [over 25 SDGs actions]
		37	Involvement in other Global Agenda Initiatives	Exploitation of EO as a tool in relevant Global Agenda initiatives and conventions (other than SDGs)	No national strategy to tackle it.		Use of EO in reporting.		Specific EO mention in consolidated country roadmap.

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		38	Involvement in UN Ecosystem activities	Country participation to UN EO-focused programmes and relations with UN institutions (UNITAR, UNOSAT, UN-OOSA, UN-SPIDER, UNEP, etc.).	No membership of UN bodies related to Space activities nor participation in UN activities [no participation UN bodies]	Participation in at least one UN [EO activity (events w/g´s) [at least 1 active participation in UN agency/organisation]	Participation (between 2-5 activities) or plans for links to reference UN sites to focus international efforts, facilitate traceability and enable the establishment of measurement 'best practices' and active participation at one of the UN offices [participation in 2-5 UN agencies/organisations]	Active participation in more than 6 of the UN offices [participation in >6 UN agencies/organisations]	Active participation or membership of more than 6 UN bodies / offices related to space activities: in the last 5 years [participation >6 UN agencies/organisations/10 years]
		39	Involvement in Spatial Data Infrastructure Efforts	Involvement with Infrastructure for Spatial Information (INSPIRE or other. Possibly monitoring of n. of reports about the implementation and use of their infrastructures for spatial information)	TBD	TBD	TBD	TBD	TBD

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
		40	Involvement in Standardisation and Interoperability Efforts	Country participation in other international organisations dealing with interoperability, standards, etc such as OGC	Not following programmes on standardisation processes: compatibility, interoperability, safety, repeatability [no engagement with Standardization discussions]	One public or private organisation participating in one of other international organizations dealing with standardisation, interoperability…etc [one organisation engaged with Standardization discussions]	2-5 public or private organisations in the country have fully implemented and developed technical standards for EO [2-5 organizations engage with Standardization discussions]	6-10 public or private organisations participating in an international organisations dealing with standardization, interoperability…etc [6-10 organizations engage with Standardization discussions]	Over 10 public or private organisations are leading standardisation processes [> 10 organizations engage with Standardization discussions]
	Involvement in International R&D efforts	41	IFIs (World Bank, Regional Development Banks, etc.)	R&D funds from IFIs implemented on the country's territory within the past 3 years	None.	Up to 5 projects, all of them small.(<100k)	Small projects and at least two over EUR 250k.	At least two medium projects (>EUR 1 M) present as well.	At least two big projects (>EUR 3 M) present as well.
		42	Other funds	Other Projects executed by national actors funded through national or international institutions (other than IFIs) within the past 3 years.	None.	Up to 5 projects, all of them small(<EUR 50k)	Small projects and at least one of them over EUR 100k.	At least two medium projects (>EUR 500k) present as well.	At least two big projects (>EUR 1M) present as well.
Innovation	Innovation Support Mechanisms	43	Clusters or Innovation Hubs	Number of clusters and innovation hubs in a country	No concentration of business activities around EO information [no clusters]	At least one ICT cluster and hubs which could promote innovation and technological development [1 cluster]	2-5 professional cluster and hubs organisations involved in technological transfer and innovation [2-5 clusters]	6-10 clusters and hubs in more than one thematic (EO sector-specific). one cluster with silver impact [6-10 clusters]	Over 10 clusters and hubs in more than one thematic[1] including silver impact and at least

Pillar	Group of indicators	#	Indicators	Description	0 - initial	1 - basic	2 - intermediate	3 - advanced	4 - optimised
									one with golden [>10 clusters]
		44	Funding for startups	Amount of available funding for startups	None.	TBD	TBD	TBD	TBD
	Startup Creation	45	Total number of startups	Number of existing startups (*created within the last 3 years*)	0	1-5	6-10	11-20	Over 20
		46	Creation Rate	Creation rate of startups (*for the past year*)	0	1	2-5	6-10	Over 10
		47	Annual Revenue	Average annual revenue of startups	Less than EUR 10k	EUR 10-50k	EUR 51-250k	EUR 251k - 1 M	Over EUR 1 M
	Patents	48	Hardware	Number of patents registered for hardware innovation	No patents registered.	TBD	TBD	TBD	TBD
		49	Software	Number of patents registered for software innovation	No patents registered.	TBD	TBD	TBD	TBD
	Capital Investment	50	Venture Funds	Existence of available venture funds	None available.	Less than 3 generic innovation -research related.	4-10 generic innovation -research related.	Over 10 generic innovation -research related.	Over 10 generic innovation - research related. Dedicated EO funds as well.
		51	Capital raised	Amount of investment raised by national players in the space sector	Less than EUR 100k	EUR 100k-1 M	EUR 1-10 M	EUR 10-50 M	Over EUR 100 M