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e-shape – Reusable knowledge and EO applications contributed by EuroGEO

04/07/2023

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e-shape - EuroGEO Showcases **Applications Powered by Europe**



- European Commission H2020 contribution to EuroGEO
- 15M€, 68 partners, **37 pilots** in 7 showcases
- **4 years** grant (2019-2023)
- **ARMINES** (France) coordinator e-shape.eu
- Promoting **users' uptake** of **European** Earth Observation (**EO**) resources
- Building on **Copernicus** and **GEOSS** through the development of **co-design** pilots
- Built on a **user-centric approach** to deliver economic, social and policy **value** to European citizens









water

EuroGEO Showcases: Applications Powered by Europe





agriculture

health

renewable energy

ecosystem

disaster

climate

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e-shape - EO applications contributed by EuroGEO

2

e-shape in numbers – Towards reusable knowledge



- 68 partners / **37 Pilots** / EUR 15 million / 4years
- 2 on-boarding phases (10 pilots)
- 26 user uptake workshops
- 15 Executive Board meetings
- 165 PMT meetings held (3.2/month)
- **16,000 emails** exchanged in 17 mailing-lists
- 85 deliverables reviewed
- 111 articles in media and magazines
- 37 Data Management Plan (x 2)
- 4 General Assembly (2 virtual) (100-200 pp. each)

8 public outreach platforms:

- Website (27,000 unique visitors)
- Helpdesk
- Sustainability Booster
- Eowiki
- EOMall
- Webservice-energy catalogue
- GEO Portal
- GEO Knowledge Hub
- Private Jira ticketing system (443 tickets)
- Confluence workspace (250 users / 1,200 pages)
- Social media presence
 Facebook/Twitter/LinkedIn: 2400 posts
 YouTube: 59 videos

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Reusable knowledge on the shelf for the EO sector





- 1. Data Management Plan (DMP) self-assessment tool
- 2. Co-design methodology and self-diagnosis tool
- 3. Best practice guide for EO developers,
- 4. Sustainability Booster for EO application
- 5. EuroGEO position paper

• 37 pilot applications in 7 showcases



Reusable knowledge - Generic #1 - DMP self-assessment tool



- Create a DMP for GEO and FAIR Principles
- Tool Excel package (Macro)
- Free, open, simple and easy to navigate
 - **10** GEO DMPs
 - 5 FAIR Principles
- Based on self-assessment (Pilot or project)
- Provide recommendations and guidance's
- Allow templating (Look & feel)
- Tested and validated on 37 pilots (X2)
- Available as a package on the **GKH**
- Next: Machine-actionable DMP
- **Open position** for 6 month training period

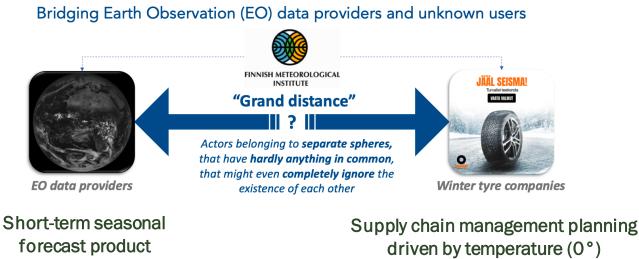
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e-shape			DMP Summary				EXPORT TO WORD									
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GEO Data Management Principle	compliance (select)	compliance (select)	Details included (mandatory)	Exceptions	exception		- TO START									
P-1: METADATA FOR DISCOVERY a and all associated metadata will be overable, through catalogues and search ines, and data access and use conditions, using licenses, will be clearly indicated.	(select value in dropdown menu)	(select value in dropdown menu)			(select value i dropdown me	BACK	FO EDIT DMP -	1>								
P-2: ONLINE ACCESS a will be accessible via online services, ading, at a minimum, direct download but ferably user-ustomizable services for access, alization and analysis.	(select value in dropdown menu)	(select value in dropdown menu)			(select value i dropdown me	u) BACK 1	FO EDIT DMP -	2>								
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P-5: DATA TRACEABILITY smalls: metadata creation: 'Tools that create manipulate the data also should produce evance documentation automatically to avoid ug stags or incorrectly documenting Tools need to her? the provenance from previous sources. serences to algorithms and versions need to be ed.	(select value in dropdown menu)	(select value in dropdown menu)			(select value i dropdown me		FO EDIT DMP -	5>								
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-7: DATA PRESERVATION will be protected from loss and preserved for te use; preservation planning will be for the term and include guidelines for loss ention, retention schedules, and disposal or fer procedures.	(select value in dropdown menu)	(select value in dropdown menu)			(select value i dropdown me	BACK	FO EDIT DMP -	7>								
8: DATA AND METADATA VERIFICATION and associated metadata held in data gement systems will be periodically verified sure integrity, authenticity and readability.	(select value in dropdown menu)	(select value in dropdown menu)			(select value i dropdown me	BACK	FO EDIT DMP -	8>								
-9: DATA REVIEW AND REPROCESSING will be managed to perform corrections and tes in accordance with reviews, and to enable cossing as appropriate; where applicable this follow established and agreed procedures.	(select value in dropdown menu)	(select value in dropdown menu)			(select value i dropdown me	BACK	FO EDIT DMP -	9>								
-10: PERSISTENT AND RESOLVABLE																

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Reusable knowledge - Generic #2 – Co-design



- Methodology and self-diagnosis tool
 - Dedicated to the EO sector
 - Bridge "grand distance" EO actors



How to create collective action in "grand-distance" situations?

Reusable knowledge - Generic #2 – Co-design



- 4 types of co-designs methodology
 - **Defined user and requirements**
 - 2. Unknown users to interact with
 - Uncertainties in operationalization 3.
 - 4. Extend the scope of usage of service
- "Resilient fit" actions for long term sustainability
 - **Diagnosis** via interviews
 - Cycles of Workshop
 - Formalization of outcomes
- Tool enable a self-diagnosis
 - Template and examples
- Tested and **validated** on 27 pilots
- 3 academic papers 1 PhD Thesis*
- Part of GEO Post 2025 Strategy WG
- Release as a GKH package: https://gkhub.earthobservations.org/packages/mbktp-rdv39

	"Quick-fit" actions	"Resilient-fit" actions						
General lescription	Focus on finding ONE type of interaction with the ecosystem (single list of requirements with one user, in a punctual relationship) If roots only at surface level: plant only arows if water is easily accessible	Generating a range of alternatives (regarding the lists of requirements, the stakeholders involved, the types of partnerships) for a better adaptation to future surprises Expanded root network: plant more resistant to various water conditions						
Type 1	Finding ONE satisfying list of requirements	In order to end up with a robust list of requirements,						
	with one specific user time horizons and related cooperation modalities							
Type 2	Finding ONE relevant user to interact with	Progressively building a better understanding of the usage ecosystem and cooperation agreements with a portfolio of relevant actors						
Туре 3	Building the engineering for the operationalization of one service	Building relationships with relevant partners to ensure a continuous investigation on modules to be operationalized/to be explored						
Type 4	Merely asking existing users what they would dream of	Setting-up a joint program for long-term exploration of new usages with existing and new actors (identification of obstacles, research efforts to be made, 'stimulating' proofs-of-concept, etc.)						

Table 3: Distinction between 'quick-fit' and 'resilient-fit' perspectives for the 4 types of co-design

* Barbier, R., 2023. Collective action for bridging digital and sustainability transitions: modelling and experimenting a new form of co-design between Earth-observation data providers and unknown users. (Doctoral thesis). Mines

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e-shape - EO applications contributed by EuroGEO

Paris, PSL University. https://www.theses.fr/s210910 [soon to be released] 7

Reusable knowledge - Generic #3 – Handbook

- Handbook Best Practice Development Guide (Under final review)
- Captures requirements and lessons learned
 - Implementation of the 37 pilots
- Conducted under
 - 1 year pilot's initial assessment period
- Monitored
 - 2 Sprint periods (430 challenges tickets)



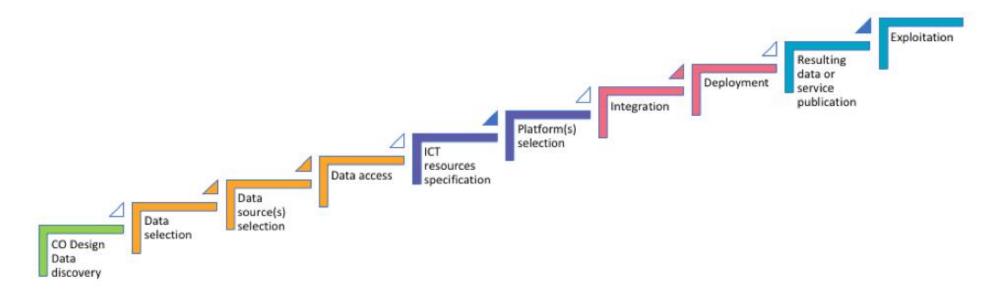




The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852 Reusable knowledge - Generic #3 - Reproducible development workflow



• Based on a reproducible Pilot development workflow



Based on wealth of knowledge collected from the 37 pilots in e-shape:

- Speed up the development process from the concept to a prototype and up to operations
- Provides generic and reproducible workflow from data discovery to results publication

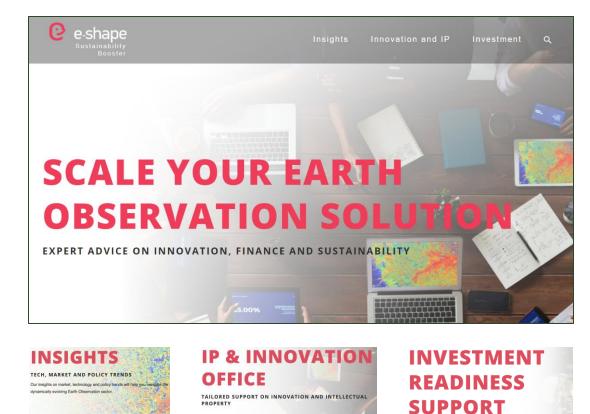
Reusable knowledge - Generic #4 – Sustainability Booster



"Enables the long-term sustainability of e-shape pilots, their penetration in public and private markets and support their upscaling"

Sustainability Booster give access to documents, videos, notices...:

- 1. Insights on market, technology and policy trends of EO sector
 - Agriculture, water, climate, energy, ecosystem...
- 2. IP and Innovation Office:
 - **Guidance** through the complexities of the **innovation process**
 - **IP** and innovation **stories**
 - FAQ on best practices, common mistakes and smart solutions
 - **Tailored** innovation support (On request)
- 3. Investment Readiness Support
 - Guidance to raising additional funds to grow your business





Tailored support to raise funds for your business

Reusable knowledge #5 – Contribution to EuroGEO

e-shape task 5.4 Governance: (2 deliverables)

 Explored different options for the future governance of EuroGEO based on the e-shape experience

EuroGEO **position paper** (Nov. 2022):

https://e-shape.eu/images/news-events/Shaping_EuroGEO_Position_Paper.pdf

EuroGEO should endorse a multifaced role to:

- Support the coordination of EU contributions to GEO
- Foster partnerships between public, academic and private actors
- Promote the FAIR and GEO principles
- Create of an innovation pipeline in Europe

Apply to the HORIZON-CL6-2023 CSA EC call:

« Support to EuroGEO initiative coordination/establishing a EuroGEO secretariat »



FARTH OBSERVATIONS

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Reusable knowledge - Thematic



SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7
agriculture	health	energy	ecosystem	water	disasters	climate
Pilot 1.1 GEOGLAM Pilot 1.2 EU-CAP Support Pilot 1.3 Vegetation-Index Crop- Insurance in Ethiopia Pilot 1.4 Agro industry Pilot 1.5 Linking EO and Farm IoT for Automated Decision Support Pilot 1.6 Service for SPC 2011 and	Showcase 2 - Pilots Pilot 2.1 EO-based surveillance of mercury pollution Pilot 2.2 EO-based surveillance of POPs pollution Pilot 2.3 EO-based pollution- health risks profiling in the urban environment Pilot 2.4 EYWA - EarlY WArning System for Mosquito-Borne Diseases	Showcase 3 - Pilots Pilot 3.1 nextSENSE: solar energy nowcasting & short-term forecasting system Pilot 3.2 High photovoltaic penetration at urban scale Pilot 3.3 Merging offshore wind products Pilot 3.4 WindSight - First class input data for wind energy models	Showcase 4 - Pilots Pilot 4.1 mySPACE Pilot 4.2 mySITE Pilot 4.3 myVARIABLE	Showcase 5 - Pilots Pilot 5.1 Improved historical water availability & quality information service Pilot 5.2 Satellite Earth Observation-derived water bodies & floodwater record over Europe Pilot 5.3 Dive - Diver Information on Visibility in Europe Pilot 5.4 Sargassum detection for seasonal planning Pilot 5.5 Monitoring fishing activity Pilot 5.6 EO based phytoplankton	Showcase 6 - Pilots Pilot 6.1 EO4D_ASH - EO Data for Detection, Discrimination & Distribution (4D) of Volcanic ash Pilot 6.2 GEOSS for Disasters in Urban Environment Pilot 6.3 Assessing Geo-hazard vulnerability of Cities & Critical Infrastructures Pilot 6.4 ReSAgri - Resilient & Sustainable ecosystems including Agriculture & food Pilot 6.5 FRIEND Pilot 6.6 MountaiNow	Showcase 7 - Pilots Pilot 7.1 Global Carbon and Greenhouse Gas Emissions Pilot 7.2 Urban resilience to extreme weather - climate service Pilot 7.3 Forestry conditions - climate service Pilot 7.4 Hydropower in snow reservoir – climate service Pilot 7.5 Seasonal preparedness Pilot 7.6 Super resolution air quality monitoring service

Pilot 5.7 Rheticus[®] AquaculturePlus

Reusable knowledge - Thematic

ISO and INSPIRE Metadata in webservice-energy catalogue

Aligned with "GKH Packages spirit"

- Minimum metadata requirements
 - Link to the application
 - Link to video support
 - Link to e-shape web site
- Additional information
 - Link to **publication**
 - Link to Notebook
 - Link to GitHub
 - Link to WebService (WPS)

Harvested and visible on

- GEO Portal
- GEO Knowledge Hub



See Webservice-Energy Catalogue × +					~
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	ø	GitHub Master Access to the GitHub Master Branch of the Solar Energy Pilot https://git.sophia.mines-paristech.fr/e- shape/e-shape-S3P2-notobook/	Ouvrir le lien	% Lien vers le portail Consultez l'intégralité des métadonnées et accédez à la donnée.	
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https://tinyurl.com/5dk34cks

Reusable knowledge - Thematic

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Harvested and visible on

- GEO Portal
- GEO Knowledge Hub

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		36 result(s) found	Sort by	Newest	•				
Versions		May 3, 2023 (v1) Knowledge Package 🗣 Metadata-only							
View all versions		e-shape co-design self-diagnosis tool Barbier, Raphaëlle; Menard, Lionel							
Status Published (171)		Introduction This tool has been developed in the framework of the European Commission H2020 funded project e-shape. It is a contribution to EuroGEC and the GEC Community. It helps to carry out its own co-design needs diagnosis in the Earth observation domain. It is composed of three sheets : the first one presents all the necessary instructions Updeated on June 2, 2023							
Resource types Clear									
> Software		April 14, 2022 (11) Knowledge Package A Metadata-only							
✓ Knowledge Package 36		e-shape pilot S7-P6 - Super resolution air quality monitoring service habib, Tarek							
Video/Audio	33	Air quality issues are directly related to the well-being of oppulations; the European Environmental Agency has recently reported that more than 300,000 deaths in Europe are directly linked to poor air quality. Moreover, the World Health Organisation (WHO) has recently updated its standards and quidelines regarding air quality emphasizing on the							
> Publication	10	Uploaded on March 28, 2023							
> Dataset	5	April 14, 2022 (v1) Knowledge Package 🔍 Meladate-only							
Other	3	e-shape pilot S2-P4 - EYWA - EarlY WArning System for Mosquito-Borne Diseases							
Lesson (Training material)	2	Tsaprailis, Kostis More than 80% of the global population lives in areas at risk of at least one major Vector-Borne Disease (VBD), with more than 700.000 deaths at a							
Presentation	1	More than 60% or the global population lives in areas at risk or at least one major vector-borne Lisease (VBD), with more than 700.000 deaths at a global scale (WHC), 2020). Mosquitoes are the protagonists of these vectors, transmitting pathogens to living beings with the most important being the Mosquito-Borne Diseases (MBDs) in Europe, namely W							
GEO Work Programme Activities		Uploaded on February 20, 2023							
GEO Vision for Energy (GEO- VENER)	14	February 20, 2023 (v2) Knowledge Package 🗣 Metadata-only							
Advancing Communication Infrastructure and Services (ACIS) ²		e-shape pilot S4-P1 - mySPACE ADAMO, Maria Patrizia							
Target Audience		In order to secure ecosystem benefits under increasingly anthropogenic pressures , knowledge-based conservation, management and restoration policies are needed. The key to that is data services that encompass effective monitoring (combined Remote sensing RS and insitu) and modelling of							
Aggregator for energy trading	7	the trends and states of the ecosystem and its services. The							

https://gkhub.earthobservations.org/communities/e-shape



GEO GROUP ON EARTH OBSERVATIONS

Pilot Solar Energy - High PV penetration at urban scale

Transition from static Solar Cadaster....

- Providing free and easy-to-use tool for the general public to assess solar potential of rooftop PV systems !
- **Pre-computed** solar map providing **multiyear average** yearly or monthly PV yields

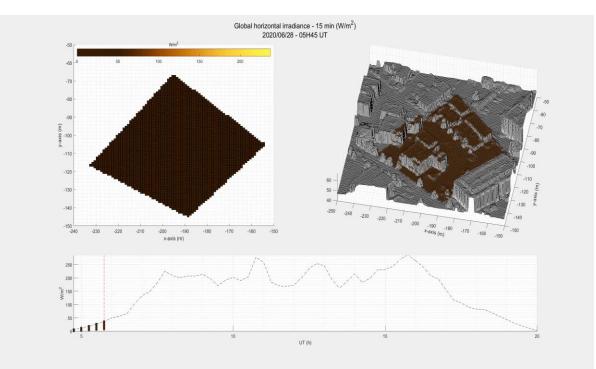




To dynamic Solar Assessment and Forecasting as a Service - (SAF-aaS)

Downscaling at urban scale **solar irradiance** and PV power output

- Computed "on-the-fly"
- Over any area of interest (User selection)
- Temporally resolved (15 min)
- Spatially resolved (1m)
- Taking into account **shadow's effects, tilt and azimuth !**



SAF-aaS - Infrastructure and service characteristics

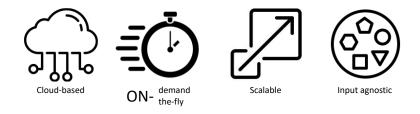
• Input data and access agnostic:

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- Solar data, weather data, DSM*, DEM*
 - Copernicus CAMS, IGN (French Mapping Agency), SRTM
- Local, remote (WPS/WMS) access
- Accessible via WPS (Interoperable OGC Service)
- Output results as NetCDF file + CF Conventions
- Deployed on scalable, parallel WEkEO DIAS cloud infrastructure
- Elastic resources management (shelve un-shelve on-the-fly)
- Variety of access from Web, Notebook, Desktop Apps, M2M



*DSM : digital surface model (< 1m) *DEM : digital elevation model (30 m)



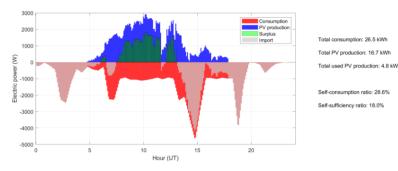




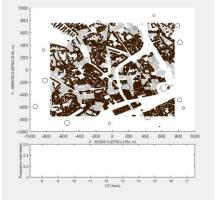


Co-designed several use cases for high **PV penetration in cities**

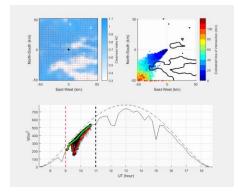
PV self-consumption: sizing PV systems when **compared** to concomitant **electric consumption**



PV integration in the grid: Simulated **PV injection in different source points of the electric grid** for different scenarios of PV penetration (for **Distribution System Operator**)

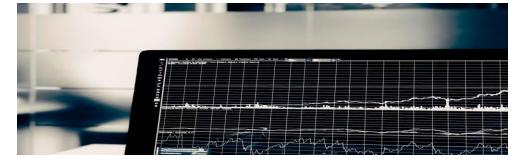


Energy trading: SPOT market with portfolio of PV rooftop systems









Benefit from Sustainability Booster to investigate sustainable alternatives

- For pay
 - Creation of a **spin-off** for commercial applications
 - Urban planners, Distribution System Operator (DSO), Transmission System Operator (TSO)
- Community based
 - Collaboration with JRC/Knowledge Centre on Earth Operation (KCEO)
 - Covenant of mayors initiative for **climate and energy policies** actions in **cities**
 - **PV-GIS** team to enhance spatial resolution (90m DEM -> sub-metric DSM)



CONTACT DETAILS



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