OPEN DATA & OPEN KNOWLEDGE Workshop

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

Lionel Menard – MINES Paris PSL University – ARMINES – lionel.menard@minesparis.psl.eu

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***

agriculture   health   renewable energy   ecosystem   water   disaster   climate

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:**
  - **Web site** (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

Reusable knowledge on the shelf for the EO sector

GENERIC ⟷ THEMATIC

1. Data Management Plan (DMP) self-assessment tool

2. Co-design methodology and self-diagnosis tool

3. Best practice guide for EO developers,

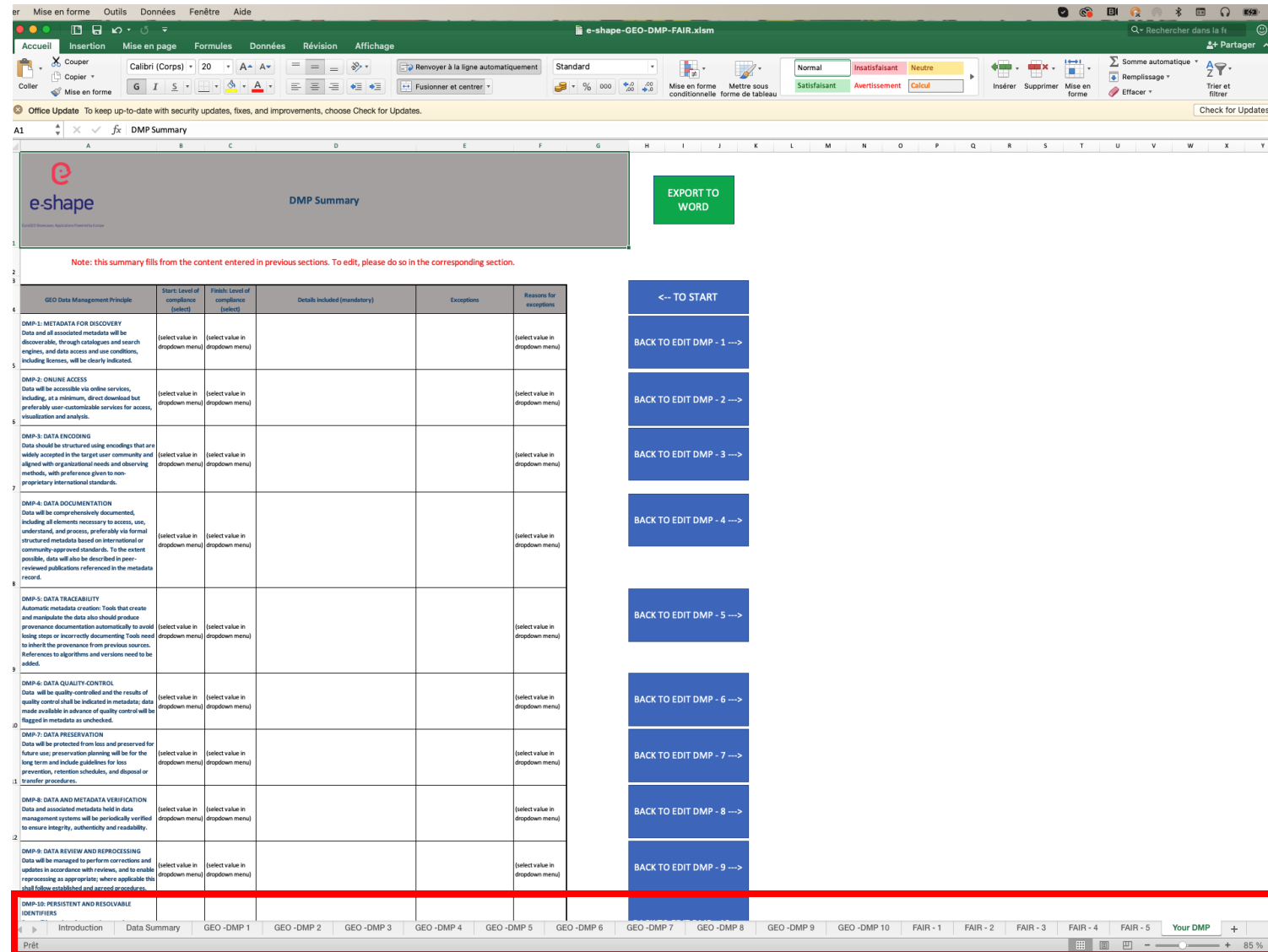4. Sustainability Booster for EO application

5. EuroGEO position paper
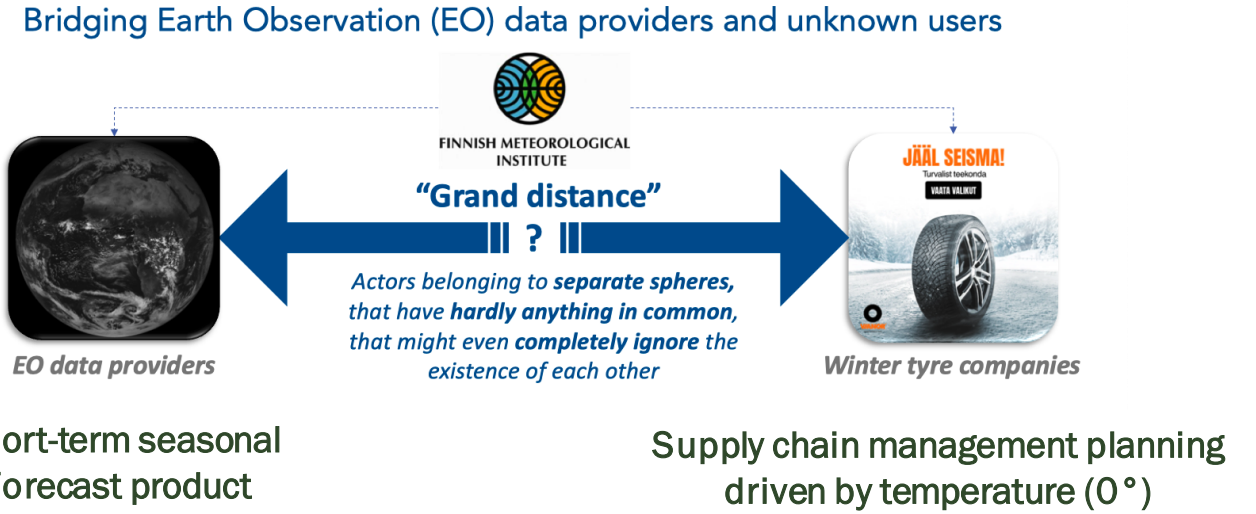
- 37 pilot applications in 7 showcases

agriculture   health   renewable energy   ecosystem   water   disaster   climate

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

Reusable knowledge - Generic #2 – Co-design

- **Methodology** and **self-diagnosis tool**

  - Dedicated to the **EO sector**

  - Bridge "**grand distance**" EO actors

Bridging Earth Observation (EO) data providers and unknown users

"Grand distance"

?

*Actors belonging to **separate spheres**, that have **hardly anything in common**, that might even **completely ignore** the existence of each other*

EO data providers

Winter tyre companies

Short-term seasonal forecast product

Supply chain management planning driven by temperature (0°)

How to create **collective action** in ''grand-distance'' situations ?

Reusable knowledge - Generic #2 – Co-design

- **4 types** of co-designs **methodology**

  1. **Defined user and requirements**

  2. **Unknown users to interact with**

  3. **Uncertainties in operationalization**

  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

General description	"Quick-fit" actions	"Resilient-fit" actions
	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 grows 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 with one specific user	In order to end up with a robust list of requirements, exploring a range of potential services at different 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
Type 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 Paris, PSL University. https://www.theses.fr/s210910 [soon to be released]

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)

Reusable knowledge - Generic #3 – Reproducible development workflow

- Based on a **reproducible** Pilot development **workflow**
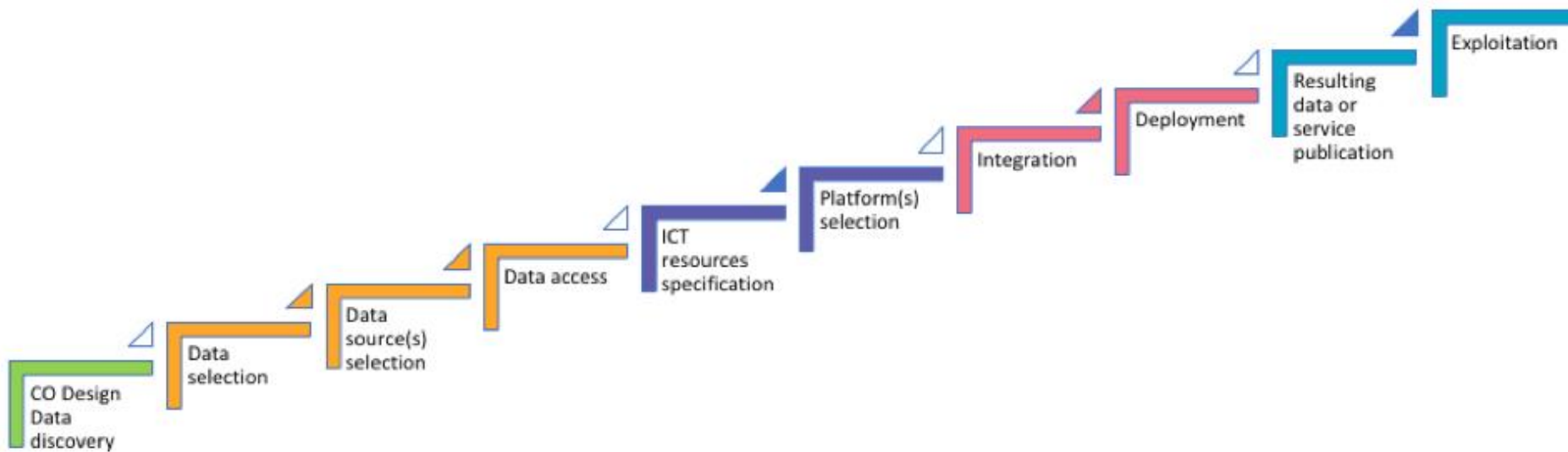
Based on **wealth of knowledge** collected from the 37 pilots in e-shape:

- **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
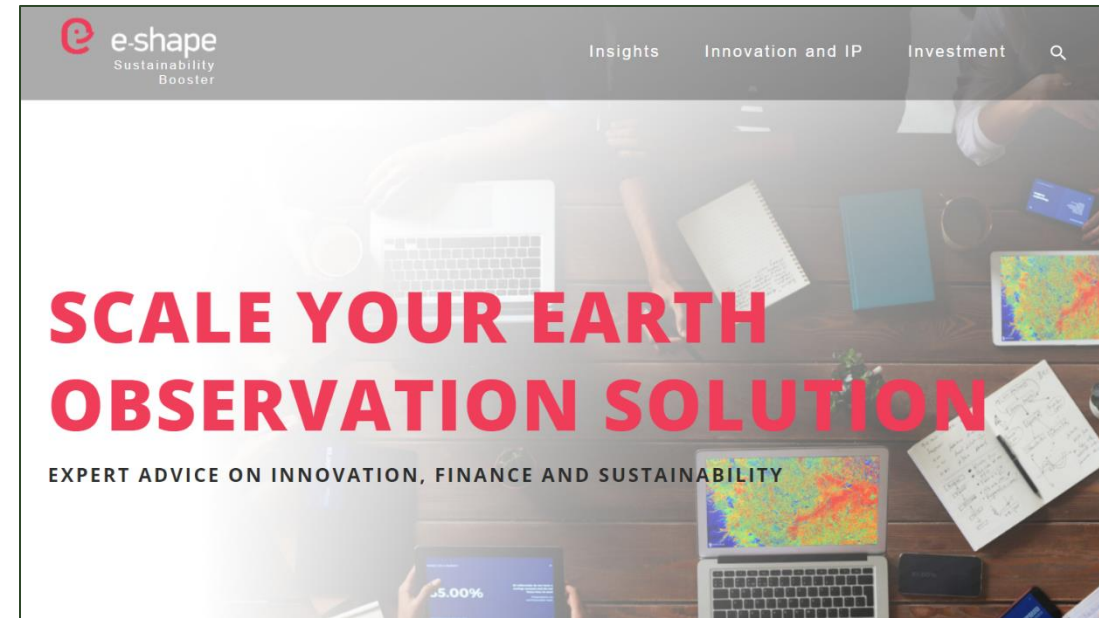
sustainability.e-shape.eu

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 **multi faced 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** »

Reusable knowledge - Thematic

SC-1 agriculture	SC-2 health	SC-3 energy	SC-4 ecosystem	SC-5 water	SC-6 disasters	SC-7 climate

Showcase 1 - Pilots

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 SDG 2.4.1 and 15.3.1 indicators assessment:
Pilot 1.7 | DynaCrop- unlocking EO intelligence across the food value chain

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 biomass for WFD reporting
Pilot 5.7 Rheticus® AquaculturePlus

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
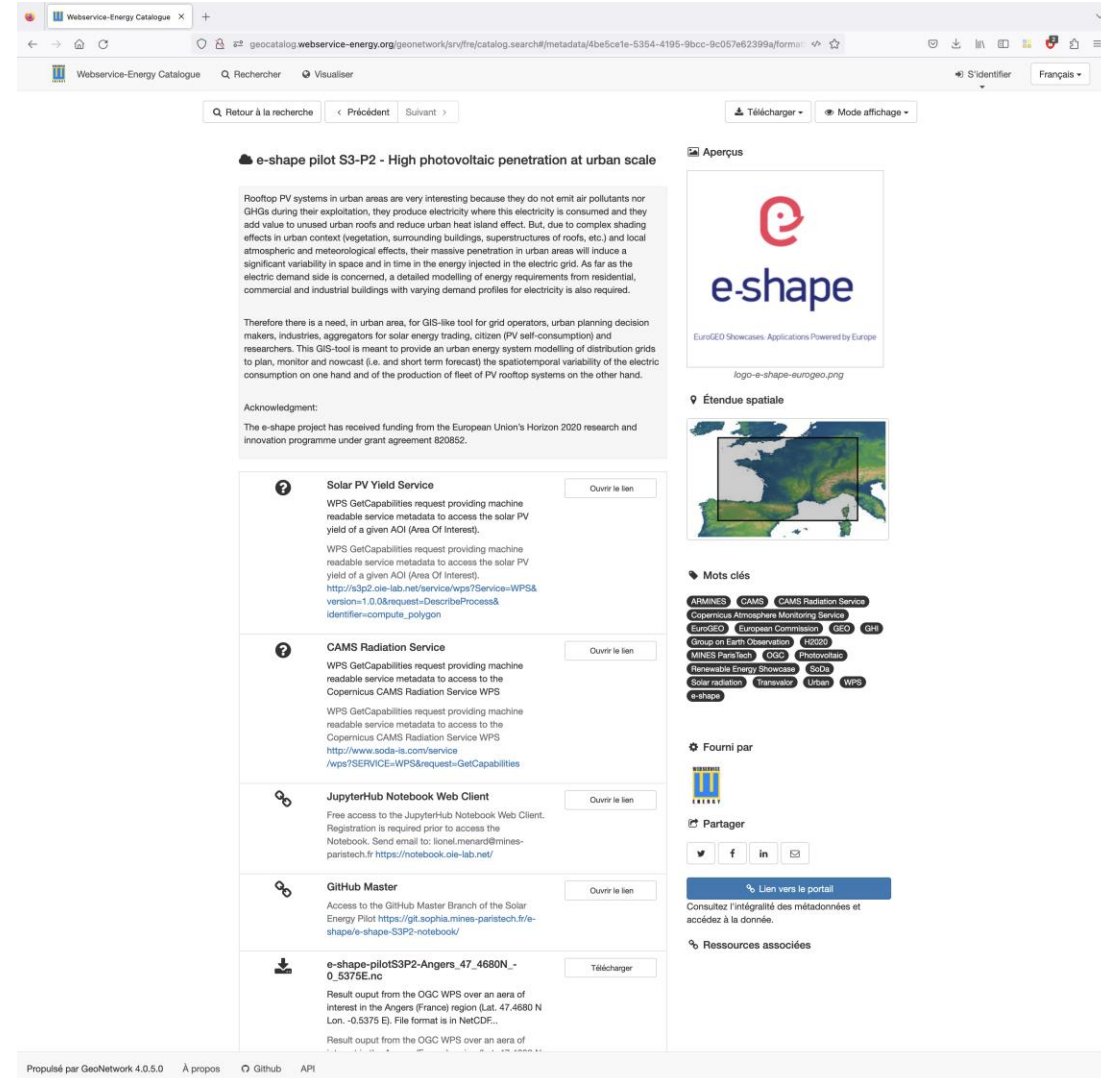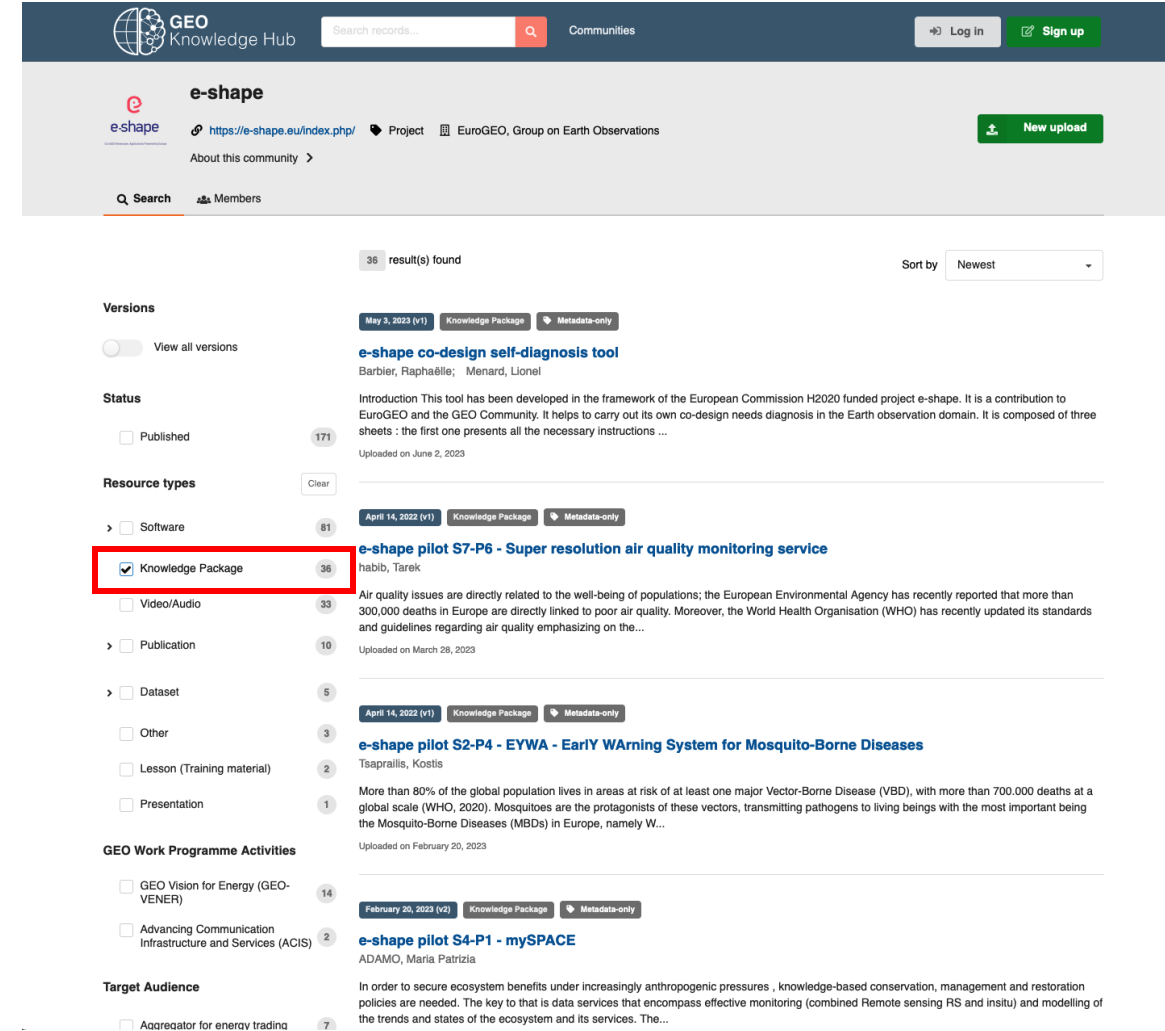
Reusable knowledge - Thematic

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 **Web Service** (WPS)
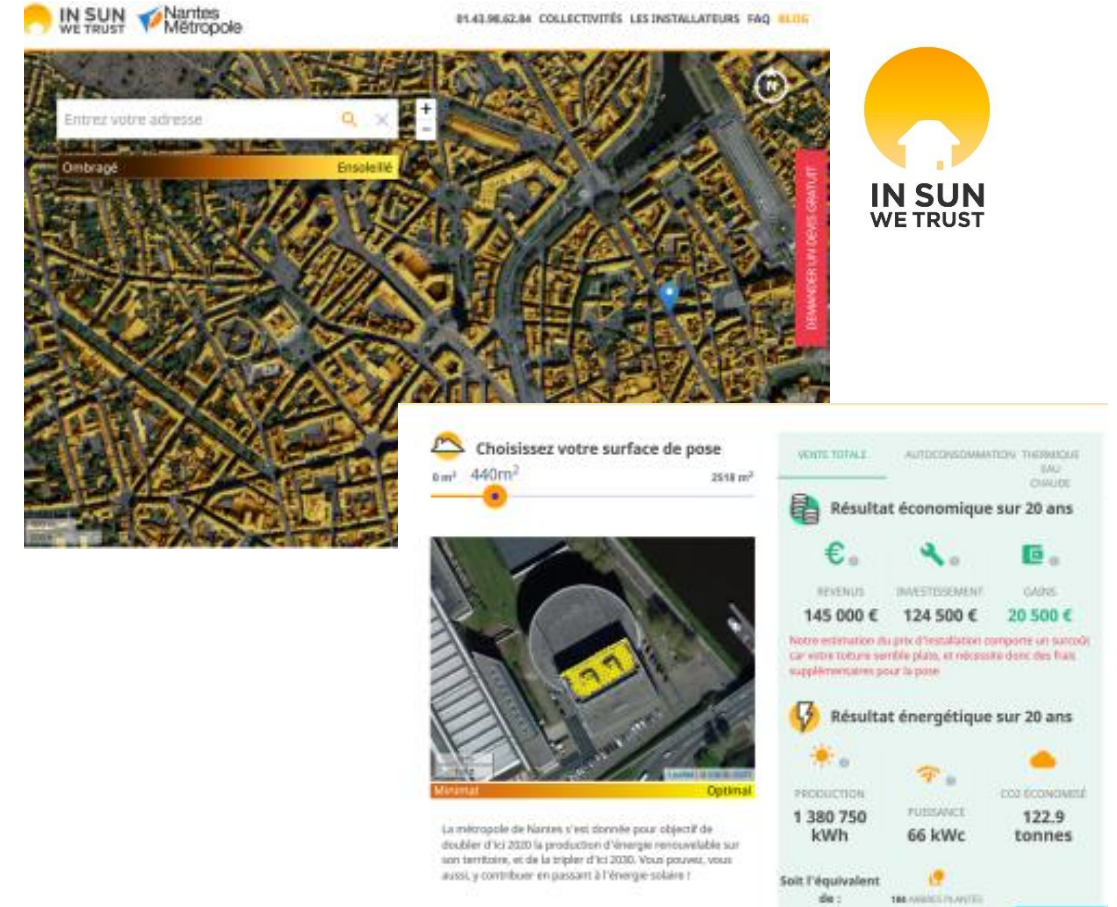
Harvested and visible on
  - **GEO Portal**
  - **GEO Knowledge Hub**

https://tinyurl.com/5dk34cks

Reusable knowledge - Thematic

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

Reusable knowledge – Thematic – Copernicus Services

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 **multi-year average** yearly or monthly PV yields

Reusable knowledge – Thematic – Copernicus

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

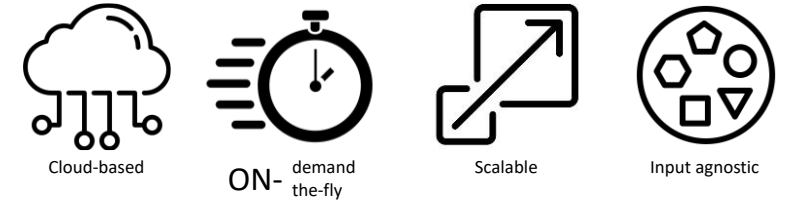### Downscaling at urban scale solar irradiance and PV power output

- 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 !**
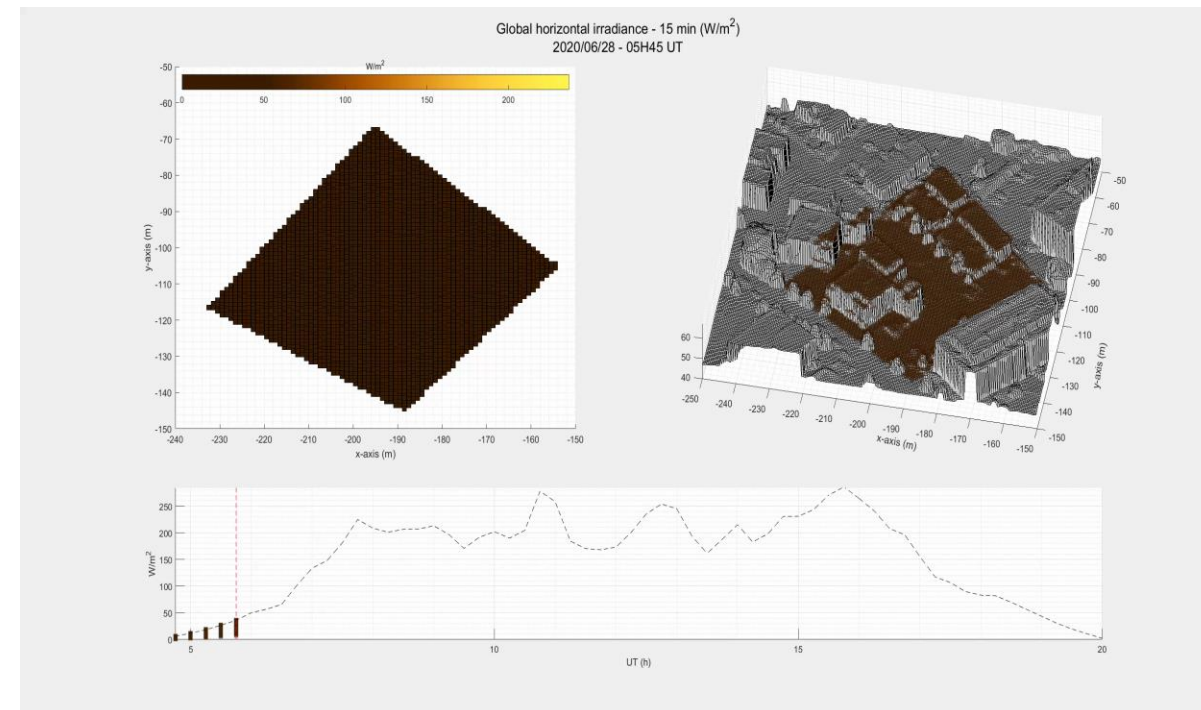
Reusable knowledge – Thematic – Copernicus

SAF-aaS - **Infrastructure** and **service** characteristics

- Input **data and access agnostic:**
  - 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

Cloud-based   **ON-** demand the-fly   Scalable   Input agnostic

Atmosphere Monitoring Service   SoDa Solar radiation Data

WEkEO

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

# Reusable knowledge – Thematic – Copernicus

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

PV self-consumption: sizing PV systems when **compared** to concomitant **electric consumption**
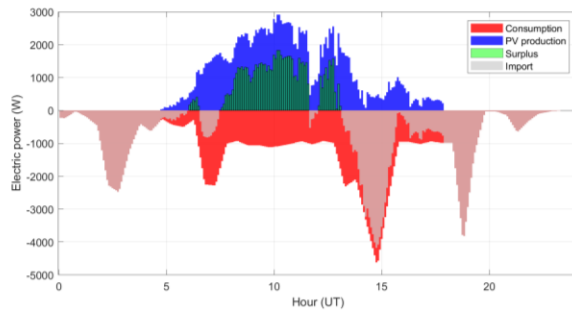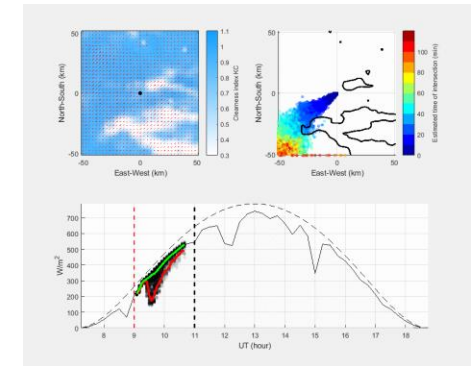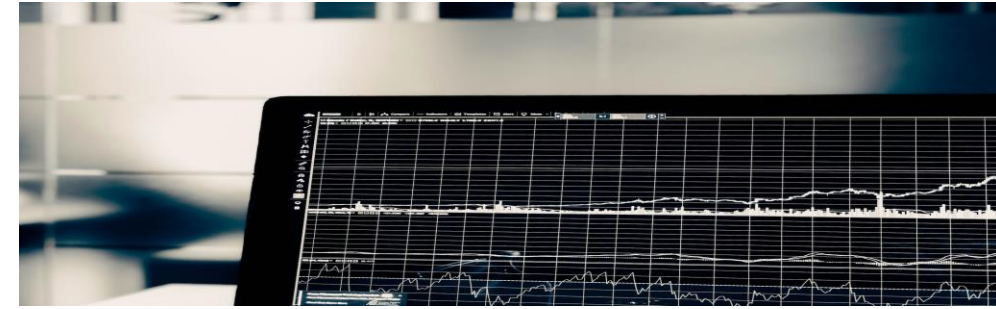
PV integration in the grid: Simulated **PV injection in different source points of the electric grid** for different scenarios of PV penetration (for **Distribution System Operator**)
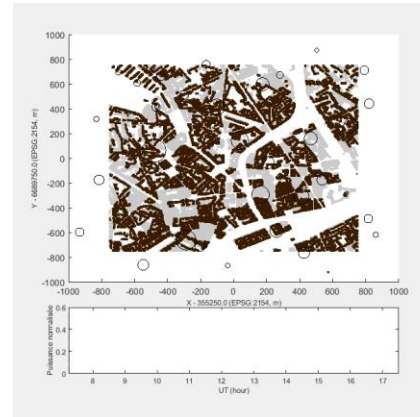
Energy trading: SPOT market with **portfolio of PV rooftop systems**

Reusable knowledge – Thematic – Copernicus

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

EMAIL ADDRESS

Lionel.menard@minesparis.psl.eu

PHONE NUMBER

+33(0)4 93 95 74 23

GEO
GROUP ON
EARTH OBSERVATIONS