



Copernicus for Future Cities Workshop
9 November 2018
Brussels

Smart Urban Solutions for air quality, disasters and city growth (SMURBS)

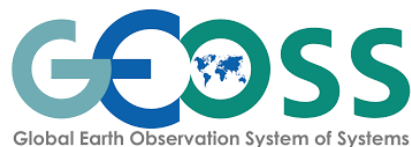
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Director of the Greek GEO Office

ERA-PLANET – Strand 1
“Smart Cities & Resilient
Societies”
under H2020-MSC-10-2015-
Strengthening the European
Research
Area in the domain of Earth
Observation
Type of action: ERA-NET Co-funded
Co-funding agreement no: 080463



SMURBS project



ERA-PLANET

The European
network
for observing
our changing
planet



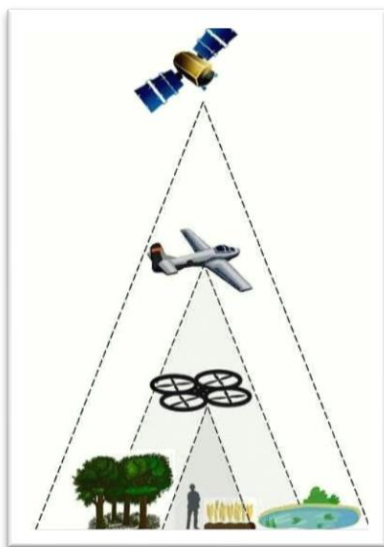
Strand 1
“Smart Cities and
Resilient Societies”



the fellowship of SMURBS

- 19 partners, 12 countries
- 9.15 m€ total



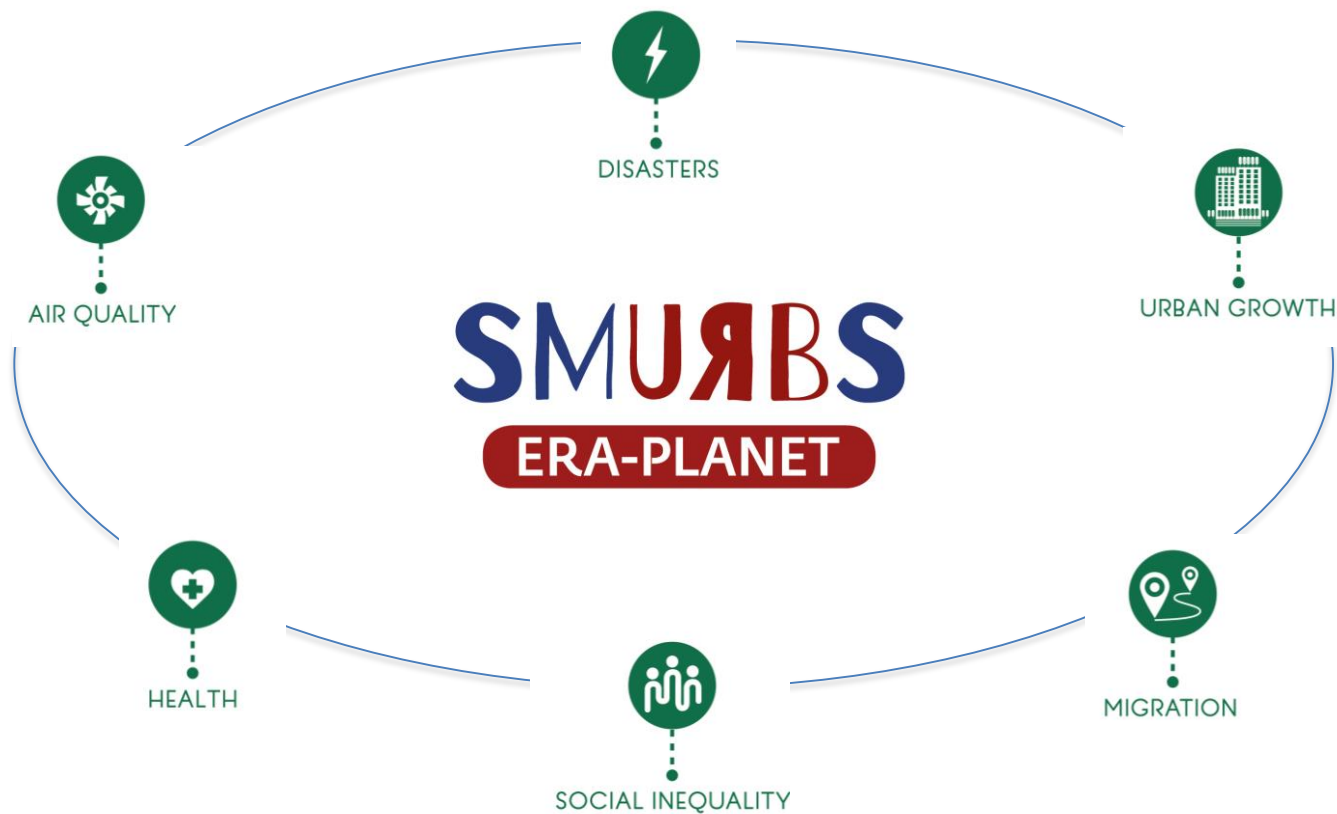


**ZSMC
RE
FOCUS**

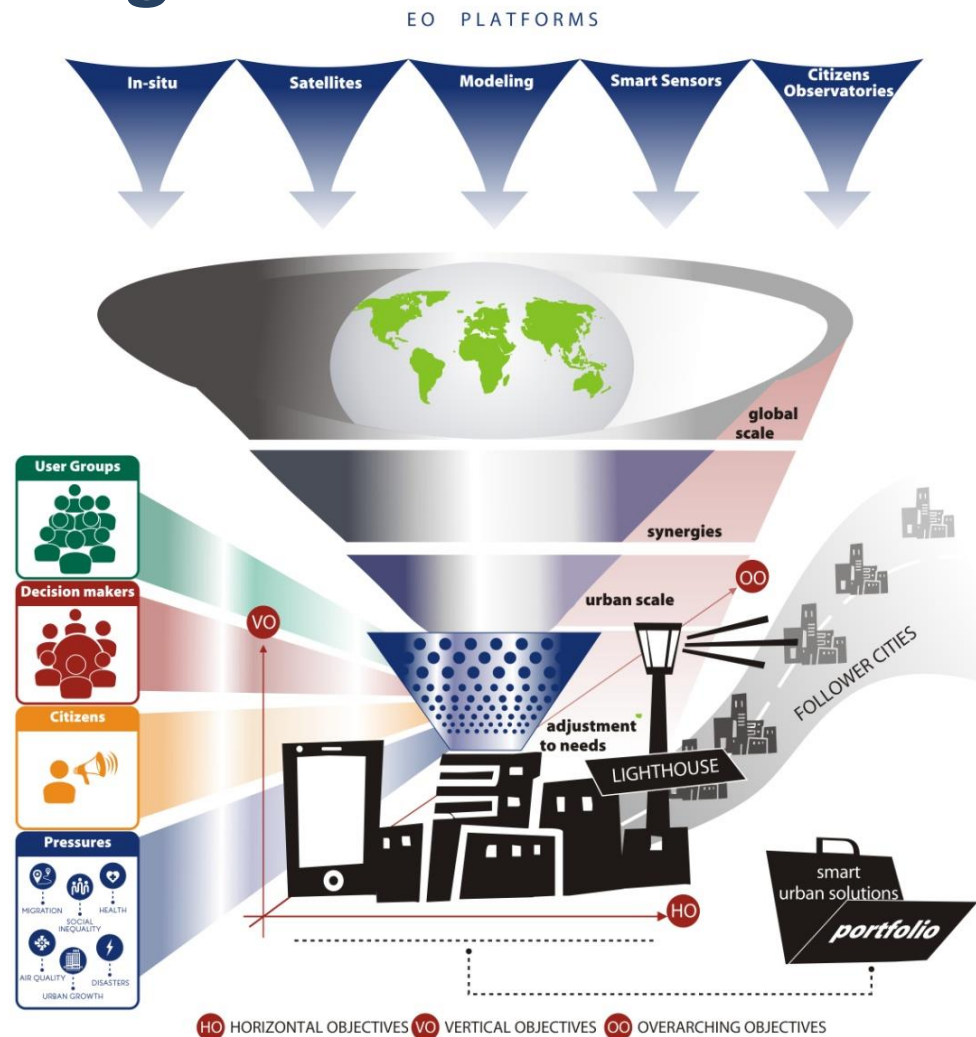
We aim at linking these two huge, distinct yet interconnected worlds, and deliver our own interpretation or definition of smart cities



Our themes



Concept at a glance



- develop **synergies** between EO platforms
- converge under the “**smart city**” banner
- uptake **Copernicus services**
- take **user needs** on board
- tailor **solutions** to the thematic areas
- deliver a **portfolio** of smart urban solutions
- test and showcase in **pilots**
- let the **followers** amplify the impact

More info at: <http://smurbs.eu/>



Smart urban solutions must address real world needs in a practical way, and ensure long-term sustainability, thus necessitating the early and meaningful engagement of end-users...

To this end,

SMURBS has so far reached:

- >50 policy makers
- >60 other stakeholders
- >50 citizens in our first workshop
- 7 experts on AQ sensors from the private sector

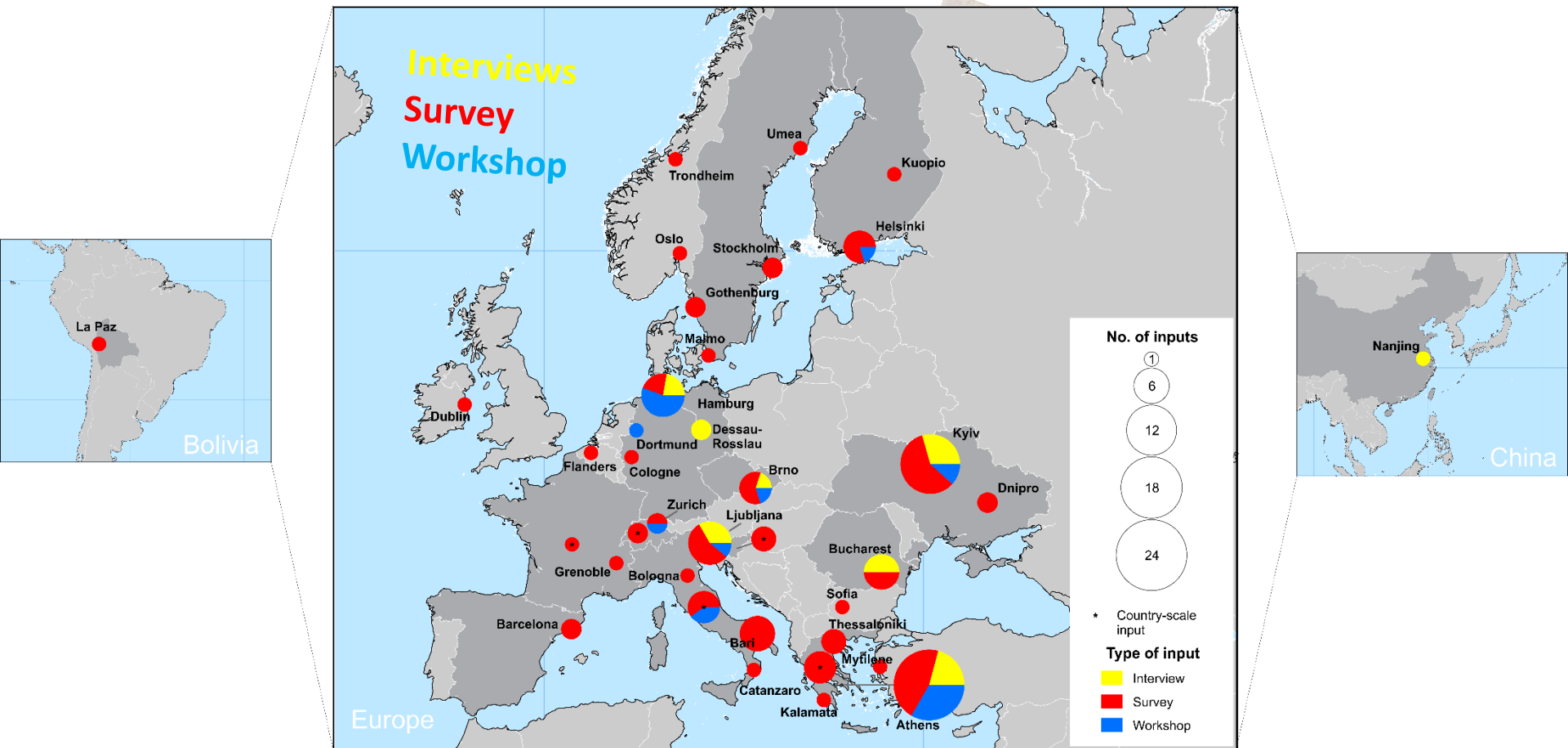
...from 33 cities and 18 countries.

Their input has been used for the identification (and fulfillment) of the:

- User needs
- Legal, methodological and technological gaps



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challenges



SMURBS

ERA-PLANET

challenges



URBAN GROWTH



DISASTERS



AIR QUALITY

Sustainability of procurement of data, offered services and apps

Support of "city standards" criteria

Data management, coordination and capacity building

Intra-urban variability

Multiple pollution sources

NIMBY, reinvigoration of citizen participation

Integration of EO into public authorities' operational procedures

Critical uncertainties of collected data

Multiplier effects

Timeliness

Coupling of spatio-temporal scales

Regional and/or trans-boundary transport

Interlinks with Urban Growth

Update regulated species

QA/QC of IoT and new technologies

Citizen – AQ bilateral relation

Locality of the problem

Robust science under the hood; excessive amounts of information and overlapping applications

Emerging disasters like peri-urban fires and industrial accidents with toxic releases

Land cover changes and arbitrary human interventions in disaster prone areas

Integration of EO data with socio-economic data

Definition of city "area", "characteristics" e.g. functional urban areas (FUA)

Facilitation of policy enforcement

Big data, artificial intelligence, machine learning, data mining

Access to Energy during and after the disaster

Empowerment of citizens' participation

user needs



Key messages on user needs



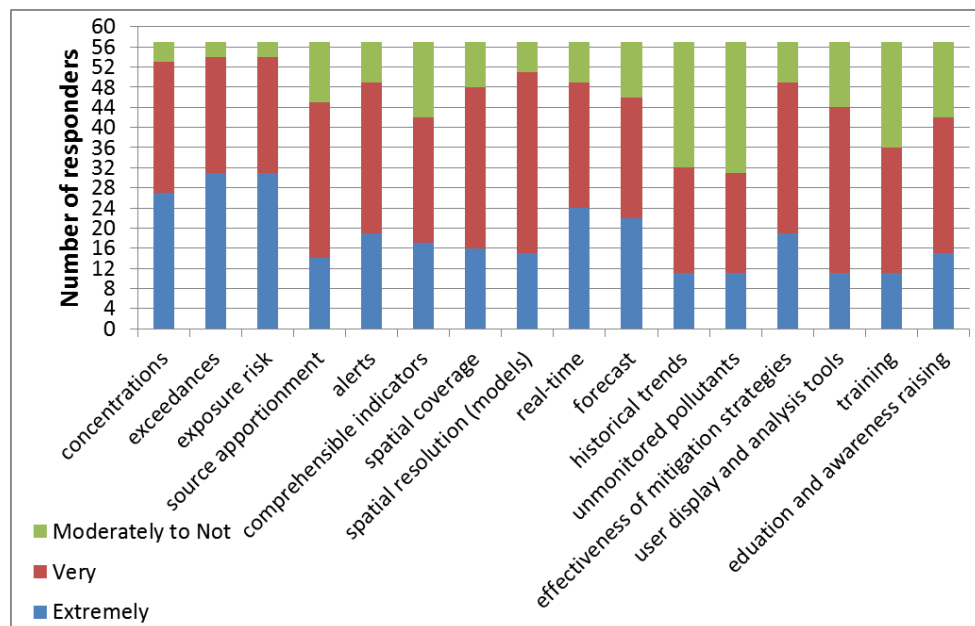
Monitoring

Modeling

Source apportionment

Health impacts

Awareness dissemination



Key messages on user needs



Monitoring

Higher spatial resolution is demanded, at least in monitoring basic air pollutants, and **new pollutants**, with potentially high health risks, should be gradually incorporated in regulatory urban AQ monitoring. **Online, real-time delivery of AQ** information should be the driving target and both smart sensors and citizen participation emerge as promising additions to a city's AQ monitoring arsenal.

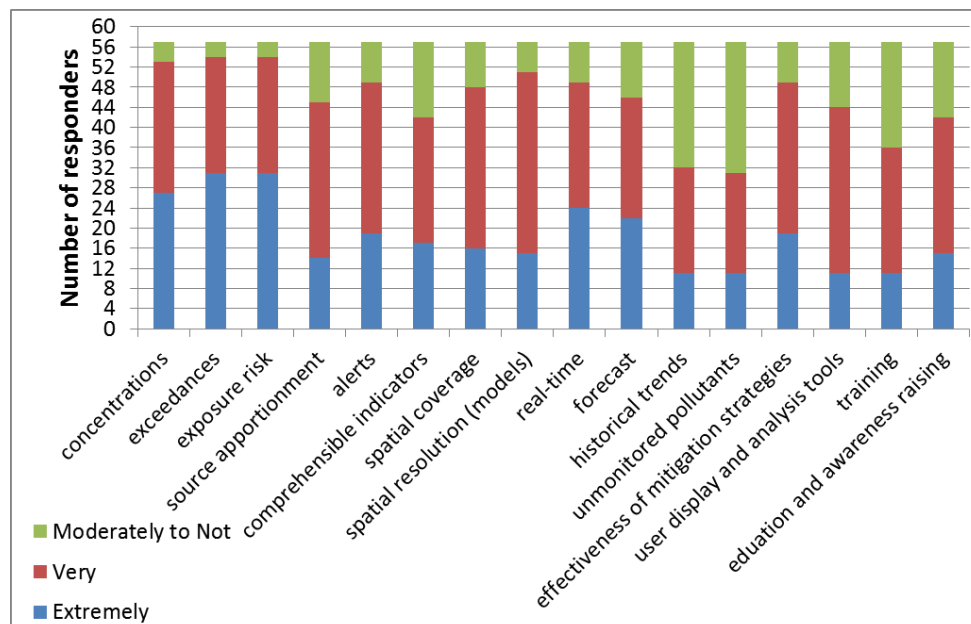
Modeling

Bridging regional with city scale air quality models, and utilizing them in a complementary fashion, to **balance between high spatial resolution needs, overall accuracy and available resources**, is the way to fill spatial monitoring gaps, provide trustworthy forecasts and develop effective mitigation strategies.

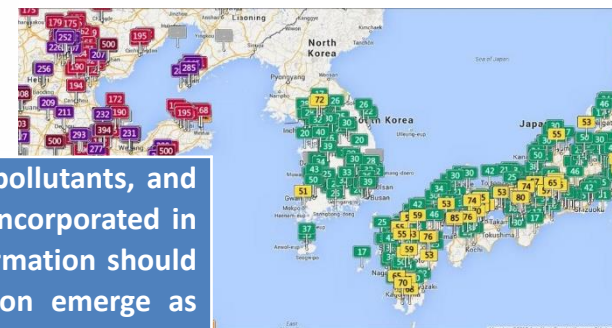
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Modeling

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Source apportionment

Near-real time and offline source apportionment are necessary in modern times, in excess to standard monitoring and model forecast, in order to **determine individual source contribution and to assess the impact of mitigation strategies**.

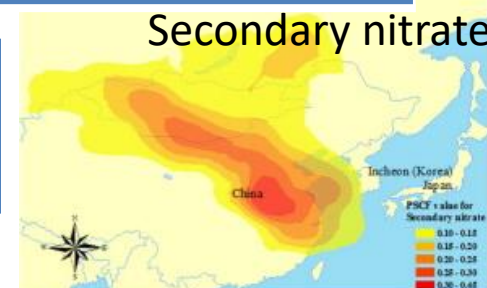
Health impacts

The need to understand the perplexed linkage between air pollution and health symptoms/diseases is imperative. That would increase the perception of health impacts on behalf of the public and policy makers and would unfold a great number of **tools for personal exposure information**, which is the request.

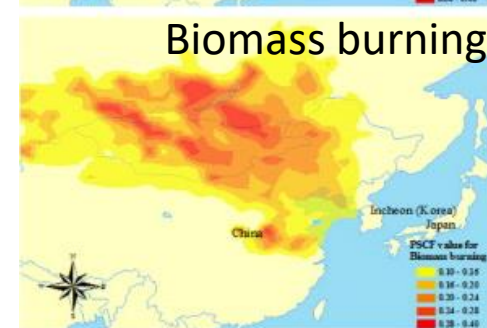
Awareness dissemination

Tailored AQ information needs to be communicated through the appropriate channels and current facilities - Services should be adjusted to provide **localized and personalized information**.

Secondary nitrate



Biomass burning



Key messages on user needs



Urban densification vs sprawl

EO is able to **overcome the strong dependence on locality manifested in urban densification or urban sprawl** and should be effectively incorporated in decision making mechanisms to feed scenario-based city planning and/or uphold city standards.

Loss of green area and soil sealing

Monitoring of **loss of green areas and soil sealing** should be intensified and **the reciprocal relations with other urban aspects (natural disasters, micro-climate etc.)** must be delineated.



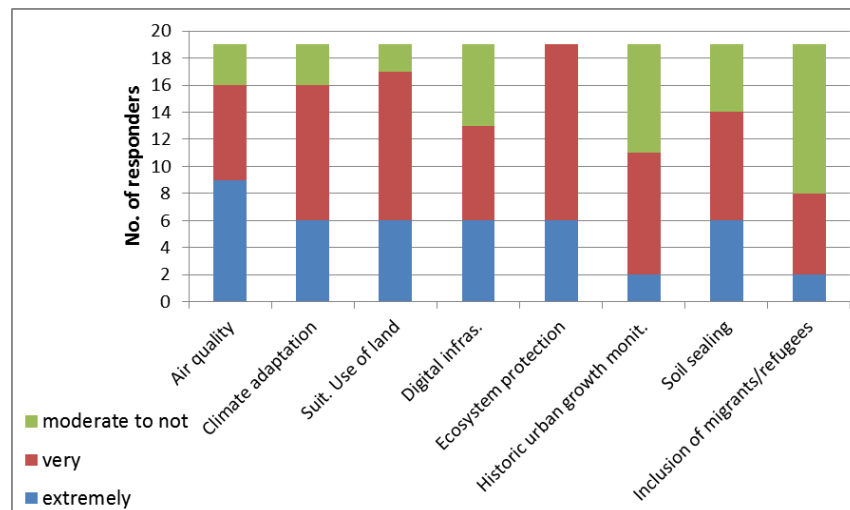
Data integration and tailored indicators



Data quality improvement and the **enrichment of geo-information layers** should be the focus of EO activities in the domain of urban growth. **New, smart indicators** should be tailored towards covering a wide range of the perplexed urban growth elements, in a comprehensive and ready for uptake fashion from decision makers.

Migration

Migration is a sensitive issue with particular aspects of locality and synergistic effects, along distinct phases of evolution. EO can help address these aspects inter alia with respect to the **suitability of hosting areas**.



Key messages on user needs



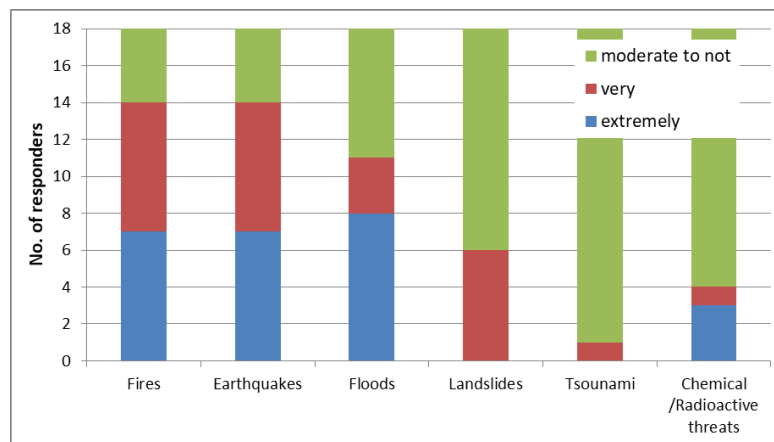
Critical requirements

The critical nature of disasters makes **better data quality, higher spatio-temporal resolution and enrichment of geo-information layers** with more data/information imperative. Exploitation of Copernicus EMS needs to be more efficiently disseminated and intensified.

Integration of new technologies

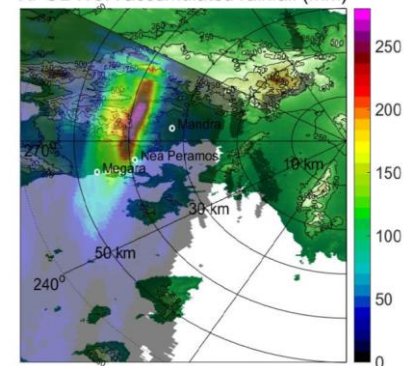
Disasters present the ideal ground for new EO technologies deployment. **Scientifically guided crowd-sourcing**, in particular, holds great potential in upgrading the urban disaster management arsenal.

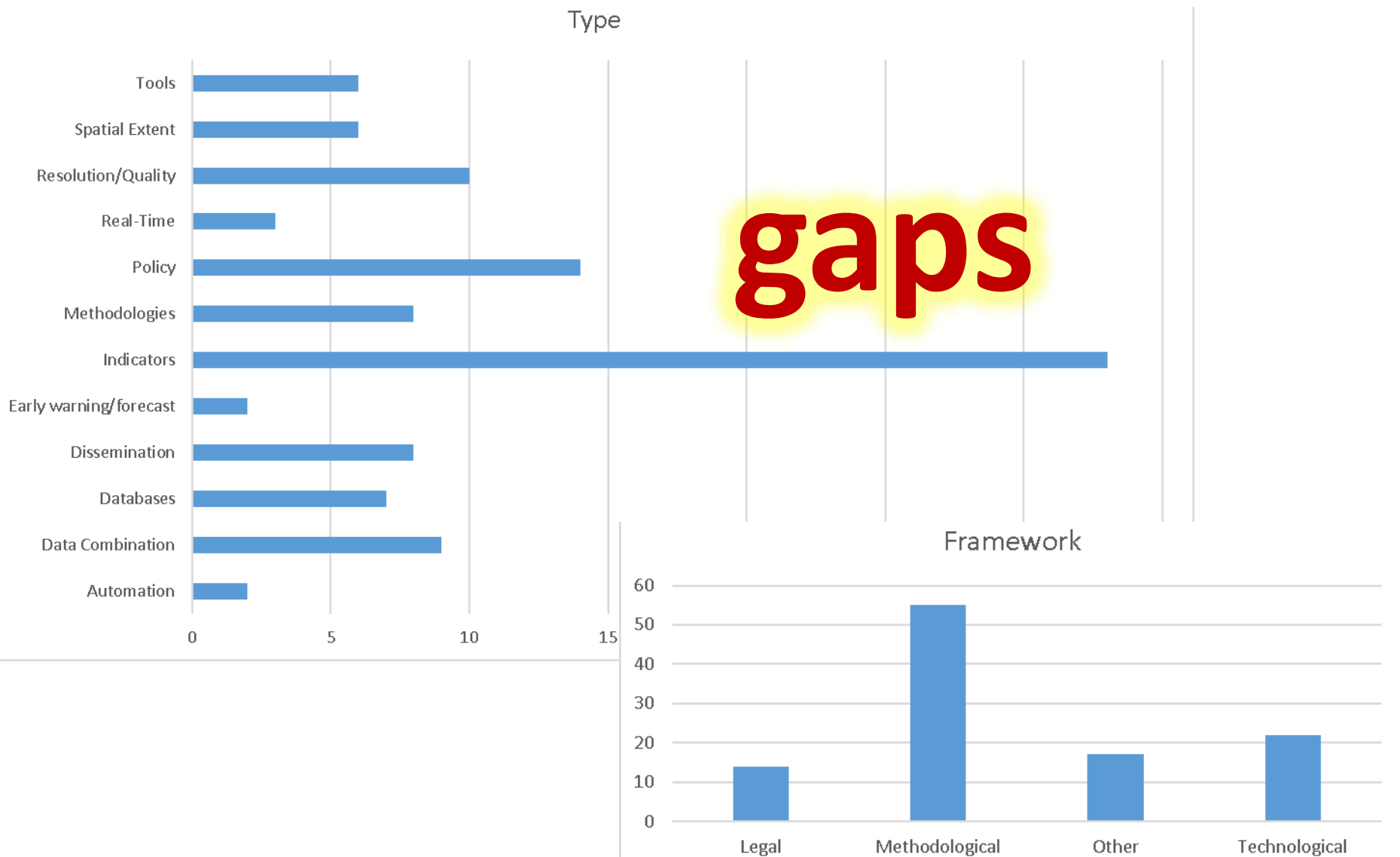
Multiplier effects



Disaster impacts are amplified by several critical factors. Services should be tailored to address them in an integrated manner and **disaster management protocols are needed to enclose and coordinate these services and tools under unified platforms.**

XPOL-NOA accumulated rainfall (mm)





Gap Analysis on AQ, disasters and urban growth in cities

AQMI1: Metric for

Gap Name	AQMI1	
Description	Metric for human health risk by combining human heat stress with air pollution	
Theme	Air Quality	
Framework	Methodological	
Type	Indicators	
Feasibility	4 (Very High)	There is a mature technique, needs to be standardized
Impact	4 (Very High)	Most of urban communities will be impacted
Costs	3 (High)	More than 5 M€ less than 20 M€
Time Frame	2 (Medium)	Less than 5 and more than 2 years
Priority	2.7	

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31

for URBAN GROWTH

Identified gaps

Recommendations

HEALTH

$$p = \frac{f \cdot i}{c \cdot t}$$

- *p* priority
- *f* feasibility
- *i* impact
- *c* costs
- *t* time frame

8

HORIZONTAL

10



for MIGRATION







implementation



Portfolio of smart

- ❖ ENVI4ALL+ 
- ❖ Athens LMS AQ network 
- ❖ Helsinki AQ integrated system
- ❖ Emission footprint area determination

- ❖ Floodhub  
- ❖ 2D/3D mapping of urban infrastructure
- ❖ FORCIP+
- ❖ Land Deformation Mapping  
- ❖ Suburban and Urban Thermal Anomalous Service

- ❖ Very High Resolution Layer for Urban Change Detection 
- ❖ Urban Growth Metrics 
- ❖ Urban Land Cover Classification based on EIONET EAGLE 
- ❖ Copernicus-compliant Urban Atlas 
- ❖ SRI Settlement Layer Validation Methodology 
- ❖ EXTREMA
- ❖ Disaster Risk Assessment for Refugee Areas 
- ❖ Resilience Indicators for Migration

Implementation Status

Potential Applications



18 AQ solutions with 8 CAMS interactions

8 UG solutions with 5 CLMS and 1 EMS interaction



5 Disaster solutions with 3 CLMS and 3 EMS interactions

**Interaction
type**

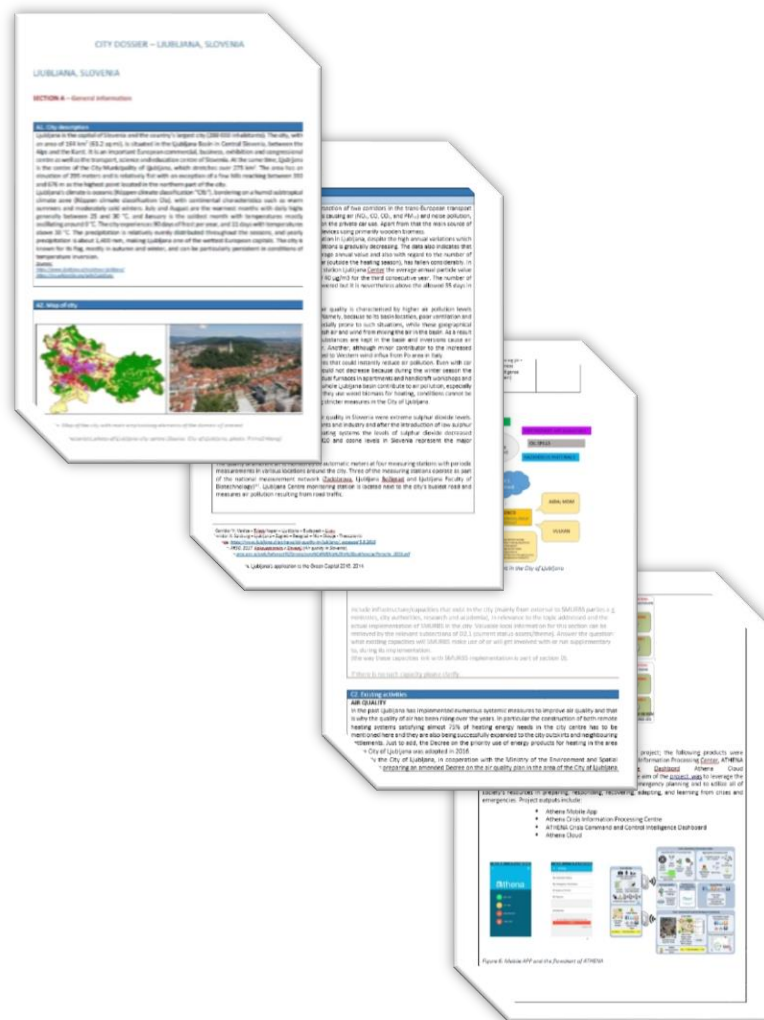
- Regional ensemble CAMS forecast
- CAMS reanalysis products
- Sentinel Sentinel-1, 2, 3 and 5p data uptake (and validation)
- TNO MACC Emission Inventory and inventory refinement
- Copernicus Open Access Hub
- Sentinel-3 Pre-Operations Data Hub
- EU Ground Motion Service for Land Deformation mapping using InSAR
- CAMS global model uptake
- Validation of CAMS with in situ data
- Data generation as part of GAW/METEOSWISS/Copernicus contract
- Copernicus Urban Atlas use
- CLMS-Land surface temperature
- EMS activation
- EMS-EFFIS



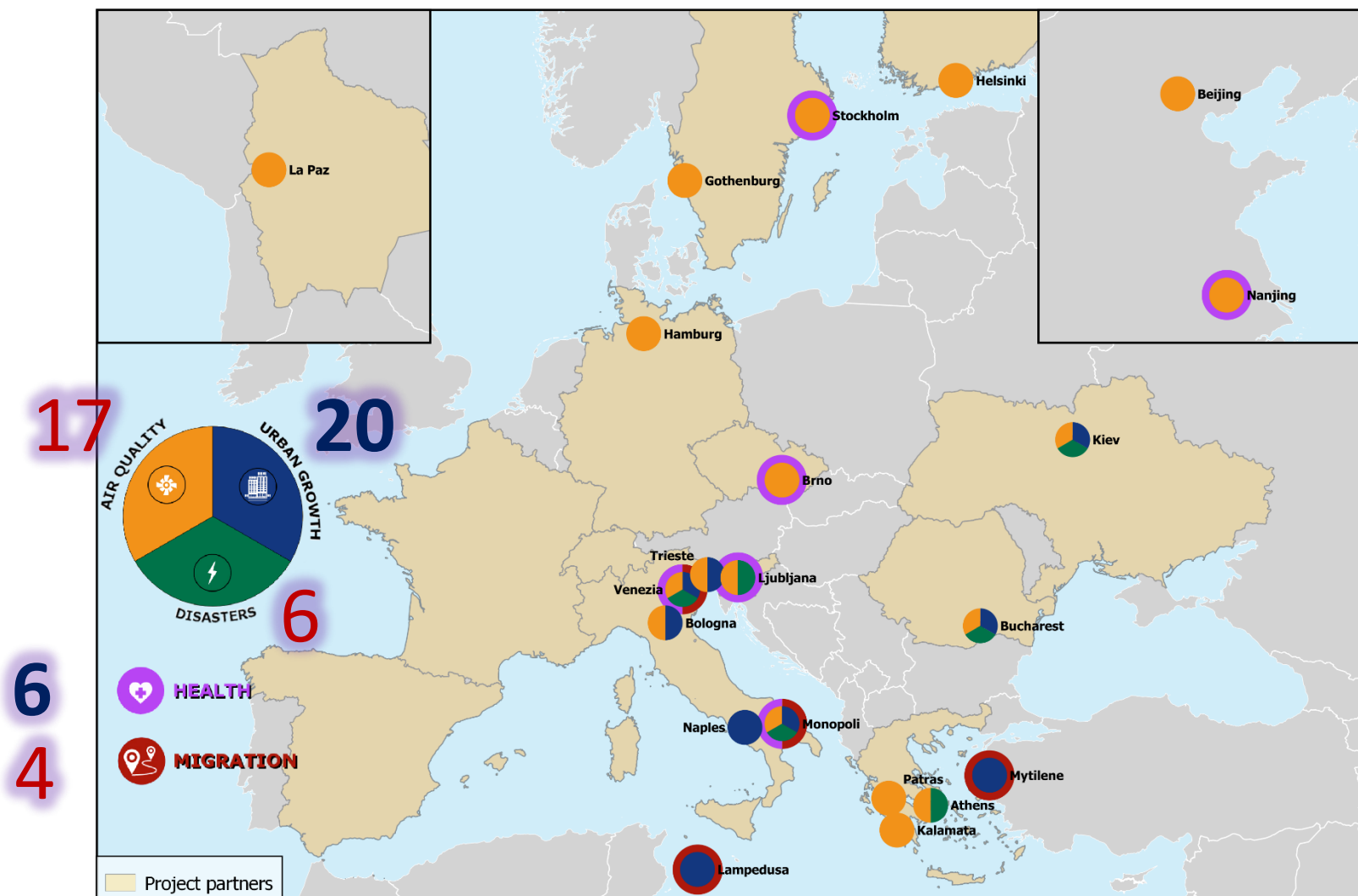


City dossiers

- Structured overview of individual city-specifics
 - General characteristics
 - Environmental pressures
 - Reference network
 - Implementation plan
- Internal "manual" per city for the next two years, upon which concrete actions will be implemented.
- Details on partners involved (interactions, responsibilities...)
- Stakeholders (problem understanding, benefits, their role...)
- The city dossier is *dynamic* document!



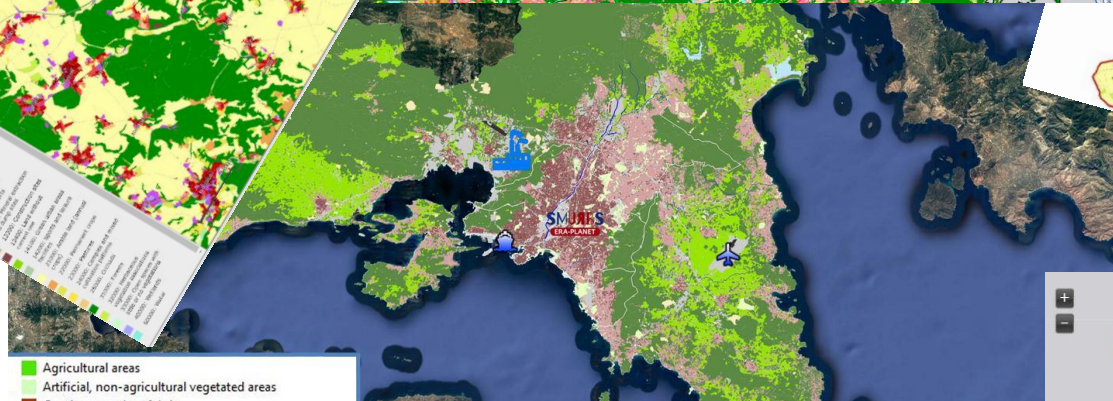
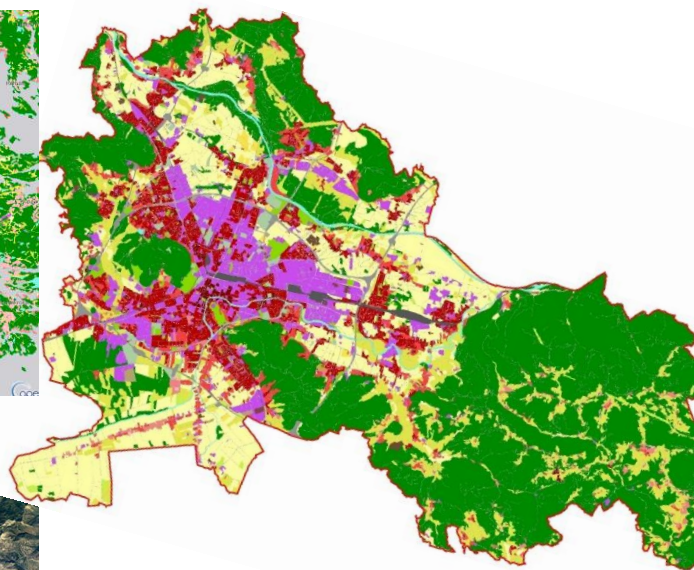
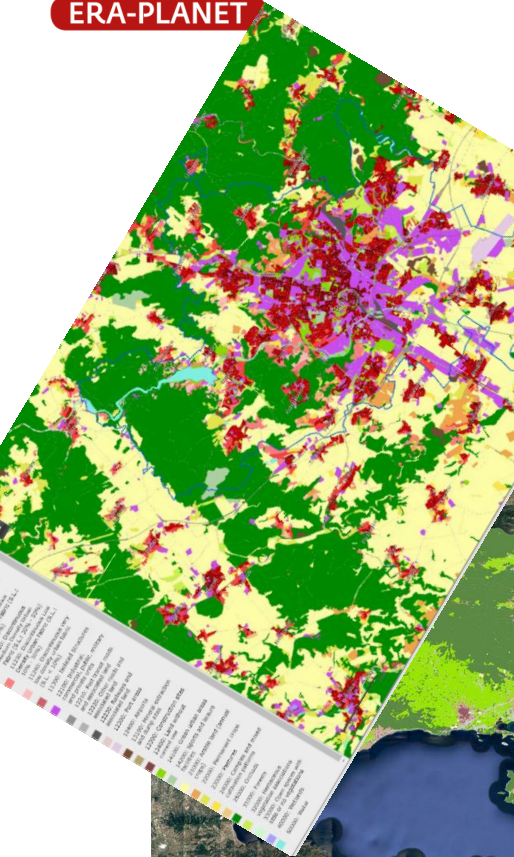
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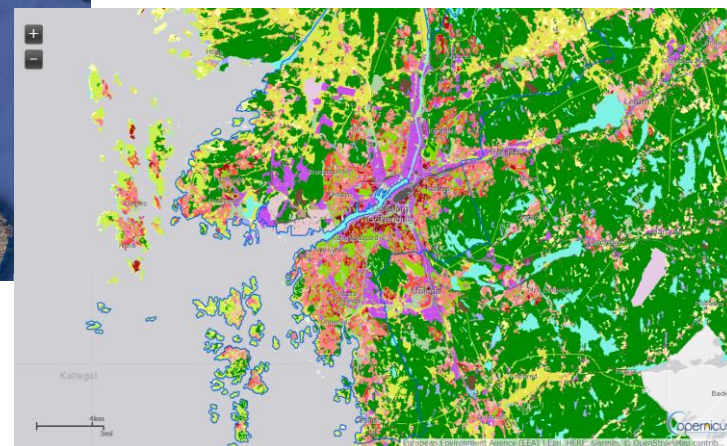
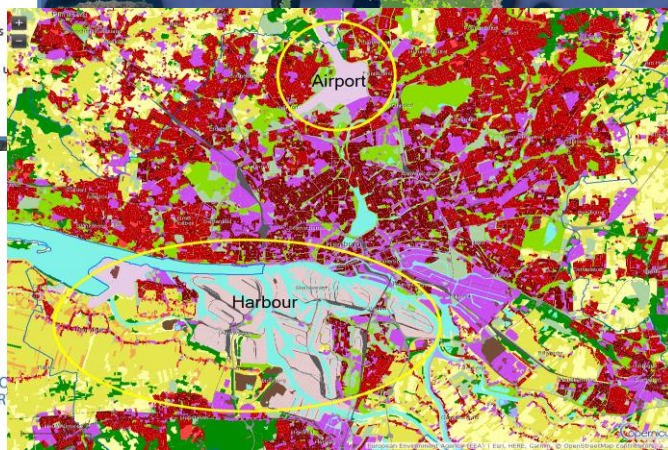
Diversity of cities

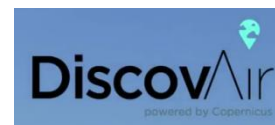


Diversity of cities



- Agricultural areas
- Artificial, non-agricultural vegetated areas
- Continuous urban fabric
- Discontinuous urban fabric and isolated structures
- Forest and semi natural areas
- Industrial, commercial, institutional and transport
- Land without current use
- Mine, dump and construction sites
- Wetlands and water bodies





Networking Collaboration





Ευχαριστώ !

