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Scent

Smart Toolbox for Engaging Citizens into a People-Centric Observation Web

Observing the Environment: Challenges and Opportunities in Citizen Science
Brussels, 09/10/2019

Smart Toolbox for Engaging Citizens into a People-Centric Observation Web

Project Overview

EU-funded Horizon 2020 project engaging citizens in environmental monitoring of land-cover/use changes using a unique toolbox of user-friendly tools and technologies
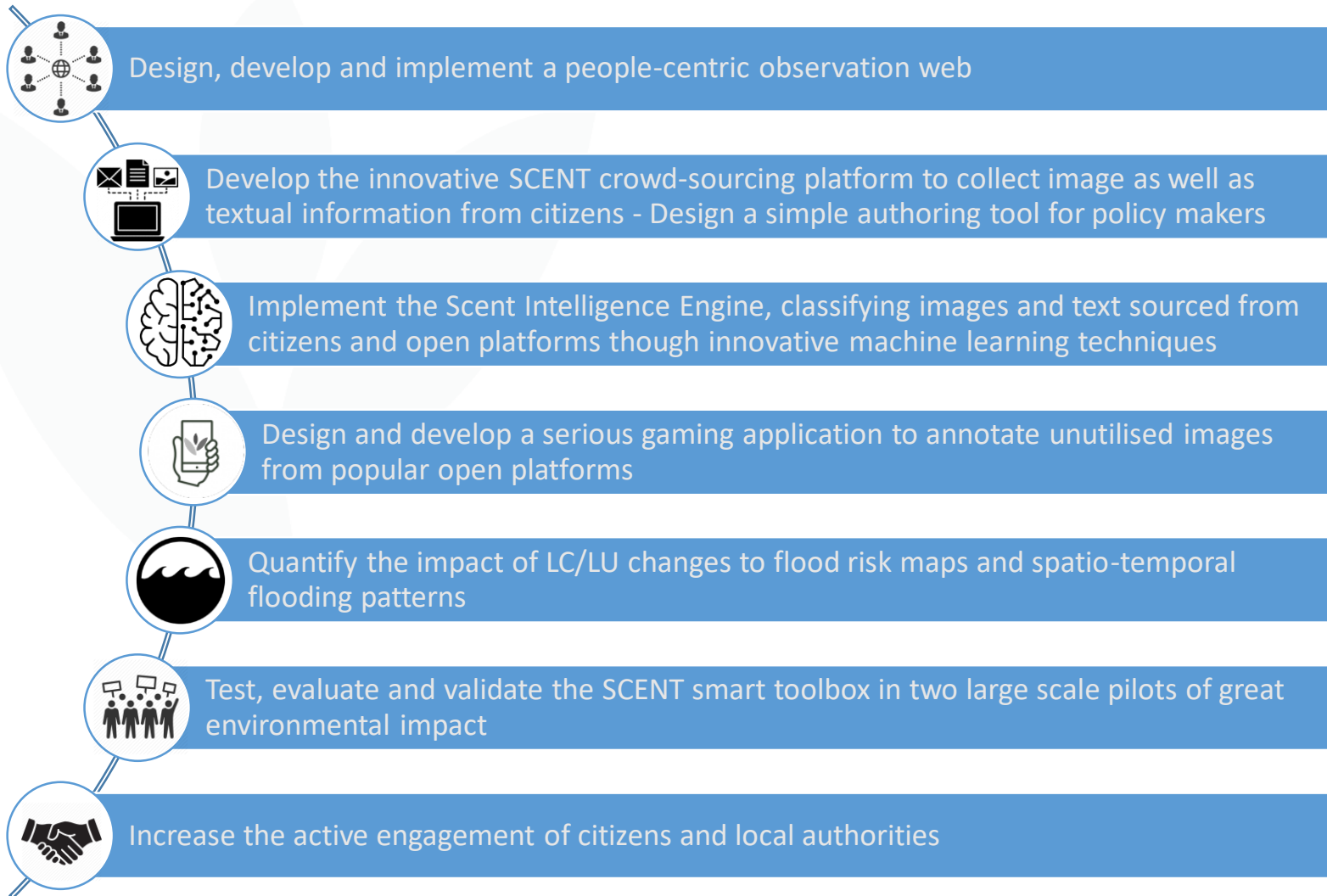
10 partners from 6 countries

- Coordinator: Institute of Communications and Computer Systems (ICCS)
- 3 Research institutes
- 3 SMEs
- 2 NGOs
- 1 Large industry
- 1 Public Body

Duration: 3 years (9/2016 – 8/2019)

EU funding: €3,264,675

The Netherlands
IHE Delft Institute for Water Education

Ireland
C.C.I.C.C. Ltd

Romania
Danube Delta National Institute
Romanian Ornithological Society

Italy
U-Hopper srl
XTeam Software Solutions

Israel
IBM Research Haifa

Greece
Institute of Communication and Computer Systems
Hellenic Rescue Team Attica
Region of Attica

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Main objectives

Design, develop and implement a people-centric observation web

Develop the innovative SCENT crowd-sourcing platform to collect image as well as textual information from citizens - Design a simple authoring tool for policy makers

Implement the Scent Intelligence Engine, classifying images and text sourced from citizens and open platforms though innovative machine learning techniques

Design and develop a serious gaming application to annotate unutilised images from popular open platforms

Quantify the impact of LC/LU changes to flood risk maps and spatio-temporal flooding patterns

Test, evaluate and validate the SCENT smart toolbox in two large scale pilots of great environmental impact

Increase the active engagement of citizens and local authorities

Gaming platforms & low-cost sensors

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An augmented reality application for citizens, which supports the collection and annotation of images/videos of land-use/cover
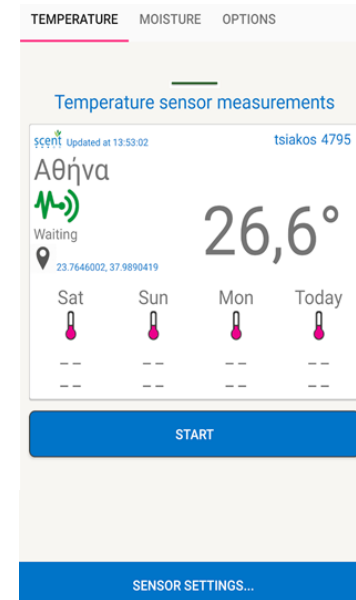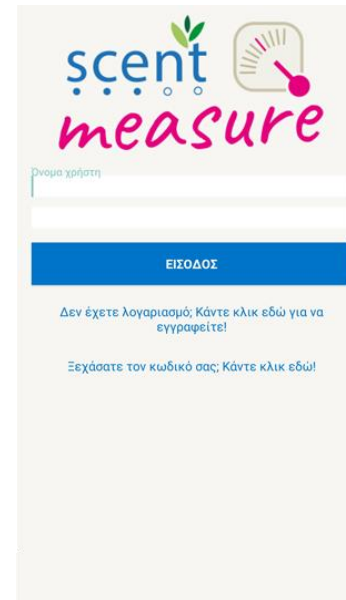
scent measure

A mobile application for citizens, which uses portable sensors to measure air temperature and soil moisture

scent collaborate

A crowdsourcing platform allowing users to train the Scent automated tools to identify natural features e.g. rivers, trees, pastures etc.

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# Gaming platforms & low-cost sensors
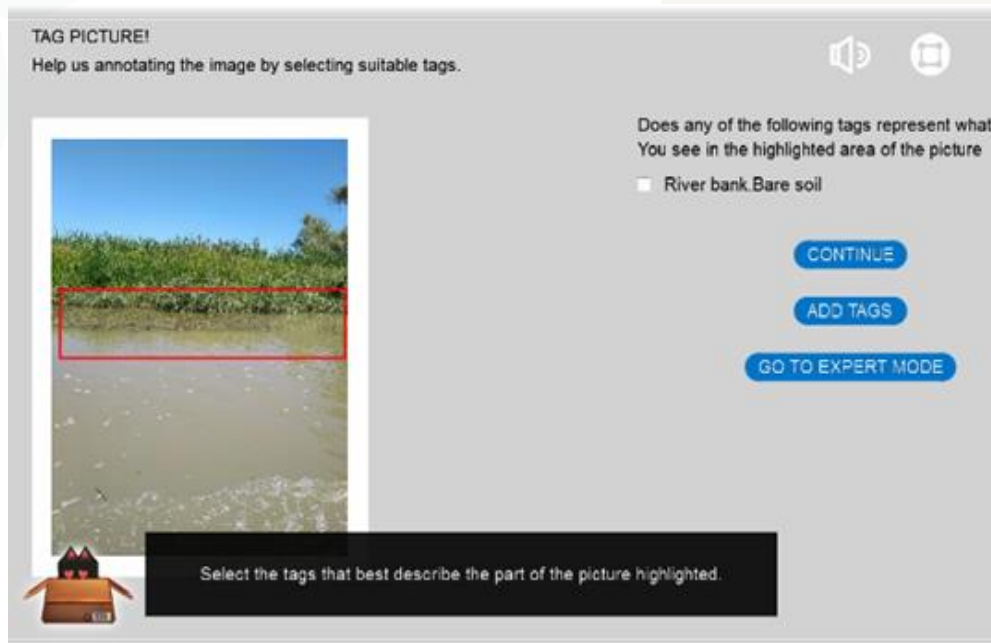
Crowdsourcing & interoperability

Connects all applications and services in the Scent Toolbox linking the data gathered by citizens through the front-end applications to all other toolbox components

A web-based platform enabling the management, storage and provision of citizen-generated data and added-value information produced by the Scent tools, and translates them to standardized resources

A web-based application allowing public administrators, policy makers and others to create and manage citizen science campaigns.
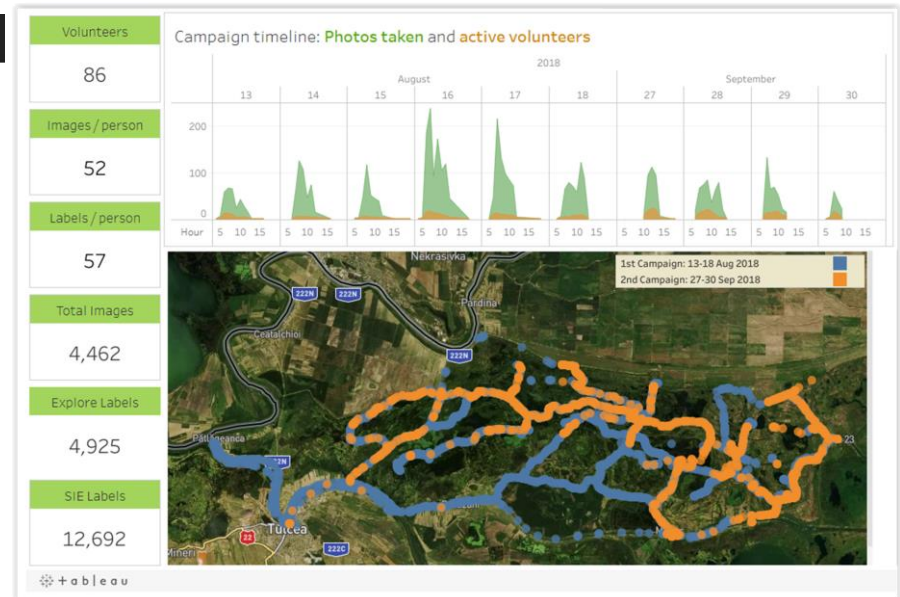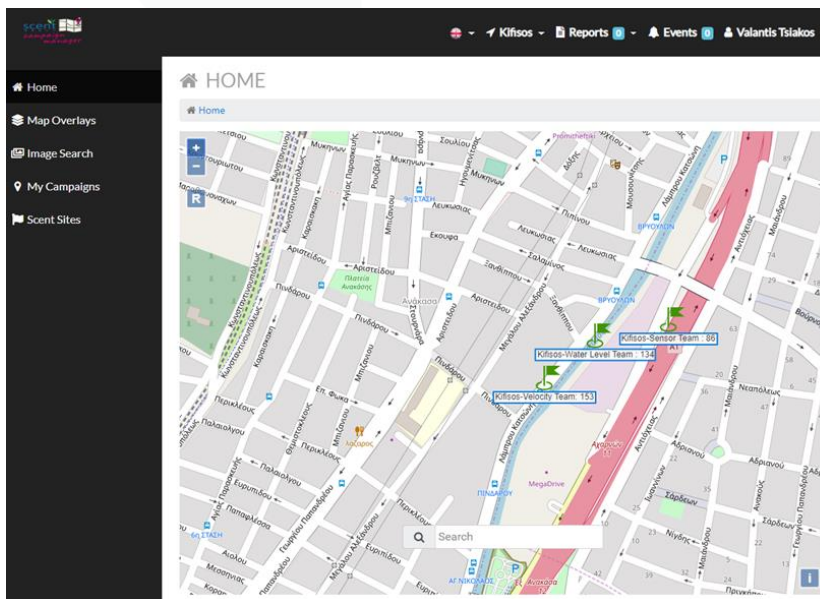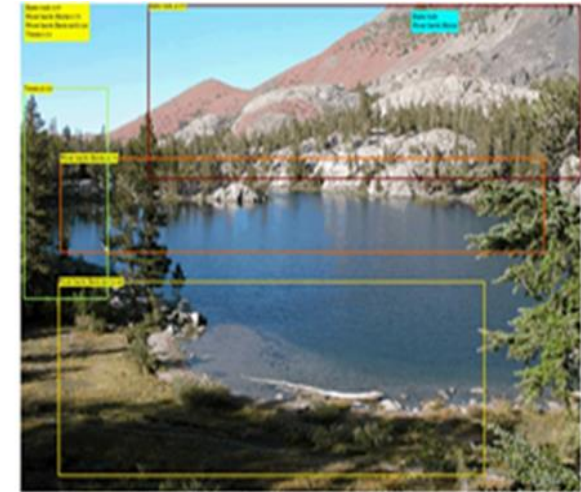
Data analysis, LC/LU mapping & flood modelling

Utilises machine learning to classify and annotate images from citizens and open platforms

Detects water level indicators and supports the automatic extraction of water level data from images and water velocity from videos
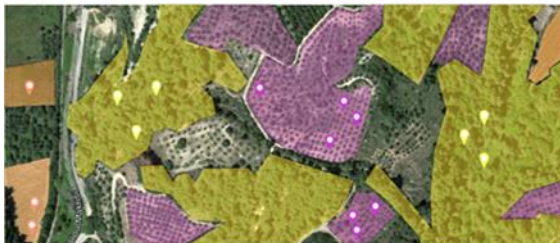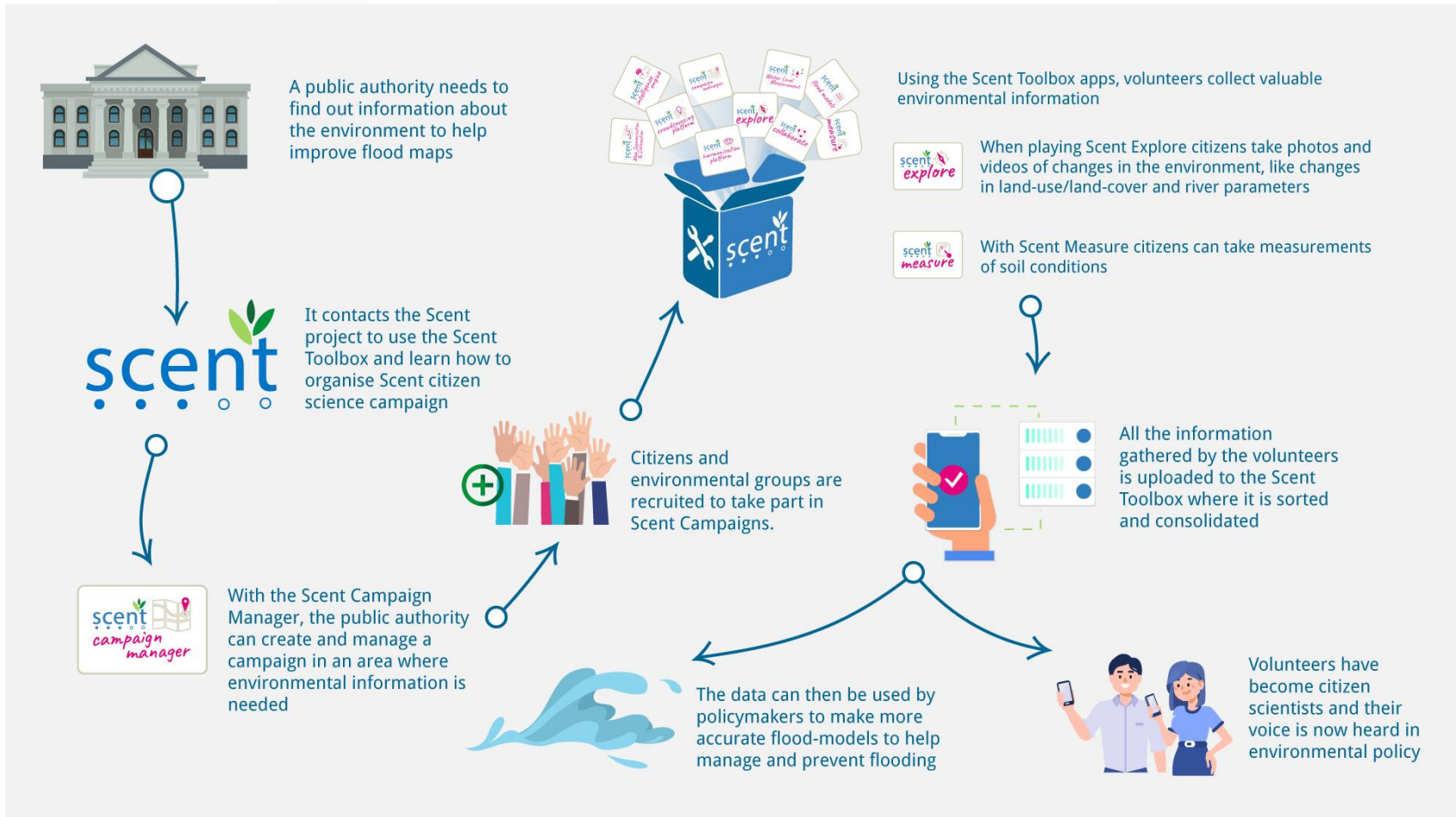
Utilises machine learning to automatically detect and annotate segments on satellite and aerial imagery with land-use/cover elements that affect flood risk and flood pattern determination e.g. river banks, forests etc.

Computational representations of water dynamics in the pilot areas, built using ground observations and remote sensing data, and enhanced with crowdsourced data

How does it work ?

A public authority needs to find out information about the environment to help improve flood maps

It contacts the Scent project to use the Scent Toolbox and learn how to organise Scent citizen science campaign

With the Scent Campaign Manager, the public authority can create and manage a campaign in an area where environmental information is needed

Citizens and environmental groups are recruited to take part in Scent Campaigns.

Using the Scent Toolbox apps, volunteers collect valuable environmental information

When playing Scent Explore citizens take photos and videos of changes in the environment, like changes in land-use/land-cover and river parameters

With Scent Measure citizens can take measurements of soil conditions

All the information gathered by the volunteers is uploaded to the Scent Toolbox where it is sorted and consolidated

The data can then be used by policymakers to make more accurate flood-models to help manage and prevent flooding

Volunteers have become citizen scientists and their voice is now heard in environmental policy

Scent citizen-science campaigns

Formulation of data collection needs

- Campaign scope (thematic focus)
- Duration (alignment with relevant events)
- Preliminary points of interest to be covered

Engaging with and mobilising volunteers

- One-way communication channels
- Social media campaigns, calls-to-action
- F2F meetings, phone calls, B2B discussions
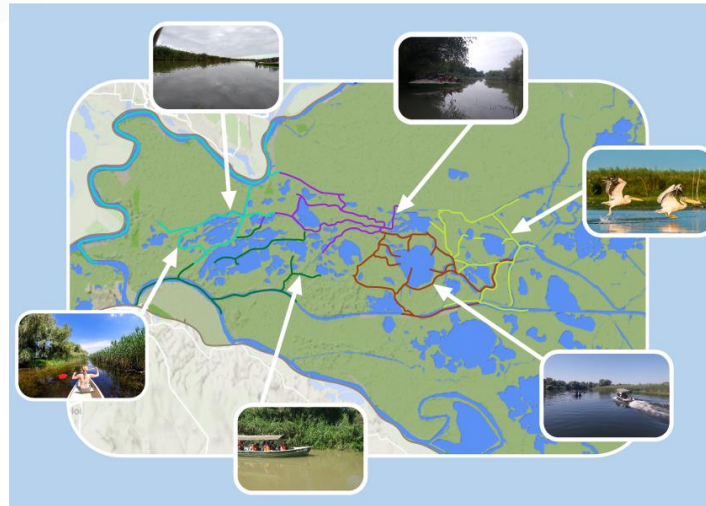- Common understanding & active engagement

Campaign design and considerations

- Safety considerations
- Logistics: finalisation of points of interest & routes; field visits
- Organisation of participants & schedule per day

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Scent citizen-science campaigns - Danube Delta

✓ Rural / remote environment
✓Training session in beginning of each campaign
✓On-board data collection
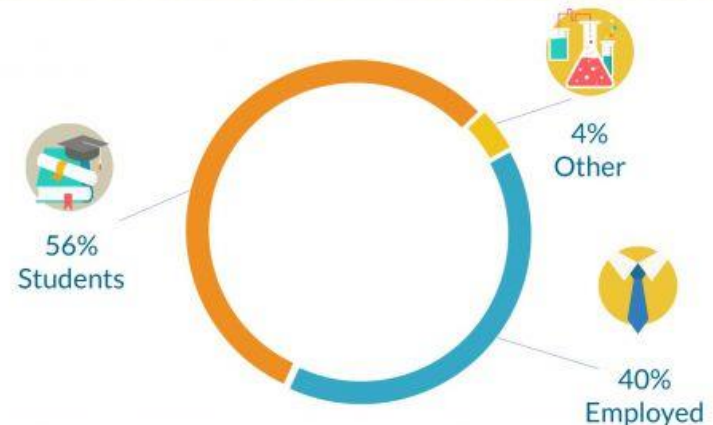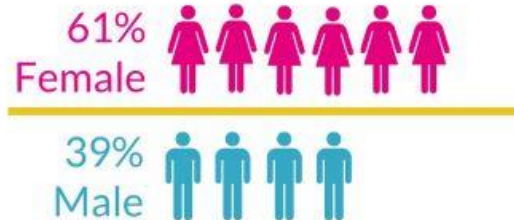✓Duration: 3-7 days
✓15-20 people per route, 8-10 volunteer per boat

SCENT CITIZEN SCIENTISTS

Total Participants: 193

Unique Participants: 169

61% Female

39% Male

56% Students

4% Other

40% Employed

SCENT CAMPAIGNS

1st CAMPAIGN
- Land-cover/land-use campaign
- 12 – 18 August 2018
- 4,725 images collected

3rd CAMPAIGN
- Land-cover/land-use and river parameters campaign
- 02 – 05 May 2019
- 4,285 measurements and images collected

5th CAMPAIGN
- Land-cover/land-use, river parameters and soil measurements campaign
- 31 May – 02 June 2019
- 4,201 images and measurements collected

08/18 — 09/18 — 05/19 — 05/19 — 05-06/19

2nd CAMPAIGN
- River parameters, land-cover/land-use and soil measurements campaign
- 27 – 30 September 2018
- 2,500 images and measurements collected

4th CAMPAIGN
- Land-cover/land-use, river parameters, and soil measurements campaign
- 24 – 26 May 2019
- 3,293 images and measurements collected

18,979+ pieces of data collected, including: land-cover/land-use images; river measures such as water level and surface flow velocity; and soil measurements such as soil moisture and air temperature

Scent citizen-science campaigns – Kifisos

✓ Urban & rural environment
✓Training session in the beginning of each campaign day
✓Duration: 2-4 days
✓20-25 volunteers per route

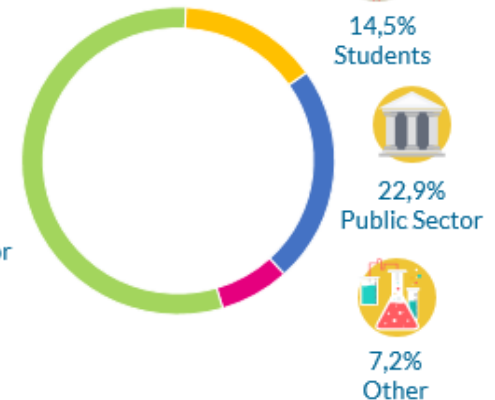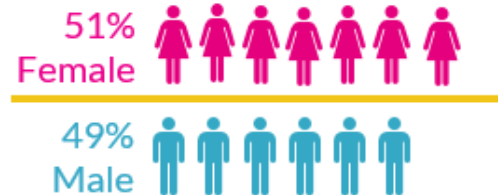## SCENT CITIZEN SCIENTISTS

Total Participants: 511
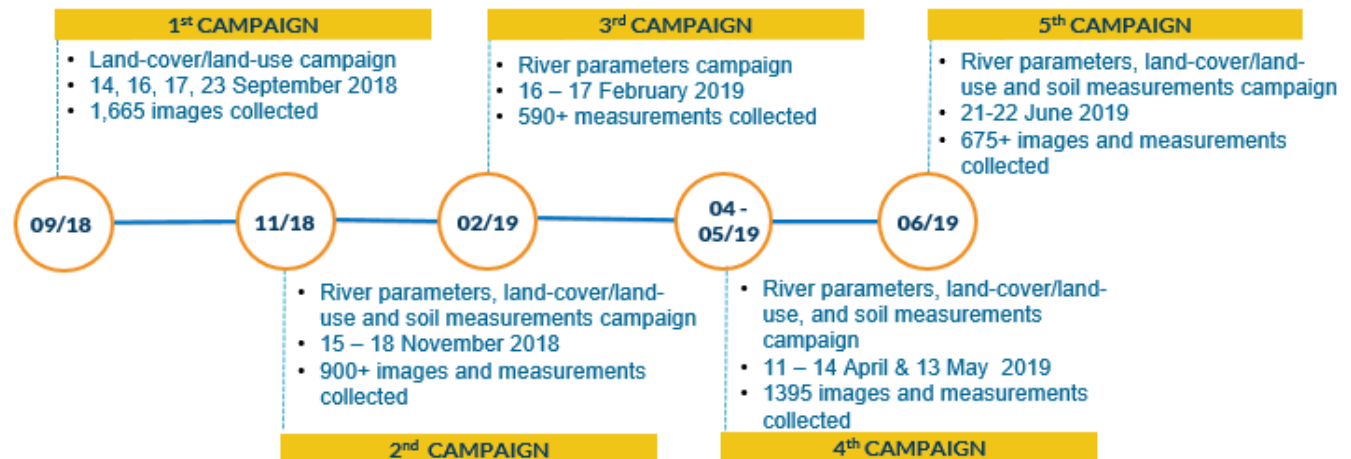Unique Participants: 341

51% Female
49% Male

55,4% Private Sector

14,5% Students
22,9% Public Sector
7,2% Other

SCENT CAMPAIGNS

1st CAMPAIGN
- Land-cover/land-use campaign
- 14, 16, 17, 23 September 2018
- 1,665 images collected

3rd CAMPAIGN
- River parameters campaign
- 16 – 17 February 2019
- 590+ measurements collected

5th CAMPAIGN
- River parameters, land-cover/land-use and soil measurements campaign
- 21-22 June 2019
- 675+ images and measurements collected

09/18 — 11/18 — 02/19 — 04 - 05/19 — 06/19

2nd CAMPAIGN
- River parameters, land-cover/land-use and soil measurements campaign
- 15 – 18 November 2018
- 900+ images and measurements collected

4th CAMPAIGN
- River parameters, land-cover/land-use, and soil measurements campaign
- 11 – 14 April & 13 May 2019
- 1395 images and measurements collected

5,225+ pieces of data collected, including: land-cover/land-use images; river measures such as water level and surface flow velocity; and soil measurements such as soil moisture and air temperature

Scent online community

- ✓ 10000+ unique users have visited the SCENT Collaborate site

- ✓ 1210+ active registered users of Scent Collaborate platform;

- ✓ SCENT Explore and Measure: 3000+ downloads, with 705 active users;
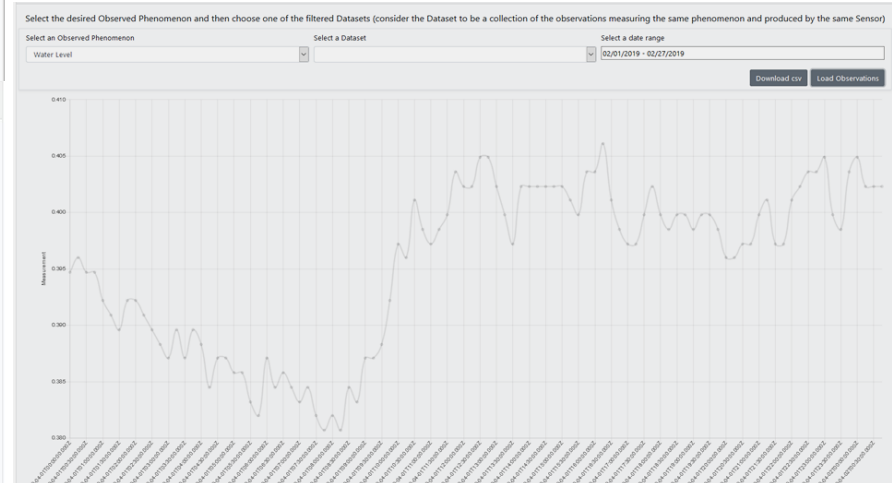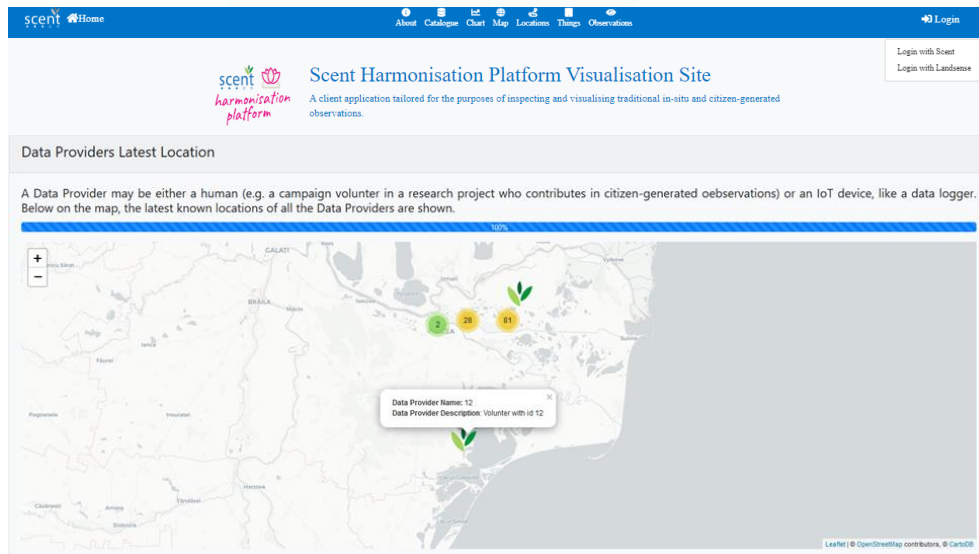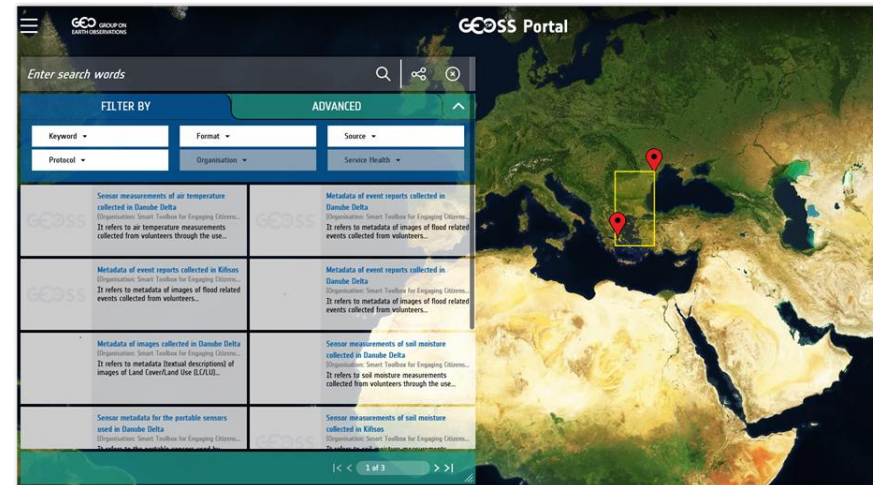
- ✓ 17500+ annotations
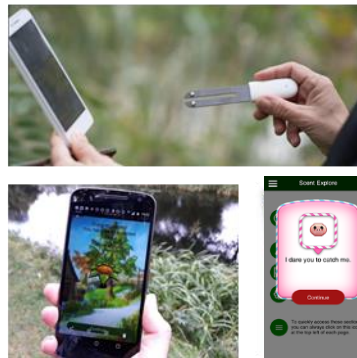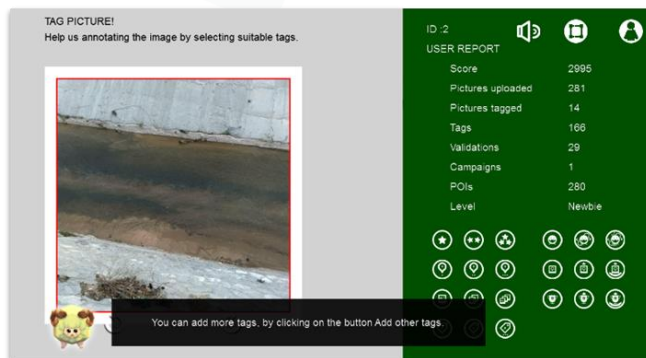
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Linkage with EO - Applications

- Combined use with Copernicus data (flood models, LC/LU maps):

  - Copernicus Contributing Missions

  - CORINE LC/LU, soil sealing map, DEM
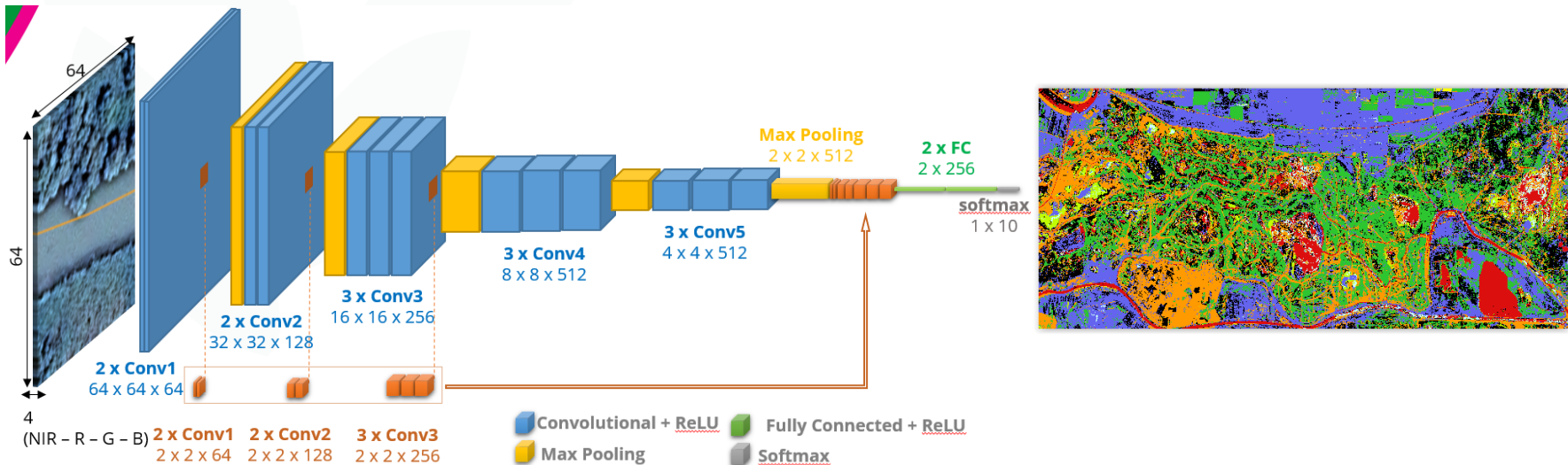
Scent datasets & future exploitation

- Scent data → openly accessible (web services & dashboards):

  - Scent Harmonisation Platform

  - GEOSS portal

  - EOSC (interaction ongoing)

Challenges

Awareness
➢ Engaging with and mobilizing citizens as individuals (without being involved in relevant communities) can be challenging, especially if they do not have environmental awareness

Acceptability
➢ Developing data quality systems can be complex; need to cope with the correctness/accuracy of the citizen generated measurements, user reliability, and protection of the system from malicious contributions

Sustainability
➢ Modelling different types of data, collected through different methods (i.e. moving sensors), necessitate the use of novel standards and interfaces to facilitate harnessing the full potential of citizen-generated data

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Scent Best practices

User engagement & motivation

- Serious gaming constitute an intriguing mechanism that can support motivation and engagement in data collection process (15% increase of Scent Collaborate, Explore, Measure registered users since the end of the project)

- Design of citizen science campaigns (targeted field visits) should take into account area characteristics whilst aiming to maintain an educational character for the participants, equipping them with the necessary skills to observe, monitor and take action in their own environments → social inclusion & cooperation.

Technology enablers

- Low-cost and portable sensors coupled with quality control mechanisms and machine learning frameworks can extent (both quantity and semantically wise) traditional in-situ networks, providing resources that can be used successfully either for the validation of existing products or in the concept of new applications

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Scent Best practices

- Showcasing the applicability and potential of citizen science in leading to improved results in the fields of Land Cover / Land Use and flood management and thus facilitating decision making process;

- Citizen science has been very successful in the field of water parameters and the results obtained indicate that crowdsourced data can be explored for the validation of models;

- The design of a modular architecture that can store, provision and visualize data from heterogeneous sources in a unified way is crucial to the sustainability and maintenance of citizen empowered projects;

- Adoption of new standards, such the OGC SensorThings API can support combined use and integration of citizen-generated data with existing information systems and legacy data sources;

- Establishing a connection between citizen science and GEOSS is a beneficial process as it enables the uptake of resources in global scales.

THANK YOU FOR YOUR ATTENTION

Any questions?

Angelos Amditis, Athanasia Tsertou, Evangelos Sdongos, Valantis Tsiakos

I-SENSE Group, ICCS