

Evaluation of the CITI-SENSE project pilot studies: Lessons learned from the Empowerment Initiatives of eight international cities

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CITI-SENSE project
Grant agreement n°: 308524



Background: project administration

“Development of sensor-based Citizens’ Observatory Community for improving quality of life in cities”

- *Project website:* www.citi-sense.eu
- *Starting date:* 01/10/2012
- *Duration:* 48 months
- *Budget:* 12M €
- *Participants:* 27 organizations (11 SMEs, 4 Universities, 12 Research institutes)
- *Call:* FP7-ENV-2012.6.5-1 Developing community-based environmental monitoring and information systems using innovative and novel earth observation applications



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Background: project objective

To develop Citizen's Observatories to empower citizens to:

- Contribute to and participate in environmental governance;
- Support and influence community and policy priorities and associated decision making; and,
- Contribute to Global Earth Observation System of Systems (GEOSS).

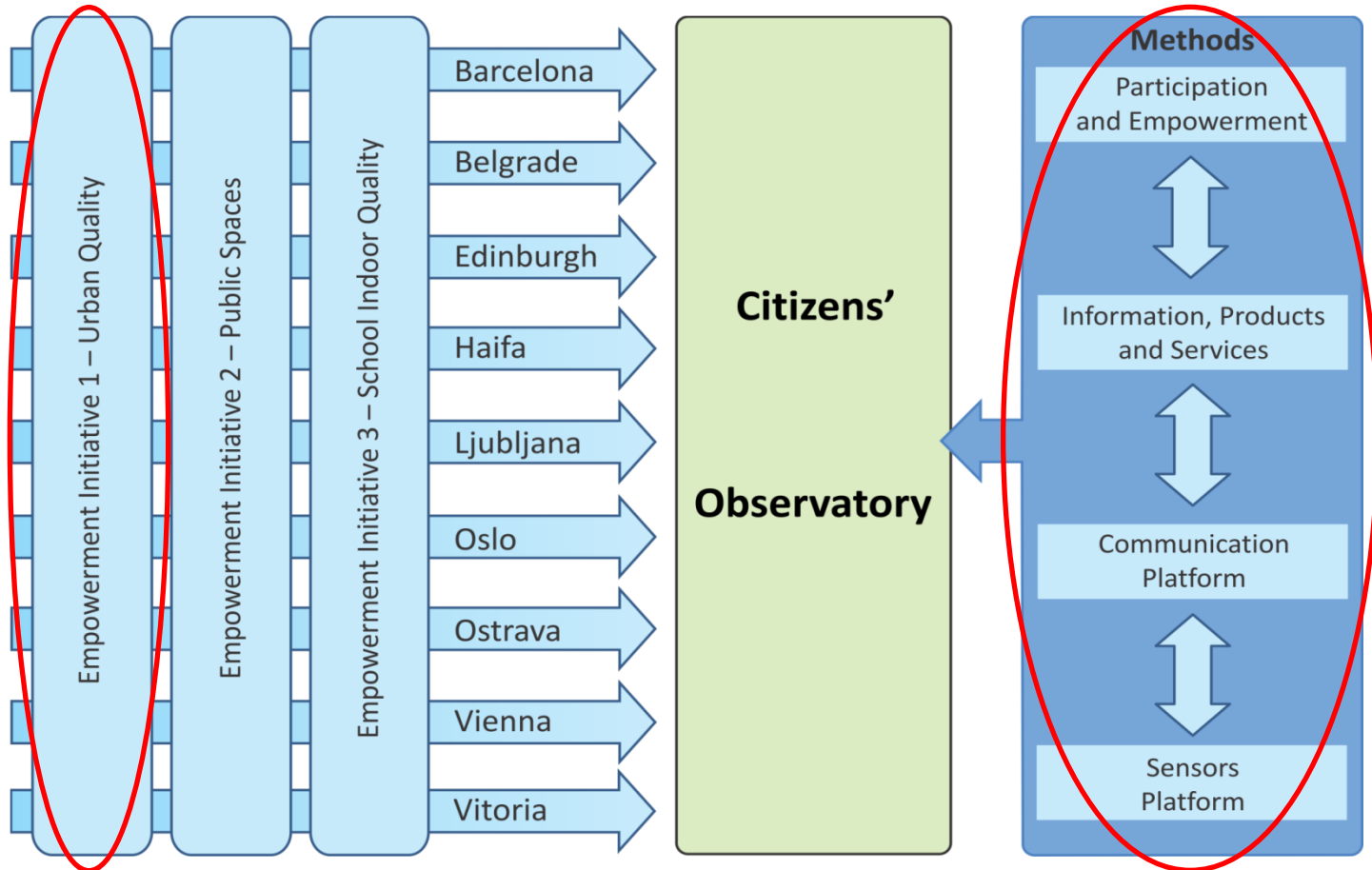
Citizen's observatories – *communities of users that will share technological solutions, information products and services, and community participatory methods, using appropriate communication solutions, thus complementing established environmental data and information systems and improving local environmental decision making.*



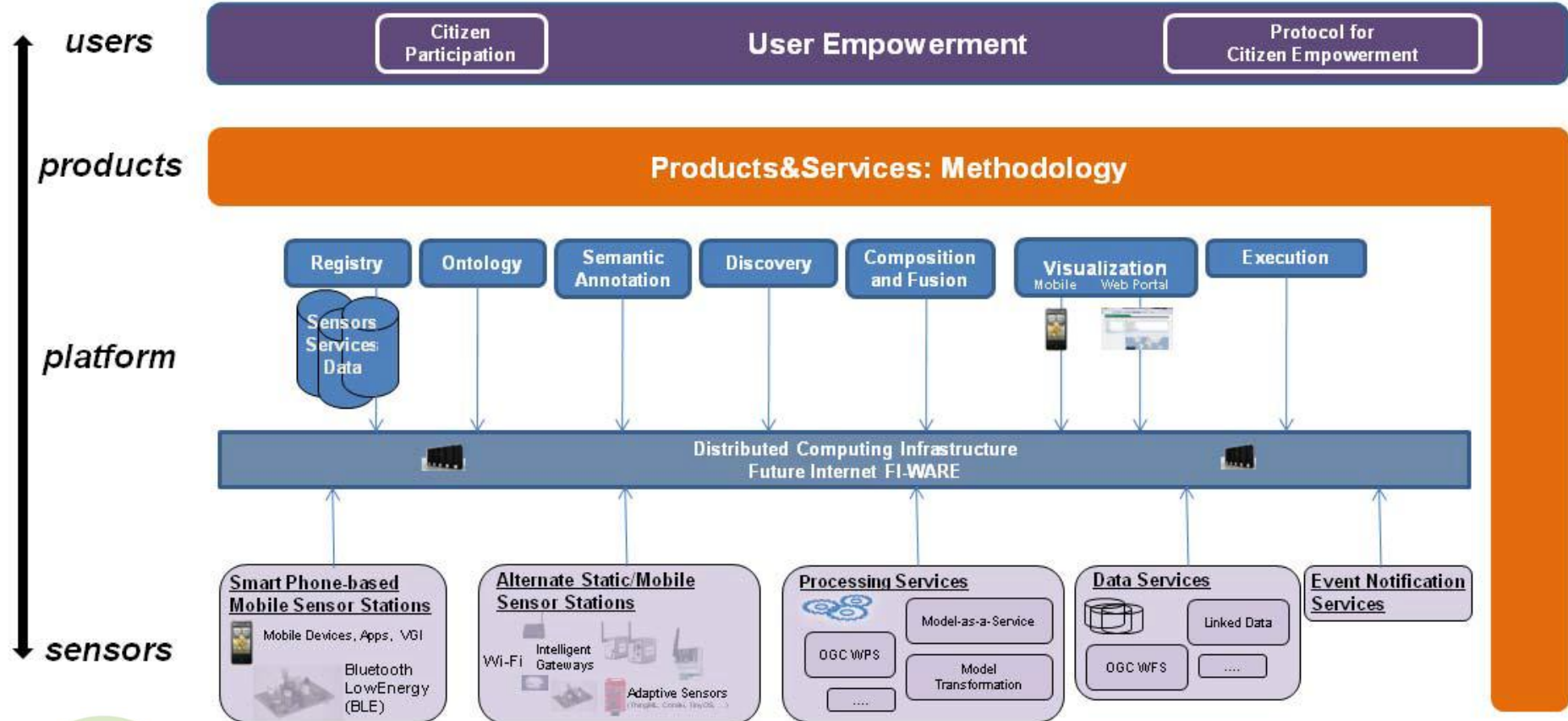
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Background: project structure



Background: project structure



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Introduction: pilot study

- In 2013/2014, urban quality empowerment pilot study performed in eight European cities including Barcelona, Belgrade, Edinburgh, Haifa, Ljubljana, Oslo, Ostrava and Vienna to:
 - trial technologies from end-to-end prototypes and evaluate application of technologies (communication networks); initiate stakeholder engagement;
 - prepare full-scale deployment protocol, maximising impact and longevity;
 - provide insight on up-scalability and transferability of COs.



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Methods: pilot tools/ services

▪ Objective (technological) sensors

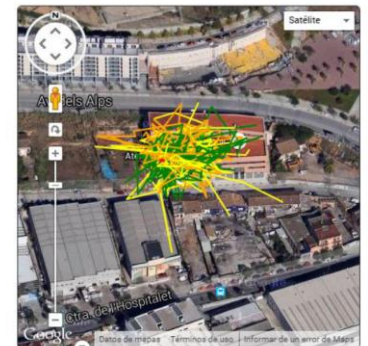
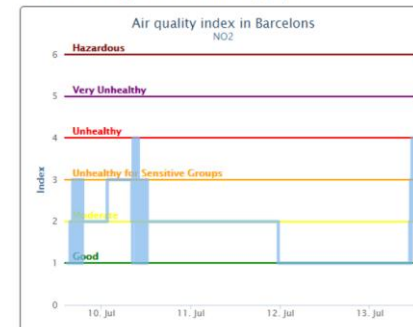
- air quality (CO, NOx, O₃)
- wireless power & transmission
- server-backed data storage, processing & visualisation



▪ Subjective (sociological) sensors

- exposure profiling (GPS-MET-model) & perception reporting
- smartphone application
- server-back data storage processing & visualisation

Visualization will produce the following graph:



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Methods: pilot evaluation

- **Key performance indicator (KPI) analysis:**
 - define and measure progress toward goals;
 - quantifiable measurements of the analysis of mission, identification of stakeholders and definition of goals.
 - pilot study = self-evaluation

- **Strength, weakness, opportunity & threat (SWOT) analysis:**
 - identify strengths & weaknesses of the project personnel and technology (i.e., internal factors);
 - identify opportunities & threats within case environment.
 - pilot study = internal administration



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Results / 'lessons learned'

- **Limited number of nodes meant limitations in extent of engagement and testing opportunities:**
 - Only one/ lead location able to pilot mobile nodes;
 - Quality of data coming from nodes not considered mature enough for public dissemination (except AQM station co-located personnel);
 - Sensor-enabled information showed potential for patterns of spatiotemporal variability.



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Results / 'lessons learned'

- **Overemphasis (necessity) on physical sensor technology, limited user co-design, neglected sociological sensor maturity:**
 - Qualitative data from user experience surveys showed technology to be interesting and practical, long-term use feasible;
 - Local authorities hesitant to be involved with project due to potential of increasing public pressure to address complicated issues such as deteriorating air quality.



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Results / KPIs

City location	KPI type (# of sub-KPIs)	KPI score (%)	Comment (outcome)
Barcelona	Sensors (4)	90	Good
	Platforms (1)	60	Fair
	Products (9)	64	Relatively good
	Users (8)	75	Relatively good
	Others (2)	100	Excellent
	Location Total (24)	75	Good
Belgrade	Sensors (4)	80	Relatively good
...



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Results / SWOT

Internal Factors

STRENGTHS

- high number of semi-portable, (i.e., battery-operated, compact, wireless) air quality sensor nodes: spatial variability from wide-spread distribution; many direct participants can be engaged to host sensors; many indirect participants can be empowered by receiving spatially-relevant info

WEAKNESSES

- sensor nodes have shown to be **fallible**: common sensor failures are a substantial maintenance cost (financially and logistically); data currently non-compliant with standard reference air quality sensors
- **sensor nodes need secure, stable deployment sites**: limited selection

External factors

OPPORTUNITIES

- **local authority co-operative**: desire for greater spatial coverage in monitoring; facilitative of linking (empowering) citizens with local authorities/ government

THREATS

- **non-compliant data**: local authorities may not listen to 'empowered' citizens' concerns
- **sensor nodes may be damaged/stolen/vandalised**: failure in system

Conclusion

- **Successful progression from pilot to full implementation needs:**
 - *knowledge* to exploit strong points and protect weaker points;
 - *familiarity* with end-to-end tools, from nodes to servers;
 - *transparency* in tool performance (e.g. not reference standard).
- **Project legacy from tool/ service compatibility/ longevity...**
 - Goal-driven collaboration with peers and stakeholders to maintain interest throughout and beyond study
 - Meet user satisfaction in design of tools/ services to strengthen engagement/ empowerment of stakeholders
 - Commonality to support comparability and consistency of outcomes for international applicability and therefore impact



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Citizens' Observatories Toolbox (COT)

co.citi-sense.eu



Tell me and I will forget.
Show me and I will remember.
Involve me and I will understand.
Ancient Chinese proverb

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Gateway to the Citizens'
Observatories Toolbox
is now open...



The Citizens' Observatories of Air

The CITI-SENSE public portal is designed to enable citizens to not only have **ACCESS** to real-time environmental information provided by a wealth of **SENSORS**, including personal sensors, mobile sensors and static stations, and different types of **AIR POLLUTION PERCEPTION SURVEYS**, but also to provide a **FORUM** for discussion, debate and **SHARING** of your own personal observations. Your contributions are important and the **Citizens' Observatories Toolbox (COT)** is yours! Here you can find what our COT can do for you and what you can do with our COT.

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Citizens' Observatories Toolbox (COT)

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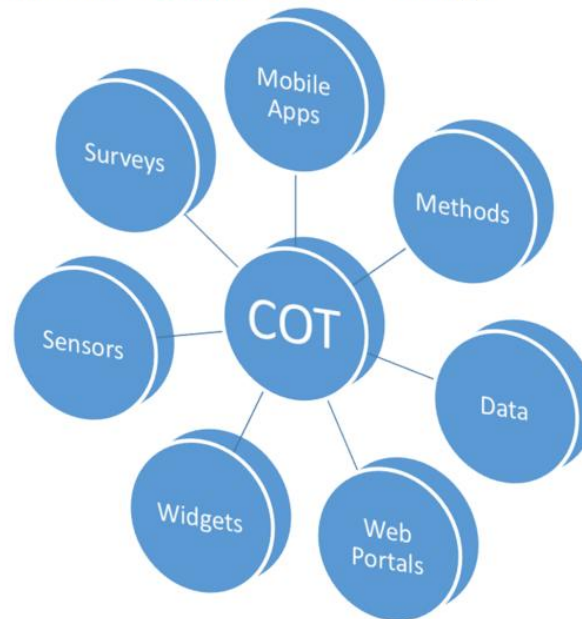
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CITI-SENSE Citizens' Observatories Toolbox - COT

The Citizens' Observatories Toolbox (COT) includes any resources and guidance, procedure, software, hardware or service developed by CITI-SENSE that can be used to support citizens to participate in environmental monitoring programs, enabling citizens to contribute to community based environmental decision making.

Our COT can provide personalized environmental information that can help you as a citizen be a healthier person, help you and your kids avoiding polluted areas, provide you time-activities pollution exposure trajectory, and help policy-makers to make actions to improve air quality in cities, schools and public spaces, etc.

Click to learn more about our featured COT. [Contact us](#) to see how we can help you!



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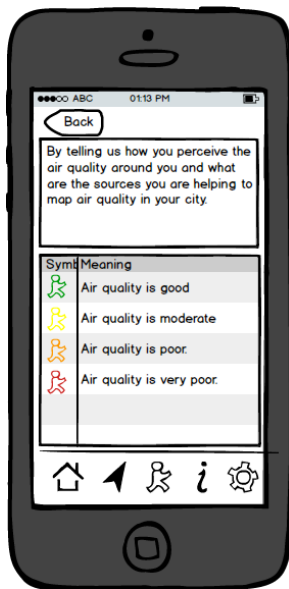
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Citizens' Observatories Toolbox (COT)

co.citi-sense.eu

- **CityAir app**, on *Android* and *iOS*
 - report geolocated perceptions
 - visualise user community reports



Thanks!

For more to come, see Poster...

“Towards a system of citizen-based environmental health governance: the CITI-SENSE project’s main study”

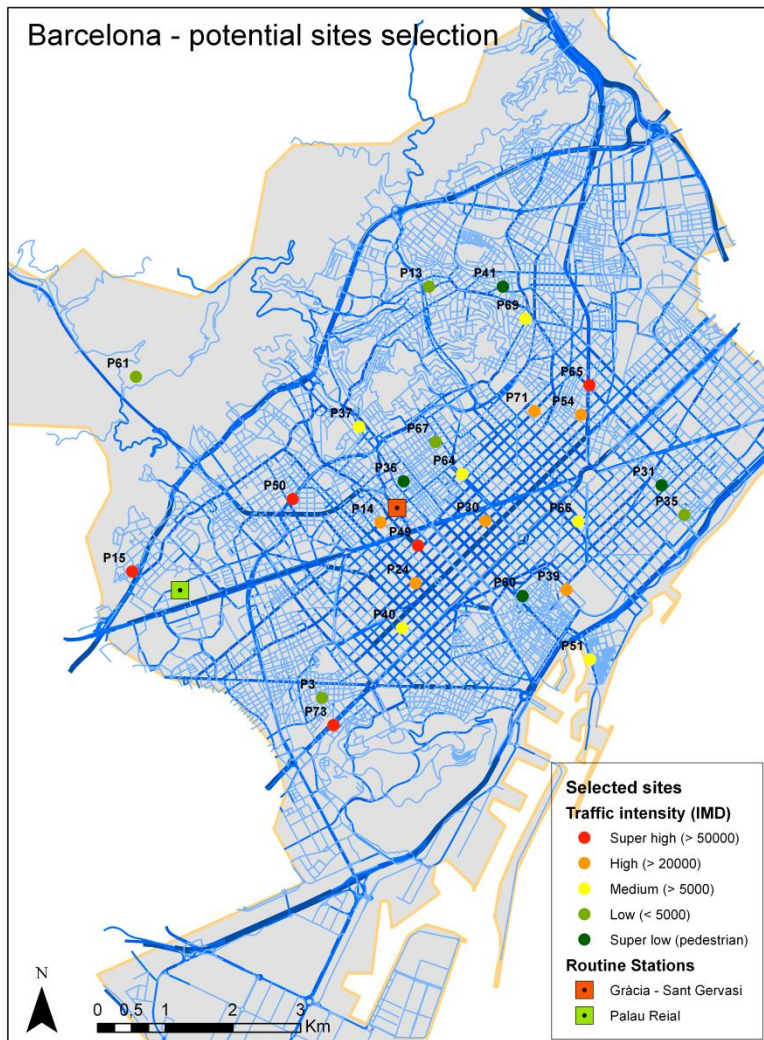


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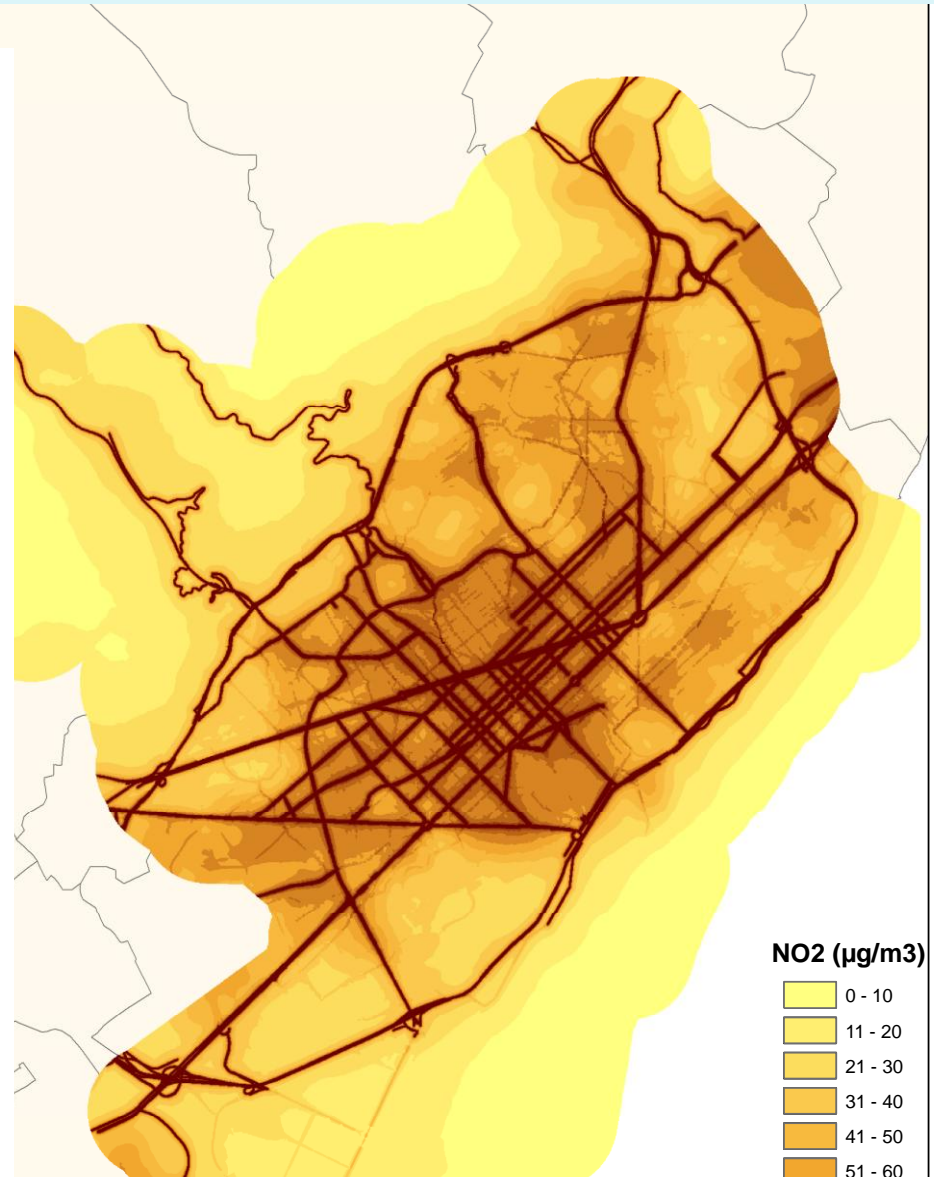
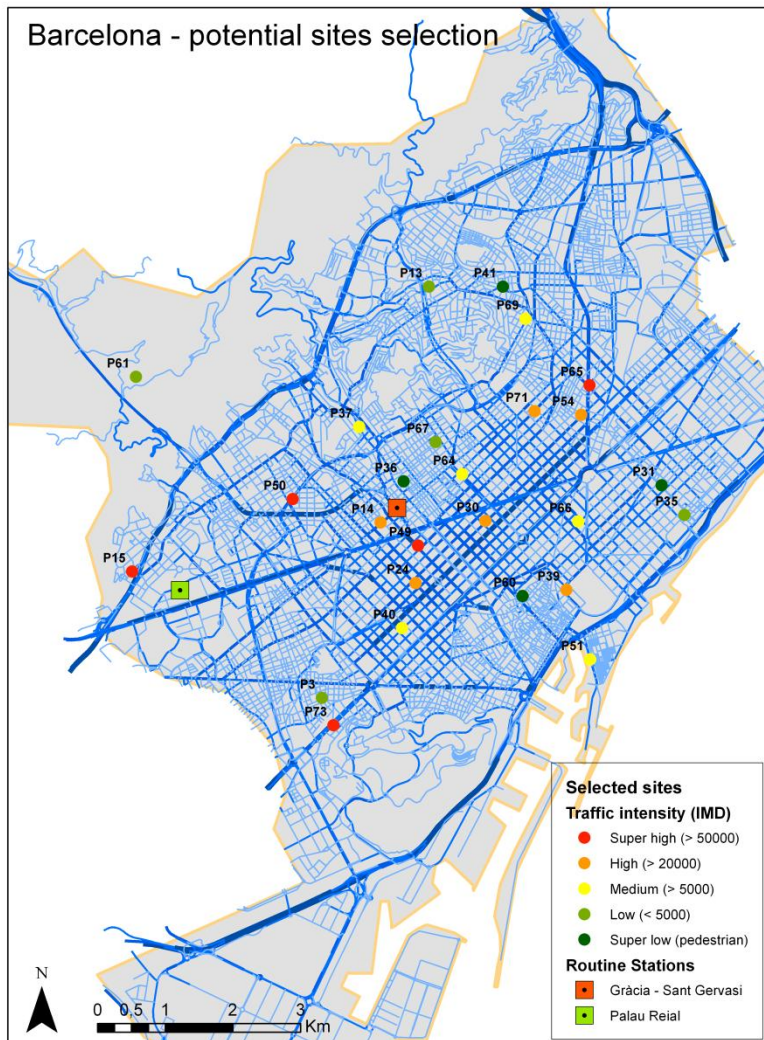
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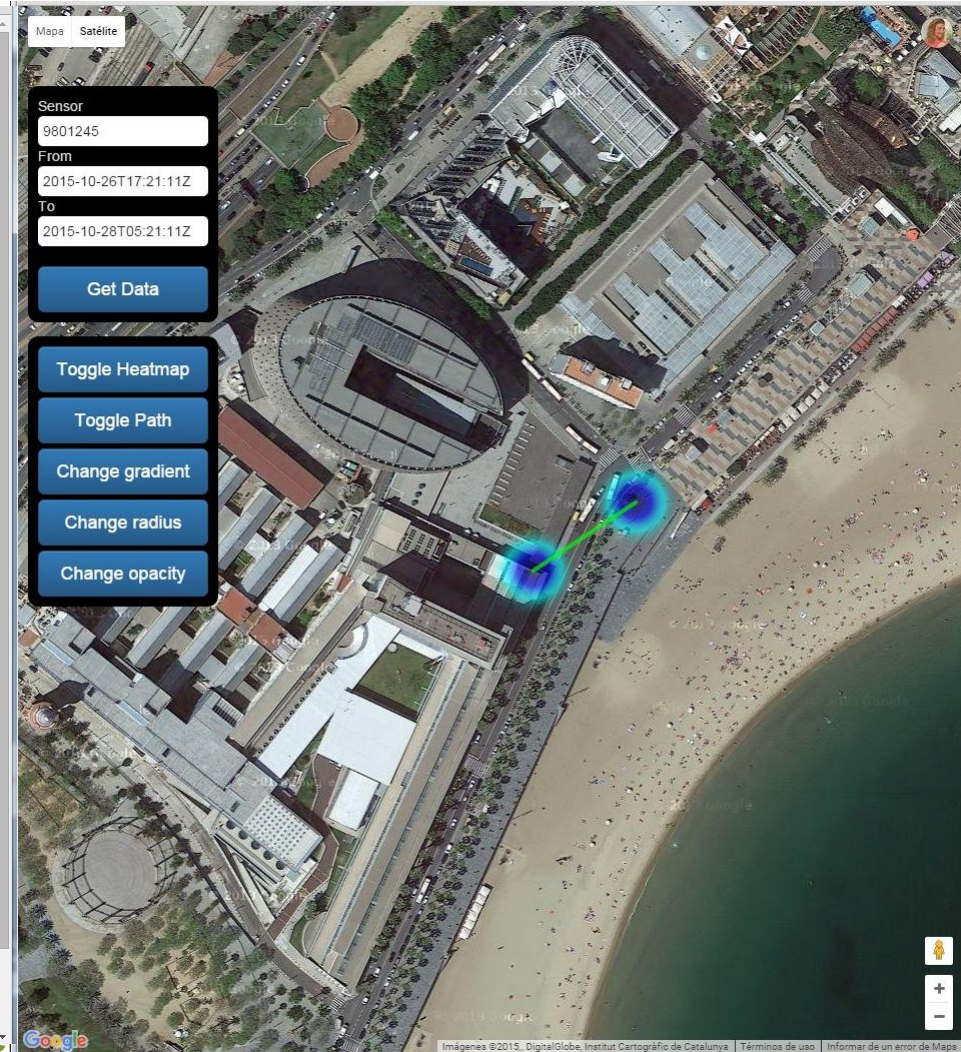
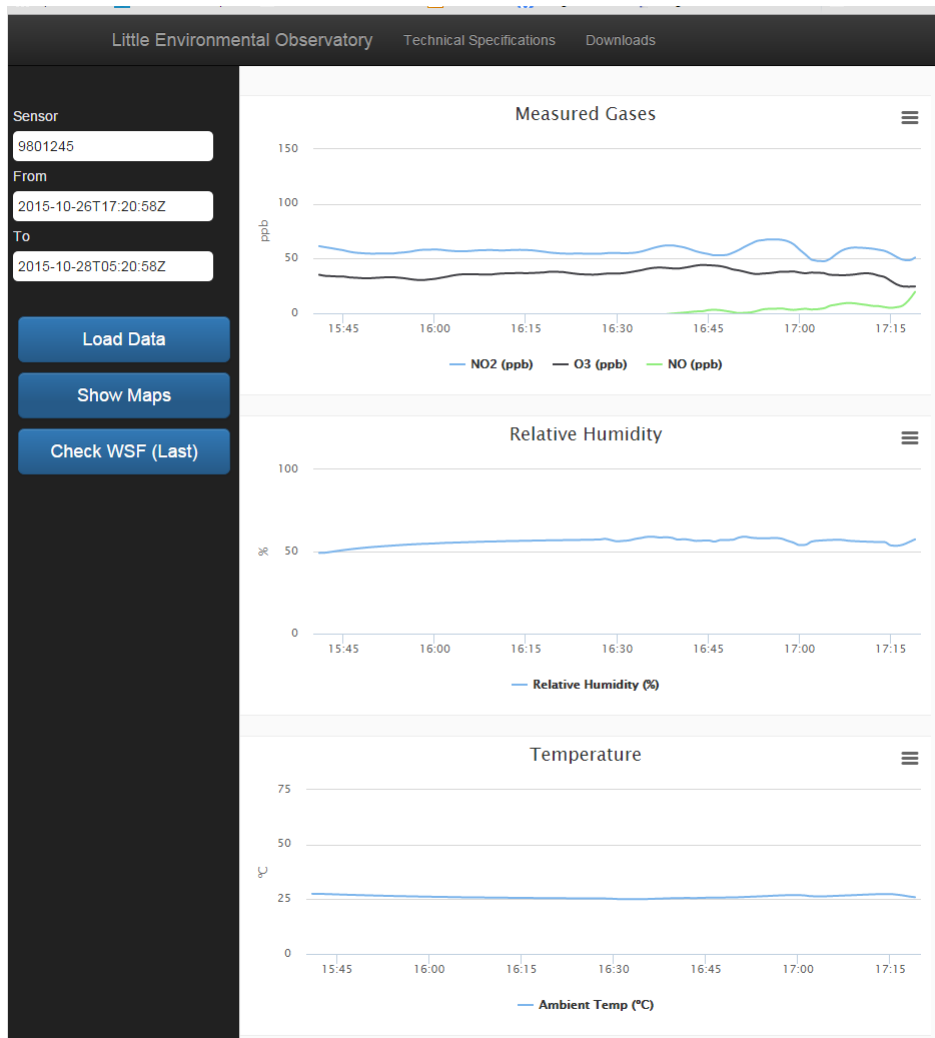


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- Temperature (°C), Relative humidity (%),
- Gases (ppb)
 - CO [0-1000 ppb ($\sigma < 5$ ppb)]
 - NO [0-4000 ppb ($\sigma < 5$ ppb)]
 - O₃ [0-1800 ppb ($\sigma < 5$ ppb)]
 - NO₂ [0-4000 ppb ($\sigma < 10$ ppb)],
- Particles (count) [1-30 μm (σ 1 μm)]
- <2 year battery life
- 1-60-minute sampling frequency
- Wireless (GPRS) transmission to server



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- Temperature ($^{\circ}\text{C}$), Relative humidity (%)
- Gases (ppb)
 - NO/ CO [σ 10 ppb]
 - O₃ [σ 15 ppb]
 - NO₂ [σ 15 ppb]
- Geolocation (GPS), Physical activity (METs)
ExpoApp, CitySense
- Multiple-day battery life
- 5-60-second sampling frequency
- Wireless (bluetooth) transmission to server
via smartphone



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Layer Selection

- ☐ Sensors
- ☐ Interpolated map
- ☐ Perceptions
- ☐ Comments

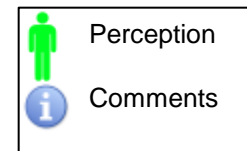
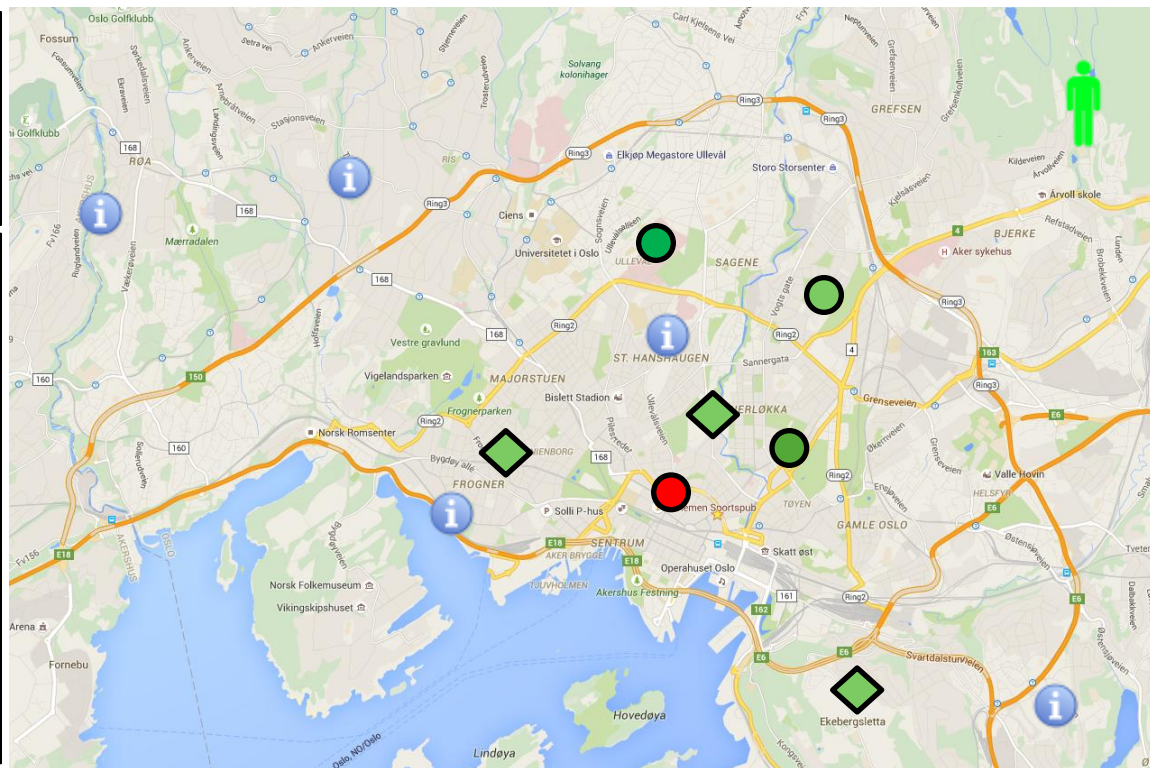
Hot-spot and route Selection

(show only the perceptions that are the same colour as the icon)



Calendar

- ☐ Select a day from... to
- ☐ Today
- ☐ Last week
- ☐ Last month



Air quality index



Disclaimer: The perceptions, marked as the icon of a person, are based on information reported by people.

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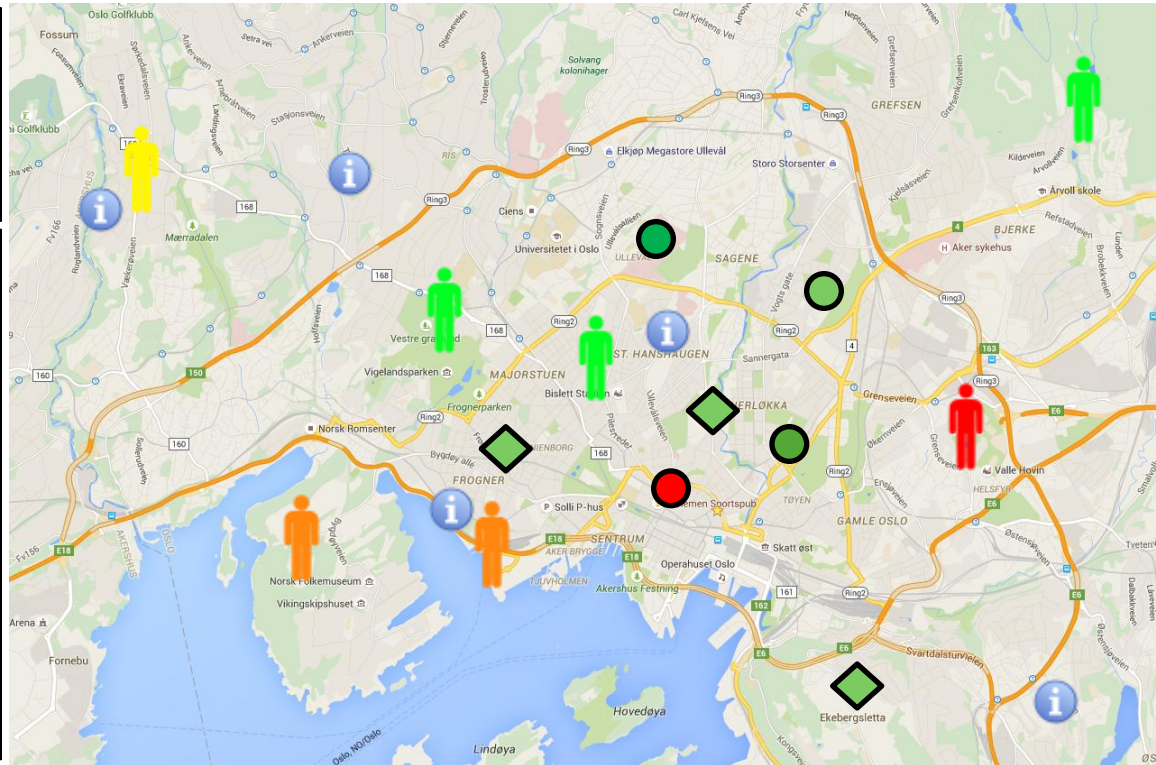
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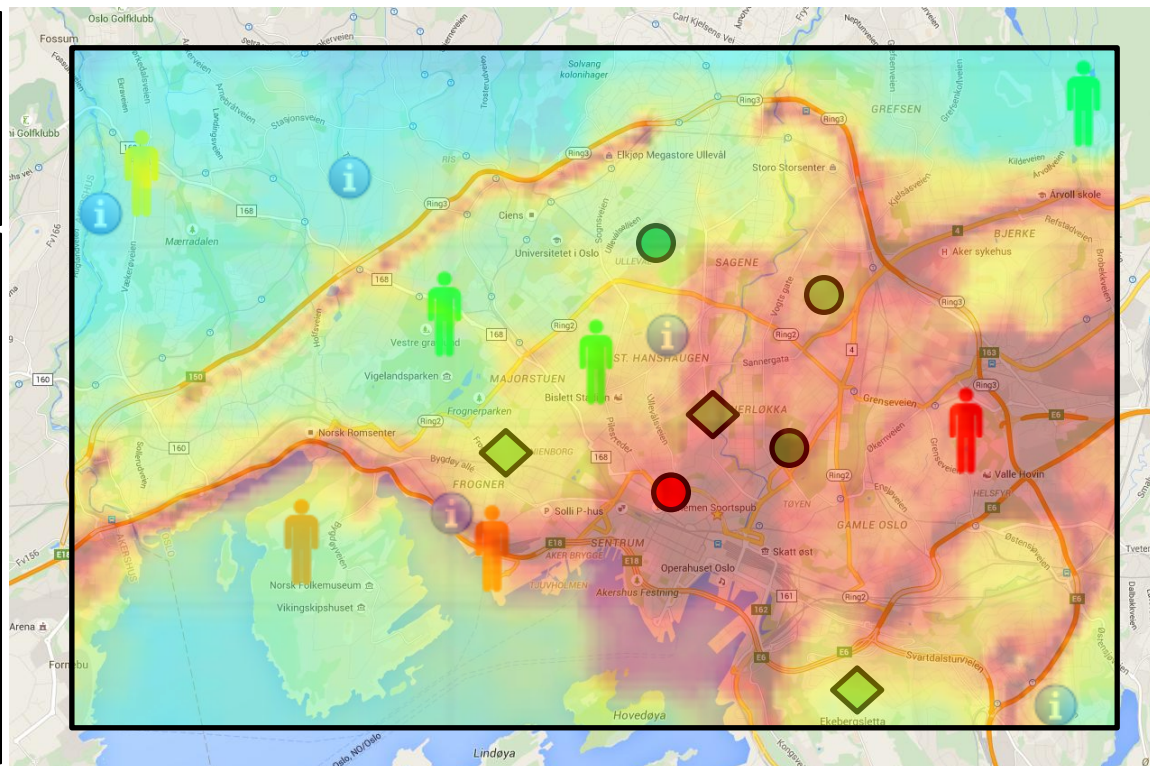
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