



interoperable Smart City services through an Open Platform for urban Ecosystems  
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Fact & Figures

- i-SCOPE, interoperable Smart City services through an Open Platform for urban Ecosystems
- i-SCOPE is supported by the CIP / ICT Policy Support Programme Pilot Type B of the European Commission
- Framework: Competitiveness and Innovation Framework Programme
- ICT PSP Identifier: CIP-ICT-PSP-2011-5
- Objective Identifier 5.1: Open innovation for Internet-enabled services in «smart» cities
- Duration: 36 months
- Project Coordinator  
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## Project Overview

The i-SCOPE project plans to develop and test technologies for the so-called smart cities services based on interoperable 3D Urban Information Models (UIM). Indeed, the latest generation of UIM, created from accurate urban-scale geospatial information, can be used to create smart web services based on geometric, semantic, morphological and structural information at urban scale level, which can be used by local governments to:

- Improve decision-making on issues related to urban planning, city management, environmental protection and energy consumption based on urban pattern and its morphology.
- Promote inclusion among various users groups through services which account for barriers at city level.
- Involve citizens at wider scale by collecting geo-referenced information based on location based services at urban scale.

Furthermore, i-SCOPE aims at providing a significant contribution to standards in the domain of smart city services, through contribution to the extension and wider adoption of CityGML as a key enabling open standard for 3D smart city services. With specific regard to this, i-SCOPE has the following goals:

- Promoting establishment of a common "Urban Information Model" (UIM).
- Accelerate the uptake of CityGML as the reference standard to support simulation.
- Extending the core CityGML open standard.
- Promoting a number of awareness activities to accelerate the uptake of CityGML as the reference standard to support urban-scale smart services, sustainable planning and simulations.

Moreover, i-SCOPE will deliver an open platform on top of which to develop three 'smart city' services, which will improve:

- Inclusion and personal mobility of aging and diversely able citizens.
- Optimization of energy consumption
- Environmental monitoring.

The Consortium

## WorkPackages

- WP1**  
Requirement analysis, system specifications, data inventory, privacy and security analysis
- WP2**  
Data collection and adaptation
- WP3**  
Smart services
- WP4**  
Deployment of "smart" services toolkit

This work package will involve the final users (i.e. city administrations) in order to collect different types of requirements necessary to drive the project activities. The involvement of the final users will take place through a series of organized workshops and interviews. The goals of this WP are to identify:

- Type of users and precise use cases.
- User and training requirements.
- Specific service requirements.
- Hardware, software requirements.
- Data, metadata and modeling requirements.
- Privacy requirements and potential vulnerabilities and risks.

All the information collected will be used in determining the software architecture for the development of the prototype.

The main goal of this WP is to provide the properly harmonized data necessary to set-up and deploy the smart services developed within WP4, which will be collected during this task. To do so, this WP will have to:

- survey available data and services.
- collect available GIS data from city administrations.
- collect key reference data through airborne surveying campaign to be used as baseline to assess effectiveness of solar potential assessment services.
- collect a significant sample noise data on the location where this pilot is planned , in order to be used for technical activities.

Within this WP, pilot-related partners will play a key role with regard to overall data collection, real-time noise data collection and airborne acquisition.

The goal of this work package is to extend standards relevant to the creation of smart services, specifically in terms of:

- Core CityGML (from OGC).
- The creation of two new ADEs (Application Domain Extension) to CityGML
- Privacy and security standards.

The goals of WP4 are:

- To develop the different smart 3D services that can benefit from CityGML urban information model. More specifically, the smart services to be developed are:
  - i. A "platform"-level CityGML data management services
  - ii. A Process management for thematic services
  - iii. High-level smart city services so as to provide inclusive routing, noise level mapping, noise level simulation, and solar energy potential assessment.
- A further goal of this WP is to deliver:
  - i. A Web client.
  - ii. A Mobile client application capable to leverage on LBS.
- The last goal is to deliver an integrated client-server solution. This task will ensure integration and extension of all technologies available to i-SCOPE, ready to be deployed as toolkit by city administrations.



i-SCOPE Partners



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- WP5 Pilots deployment and assessment
- WP6 Awareness, networking and dissemination
- WP7 IPR management and exploitation
- WP8 Project Coordination

The goals of this work package are:

- To define the deployment and evaluation methodology.
- To perform a number of assessment stages involving city administrations, which will provide the relevant feedback to the final release of i-SCOPE toolkit.
- To train operators from city administration to use i-SCOPE.

Objectives of this WP are:

- To make the project website and social networks, publications and dissemination activities, events involving citizens and experts (e.g. workshops, conferences).
- To activate dialogue and community participation with a network of other relevant initiatives, as well as with ICT PSP joint working group.
- To establish interrelated regionally rooted stakeholder networks through the creation of a Smart City 3D Services (SC3S) Living Lab.
- To promote a i-SCOPE challenge so as to incentive take-up of i-SCOPE results and early adoption by interested citizens.

The objective of this WP is to delineate a common strategy towards exploitation of i-SCOPE tangible and intangible results. This comprises the:

- Editing of an exploitation plan, to be regularly updated during the project.
- Definition of IPR and Licensing policy.
- Creation of a market and business plan.
- Definition of a Service Level Agreement (SLA).
- Formal creation of a S3S EEIG (Smart 3D Services European Economic Interest Grouping) to extend the scope of the project beyond the project duration and EU funding.

The main objectives of this WP are:

- To ensure all formal procedures, including contractual agreements, are properly dealt with.
- To ensure the project's goals and objectives are met in compliance with the project work plan.
- Risks are properly monitored and relevant countermeasure taken.
- Highest quality standards are met.
- Costs are compliant with initial budget.

## The Pilot Scenario

The smart services proposed address the following three scenarios:

- Improved inclusion and personal mobility of aging people and diversely able citizens;
- Energy dispersion & solar energy potential assessment;
- Noise mapping & simulation.



### Scenario 1: Energy dispersion & solar energy potential assessment

The first scenario of i-SCOPE project deals with Energy dispersion and solar energy potential assessment.

In general, this scenario reflects the importance of renewable energies and reflects this in the project. There, it exemplarily handles both aspects, the generation of energy with solar panels on building roofs as well as the heat losses on building at a roof level. The integrating factor between the two aspects of the scenario is the CityGML based data-structure, which allows handling with a 3D city model enriched from both directions with a classification regarding the solar power potentials of the building roof and a classification of the heat loss too. Both aspects can be evaluated as separated from each other or in an integrated way. Thus, the scenario provides an appropriate knowledge-base and a support system for energy related spatial decisions.

For the solar energy potential assessment, a 3D city model is generated based on the projects platform infrastructure. This model can then be used:

- to assess the solar power potential considering the exposition and inclination of the roof surfaces,
- to assume the roof coverage with solar panels and to estimate the related investments and benefits, or
- to simulate the effect of planning to the solar power potentials.

Heating loss is captured based on infra-red areal surveys. The information gathered from this sensor is used to perform a classification of the building roofs. It can be used to identify urban areas where energy saving activities would be appropriate: starting from an image based data capturing process, the scenario will not only allow the storage and use of semantics (classification) generated throughout the process, but will also enable using the images themselves as textures to the 3D city model.





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The information generated throughout the mentioned processes is managed in a CityGML schema that is currently under development within the project. The information is always managed on a building level; nonetheless, the scenario addresses rather regional decision makers that owners of single buildings. This level defines the requirements towards the data acquisition and modelling, the simulation processes and the final results themselves. While using the system, users will have the chance to access the information stored in the project's 3D city model database novaFACTORY or to initiate the mentioned analyses, simulations and processes. Results can enrich the existing dataset, can be used to generate an independent scenario related dataset or handled as a temporarily evaluation scenario. Decision makers can again access the same database and visualize, evaluate and compare the information. The entire system is web-based and allows the access to the information and processes for an office, meeting facility or mobile client.

This flexible approach allows the user the following processes, for instance:

- Example 1 - Establishing the smart city knowledge pool on energy.  
 So as to motivate citizens in contributing to the power generation by implementing solar panels or to invest in insulation to avoid heating losses, city administration performs a solar power potential assessment and captures the heating losses based on the i-SCOPE technology. This information is published to the citizens, which can view the loss and potential classification of their own buildings and can decide about appropriate activities and potential investments.
- Example 2 - Assessing the affect of a new building to existing and potential solar panels.  
 When getting the request for approving a new house being built, city administration workers can access i-SCOPE technology. The database provides them with the current status of solar potentials in the surrounding of the new house. By using the platform technologies, the new house can be inserted as a scenario dataset to the platform and can be used to recalculate the solar power potentials of the surrounding and to estimate the impact of the new house by comparing the original and the scenario dataset.

Scenario 2: Noise mapping & simulation  
 This Pilot. The The • To



Roof classification for solar power potentials



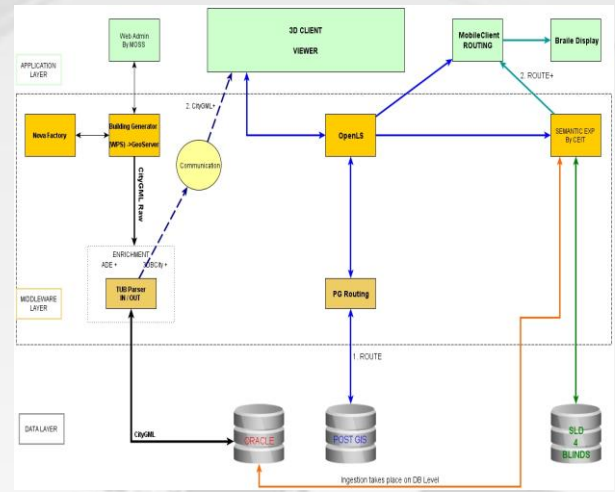
**Scenario 3: Improved inclusion and personal mobility of aging people and diversely able citizens**

The i-SCOPE project will develop inclusive routing that will be targeted for visually impaired and wheelchair users. The results of route planning can be made available for blind people as spoken instructions. Unlike route planners, the innovativeness of the application lies in the fact that the blind are not guided in a linear fashion through the city. Instead, they are offered the possibility to experience and understand city spaces, streets, places, parks, etc. as spatial constructs.

The idea is not to navigate the user, but to open up the chance for the user to navigate himself by interactively discovering web-based city maps. The aim is to provide a holistic description of the urban space which means that the user should be able to discover as many attributes of a street section as possible to get a better image of the city. This image – or mental map – should include information about streets, intersections, blocks, points of interest, possible causes of risk, etc. and their spatial relation to each other. The elements of the map need to be described in a semantic way that is adapted to the requirements of pedestrians, especially blind and visually impaired ones.

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### System Architecture



Routing architecture overview

i-SCOPE system architecture document is aimed to design the platform of software components and the client applications already developed by the consortium partners:

- City model management and ingestion technology by MOSS.
- Noise simulation component by MOSS.
- Noise mapping client and server technology by Sony CSL (for FP6 project TAGora) and VUB (open source).
- Mobile 3D/AR client (with OpenLS support) by FG.
- Spatio-temporal processing services developed by project (coordinated by FG).
- Solar potential assessment technology, available from MOSS and as open source through GRASS project, under responsibility of MOSS.

- Semantic description technology (for creation of visually-impaired-friendly routing instructions) developed by CEIT.
- Mobile client technology supporting visually-impaired-friendly visual, spoken, and Braille output, developed by CEIT

The final i-SCOPE platform is being specified and implemented as an open design in a pre-competitive environment that provides easy customizability for better integration with existing platforms. The approach is 'User-Centered Design' (UCD), also known as 'pervasive usability', in which specific attention is paid by users to the final infrastructure at each stage of the design process.

The entire i-SCOPE architecture has been designed according to the classical multi-tier (layer) system with a communication paradigm based on open source service oriented architecture, where each component (service), interacts with the others through a set of messages written in a standard format. With the term service, we do not only include each one of the three layers but also all the components inside them, allowing the integration of several multifaceted computational units inside a unique system.

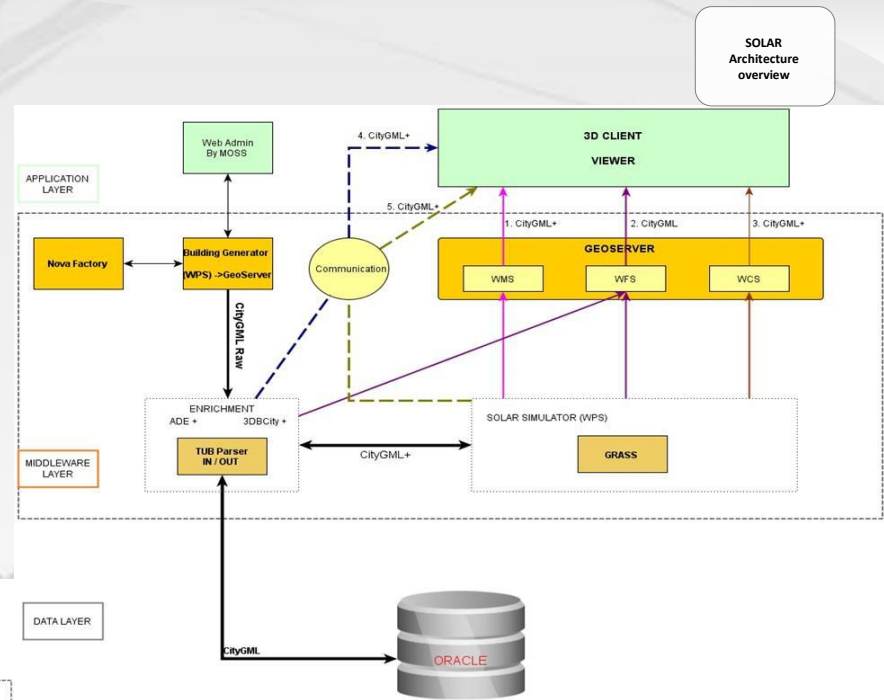


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At the lowest **data level** all the different datasets (both static and real - time) are made available within the network by the different content providers: noise, routing and solar. The data repositories are based on CityGML format which is enriched by ADE and 3DBCity. Beside this format there are multiple different data formats that are necessary for routing and noise scenarios. At the **middleware layer** on the left side of each architecture diagram can be noticed the same 3D Platform which is a main i-SCOPE toolkit for CityGML manipulation and handling.

This is a core low middleware level and the rest of the middleware layer components communicate with 3D Platform to get reliable and correct data. Noise, routing and solar architecture contains different web services at middleware layer and they are based on OGC standards (WMS, WFS, WCS, WPS, OpenLS). Different software is used for web services implementation and deployment: GeoServer, NovaFactory, Building Generator. Additionally it is important to underline that services will be based on a number of heterogeneous software platforms.

Different parts of i-SCOPE have been already developed and will be integrated within a single framework. Most components have been developed in Java, Ruby, and PHP to name but a few. 3D Clients, Web clients and Mobile clients at **application layer** are used for visualization as a common comprehensive interface. The main goal of the developed software (Applets) is to visualize the information provided by the middleware layer.



SOLAR Architecture overview



NOISE Architecture overview



i-SCOPE integrates a number existing technologies as federation of interoperable web-services which will ensure interoperability through support of OGC standards. The project is based on use of CityGML as Urban Information Model on top of which 3D smart city services are created. Smart services will be accessible via a web-based 3D client as well as through mobile applications that is used to crowdsource environmental (noise) data from the citizens. To do so i-SCOPE implements technology as Location-Based Service. For this reason i-SCOPE develops trustable, secure privacy schemes to ensure the highest level of protection of users' information. Finally i-SCOPE will use ultrafast internet technologies (two fiber-optic regional-scale networks).



## Key Past Events

i-SCOPE was present in various conferences and events in many cities in Europe.

Among the most relevant we list:

- **CORP Conference** ([www.corp.at](http://www.corp.at)), where i-SCOPE submitted a scientific paper and had a presentation.
- **Zagreb Energy Week**. The 16th of May 2012, dr. Raffaele De Amicis participated to the international Conference "Local and regional authorities in the process of Sustainable Energy Development" within the Zagreb Energy Week, with a presentation on the project i-SCOPE.
- **COST Workshop**. Carsten Roensdorf from Ordnance Survey presented the i-SCOPE project at the COST action TU 0801 workshop focused on the semantic enrichment of 3D city models. The meeting took place on 13rd april 2012 in Madrid, Spain, attended by approx 35 participants from across Europe.
- **OGC TC Meeting**: A presentation to the Open Geospatial Consortium 3D Information Management Domain Working Group was given to introduce the iSCOPE project, the use cases we will be working on as well as setting the expectation to receive standardisation requirements for CityGML in the future. The meeting took place on 21st march 2012 in Austin, Texas (USA), attended by approx. 30 experts in geospatial technical standards with a further 50 experts expected to view the presentation on the OGC web portal. More information are available at the event website: <http://www.opengeospatial.org/event/1203tc>
- **Workshop on ICT Innovations**. Graphitech joined the Workshop on ICT Innovations (19-21 march 2012) with a presentation on i-SCOPE project. The title has been: "From research to innovation: a European perspective on Internet of places. Geointelligence for society."

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### Festival dell'Economia 2012: Smart City. How Internet and ICT new technologies change people and generations lifestyles

In the setting of the Festival dell'Economia of Trento, a conference on "Smart City. How Internet and ICT new technologies change people and generations lifestyles" was held the 2th of June 2012 at 17:00, in the Kessler Room of the Faculty of Sociology, University of Trento, Via Verdi 6 (TN).

This event, organized by Informatica Trentina and Fondazione Graphitech within the EU project i-SCOPE, has had the aim of "exploring cities and territories opportunities, outlining the existing changes scenario and activating a comparison on how Internet and ICT new technologies can change people and generations lifestyles and relationships in a urban setting and not only".

The main subject will be developed with the "Smart cities. Smart citizens" speech by **prof. Carlo Ratti**, Director of the SENSEable Lab of the MIT (Boston, MA, USA) and considered as one of the leading person on the subject. Prof. Ratti will explain scenario and opportunities of the future cities and "smart territories", where the new generation communication networks, applications and accessible data (through smartphones and tablets), will help to improve life, work and relationships quality.

### INSPIRE Conference 2012

The INSPIRE Conference 2012 took place from Saturday 23rd – Wednesday 27th June 2012 in Istanbul, Turkey. The theme of this year's edition was "Sharing environmental information, sharing innovation".

Fondazione Graphitech attended it with a presentation of the project: Paving the way to smarter cities.

For more information, i.e. the agenda of the meeting and the speakers' list, go to the following website: [http://inspire.jrc.ec.europa.eu/events/conferences/inspire\\_2012/](http://inspire.jrc.ec.europa.eu/events/conferences/inspire_2012/)

## INSPIRE CONFERENCE ISTANBUL JUNE 2012



Photo of the workshop at the INSPIRE 2012 conference



## Future Events

The project will be further disseminate through the participation to:

- The International EUROSUN2012 conference. Partners Evrogeomatica and Indjija will attend this conference, which will be held in Opatija, Croatia on September 2012.
- SIGGRAPH 2012 Conference. Fondazione Graphitech will attend this international conference from the 5 to the 9 of August 2012, in Los Angeles USA.
- International Meeting. Partner Gistandards will attend an international meeting in San Diego USA the 22<sup>nd</sup> of July 2012 and here the project will be presented.
- CEN/TC 287 Edimburgh . The project will be presented by partner Gistandards in occasion of the CEN/TC 287 workshop, which will be held on Edimburgh (Scotland) the 12<sup>th</sup> of September 2012.
- AGI Conference, Edimburgh. The project will be presented even in occasion of the AGI Conference, which will be held on Edimburgh (Scotland) the 12<sup>th</sup> of September 2012.

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## Project Meetings



### Kick-Off Meeting

The first (kick-off) project meeting was held in Brussels, Belgium, on the premises of the Vrije Universiteit Brussel, from the 23<sup>rd</sup> to the 25<sup>th</sup> of January 2012. The purpose of the meeting was to introduce the project and its work packages. All consortium members, EC project officer, advisory group members, related project representatives and invited guests attended the meeting.

The project was officially introduced by the project coordinator (Raffaele De Amicis - Fondazione GraphiTech), and then followed by the presentation of all the partners institutions. Next, the agenda of the first day also included presentations of each work packages by the WP leaders, which then continued on Day 3. The second day all the partners participated to the CIP, OPEN INNOVATION FOR SMART CITIES CONSTITUENCY BUILDING WORKSHOP organized by the European Commission, while in the 3<sup>rd</sup> day, after the presentation of the final WPs, there has been the description of the project management, with general information concerning project handbook, the appointed roles, communication practices, the procedures for quality and risk management, and the reporting procedures.

### Malta Meeting

The second project meeting was held in St Julians, Malta, from the 12<sup>th</sup> to the 14<sup>th</sup> of June 2012. The meeting was hosted by the project partner GEOSYS.

During the meeting the state of the art of the project activities was presented. Presentations were given by the work packages leaders, the task leaders and the project coordinator. The third day started by presentation regarding the project management issues which was given by the project coordinator, while in the afternoon the sorting out of technical issues was discussed during the technical board meetings.



Photo of the Festival dell'Economia 2012



## Publications

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Within the project, some publications have been made, i.e.:

- *Mapping of potential of roofs for the solar energy assessment*, Ivan Vučetić.
- *Development of "smart city" services for the support of energy-efficient society*, Protić et al. (EGEO team), within the Environmental protection and energy efficiency conference, <http://www.sits.rs/include/data/docs0341.pdf>.
- *I-SCOPE. Interoperable Smart City services through an Open Platform for urban Ecosystems*, Raffaele de Amicis, Giuseppe Conti, Daniela Patti, Martin Ford, Pietro Elisei, within the REAL CORP 2012 conference.
- *Use of OGC Web Standard for a Spatio-Temporal Enabled SDI for Civil Protection*, Federico Prandi, Raffaele De Amicis, Giuseppe Conti, Alberto Debiasi, WEB3D 2012, within SIGGRAPH CONFERENCE.
- *Pervasive Touristic Location Based Service Mobile App with a Social Perspective*, Umberto di Staso, Raffaele De Amicis, Gabrio Girardi, Federico Devigili, WEB3D 2012, within SIGGRAPH CONFERENCE.
- *Mapping of potential of roofs for the solar energy assessment*, Ivan Vučetić, Faculty of Civil Engineering, University of Belgrade, 22 March 2012.
- *Development of "smart city" services for the support of energy-efficient society*, Protić et al, Association of Engineers of Belgrade, May 2012, <http://www.sits.rs/include/data/docs0341.pdf>.
- *I-SCOPE – Smart Geo-Services für innovative Stadtentwicklung*, Ines Döring, Daniel Holweg, within the AGIT2012 Conference (www.agit2012.at).
- *Participatory noise mapping*, Ellie D'Hondt, Matthias Stevens, on the Adjunct proc. 9th Int. Conference on Pervasive Computing,, June 2011, <http://www.noisetube.net/publications/Pervasive2011.pdf>.
- *Citizen Noise Pollution Monitoring*, Nicolas Maisonneuve, Matthias Stevens, Maria E. Niessen, Peter Hanappe, Luc Steels, in Proceedings of the 10th Annual International Conference on Digital Government Research (dg.o2009), May 2009, <http://www.noisetube.net/publications/DG.O2009.pdf>.
- *NoiseTube: Measuring and mapping noise pollution with mobile phones*, Nicolas Maisonneuve, Matthias Stevens, Maria E. Niessen, Luc Steels, in Proceedings of the 4th International Symposium on Information Technologies in Environmental Engineering (ITEE 2009), Thessaloniki, Greece. May 28-29, 2009, <http://www.noisetube.net/publications/ITEE2009.pdf>.
- *Crowdsourcing of Pollution Data using Smartphones*, Matthias Stevens, Ellie D'Hondt, in Proceedings of the Workshop on Ubiquitous Crowdsourcing, held at ACM conference on Ubiquitous Computing 2010 (UbiComp2010), Copenhagen, Denmark, Sep 26-29, 2010, <http://soft.vub.ac.be/Publications/2010/vub-tr-soft-10-15.pdf>.
- *Context-aware Resource Sharing for People-centric Sensing*, Jorge Vallejos, Matthias Stevens, Ellie D'Hondt, Nicolas Maisonneuve, Wolfgang De Meuter, Theo D'Hondt, Luc Steels, presented at the First International Workshop on Software Research and Climate Change (WSRCC-1), part of Onward! 2009 (co-located with OOPSLA 2009) in Orlando, USA, Oct 26, 2009, <http://soft.vub.ac.be/Publications/2009/vub-soft-tr-09-04.pdf>.
- *Measure and map noise pollution with your mobile phone*, Nicolas Maisonneuve, Matthias Stevens, Luc Steels, in Proceedings of DIY for CHI: Methods, Communities, and Values of Reuse and Customisation, workshop held at the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI 2009), Boston, USA, Apr 4-9, 2009, <http://www.noisetube.net/publications/DIYforCHI2009.pdf>.
- *Participatory noise mapping works! An evaluation of participatory sensing as an alternative to standard techniques for environmental monitoring*, Ellie D'Hondt, Matthias Stevens, An Jacobs, Under submission. Dec. 2011, <http://www.noisetube.net/publications/partnoisemaps.pdf>.
- *Participatory noise pollution monitoring using mobile phones*, Nicolas Maisonneuve, Matthias Stevens, Bartek Ochab, Information Polity, 15(1-2):51-71, Aug 2010, <http://www.noisetube.net/publications/IP2010.pdf>.

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The I-SCOPE project is also promoted through several social networks including Facebook, LinkedIn, Twitter and YouTube. These can be accessed at the following addresses or through the QR codes next to each of the social network's logo.

Linked-in:  
[http://www.linkedin.com/nhome/?report%2Efailure=Y\\_3359WMVZNO-yw1mZvHx4RG-k5CrARJIYIYv9KXZyyIkFDEqYzRfXn8ICX0rAiaArzPK5KO18g06AaaPUpCW5Q8q8Ja79bNmxeW5UXP85z85UEPY0YID\\_3Ar58tkWE](http://www.linkedin.com/nhome/?report%2Efailure=Y_3359WMVZNO-yw1mZvHx4RG-k5CrARJIYIYv9KXZyyIkFDEqYzRfXn8ICX0rAiaArzPK5KO18g06AaaPUpCW5Q8q8Ja79bNmxeW5UXP85z85UEPY0YID_3Ar58tkWE)

Facebook:  
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YouTube:  
<http://www.facebook.com/pages/iscop4eu/286235631430210>

Twitter:  
<http://www.facebook.com/pages/iscop4eu/286235631430210>