

WeSense: Social Sensing the Quality of Urban Environments

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WeSense is a research and valorisation project to help create cities that are more attractive, healthier, equitable and safer. **WeSense** will develop and apply mobile technologies and Social Media Information System (SMIS) to qualify public urban spaces. The project aims to:

- Contribute to the scientific knowledge base on environmental perception related to landscape architecture and urban planning;
- Improve the insights of administrations into citizen perception, use and valuing of public urban spaces for policy making and planning of public space;
- Provide a platform for citizen and stakeholder interaction to enhance public involvement in urban space related issues.

WeSense is an integrated platform that includes a mobile phone app and web-based Social Media Information System. It will be developed in two stages:

1. Pilot stage with test implementation in the metropolitan region of Amsterdam;
2. Follow up stage with full implementation in Amsterdam, to be followed in other cities in the Netherlands and abroad.

In the Pilot stage the WeSense project will develop:

1. A systematic and verifiable method to collect data on citizen's perception, use and valuing of the public urban environments in Amsterdam.
2. A mobile phone application for social sensing.
3. A demonstration version of the website to show the basic functions of the future SMIS and present the results of the pilot stage.
4. A method to provide direct, simple and visually appealing feedback of responses on both mobile phone app and a website.

In the Follow-up stage the WeSense project will develop:

1. An approach to best display information of perception, use and valuing of public urban spaces as a complete Social Media Information System.
2. A platform to raise awareness of citizens and stakeholders about the perceived quality and existing experiences of public urban environments.
3. A platform where citizens and stakeholders can act together in matters arising from collected information.

1 Environmental Perception and Urban Governance

People's perception of the urban environment is important for spatial planning and design. This can be used in a number of ways to support both operational and strategic decisions. The problem of understanding environmental perception is often associated with lack of objectivity and reliability of the research methods used (Colin, 2013; Tisma et al., 2015). It is an established practice in spatial decision-making to act in accordance with an expert-based interpretation of the citizens' needs, originating from theoretical studies and empirical research. However, in many cases, citizens' experiences differ from those of experts (Kaplan, 1985; Kytta, 2011). The aim of the WeSense technology is to help solving the discrepancy between these two.

More and varied data and direct involvement of citizens in the decision-making process can overcome issues resulting from this difference (Campagna, 2014). Mobile computing devices can be used to involve citizens in decision-making, asking them to deliver data, information or opinions and using these to measure and map environmental perceptions. This type of data collection is termed crowd sensing or social sensing. Social sensing as a data collection and research method can provide direct provision of dynamic data. In this way it overcomes weaknesses of traditionally used research methods (survey, surrogate landscapes, manipulated photos, 3D visualizations, soft GIS, etc.). Surveying people at the moment of experience avoids biases, provides high resolution data and enhances the objectivity of results. Additionally, this process can have educational value as measurement at temporal frequency raises awareness about the quality of the surroundings (McKerron, 2013). Social sensing is seen as a promising method for rapid collection of localized data that allows administrations to react adequately, timely, and efficiently to problems in specific locations. The use of such data can improve the quality of urban environment and forms a part of the smart city concept. This can stimulate innovative planning concepts.

2 Citizen interaction and participation

One of the ways citizens can be involved in decision-making is to ask them to deliver data, information or opinions by using mobile computing devices. Research into Volunteered Geographic Information (Goodchild, 2007) has flourished in the last half-decade. Data from mobile phones have been used in geography and social science research, mostly in a common format called 'Call Data Record'. Empirical studies of complex city systems which use Call Data Record already provide new insights to develop promising applications for supporting smart city initiatives (Steenbruggen et al., 2014). By now many versions of mobile phone apps as well as social media information systems have been used in studies in environmental issues such as air and water pollution, noise impact, traveller behaviour, transit information exchange or hazard and risk assessment.

The widespread popularity of social media enables their use to access, collect and share important knowledge on diverse topics (Campagna, 2014). Social networks are proven to be useful in different domains such as environmental monitoring, crisis management, disaster management, situation awareness, stock market prediction and urban planning. Therefore, within the context of urban planning, social media may be considered as a valid supplement to participatory platforms in order to gain insights and ease the study of local communities' perceptions, opinions and needs.

3 Research objectives

The main objective of the **WeSense** project is to develop mobile media infrastructure to improve the insights of urban administrations into citizen perception, use and valuing of public urban spaces. This information will greatly assist policy-making, planning and design of public space. Spatial decision-making is currently done using expert-based interpretations of people's needs, or by lengthy survey procedures. In many cases however, citizens' experiences differ from those of experts, and survey procedures are lengthy and expensive. The aim of the WeSense technology is to address these two problems in a concrete way. A collateral advantage (and secondary objective) of the project is to develop a platform for citizen and stakeholder interaction to enhance public involvement in urban space related issues. The project is also expected to contribute to the scientific knowledge base on environmental perception related to landscape architecture and urban planning. Environmental perception research into urban environments is presently patchy and sometimes even contradictory. Methods used are also often criticized for the lack of

objectivity and scientific rigor. Insights into perception of urban environment can thus be expected to benefit from social sensing projects in terms of amount and type of data collected. Academic expertise on the applications of digital technology in landscape research and planning can also be expected to be boosted by the project.

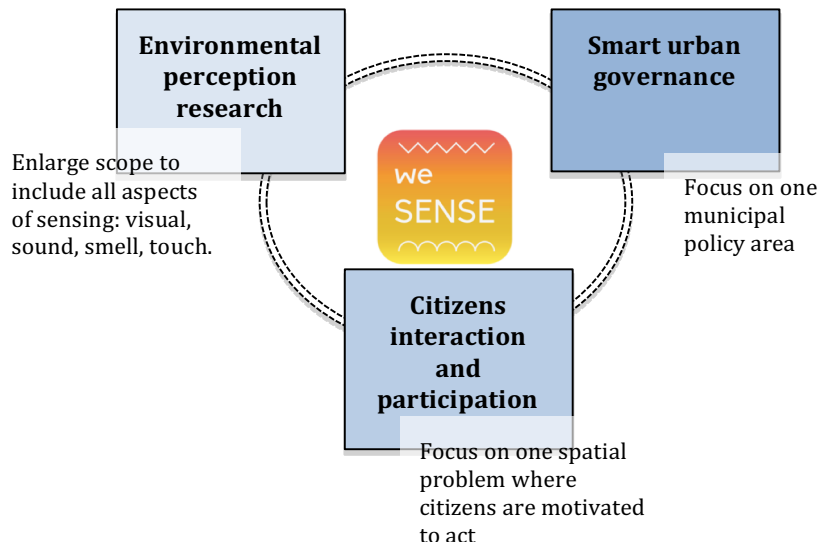


Figure 1. Positioning WeSense research

4 Expected Results

The expected results of the **WeSense** platform are:

- the enabling of situated data collection from citizens on how they experience an outdoor space *while* they are there;
- the enabling of participatory sensing by mapping people’s subjective experience;
- the enabling of high resolution data collected in a wide variety of metropolitan spaces and conditions (e.g., time of the day, day of the week, season, etc., weather, activity, company, state of mind, crowdedness, space, population);
- reliable/accurate data which supports objectivity by involving statistically valid numbers of people to actively participate and contribute;
- the incorporation of multiple sensorial aspects: visual, audible, olfactory and haptic experiences.

Data collected by social sensing will be aggregated, analysed and displayed on the website in the form of perception maps. The **WeSense** platform will produce an additional layer to the currently available standard information that the municipality presents on the website www.maps.amsterdam.nl, such as land use, topography, air pollution, etc. WeSense will also realise an additional tool for the City Dashboard (www.citydashboard.waag.org). By linking perception data layers with the physical data layers the overlaps and/or discrepancies between physical reality and perceived quality of the living environment will become transparent. The new insights in differences between laymen and expert opinions will form a basis for smart and tailored spatial policy development. Additionally this can become a basis for citizens groups around specific issues or areas resulting in joint actions and initiatives in cooperation with the local government.

In the first year the results the research will be published in a scientific and/or professional journal, on the project website and in a final report. Outcomes will be disseminated through media and social networks. Two workshops with stakeholders in Amsterdam are planned,

one intermediate and one at the end of the project. At the end final report will be written. The app will be also used for educational purposes.

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