Deliverable D 5.3

Methodology and protocol for citizens' empowerment

Work Package 5

Date: 27.11.2015

Version: 1.1

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Dissemination level:	RE (Restricted)

Versioning and contribution history

Version	Date issued	Description	Contributors
0.1	24.04.2015	First draft of the outline	H Cowie, F Hurley, H Keune, K Cada
0.2	09.07.2015	Revised to incorporate comments from WP5	H Cowie F Hurley, H Keune, K Cada, S Grossberndt, W Verheyden
0.3	27.10.2015	Revised to incorporate comments from the peer review	H Cowie
1.0	28.10.2015	Final editorial comments	S Grossberndt
1.1	27.11.2015	Final edit to incorporate editorial comments	H Cowie

Peer review summary

Internal review 1			
Reviewer	William Lahoz		
Received for review	31 August 2015	**Date of review**	1 September 2015

Internal review 2			
Reviewer	Sofia Aivalioti		
Received for review	29 September 2015	**Date of review**	6 October 2015

Executive Summary

The present report, being the third formal Deliverable of CITI-SENSE Work Package 5 Participation and Empowerment (WP5), is the second phase of the work begun and reported in D5.2 on developing and presenting the methodology (principles and criteria) and protocol for citizens' empowerment, including inclusive risk governance.

Aim

The ultimate aim of the work reported here was to prepare the LOs, together with the members of WP5, to implement best practice in engagement and empowerment of a range of stakeholders during the main study; with a major purpose for WP5 to support, both methodologically and through practical help, the detailed planning of the full implementation in each city.

Methods

Key to the achievement of this aim were three very interactive and collaborative workshops with WP2 and 3 involvement.

  a. The first workshop-meeting was held in late September 2014 in Barcelona, principally for WP5 but also attended by leaders of WP2/3, with the aim of developing coherence and skills for communication and empowerment using a stakeholder communication framework, in order to optimise the support from WP5 to the LOs in the implementation of the EIs.

  b. This was then strengthened and expanded in a larger workshop in Oslo in early December 2014, for all of WP5, 2 and 3. The overall aim of this meeting was to develop a plan for engagement and empowerment in the main study implementation of the EIs.

  c. Finally, there were further collaborative meetings during and immediately after the CITI-SENSE full consortium meeting in Barcelona in March 2015.

All these meetings were jointly planned with WPs 2 and 3 and well-structured to ensure small team discussions and active participation. They succeeded in establishing a very good collaborative understanding and atmosphere, focused on practical issues that need to be in place for the full implementation.

In addition, a comparative analysis of the experience of the different EIs through the period of the pilot study was carried out, with the aim of identifying cross-cutting issues and integration issues across locations and of drawing lessons from all the pilot studies which will be informative for implementation of engagement and empowerment in the main study. The outcomes of this comparative analysis will also contribute to the final evaluation of engagement and empowerment of the study as a whole.

Results

The work has led to development of very practical collaboration products for use in the main study fieldwork. These products are focused on crucial issues such as perception monitoring (two methods are now being finalised, an app for 'just-now' monitoring of perception, and a questionnaire for assessing longer-term perspectives on air quality); data-related issues have been discussed and draft plans made (for user agreement, data flow including sensitive issues of confidentiality, data visualisation for individuals and for the public – this was led by WP7, assisted by WP1) and more general issues of communication (e.g. on air quality and health) have been considered. The principle of co-design with user involvement has been highlighted and discussed and is being implemented in some locations on particular issues.

The comparative analysis was complicated by the differential quality of information provided; the detailed planning and recording forms from D5.2 were been used consistently. The exercise has however helped to highlight the need for consistent reporting, even if this seems a burden to already hard-pressed LOs. In the coming months this work of Task 5.5 (Coordinated analysis across empowerment initiatives) will be further developed and operationalized for D5.4 'Methodological study to support the representativeness of citizens' participation and beyond'.

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1. Introduction

1.1 Background and purpose

As its name suggests, the present report, being the third formal Deliverable of CITI-SENSE WP5 (Participation and Empowerment), follows on from the earlier deliverable D5.2 'Methodology and protocol for citizen empowerment and decision making (phase 1)'. It is is the second phase of the work begun and reported in D5.2 on presenting the methodology and protocol for citizens' empowerment. D5.2 had itself drawn on

a. A literature review (D5.1 'Baseline for studying citizen participation and empowerment');

b. Further discussions within WP5;

c. Increasing collaboration and contacts between WP5 and the EI WPs: WP2 (outdoor air quality in cities) and WP3 (maintainted public spaces in cities; indoor air quality in schools); and

d. The increasing clarity of purpose of CITI-SENSE as a whole, especially regarding to what extent the engagement and empowerment aspects of CITI-SENSE are dependent on having available sufficient sensors, functioning reliably enough and to good enough quality.

On this basis and on their own knowledge and experience, VLAGEW-INBO especially had developed an extensive set of materials, with detailed supporting documents, to assist the EIs and colleagues in WP5, in preparing and carrying out the engagement and empowerment aspects of CITI-SENSE, including in recording systematically the work that had been done, with a view to analysing it coherently later (for D5.5 'Co-ordinated analysis across empowerment initiatives', June 2016). This is what was reported in D5.2, as Phase 1 of presenting the methodology (principles and criteria) and protocol for citizen empowerment including inclusive risk governance.

The main purpose of the present report is to follow on from D5.2 and present Phase 2 of the methodology (principles and criteria) and protocol for citizen empowerment, including inclusive risk governance.

1.2 What has happened in the interim (Methods for the present report)

While WPs 2 and 3 understood from the beginning the importance of engagement and empowerment, initially these issues seemed either remote or difficult, because their main interest was on getting the pilot studies going and having sensors that worked dependably well. Location officers (LOs) were understandably reluctant to engage with city stakeholders until they could be confident of being in a position to do reliable monitoring.

At the same time, as the period of direct preparation for the main study intensified, issues of stakeholder engagement have been prominent across the project. This was centrally so in the connections between WP5 and WPs 2/3, where connections on the individual level (i.e. for each EI, between the LO and the nominated WP5 contact person) became more frequent and more practice oriented. These were supplemented by regular (fortnightly) WP5 web based telephone conferences (GoToMeetings – GTMs) and occasional GTMs between the leaders of WP5 and the leaders, respectively, of WPs 2 and 3. Development of particular aspects involved also liaison between WP5, variously WPs 2 and 3, and WP6 (Methods - Information Products and Services; i.e. data visualisation and products), WP4 (Citizens' Observatory (CO)), WP7 (Methods - Communication Platform; i.e. data

flow), WP9 (Dissemination, Exploitation & Training) and of course WP1 (Management and Administration). (Links with WP8, Sensor Platform, have mostly been indirect, via WPs 2 and 3.)

Key to this there have been three very interactive and collaborative workshops with WP2 and 3 involvement.

d. The first workshop-meeting, in late September 2014 in Barcelona, for WP5 and leaders of WP2/3, was crucial in giving direction and momentum to the collaboration between WP5 and WPs 2 and 3, to reflect on the usage of D5.2 and to further develop together the materials and plans for the work of the past 6 months (Oct 2014 to Mar 2015);

e. This was strengthened by a larger workshop in Oslo in early December 2014, for all of WP5, 2 and 3;

f. Finally, there were further collaborative meetings during and immediately after the CITI-SENSE full consortium meeting in Barcelona in March 2015.

All these meetings were jointly planned with WPs 2 and 3 and well-structured to ensure small team discussions and active participation. They succeeded in establishing a very good collaborative understanding and atmosphere, focused on practical issues that need to be in place for the full implementation.

This has led to development of very practical collaboration products, aiming on crucial issues such as perception monitoring (two methods are now being finalised, an app for 'just-now' monitoring of perception, and a questionnaire for assessing longer-term perspectives on air quality); data-related issues have been discussed and draft plans made (for user agreement, data flow including sensitive issues of confidentiality, data visualisation for individuals and for the public – this was led by WP7, assisted by WP1) and more general issues of communication (e.g. on air quality and health) have been considered. The principle of co-design with user involvement has been highlighted and discussed and is being implemented in some locations on particular issues.

In addition, first steps were made on developing comparative analysis regarding the experience of the different EIs through the period of the pilot study. In particular, as described in detail in Chapter 3 of this report:

a. A draft analytical framework has been developed to guide the project through to completion; and

b. First attempts have been made at a co-ordinated analysis across EIs, based on materials already available.

This has been complicated by the differential quality of information provided; the detailed planning and recording forms from D5.2 have not been used consistently. The exercise has however helped to highlight the need for consistent reporting, even if this seems a burden to already hard-pressed LOs. Additionally, special difficulties occurred in Ostrava, to the point that work there was something of an 'outlier' compared to the other cities, and so it was not included in the comparative analysis. In the coming months this work of Task 5.5 (Coordinated analysis across empowerment initiatives) will be further developed and operationalized for D5.4 'Methodological study to support the representativeness of citizens' participation and beyond'.

There is one final important contextual point. One major purpose of all of this work was to support, both methodologically and through practical help, the detailed planning of the full implementation in each city, especially in respect of its engagement and empowerment aspects. However, the detailed city-specific plans form the basis of the relevant deliverables D2.3 'Recruitment assessment, report and plan for Phase 2: Full Implementation' from WP2 and D3.3 'Recruitment Assessment and Plan for Phase 2: Full Implementation' from WP3.

The present report (D5.3) does not wish to repeat this work and so these city-specific engagement plans are not included here. Instead, the present report focuses on (i) the many other project-wide aspects of the work to build collaborations between WPs 2/3 and WP5 in the clarifying what needs to be done in the full implementations and in building or refining methods and tools to do this, and (ii) on the preliminary project-wide analysis based on what happened (including what was recorded) during the pilot study, in order "to update the work of D5.2 in the light of work in the EIs and cities, for the main implementation of Years 3 and 4"[1].

1.3   Timescales

Some delay in the preparation of D5.3 was inevitable, if the Deliverable was to be effective. This is because the work to be reported is work that needed and needs to be in place for the start of the main (i.e. not the pilot) parts of the EIs of WPs 2 and 3. On that basis, D5.3 was timed for M24. However, the project as a whole has run late because of difficulties with getting various combinations of sensors and platforms tested, validated and shipped to the different locations; and, as noted earlier, it was not possible to give sustained attention to the engagement and empowerment aspects until there was a credible timeline for the availability of suitable sensors.

In practice therefore, the topics that D5.3 is to report on have been delayed as part of the wider momentum of the project. This left a choice between a report in time but one that is premature and hence sparse in terms of project momentum; or a delayed report with more substance, where there is substantially more material available than would have been the case in M24; but where preparations for the engagement and empowerment aspects of the full implementation of CITI-SENSE are advanced but not yet fully finalised.

1.4   Structure and content of this report

This report describes the work of WP5 in developing methodology and skills for the implementation of successful engagement and empowerment within the CITI-SENSE project, the dissemination of this methodology to WPs 2 and 3, using a discursive workshop format with input and discussions from participants from all three workpackages, and the production of agreed methods and tools for engagement and empowerment in the main study. The ultimate aim of the work reported here was to prepare the LOs and the members of WP5 to implement best practice in engagement and empowerment of a range of stakeholders during the main study. This aim was achieved through a skills development meeting of the WP5 team, a comparative analysis of the engagement and empowerment work already carried out before and during the pilot studies and a workshop for two-way exchange of ideas and methods between WP5 and each of WPs 2 and 3.

Throughout, WP5 has tried to look on CITI-SENSE as a learning project and the CITI-SENSE team as a learning organisation. With regard to engagement and empowerment specifically, this has involved learning :

- Within WP5, across a range of experiences, where several participants have expertise in social science / engagement / politics as formal scientific background, whereas others have come via health promotion or health impact assessment, though with a special interest in environment and health / air pollution and health;

- Between WP5 and other WPs, especially WPs 2 and 3, but also the more 'technical' WPs (4, 6, 7 and 8); and

[1] CITI-SENSE Description of Work - DOW CITI-SENSE (308524) 2014-08-26 p24

- Between CITI-SENSE as a whole and local stakeholders and policy-makers, where the front-line contacting is done by WPs 2/3, but in collaboration with WP5.

In order to show the learning process, we report D5.3 chronologically, as follows:

- Chapter 2 presents the notes from the meeting in Barcelona, September 2014, as we worked towards greater coherence within WP5 in advance of collaborating more closely with WPs 2/3;

- Chapter 3 gives the draft analytical framework for between-city comparisons together with the preliminary results from across cities in the pilot study of WP2;

- Chapter 4 presents the notes from the meeting in Oslo in December 2014 which greatly consolidated collaboration between WPs 2/3 and WP5, with a number of joint working groups (some involving other WPs also);

- Chapter 5 summarises briefly the progress on the topics identified as priority at these meetings and developed further at the major project meeting of March 2015 in Barcelona, and subsequently.

2. WP5 Coherence and Capacity Building

2.1 Aim of this work

This meeting was attended by members of WP5, with additional input from some members of WP2 and WP3. The overall aim of the meeting was to develop coherence and skills for communication and empowerment using a stakeholder communication framework, in order to optimise the support from WP5 to the LOs in the implementation of the EIs. To achieve this, the following objectives were addressed:

- *Current status of EIs:* To determine the current status of engagement and empowerment within each EI, in the context of the future plans for the EI as a whole;
- *Capacity building of EI's:* To ensure that WP5 members understand the contents of D5.2 and how the various preparatory forms can be useful and used, in the EIs, to aid in designing and evaluating engagement and participation;
- *Communication strategy:* To identify guidelines and tools (including e.g. websites and social media) for communication on multiple levels - within WP5, with colleagues throughout CITI-SENSE, with participants and other stakeholders, including local policy makers, with the general public locally and with the general public EU-wide;
- *Perception monitoring:* To develop a plan for what perception monitoring will be done, by who, when and why;
- *Empowerment data:* To develop a Data Inventory & framework and a monitoring & processing plan, as to be able to do comparative analysis. This includes all relevant kinds of data including sensor monitoring data , data for evaluations by WP5 – questionnaires, KPIs, D5.2 forms etc and perception data;
- *Bottom-up & solution oriented empowerment:* Discussion of the roles of nature-based solutions and the "Scottish case study" within WP5 with the identification of plans for and purpose of these initiatives.

2.2 Introduction

This chapter presents the notes from the meeting in Barcelona, September 2014, as we worked towards greater coherence within WP5 in advance of collaborating more closely with WPs 2/3;

2.2.1 Main aims of the meeting

The main aims of the meeting were:

Building collaboration across WPs: between WPs 2-3-5 on empowerment strategy, plans of action, evaluation, and data collection.

Capacity building: learn from each other about empowerment related expertise and issues to enhance organizational learning and capacity for teaming up with the EI LOs.

Forward looking: joint brainstorming about next steps and plans for action.

2.2.2 Preparation material

Before the meeting all the participants were asked to:

Read the deliverables: D2.2 'Pilot study evaluation and main study protocol: from phase 1 to phase 2 of the CITI-SENSE urban air Empowerment Initiative', D3.2 'Pilot study evaluation and protocol for

phase 2', D5.1 'Baseline for studying citizen participation and empowerment', D5.2 'Methodology and protocol for citizen empowerment and decision making (phase 1)'.

WP5 - EI contact person to prepare a poster explaining about their EI(s) and WP2 and WP3 focusing from their empowerment perspective on:

- Most important challenges for the empowerment strategy;
- Most pressing questions, worries, needs.

2.2.3 Meeting format

The meeting was aimed at interaction, collaboration, capacity building, brainstorming and making concrete plans for action. In order to fine tune WP5 action planning with our main clients (WP2 and WP3), representatives of both other WPs also took part in the meeting. Each session started with a plenary short presentation (food for thought), after which in subgroups key questions and ideas were discussed. At the end of each session the outcomes of subgroup discussions were presented in a plenary presentation to summarise the discussions and to define next steps.

2.3 Meeting reporting

2.3.1 Next steps EI's

Introduction: The aim of this session was to communicate about where each EI is going with engagement and empowerment, in the context of the future plans for the EI as a whole. Each WP5 contact person was invited to prepare a poster, with pressing needs, questions and comments regarding the EIs they are in contact with, and WP2, WP3a and WP3b representatives were invited to have overview posters, with pressing needs, questions and comments regarding the EIs from an empowerment perspective. The idea of posters was intended to create a creative and interactive dialogue about ongoing work. The posters were supposed to be hung on the wall, so all participants could have a look at them and on post-it notes to write comments, suggestions to the questions and issues raised. The last part did not really work out as intended, as poster presenters really had an urge to add some explanation and introduction to their posters. The idea of a more informal gathering around the posters and stimulating participants to write suggestions on post-it notes thus fell victim to time constraints. Still, the session was well appreciated by all. An ***overview of the EIs introductions*** and posters is presented in ***Appendix A***.

Discussion: In the discussion the need to diversify relations and actions towards different target groups and over time during the project with targeted approaches, challenges, needs, was prominent. Diversification related to types of actors and their roles/involvement in the project/EI, types of ambitions of the EI's, the different steps in the process and CITI-SENSE internal relations, especially between WP 2 / 3 and 5. These key challenges for the EIs followed both from the posters and the discussions.

Defining ambitions: What are the ambitions of the EI? What are the goals? What do they aim for? And who defines them? Whose ambition do we take into account?

Traditional communication or empowerment in decision making?

Should EIs opt for a rather traditional awareness raising aim, like a school educational program or a one-way risk communication model? Or that EIs can opt for a step further in trying to engage in decision making processes that affect or may affect the environmental conditions in the EI?

Technical goals or social goals?

The aim is to test the technological tools, but also the participation mechanisms, so we must be rigorous managing expectations. How do we balance the application of technology objectives and the social objectives of empowerment?

How do we maximize the project impact?

Based on the Description of Work (DoW) and stressed again in the technical review and Technical Advisory Group (TAG) recommendations, it is essential to maximize the impact of the project; since the expected impact lies to a large extent in the social domain, the engagement and empowerment perspective is very important. Some key issues from the expected impacts section from the DoW:

(a) Provide support for evidence-based decision making;
(b) Empowering citizens and citizens' associations with a "CO";
(c) Providing decision makers with models that facilitate connections between environmental governance, global policy objectives and citizens' needs;
(d) CITI-SENSE provides an opportunity to develop the mechanisms needed to implement the two-way interaction between policy makers and citizens that is fundamental to empower the citizens and allow him/her to influence environmental governance;
(e) CITI-SENSE provides an opportunity to contribute towards the infrastructure needed to design smart cities and help design an urban environment where the citizen is empowered and benefits from timely, tailor-made environmental information, and influences the development of the urban landscape;
(f) CITI-SENSE provides an opportunity to empower the citizen, and by extension society, to participate fully in the decision making process concerning environmental governance;
(g) CITI-SENSE provides the framework for the European approach needed to address empowerment of the citizen to participate in environmental governance.

How does CITI-SENSE match with citizens'/stakeholders' needs?

How can we ensure that the outcomes of the fieldwork satisfy the needs of the stakeholders and the CITI-SENSE project?

How to reconcile outcomes desired by the project (e.g. indoor air levels in schools comparable across participating cities) with outcomes desired by the schools (e.g. use the sensors in various projects designed by the pupils)?

And how to know what is really wanted, and what is needed?

How do we empower participants and stakeholders in the EI?

How do we enable participants to climb the steps of the participation ladder towards stronger participation and impact?

It may e.g. be a good idea to have a wider (external) advisory group connected to each EI.

Identifying participants and other stakeholders: Who can participate as citizen, what other stakeholders, and how can we identify other groups than the ones who seem straightforward in the specific context, but may benefit from the process and outcomes of the EI or can be supportive to the aims of the EI? Like administrations, peers, 3rd parties, the general public, people living nearby etc.

Defining the engagement strategy: Preparation of a draft of Citizen Participation Programme that collects the objectives, strategies, and sufficient mechanisms to enable citizens and associative entities the right to participate in the process.

Some key engagement aspects mentioned:

How to engage?:

Other means to engage students with and without available sensor data;
How to convince the council of a benefit to them of the work we are doing, despite its pilot nature;
How to actually get in contact with volunteers;
How to develop the recruitment/engagement campaign.

How to keep good relations?:

How to maintain interest/support/trust;
How to keep them interested and manage their expectations while waiting for main study to start and during the implementation phase;
How to maintain interest if not delivering results, services;
How best to maintain engagement/trust between scientists and stakeholders in light of possible inaccuracy of sensor readings;
How to balancing mutual interests and find synergies;
How best to manage the expectations of the cyclists (who are keen to take part) as to what action might be taken in the light of any findings;
How to dose giving too much/little resources/recognition.

How to deal with engagement risks?:

Bad quality of or lack of sensor data;
Not maximising added-value;
Repeating old work;
Misinterpreting wants and needs of participants and stakeholders;
Failure to satisfy wants and needs of participants and stakeholders.

Communication:

How do we provide necessary information to participants about the measurements?

A project summary document will be prepared with the most relevant information whose maximum length is one page. This document will also function as invitation to participate. The document will have information on: sample definition and objectives of the project; explaining the importance of their role in the project; the type of involvement; approximate development schedule of the first phase; contact information.

Contact with participants during the project:

Mail and telephone contact: the most effective is telephone contact if a small group of people (20-30 people), mail will support this contact;
At times it may be necessary to meet in group; a doodle poll can support this;
Continuous mailing list information by which participants will be informed about the evolution of the project;
Website providing information and social media like Facebook.

How to keep participants motivated via good communication?

To maintain the motivation of the participants throughout the project, we expect to maintain continuous contact about the evolution of the project (main tasks), return results of their contributions, to value their role in the project, e.g. by showing the importance of their involvement and showing how their proposals and ideas are used. You can also consider rating in the whole community of project participants, those participants more involved and more active (reward with recognition within the group the most active and engaged users).

Contact with participants at the end of the project:

Synthesis of process, completion and return of results to the participants;
Writing a final report on the results obtained;
Workshops to present results;
Process evaluation;
Communication actions related to the return of results (press, TV, radio, etc.).

Communication via social media

How can online media be used for communication; e.g. school-specific CITI-SENSE websites;
Facebook is not a viable option at all schools, because the pupils are not allowed to use Facebook at school;
There is the opportunity to use blogs instead of Facebook.

Possible difficulties identified and discussed:

What if the stakeholders don't want to use your discussion platforms; neither the local web pages nor Facebook?
How to avoid panic from false alarms? E.g. what do we do in case of media scandal and if people start pointing at us and blame us?

Data communication:

How to communicate effectively?

How do we best represent information? Which phrases we should use to explain to the stakeholders that the data from our units are only indicative?

How do we communicate risks?

Open data:

This could potentially spark off interest among citizens to play around with the data and create their own visualizations.

Whether or not data should be open also relates to whether or not the data provided are reliable and accurate.

What if…?

… high levels of any pollutants are detected?

… we have no sensor data available – how shall we empower people then? What kind of data can be used instead?

Some less elaborated, but nevertheless relevant issues:

Social data collection: Different means (or participatory spaces) can be foreseen: face to face group meetings; sensors and smartphone specific questionnaires; other forms of questionnaires; open spaces to collect proposals (through portable tents); personal interviews with experts.

Empowerment & governance:

Empowerment:

How should the stakeholders' approach higher level policy makers and how do we motivate them to make further steps to be heard?

Governance:

Which methods we should use to make sure everyone's opinion is being listened equally? E.g. the ones briefly mentioned in D5.2

Solutions: Do you have examples of quick-wins that we could implement?

Evaluation: How will we evaluate the engagement and empowerment processes in the EIs? Who should be involved in the evaluation? Only CITI-SENSE researchers? Or also participants, stakeholders and others?

Data relations: WPs 2 and 3 also need to further develop a data relation with WP5. WP2 and 3 need to know more clearly how WP5 would like to document engagement and empowerment, so they can better document – also in a scientifically robust way – all on-going engagement and empowerment processes.

2.3.2 Capacity building EIs

Introduction: The purpose of this session was to ensure that we all understand the contents of D5.2 and how the various preparatory forms can be useful and used, in the EIs, for D5.3 and beyond for evaluation purposes.

Discussion: A key reminder for this session and focus was the set of questions posed at the full consortium meeting in Belgrade (October 2013):

"Can information from sensors complement other information sources?"

"Will sensor-information lead to greater involvement of citizens?"

"What will happen when citizens can measure, sense and be aware of consequences of living in a polluted city, and of their contribution to this pollution?"

These issues/challenges still seem prominent and unresolved or at least not sufficiently taken into account yet in current EI practices.

Another issue that came forward in the discussion was confidentiality/ethics: this clearly needs further attention.

Finally the importance of LOs completing the D5.2 forms was stressed again. To help them, WP5 EI contact persons will find out how best to help them; timing end of October 2014, after which there will be intermediate synthesis/analysis from WP5 will be performed as a basis for input in the December 2014 face-face meetings with the LOs.

2.3.3 Communication strategy

Introduction: Communication is a key issue for CITI-SENSE, also, or perhaps even especially, from an engagement/empowerment perspective. Communication is important in several CITI-SENSE contexts, and between several actors. We have WP5 internal communication, communication with other colleagues within CITI-SENSE, with EI participants, stakeholders, with the general public, both local and EU-wide. All forms of communication demand to be well organized ànd documented, and supported by guidelines and tools that we can bring forward within CITI-SENSE, such as websites and social media.

Discussion: A lot has been said already on communication in the *Next steps EIs section* (see beginning of this report). In the discussion here, discussion focused mainly on the use of social media. The discussion resulted in a long list of questions and a short list of conclusions. First the ***long list of questions*** to be taken into account. We will list the main questions here, and refer to some answers in Appendix B:

- Why use social media? Does each location use their own social media?-Do we have a policy?
- Are the CO web portals also considered as social media?
- How many posts a week are enough?
- How many people are we expecting to influence with our Facebook pages?
- Where are our COs? On Facebook or on local CO portals?
- Will someone keep on running the social media also after CITI-SENSE?
- With whom do we want to communicate?
- Where do we want to be in a few years from now?
- Do we use our project as a campaign project, what is our role?
- Do we want to sound like activists?

Finally the **short list of conclusions**: Each location is encouraged to use social media. SINTEF will create a guideline/expectation, maximum one A4 page long with also examples of what is interesting for people to read in the social media (e.g*. how many litres of air they breathe a day?* sort of posts). We all can learn from existing websites (for example the Friends of the Earth has currently a campaign on air pollution, or the campaign of clean air in London).

2.3.4 Perception monitoring

Introduction: This session will focus on collecting information from participants in the EIs about how they perceive issues relevant to the CITI-SENSE ambition, such as perception of air quality, public spaces, empowerment and governance issues, potential solutions. This we can label as perception or social monitoring. The aim was to develop and get buy-in for a plan for what perception monitoring will be done, by who, when and why. The presentation introduced the value of conducting short surveys (with CivicFlow, Google forms or pen and paper) and qualitative methods such as interviews and workshops to gather data on how citizens experience indoor (WP3b) or urban (WP2) air quality, and to gather data on experienced symptoms of poor air quality. The survey data can be particularly interesting when compared to data from sensors, though such comparisons might be more easily done within the more controlled setting of the school EIs (WP3b). The topic of WP2 also makes it relevant to integrate perception monitoring as part of a communication/dissemination strategy, by setting up open participation tents in public spaces, where information about project-related topics is presented, and citizens are encouraged to fill in short surveys on how they perceive urban spaces or urban air-quality.

Discussion: First a reminder of why we started investigating the potential of perception monitoring, when it was not explicitly mentioned in concrete tasks in the DoW. One reason is that the TAG advised the project to take advantage of the occasion of working not only with sensors, but also with persons: a good opportunity to ask questions. Also, again supported by the TAG suggestions, perception monitoring may add to the quality of the project's output (as a plan B option, e.g. if the sensors fail, or the reliability of the measurements is disappointing). Another important reason is that it may add information about more social and governance type of issues like empowerment, which are mentioned in the DoW, but not specifically linked to perception research methods.

Regarding perception monitoring, a variety of methods, issues and potential aims were discussed. This not only showed different aims and goals that could benefit from it, but also some issues to be defined or solved when looked at in more methodological and technical detail. Two main different aims evolved from the discussion:

Air quality perception monitoring in line with and complementary to air quality data sensor monitoring: measuring more or less the same type of air quality issues by different means. This can add data similar to the sensor data, or can collect data on related specific issues, such as noise and

appreciation of the surroundings in public spaces or health effects potentially related to the environmental data. These forms of data collection mainly add to picturing the environmental quality status of specific locations. Also, by involving local actors, can contribute to awareness raising.

Environmental governance perception monitoring focusing on different but complementary to air quality or, more general, environmental issues: focusing on other forms of information, contributing potentially to different aims. This can add e.g. to empowerment issues and to solution oriented perspectives. These forms of data collection mainly add to problem solving perspectives, both in terms of social power relations and potential practical solutions. And they may add to agenda setting: e.g. how important do respondents consider air quality problems compared to other problems?

Methodological opportunities and challenges: How can we measure perception? We can consider sensor-like methods without much interaction between respondents and researchers. This would involve (preferably short) questionnaires for which techniques like Civic flow or QR-codes can be used. And we can consider more interactive methods, such as focus groups or open tents at public spaces where people passing by are invited to take part in answering specific questions. The advantage of more interaction is that more in-depth discussion is possible.

How do different data collection methods and forms of information relate to one another? How to combine them? And how would perception data be perceived by e.g. policy authorities? What if the data provided by our application cannot fully correspond to the "official" data or even is contradictory? Furthermore, we should consider the possibility that the perception of air quality in urban green areas can be different and may be conditioned by the green aspect of these spaces.

No method is perfect in all respects. Civic flow e.g. does not allow to collect data about the specific location of the measurement, nor of the specific timing (only the date). Using a QR code also may cause difficulties in pinpointing which location the recorded perception specifically refers to. Moreover, not all potentially targeted persons have the technical means to use it.

Talking about respondents: Who are they and what does this mean for analytical quality? Several issues were discussed. How representative will the group of respondents be, when limited to the participants in the sensor study, or gathered randomly in open tents or by QR-codes at public places? And how representative are small groups, e.g. when gathered in focus group discussions? Or may the diversity of respondent backgrounds represented in smaller groups be informative about different perspectives in society? Clearly these different groupings of respondents create their own opportunities and limitations. We should carefully consider how to organize and prepare a selection and engagement strategy.

2.3.5 Empowerment data

Introduction: This session focused on the issues relevant to WP5 and CITI-SENSE as a whole, from a data perspective: What are the data related issues important to engagement, empowerment and communication, which type of data require WP expertise, and which kind of data does WP5 need in order to perform its scientific and supportive responsibilities? This may include issues related to the sensor monitoring data, EI evaluation data for comparative analysis by WP5 and perception data. The aim was to develop a data inventory and framework and a monitoring and processing plan.

Discussion: Following from the previous sessions and their topical foci, several data dimensions and related methodological formats & opportunities relevant to empowerment, engagement and the WP5 perspective were distinguished:

Communication data:

Social Media Analysis; Forms evaluating formal communication; Feedback monitoring and analysis (interactive dialogue with citizens and stakeholders); Brand recognition

Empowerment process data*:*
Comparative analysis; Meeting minutes; Emails; Team discussions

Data on empowerment*:*
Survey; Interviews; Focus Groups

Perception data*:*
Survey; Interviews; Focus Groups

Governance/institutional data*:*
Comparative analysis; Context of EIs (Institutional analysis); Structured interviews

Evaluation data*:*
Comparative analysis; Meeting minutes; Deliverables; Key Performance Indicators (KPIs)

Key issues concerning data collection and processing that need further attention in the coming period are:

- *Elaborate more precise data relevant research questions*: which type of data relate to which elements of the DoW?

- *Participatory evaluation*: involve participants and stakeholders actively in (intermediate) reflection on the empowerment process;

- *Organize a data connection with WP2 and 3*: guarantee collection of social data , data on EI developments, feedback and reflection/evaluation on developments.

2.3.6 Bottom-up and solution oriented empowerment

Introduction: This session combined two aspects of CITI-SENSE work relevant to WP5 which until now received limited attention: 1. The "Scottish case study" (led by IOM): focusing on bottom up issue framing and representativeness of participants. 2. A focus on air quality solutions, next to air quality problems: the example of ecosystem services/Nature Based Solutions.

Discussion:

1. *The "Scottish case study"*: The question was raised how this case study connects to the rest of CITI-SENSE? The answer was: it aims to answer the question «To what extent can groups of citizens be engaged/empowered with only limited use of technology?». The bottom-up issue framing approach was considered to have potentially at least two opportunities: a) more people could be interested to join. b) more flexible in solution orientation.

2. *Ecosystem services/Nature Based Solutions*: It is widely recognised that ecosystem services can have a positive effect on air quality by natural air purification but there are other possibilities too. What could be more beneficial is thinking in terms of replacement (more green, less concrete) and the multi-faceted benefits one can derive from nature (next to air purification, quite some other benefits of living near green space can be mentioned, including very concrete health benefits, such as less risk for cardiovascular health problems, cancer, depressions and allergies). Solution oriented thinking in general may open the doors to the interests of other and extra groups of stakeholders who might want to get involved. Also, it may answer to the demand of social groups for concrete solutions, instead of only more information about problems. Additionally, it can be part of an engagement strategy to attract new citizen groups to the EIs. Some people are more concerned

about a lack of city green and/or lack of walking and cycling networks than about air quality (AQ), but they might contribute to AQ-research based on their own reasons.

3. Comparative analysis

3.1 Aims

In preparation for and during the pilot phase of the project, the EIs were planning and, in some cases, carrying out engagement and empowerment activities in their locations. As part of the pilot studies, such activity was recorded either independently by the LO or using the forms designed for this purpose by WP5. In addition the LOs completed a set of Key Performance Indicators or KPIs to reflect the state of affairs in their cities. The aim of the comparative analysis of this information which is reported in the current chapter was to identify cross-cutting issues and integration issues across locations and to draw lessons from all the pilot studies which will be informative for implementation of engagement and empowerment in the main study. The outcomes of this comparative analysis will also contribute to the final evaluation of engagement and empowerment of the study as a whole.

3.2 Introduction

In CITI-SENSE, WP5 has several tasks which have to do with analysis of the work of the case studies: "*Coordinated analysis across empowerment initiatives*" and "*Evaluation of empowerment initiatives*", resulting respectively in D5.5 and D5.6:

> *D5.5 Co-ordinated analysis across empowerment initiatives:*
>
> *After analysing information about participation, acceptance and decision-making across activities and locations, final cross-cutting issues and integration issues about citizen empowerment, engagement of public authorities and models of decision-making across EI and locations including risk governance and management will be proposed by means of a report. The methods of this report will include a description of the implementation of the protocol.*

> *D5.6 Evaluation of empowerment initiatives:*
>
> *This deliverable will be essential for CITI-SENSE. It will contain the results of evaluating each EI from the viewpoint of involving citizens and citizens' organisations effectively in both environmental monitoring and environmental decision-making, including engagement of public authorities as well as citizens' groups. It will be based on the different approaches employed in CITI-SENSE to involve different groups of people under different circumstances across empowerment initiatives and locations, and involving public authorities in diverse cities and circumstances. It will include also a series of recommendations specific for stakeholders of each location and EIs.*

In order to be able to draw generic lessons (both intermediate and end-of-project) and give targeted feedback to the case studies while simultaneously stimulating inter-case study learning, we decided to set this up as a comparative approach, aiming mainly on the WP5 topical perspective: **participation and empowerment issues**. We developed two main methodological tools for this venue: *means to monitor the developments in the case studies* in order to be able to collect data for analysis (at this stage mainly questionnaires) and **a *comparative analytical framework*** for framing the collection and analysis of case study data in a well-structured manner. The latter, the *comparative analytical framework*, is currently under development and will be adjusted along the way based in practical experience. The first, *means to monitor the developments in the case studies*, has been developed and applied in different formats from the start of the project. Both will be

discussed here: the framework more conceptually, the monitoring means also with descriptions of case study developments and analysis.

3.3 Comparative analytical framework

The following map was intended as an overview of all running ambitions and activities within WP5. The idea of this overview was to show not only the ambitions and activities, but also a stepwise analysis/research process and an overview of who is involved (next to WP5) and what are the potential data sets and streams.

```
┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ Research     │──▶│ Research     │──▶│ Research     │──▶│ Data         │──▶│ Lessons      │
│ objectives   │   │ questions    │   │ data         │   │ interpretation│  │ learned      │
└──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘
```

Design & implement citizen participation and empowerment

Design & implement better decision making

Facilitate local learning and dissemination

Empirical studies gathering data about citizens' and stakeholders' requirements, perceptions and experiences

Monitor both positive and negative environmental health quality of life aspects so as to pinpoint win-wins

Communicate results and the use of social media

All EIs

All EIs

All EIs

WP5 forms

Other WP 5 research methods

Collaborative Iterative Participatory evaluation

WP5

All EIs

WP5 contact persons

WP5

Representativeness of citizens' participation

Scotland
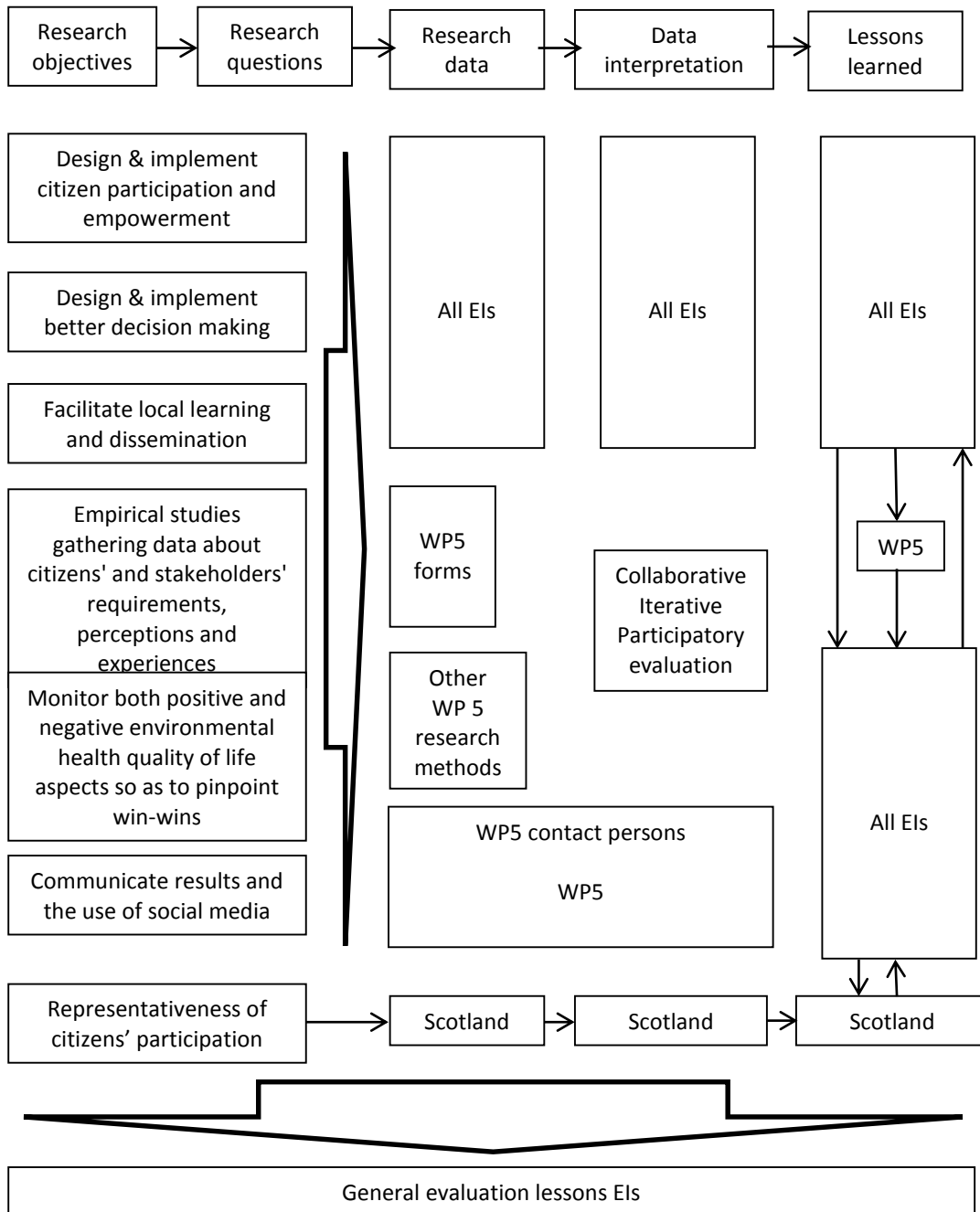
Scotland

Scotland

General evaluation lessons EIs

Figure 1. Comparative analytical framework of activities within WP5

The first layer on top shows a rather classic stepwise research process for WP5. Under each step, the main components of WP5 are listed including roles and contacts. We will not go into detail here, but the map showed to be helpful in grasping the full extent of WP5 activities focused at the case studies or EIs. It was helpful in discussing the potential connections of WP5 with the case studies during a face-to-face workshop in Oslo in December 2014 and helped structuring the set-up of closer collaboration on targeted activities.

The map also represents the playing field of comparative case study analysis, based on which we can collect the main building blocks and start building the *comparative analytical framework*. Here, we will give an overview of those building blocks. The construction of the analytical framework is still work in process, so we will not be able to present a robust version here yet.

As a general conceptual approach for building the framework, we have **two main options**. The first one is a **grounded theory approach of iterative build-up**, learning by doing. The second one is **choosing an existent conceptual model** which we can test/apply. For now we opt for the second approach, mainly because the case study practices are only just starting to take up the WP5 participation and empowerment perspectives in a more structured and collaborative (with WP5) manner, as technological problems with the air quality sensors took almost all attention of the project and the case studies over the past years. How the engagement and empowerment processes will develop in practice and how the connections with WP5 will develop, including the flow of data on practical developments, thus remains to be seen. **We rather opt for a close-to-practice approach, instead of imposing a conceptual model that may seem far from practice, especially from the case study perspective.** The latter also seems a general problem of engagement and empowerment issues in the EIs: a first approach of transferring insights and lists of things to take into account did not work well; partly, because of most of the attention and interest in this part of the project was focused more on the technical sensors, partly because of lack of relevant expertise within the LOs and lack of a view on the complexity of the engagement and empowerment issues. This was partly overcome by the new more interactive collaborative workshop approach in which the WPs worked closely together (e.g. December 2014 in Oslo), partly also by jointly developing vocabulary that seemed more helpful for mutual understanding and concrete collaboration. We learned that stronger recommendations <u>towards team-composition of local case studies can be beneficial</u> (e.g. "All EIs need to work in close cooperation with a local NGO that is familiar with the specific topic, context and engagement strategies")

We therefore have to think strategically about how to engage with the case study colleagues, for which we chose a more bottom-up collaborative way of working. This approach comes closer to a grounded theory approach which also sets off in practice, and tries to develop analytical framework from practical experience and dialogue.

As a main focus for EIs should be on empowerment, we may opt to start developing **empowerment storylines for each EI**. While the impact chapter of the DoW lists clearly the objectives of this work, how to understand, implement and effectuate it is open for discussion, it is likely that different CITI-SENSE experts and LOs will interpret it differently, as most probably will those with whom the EIs will engage.

We still can think of several issues that need to be addressed in our analysis:

The first question is: ***Who should be empowered?*** From a WP5 perspective we should distinguish at least between two of our main target groups: citizens and the LOs whom we try to support in their empowerment work. When we focus on citizen empowerment we may ask ourselves: ***On what should citizens be empowered?*** If we consider a stepwise process from problems to effective

solutions, there are several **steps** in which empowerment could be considered: **(1) issue framing; (2) methodological approach; (3) data collection/information base; (4) data interpretation; (5) potential problem solving action array; (6) effective actions and (7) evaluation throughout the process**. We should also consider *what is the empowerment context*: do we consider methodological decision making within the EI? Or do we consider political decision making in the institutional context of the citizen (governance processes – power issues, influence)? Or do we think about individual capacities for change: resources, learning and doing, the role of information and communication?

When we consider the empowerment by WP5 of the LOs, empowerment can be considered within CITI-SENSE and beyond for other projects and case studies to draw lessons from CITI-SENSE. The latter will be for later in the project when we can draw generic lessons. The first, within CITI-SENSE can be distinguished in two relationships: EI – EI and WP5 – EI. EIs can learn from each other's experiences. Main exchanges of experiences will take place within the WPs,with additional exchange of ideas across WPs for example when case studies are in several WPs.

And it can be mediated by the WP5 intermediate analysis of practice data: WP5 can analyse and synthesise what is happening in the EIs based on the data documented and transferred to WP5. With the WP5 empowerment expert lenses, targeted lessons and advise can be communicated back to the EIs. The following part of this text is an example of this. Simultaneously, all involved in these relationships, should not necessarily only reflect on what they can learn from others, or other can learn from them, but they also need to be self-reflective about their role in these collaborative relationships, including WP5 experts.

When comparing cases, on whatever aspect of ambition, there is a real danger that the incomparable or incommensurable is forced into one metric or evaluation variable or line of thought, disregarding the complexity of the specific contexts involved, which make the case in fact rather difficult than easy to compare, especially when it comes to complicated issues like empowerment.

Many factors, perspectives and perceptions play a role. Just to name one example: if EI 1 only wants to empower citizens by supplying them with information in a one-directional communication, and EI 2 wants to empower the participating citizens as co-scientists, it will be very difficult to compare the two EIs' experiences on empowerment. But even when EIs more or less share the same empowerment ambition, contextual factors which are often beyond the control of a facilitator, may play a decisive role on how the empowerment process plays out in practice. We should thus not frame the comparison as an Olympic competition, and we should be focused on how we simplify the comparison. We should try to find a balance between generic and context dependent lessons.

What we need is not only a set of comparative analytical research questions. We also need data on what is going on in EI practices. To finish this section, and before we dive into the real data, we give an overview of empowerment data we can consider to take into account. First we should consider data sources: *whose data* do we have in mind? Data from citizens or from our colleague experts? Others? This work is in progress. Through the discussion in the WP2, 3, 5 workshops and follow-up gradually the ideas of co-design and participatory evaluation are becoming part of the joint vocabulary and the way of working. For the main studies the data collection process should be designed. This follows after we have more clarity on what effectively will be done in the EIs.

And *where are the data collected from* within the EI in CITI-SENSE? Beyond the EI context? Can we use the *collection of data over a period of time* in order to establish time trends? We can e.g. also compare in time how ideas about empowerment evolve in an EI, and try to analyse why they evolve or not evolve. *How are the data collected*? We can e.g. distinguish interactive (interview or focus group) and non-interactive (questionnaire) data collection. *Who collects the data*? The WP5 actors?

The LOs? And what is the format of the data? Qualitative/quantitative? From an operational perspective, WP5 should find a pragmatic collaboration on data collection together with WP2 and 3. This not only requires some coherence in data collection, but also in understanding.We have to find common ground and language for effective communication

3.4 Means to monitor the developments in the case studies & descriptions of case study developments and analysis

The following part can serve as an illustration of the grounded theory approach of iterative build-up, which was introduced in section 3.2 above This process can be characterized by (1) simultaneous involvement in data and analysis; (2) constructing analytical categories from data; (3) using the constant comparative method, which involves making comparisons during each stage of the implementation; and (4) advancing development during each step of data collection and analysis. This process serves us to reflect both on implementation of the project across different locations and on evolving shared understanding within the project as a learning organization[2].

We ask how the CITI-SENSE project implementations can support understanding and addressing issues enhancing the level of public empowerment. We tackle this question on the basis of analysis of three types of documents: (1) **Reflection Questionnaires**,[3] (2) **Key Performance Indicators (KPIs)**,[4] and (3) **Preparatory Forms.** Each of the three documents, based upon the LOs' self-reporting, represents a different moment in the project lifespan and has different aims and objectives (see Figure 1 and 2). The Reflection Questionnaires represent a baseline enquiry providing us with overview of initial expectations. However, over time, increasing diversity and complexity of engagement and empowerment issues demanded specific tools covering specific elements of empowerment process. Preparatory forms might be one of them. The entire set of tools cannot be seen as a source of data for comparative analysis only, but rather as a way how common understanding can be built across different locations and different WPs. KPIs are specific types of information sources that serve as umbrellas for the case studies development from multiple perspectives.

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[2]For a definition of learning organisation we can for instance refer to the article "Sustainable multifunctional landscapes: a review to implementation" (O'Farrell and Anderson, 2010): "Learning organizations are defined as organizations that share and develop knowledge, resources and ideas towards a common goal and are constantly transforming themselves in order to meet this goal. They are typically informal temporary groups, assembled to focus on a particular problem, however they are not excluded from being attached to formal institutions (depending on the nature of the problem). Such organizations would serve to make research socially relevant and user-informed and simultaneously serve the ends of stakeholder empowerment." (See Deliverable D 5.2 Methodology and protocol for citizen empowerment and decision making (phase 1))

[3]Reflection Questionnaires were developed by WP5 in order to set up comparative analysis between the EIs (again, not to judge, but to draw lessons and inspiration) and to advice the EIs about how to keep track of empowerment related issues. They did not intend to evaluate progress in EIs. For these reasons, the Reflection Questionnaires are not publicly available because of the anonymity promised to respondents.

[4]Pilot trials evaluation results by applying current key performance indicators are available in the Annex of the *Deliverable D 4.2 Citizens' Observatories Strategy.*
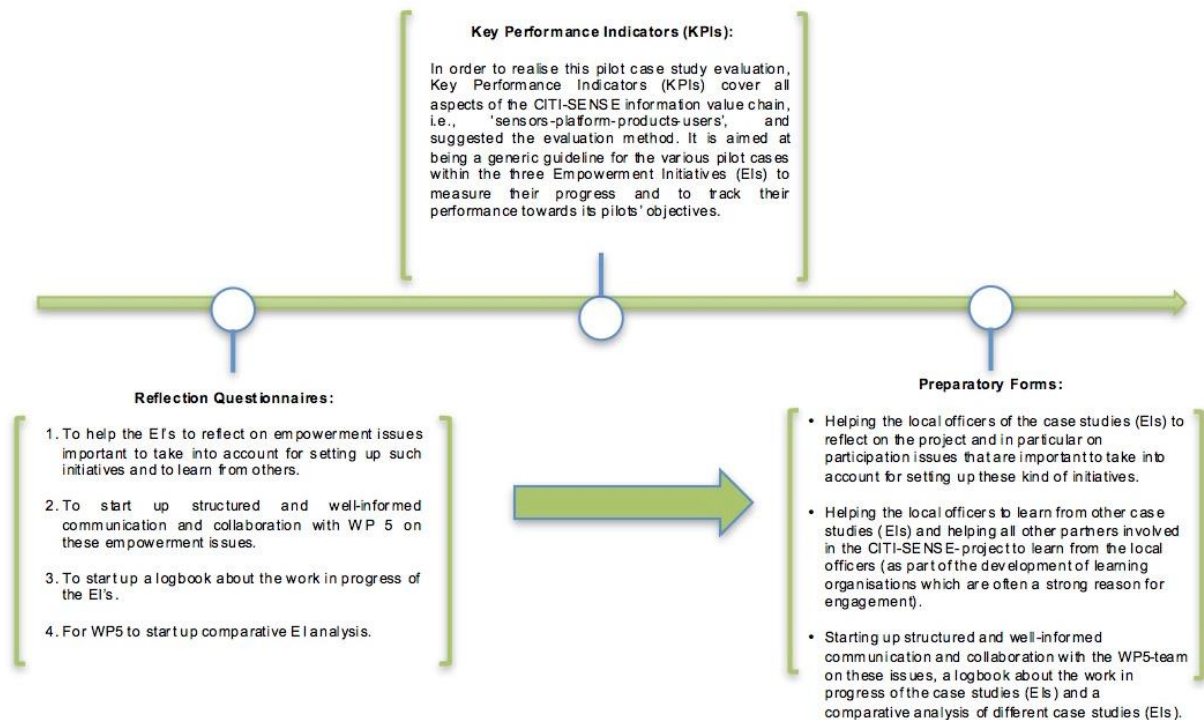
Key Performance Indicators (KPIs):

In order to realise this pilot case study evaluation, Key Performance Indicators (KPIs) cover all aspects of the CITI-SENSE information value chain, i.e., 'sensors-platform-products-users', and suggested the evaluation method. It is aimed at being a generic guideline for the various pilot cases within the three Empowerment Initiatives (EIs) to measure their progress and to track their performance towards its pilots' objectives.

Reflection Questionnaires:

1. To help the EI's to reflect on empowerment issues important to take into account for setting up such initiatives and to learn from others.

2. To start up structured and well-informed communication and collaboration with WP 5 on these empowerment issues.

3. To start up a logbook about the work in progress of the EI's.

4. For WP5 to start up comparative EI analysis.

Preparatory Forms:

- Helping the local officers of the case studies (EIs) to reflect on the project and in particular on participation issues that are important to take into account for setting up these kind of initiatives.

- Helping the local officers to learn from other case studies (EIs) and helping all other partners involved in the CITI-SENSE-project to learn from the local officers (as part of the development of learning organisations which are often a strong reason for engagement).

- Starting up structured and well-informed communication and collaboration with the WP5-team on these issues, a logbook about the work in progress of the case studies (EIs) and a comparative analysis of different case studies (EIs).

Figure 2. Documents used in implementation of the project to facilitate dialogue with WP5

These documents do not only refer to different steps of project implementation but they also foster the co-production of shared understanding across different case studies and WPs. They perform important communication work among project participants. They form common understandings but also let participants express their own points of view and facilitate a proper dialogue between WP2 and 3 with WP5. These documents serve as means of communication over differences across place and time, mediate participants' identities and enable learning within the project team. However, they are very often seen as an administrative burden. To avoid such understanding, these documents should be also living documents - they should be co-produced across WPs and actively used in project activities.
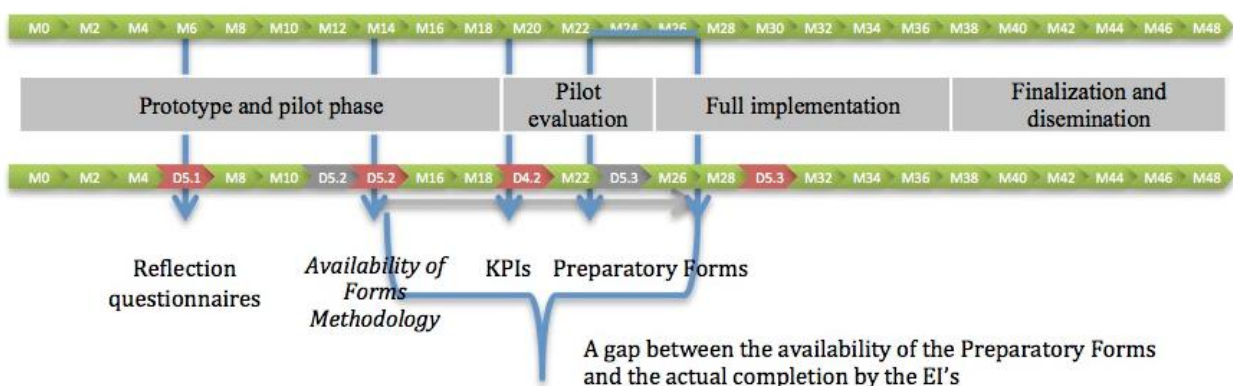

Figure 3. Timeline of the project

3.5 Reflection Questionnaires

Reflection Questionnaires were intended: (1) to help the EIs to reflect on the empowerment issues that are important to take into account when setting up such initiatives, and to learn from others, (2) to start up structured and well-informed communication and collaboration with WP5 on these empowerment issues, (3) to start up a logbook about the work in progress of the EIs and (4) to start up comparative EI analysis.

The analysis of reflection questionnaires serves us to document the **issue-framing in the initial phase of the process.** Through questionnaires, LOs shared ideas on processes in which critical mass, discussion and reflection were an important part of quality assurance. Methodologically, however, it was clear that LOs did not identify themselves with these reflection questionnaires and they were not convinced about their meaningfulness.

Even though questionnaires reflected on a broad range of problems at a general level, specific issues were mostly described with regard to **air pollution**. Local issues and context of public participation were not described in great detail. Societal factors were explicitly mentioned only in few questionnaires, which referred, for example, to a public acceptance of bad pollution as price for jobs and employment security, or to "urban legends" that need careful examination.

Empowerment was connected predominantly with new knowledge produced by sensors and disseminated among stakeholders. A belief that sensors were the best way to get citizens actively involved in urban environmental and indoor air policy was shared across different EIs. **The expected process of involvement** can be characterized as follows: (1) explain the project and recruit enough people; (2) give them a sensor; (3) control of flow of information; and (4) provide citizens with the results.

This attitude could be described as **the deficit model of the public understanding of science** (Wynne 1992)[5] – which is the assumption that clear, one-way communication of scientific information from experts to the public is sufficient to make them aware of problems and respond accordingly. In this context, it was felt that key issues which the CITI-SENSE project might address concerned: (1) the extent of public or policy makers' knowledge; (2) the most effective ways of communicating with the public (user-friendly sensors and user-friendly results - even, in this area, there are significant differences in opinions how this concern should be realized (for example through expert driven top-down processes or co-design arrangements)); (3) influence on ways in which members of public reacted on air quality. This approach does not invite scientist and public into a proper and open dialogue, but rather, it promotes one-way communication flow from science to public and delineates these two as separated areas. In D5.1, the risk deficit model approach to communication was described in a greater detail in chapters 2.1 and 2.2, including the arguments how to challenge it – mentioning for example the analytical-deliberative approach which stresses the importance of combining analysis and deliberation, resulting in more acceptable decisions to interested and affected parties. It seems that these arguments did not resonate too much in documents produced by LOs. However, their relevance in the project implementation is very hard to be evaluated through documents analysis only. This issue needs to be further elaborated using experts interviews or specific questionnaires.

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[5] Wynne, Brian (1992) "Public Understanding of Science Research: New Horizons of Hall of Mirrors?" *Public Understanding of Science* 1: 37-43.

In line with general expectations, **the expectations towards WP5 were articulated as follows:**

- Provide knowledge on public engagement - to help our LOs optimising our strategy for citizen participation and empowerment and to provide us with information about what methods other EIs employ;
- Assistance with societal decisions, such as user group and policy maker engagement - collaboration in definition of surveys and selection of the participants in the groups, and coordination of the participation group;
- Support in communication - more harmonisation on EI methodology and more specifically on communication with different stakeholders; advise how effectively involve and inform people; help in creating the materials for initial recruitment attempt.

3.6 Key performance indicators (KPIs) outcomes

To measure the degree of success of the pilot cases in meeting their objectives, WP4 developed a minimal set of Key Performance Indicators (KPIs) covering important aspects of the CITI-SENSE information value chain i.e., participation and empowerment, information products and services, communication platform and sensor platform. In contrast to the reflection questionnaire and preparatory forms, they have not been developed by WP5. In relation to WP5's needs, KPIs as they had been developed were considered as insufficient. It is evident that, apart from general KPIs, every EI should also have its own set of KPIs for local use and participants' perspective also should be involved in a complex performance evaluation.

From the WP5's perspective, the most important are these indicators: assessment of products/services completed with stakeholder groups, the level of the feedback from users and users' involvement in product development. The common and location-specific aims and key KPIs of the pilot cases were explicitly stated in D2.1 'Pilot Case Study Protocol', D4.1 'Empowerment Initiatives Analyses - Citizens' Observatories Integration' and D4.2 'Citizens' Observatories Strategy'. The resulting scores have been based upon self-reporting of LOs.[6] Even though the scaling system is very reductive and based upon self-evaluation it could give us a basic picture of pilot study implementation. Forms in which the level of scoring and level of description were accompanied by verbal reasoning were particularly valuable.

Generally speaking, sensors and products indicators got relatively low score in most cities for outdoor air quality case studies. Most cities had not received personal sensors when they tested KPIs in their case studies. At the time of completion of the KPIs, the pilot had not been finished yet, and products for serving pilot and full implementation (e.g., mobile apps, web portals) were still under development. Therefore, scores in products' indicators are relatively low. On the other hand, most cities have scored relatively high in user indicators because of initiated dialogue with relevant stakeholders.

In terms of the inclusion of different stakeholders, **local authorities, scientists and citizens** have been engaged in most of the localities (see the Annex of Deliverable D4.2 'Citizens' Observatories Strategy'). Schools involved in WP3 seem to be very enthusiastic about their engagement in the project, although there were some critical notes for example with regard to the late delivery of sensors. Many LOs declared in KPIs that regular meetings with stakeholders to understand their needs are happening and the clear stakeholders' commitment documented in meeting minutes has been achieved. However, a 'needs analysis' taking different groups of stakeholders into

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[6] Following evaluation scoring system has been suggested: (1) System option 1: Have a 5-point binary score scale for each individual KPI – score 5 when objective was achieved fully within a KPI, score 3 if it was achieved partly and score 1 in an objective was not achieved at all; (2) System option 2: Have a 5-point identical score scale for each individual KPI.

consideration had not been not carried out. Different ways how to reach the public have appeared during the pilot phase:

- In Belgrade, information about the project was broadcasted in the national television;
- Public engagement was part of two International Science Festivals in Edinburgh;
- In Barcelona, Facebook and Twitter accounts have been created but they have not been advertised yet;
- In Ljubljana, hundreds of people were approached during an open day event (posters, brochures and leaflets were distributed and t-shirts were printed). Although the measurement data for outdoor air quality is not yet been publicly available,there has been an extensive effort invested in local identity building and branding of the CITI-SENSE project. This illustrates that outreach activities do not serve only as a way of information sharing but also as a way through which **common identity, forms of social interactions and sense of belonging** to the project goals being built.

Stakeholders' response and satisfaction has been measured only in Ljubljana and partly in Ostrava and Barcelona.

The character of public engagement and empowerment in the pilot studies was also influenced by **technological factors**. There was no doubt that the technological aspects of the project were promising and raising awareness of potential stakeholders. Citizens were interested in both personal devices and sensor technology. It seems that their previous experience played a very important role. For example, involved citizens in Ostrava had been already familiar with personal monitors. In contrast to personal monitors when long time for analysis was needed, the CITI-SENSE represented for them a promise to get data in real-time. Therefore, citizens have been attracted to online sensor studies because of the promise of **immediately available results.** However, technologies as a flagship of the CITI-SENSE project can be also a limiting factor to public engagement. In Oslo, achievement of full users' satisfaction had been limited by the lack of portable sensors. The same can be said about Edinburgh. In Edinburgh, even though the relationship with the stakeholders was partly successful, this effort was hampered by the late delivery of personal sensors: "It is easier to sell the project if you have something you can give to people to use at that time" (unsourced quote). The lack of personal sensors was also mentioned as a limiting factor for engagement in Ljubljana. Lack of confidence in data was the main reason for not convening any **outreach activities** in some/many of the case studies. In involvement of particular stakeholder groups in design of tools, **the level of co-production** might represent a tool how to capitalize the interest in technology and building realistic expectations from technological tools in the same time. In Ljublana, high school students have been **involved in product development.** They have developed a phone app and they edit their project webpage. The technological aspect also attracted informed public to be keen in participation in personal measurement. All involved students might not have been interested in air quality, but rather in the technological aspects of how to analyse and visualise data. This experience illustrates that projects like the CITI-SENSE can attract a diverse public and they can bring together people with different interests and different expectations.

The stakeholders have been also involved in design of project's products in Oslo.

3.7 Preparatory Forms

In CITI-SENSE, the general idea is to develop citizens' observatories to raise awareness on air quality problems, empower citizens to participate in environmental governance to support policy- and decision-making, by giving them effective participation in the EU's environmental governance and by providing them with environmental information, including quantitative estimates of the errors in this information. It provides an opportunity to develop the mechanisms needed to implement the

two-way interaction between policy makers and citizens that is fundamental to empower the citizen and allow him/her to influence environmental governance.

Preparatory forms (a set of questionnaires) are designed to help answer these questions: (1) What does already exist?; (2) What do we want? (or what do we want to contribute to an existing initiative); (3) How will we achieve this? Preparatory forms are designed to make the location officers reflect on the next steps in the implementation of their EI, they will give an overview of the current status of the empowerment related aspects and they can be used for encouraging mutual learning. This preparatory work was intended to result in a concrete action plan summarizing the activities that will be needed to get the desired end results, a communication plan and an engagement plan.

There were developed 3 main preparatory forms and 4 additional ones:

- The first part helps to gradually deepen out the general ideas about the citizens' observatories by a list of questions;
- The second part of the preparatory forms deals with stakeholder identification and analysis, which is essential for the engagement planning process;
- The third part of the preparatory form deals with the practical implementation of EIs.

The additional forms are developed to plan and record engagement and expectations, communication, sites and sensors, ecosystem services approach (see D5.2).

In contrast to the general Reflection Questionnaire, the Preparatory Forms are more specific and provide respondents with more targeted guidance; therefore, they trigger more specific answers on more detailed aspects of experience with empowerment. All preparatory forms also end with a question about the LOs' expectations towards WP5 and the opportunity to share experiences or concerns in this phase of their initiative. On the other hand, the Preparatory Forms represent a rich information source with respect to needs of WP5 (in contrast to KPIs which were developed for overall evaluation). However, the delays (see Figure 2) in fulfilling the Preparatory Forms have significantly influenced their functionality. The Preparatory Forms had been originally targeted to be used for the pilot phase (see *Deliverable D5.2 Methodology and protocol for citizen empowerment and decision making)*, but severe delays limited their functionality and their benefits for steering activities in pilot phase.

In the preparatory forms, **municipalities in WP2** and **schools in WP3** were identified as the most important stakeholders since they can greatly facilitate direct implementation of EIs. Generally speaking, the relation with municipalities can be characterized as a dialogical one – regular meetings with local authorities are held in most EIs. With respect to previous experience and tools challenging a deficit model prevailing in Reflection Questionnaires, two important parameters of dialogue between scientists, local authorities and citizenry should be taken in consideration: (1) **inclusiveness** (who can decide about the project's decision – what is decided only by us as scientists, what is deliberated with local authorities, what is deliberated with volunteers and what is consulted with broader community - and who has the access to produced knowledge – see the chapter 2.3.2 Inclusive risk governance in D 5.1) and (2) **effectiveness in decision support** (what are the practical and concrete consequences of the involvement in the project in terms of public policy decisions and outcomes – how outcomes of the project are implemented in problem solving and decision making – see the chapter 2.6 Decision support in D 5.1).

With respect to inclusiveness, Vienna is an exemplary case. Local authorities were interested in measuring technologies but not too enthusiastic in publishing data and local authorities strictly decline publication of measurements. A critical reflection of this case seems to be very important for further consideration of collaborative and critical aspects of the CITI-SENSE project activities. In

relation to this critical reflection, different roles of the EIs, scientist involved, local authorities and citizens need to be discussed. Which roles do projects like CITI-SENSE have? What does it mean to be involved critically with local authorities and with citizens?

In contrast, in the Vitoria case, due to the current economic situation in Spain, the municipality was unwilling to commit beforehand to the results of this study. They were concerned that this would imply, among other things, committing resources which they might not have. Therefore, the municipality was unwilling to commit officially to the results of this study and expects the CITI-SENSE local team to manage the expectations of citizens accordingly. In contrast to the previous example, such cases lead us to question to what extent this lack of support might be problematic from an empowerment-oriented point of view.

The volunteers were also mentioned as one of the main target groups. Without participation of volunteers, the project could not be carried out according to the plan. Citizens were intended to be empowered by using the mobile app and giving us feedback, reporting information (persons as sensors), carrying sensors or using the data. Even though citizens can be empowered in many different ways, alternative ways of empowerment were mentioned very rarely and they were not reflected by LOs. On the other hand, LOs reflected that the level of data accessibility and data visualisation limited citizens' participation. Cooperation with already established and motivated groups (cyclists, meteorological students, etc.) was considered to be effective; however, it might be hard to reach people outside of already established participatory networks. In a longer-term perspective, and particularly if CITI-SENSE overall succeeds with communicating about the project via websites and social media, the broader community (e.g. interest-groups, voluntary organizations) could be foreseen as potential stakeholders for optimising impact.

General trends in experiences from pilot studies can be summarized using a Strengths, Weaknesses, Oppotunites and Threats (SWOT) analysis based upon individual Preparatory Forms (see Figure 4).[7] The SWOT analysis reflects the perception of LOs. The overall analysis is based upon qualitative analysis of diversity aspects mentioned in SWOT analysis in individual Preparatory Forms. All codes were sorted out in groups covering basic elements of the project: team, technology, and empowerment. A well-balanced project team with strong expertise in combination with novel technological approach was seen as the strength of the project in the majority of locations. However, it seemed that social issues were still underdeveloped in majority of locations at least during the period when preparatory forms were formulating. It seems that imbalance in favour of technological interests was neglected by the LOs. Furthermore, the project seems to be very successful in establishing relations with local authorities despite critical signals from some locations (for example Vienna). However, the project has been facing limited resources, technical problems and difficulties to get volunteers on board. According to previous experience, CITI-SENSE can benefit from municipalities' existing commitments and cooperation with already established groups. In order to be successful, the project should develop strategies how to deal with possible external threats: how to provide stakeholders with reliable measurement and how to keep them interested in the project.

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[7] The overall SWOT analysis is based upon qualitative analysis of diverse aspects mentioned in individual Preparatory Forms. As data source, there were also included information from different parts of Preparatory Forms, which were coded as strengths, weaknesses, opportunities and threats during the analysis. All codes were sorted out in groups covering basic elements of the project: team, technology, and empowerment.

Strengths:	*Weaknesses:*
Team: • Well-balanced project team: members with technological expertise and members with expertise in organising participatory processes. • Previous experience in similar projects developed in the city, strong knowledge of ecological and process based modelling. • Good contact database for recruiting volunteers and other kind of participants. **Technology:** • Novel approach to environmental governance (which will presumably attract public interest). • Low cost sensor technology: possibility to deploy multiple sensors and involve multiple schools/stakeholders. **Empowerment:** • Good relation to local authorities, schools, etc. • Competent teachers and students. • Flexibility: by giving room for schools own ideas.	**Team:** • Limited resources. Goal of empowering demobilised and underrepresented social groups might be too ambitious given this lack of resources. **Technology:** • Uncertain sensing capability. • Failing sensors and other technical problems. • The lack of back-up equipment when things go wrong. **Empowerment:** • Decision to cooperate with already established working groups and to disseminate information through public channels means that it will be hard to reach people outside of already established participatory networks. • Difficulties to get volunteers for the installation of the static sensors. • Low concern about air quality due to the high standard of living. • Participatory groups tend to be skeptical as are local authorities about new initiatives.
Opportunities: • Municipalities' commitment to citizen participation and environmental topics. • Several established participatory arenas and working groups of citizens with which to cooperate or projects in the city with which we can establish collaboration.	*Threats:* • Not to obtain good sensor information and/or different results from "official" data. • Loss of stakeholders' interest who prefer involvement in other projects

Figure 4: Summary of the SWOT analyses based on the LOs' perception

The SWOT analysis (Figure 4) is based upon the LOs' own perception. Empowerment was again connected with sensors. LOs evaluated strengths, weaknesses, opportunities and threats predominantly through technological criteria. Empowerment criteria such as level of citizens' involvement, co-production or deliberation were not mentioned and it seems that they were neglected in the preparatory forms. The crucial task for main studies and their evaluation is how to broaden the narrow technological scope of the project's perceptions in favour of more complex mode of thinking dealing with social, political and technological aspects of empowerment.

3.8   The tentative explanatory model

Based upon analysis of the pilot phase of the project implementation, a tentative explanatory model was constructed to cover the most important aspects of empowerment evolution and classify categories identified in the previous analysis. Using a comparative framework, as introduced above, it employs the stepwise approach considering evolving the project through actions towards project outcomes. This model intended to grasp both technological and social aspects of empowerment initiatives. The following model (Figure 5) was intended as an overview of phases and relations during empowerment process. The idea of this model was to show an application of the stepwise process thinking in relation to the CITI-SENSE project development.
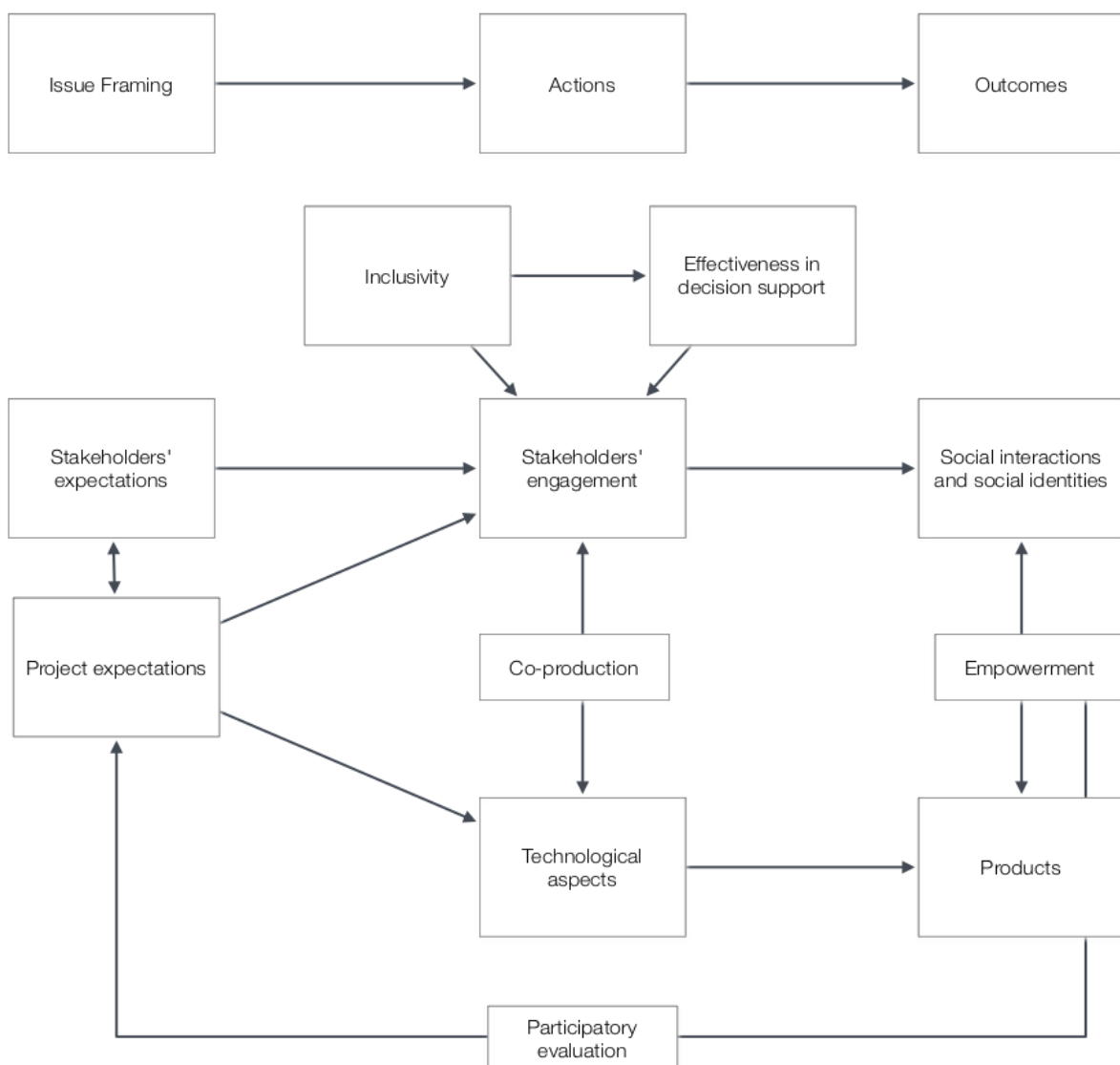

Figure 5. The tentative model for comparative analysis

The first layer on top shows a classical stepwise research process. The part below represents the relations between technological and social elements of the project and more detailed classification of stakeholders' engagement. It also shows a path dependency of the project implementation - how the set of decisions one faces for any given circumstance is limited by the decisions one has made in the past. The model needs to be further elaborated in the next steps of comparative analysis.

3.9　Next steps for the comparative analysis

We briefly want to look forward to the next steps for comparative analysis, which will focus on the main studies in the EIs, most of which will start later this year, some in the schools already started. The outcomes will have to be reported in D5.5:

> *D5.5 Co-ordinated analysis across empowerment initiatives: After analysing information about participation, acceptance and decision-making across activities and locations, final cross-cutting issues and integration issues about citizen empowerment, engagement of public authorities and models of decision-making across empowerment initiatives and locations including risk governance and management will be proposed by means of a report. The methods of this report will include a description of the implementation of the protocol.*

Based on the previous discussion, we can qualify this step for WP5 activities as an important shift in focus. In the beginning, activities were mainly raised related to capacity building and awareness raising: stimulating the EIs to start reflecting on the empowerment aspects of their work, and start preparing properly for the main studies. Both within WP5 and WP2 and 3, this demanded quite some awareness raising of the importance of these issues and capacity building on how to deal with related aspects, having to take into account much more sophisticated views on empowerment issues than what was perceived in the beginning. We made good progress over the past months, even despite severe delays in the general work of the project due to technical problems with the sensors, which took away most attention, time and energy from the EI LOs. Now WP5 is collaborating more closely with the LOs, having many more common activities.

The data collection activities presented and analysed in the previous sections (reflection questionnaire, preparatory forms and the data collected on KPIs) are to some extent relevant for our comparative analysis, as they paint a picture how on similar aspects related to empowerment, EIs work or plan to work, showing not only progress in terms of awareness and sophistication, but also differences. To some extent, nevertheless, we must realize that these activities did not have comparative analysis as their main focus. Now, in the face of the starting main studies, it is time to shift our focus to the comparative analytical ambitions, trying to organize as much as possible a more harmonized and focused efforts. As previous developments show, such organisation will always be tested in practice and can only follow the rhythm of practice, as we depend on the developments in and the collaboration of the EIs.

An important new venue that is starting to get more common ground in the practice of WP5 – WP2/3 collaboration, is the incorporation of the viewpoints of those we want to engage with: the users of our devices, respondents of our questionnaires, the participants in the EIs and to some extent stakeholders and the public at large. In recent developments on a design of a perception questionnaire and visualisation of data, and the use of the sensors, co-design and user feedback became more common elements of the design and application approaches, trying to incorporate the feedback and viewpoints of people outside of the expert group of CITI-SENSE. This development, and ideas that are emerging on participatory evaluation of the work of the project, is promising for comparative analysis and crucial from an empowerment perspective: we need to go beyond the self-evaluation that was the basis of KPI-reflection on empowerment aspects of our work.

A first step we need to organize is to create a complete overview of all running and planned activities that may contribute to the data collection effort needed as a basis for the upcoming comparative analysis work. We then have to evaluate the strengths and weaknesses and the opportunities for improvement of the current situation. We then have to engage with the colleagues of WP2/3/5 in order to establish a sound empowerment data collection system, which will form the basis of comparative analysis. This will be a combination of analytical focus and practical organization. The latter was already discussed in the WP 2/3/5 Oslo meeting in December 2014 where it was agreed that WP5 contact persons and EI LOs on an individual basis can agree on a way of working with harmonized check lists or questionnaires, in order to enhance the data transfer from practice to analysis and back for intermediate reflections, which will keep feeding into the EI-learning process. This will also have to go hand-in-hand with co-design and participatory evaluation activities within the EIs and further development of work on empowerment related KPIs for which we strongly suggest that WP5 will take the lead. Last but not least, the comparative analytical framework which will structure analytical thinking and work will have to be developed, partly from practice as it develops on the rhythm of EI practice, partly steering more strongly the data collection effort in a harmonized manner in order to better guarantee proper comparative analysis in order to draw lessons from the empowerment side of the EI. Two main lines of development and analysis that seem to have emerged so far and are promising to structure the framework are: (1) CITI-SENSE as an interdisciplinary learning organization, and (2) CITI-SENSE as a trandisciplinary EI.

4. Planning for engagement and empowerment in the main study

4.1 Aims

The overall aim of this work was to develop a plan for engagement and empowerment in the main study implementation of the EIs. This built on the work described in Chapter 2 of this report which describes the development of cohesion and skills within WP5 in order to optimise the support from WP5 to the LOs in the implementation of the EIs. In this next stage of the project, meetings were held with, separately, WP2 and WP3 with the following specific objectives:

- To determine how the main studies in each city have prepared from an engagement and empowerment perspective, and to find out what is still needed within this preparation and remains to be set-up before the main study gets underway;
- To exchange learning and experience between EIs with regard to engagement and empowerment;
- To determine how WP5 can help the EIs prior to and during the main studies – for example, communication, perception research, empowerment, solution oriented strategies, governance, participatory evaluation;
- To determine what was required from the EIs to allow WP5 to perform scientifically robust comparative case analysis on engagement and empowerment issues including how WP5 might expect the EIs to report back on engagement and empowerment issues in order to collaboratively carry out evaluation research;
- To develop a concrete plan of collaborative actions.

4.2 Introduction

This chapter consists of notes from reports on the meeting in Oslo in December 2014 which greatly consolidated collaboration between WPs 2/3 and WP5, with a number of joint working groups (some involving other WPs as well). The meeting took place over four days and was held in three parts: a preparation session for WP5, a session including WP5 and WP2, and a session including WP5 and WP3.

4.3 Meeting reporting

4.3.1 WP2: EI updates from an engagement and empowerment perspective

The aim of this session was for each EI to note up to three things that were going well in their city and three challenges that they were facing. All attendees at the meeting then considered the positive issues and the challenges and wrote suggestions for the EIs on post-its. Some suggestions general to all EIs were also provided. A summary of the positive and negative issues and of the responses provided at the meeting are shown in Appendix C.

4.3.2 WP2: What can different EIs learn from each other

The first group focused in particular on role of LO and how to learn from Ljubljana WP2 EI

- Define prioritized stakeholders. Work with stakeholders, see how EI can complement their interests;
- Define and communicate clearly the added value of specific EIs;
- Sensor data, but also output/how sensor data are presented and visualized;
- Think of how to use other relevant data (open and public data);

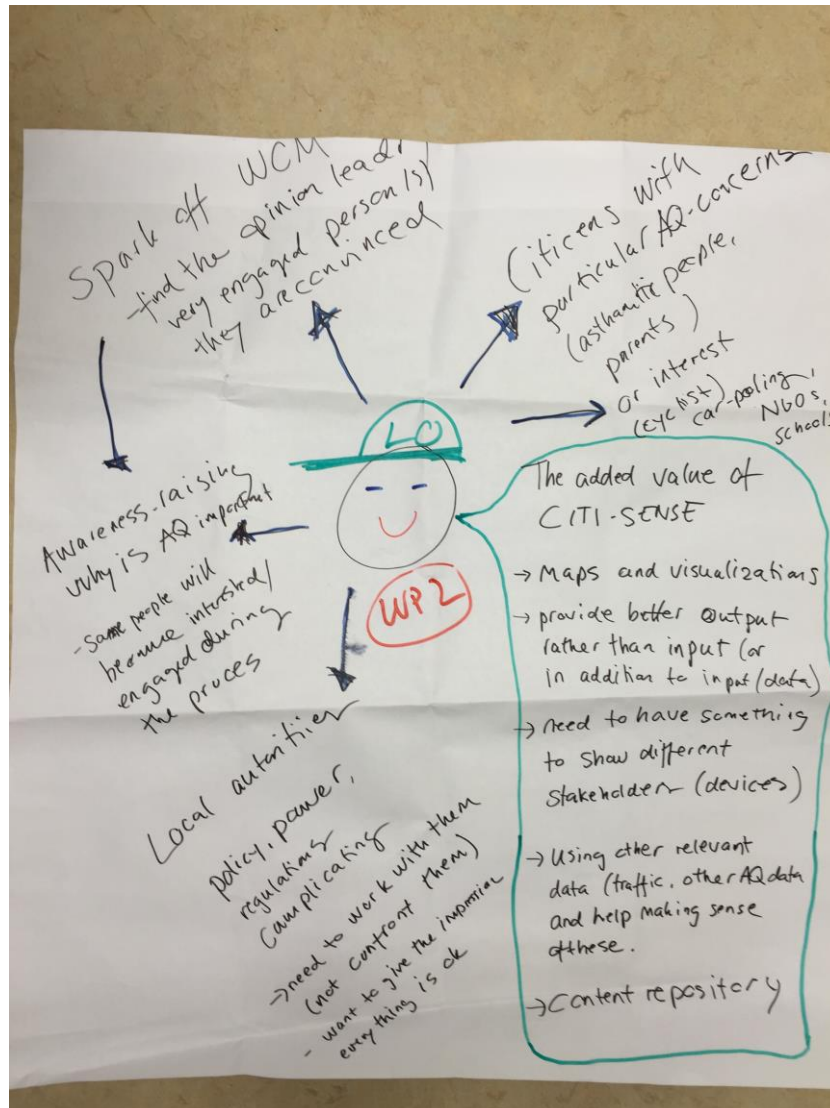- A common CITI-SENSE content repository of why is air quality important.

Figure 6. Notes from group 1 – the role of the LO

The second group focused on how different sources of AQ-data (with different quality) can be used in different ways.

- Data Quality: Why do you want quality?
- "People want to do something with the outcomes (otherwise they will not be interested)!" "People (might) want to be able to oppose authorities." (But how many people are really want this? And what do they want to oppose (e.g. the data of official measuring networks)?) Reliability will be more important in order to avoid confusing/contradicting messages;
- Perception based data (and "plan-B-discussion"):
  It can be important to give people a platform for perception based data. Oslo is working on an app for perception of air quality to be showed in maps (also based on questions about symptoms of health issues related to air quality);
- There are different purposes for data production and the accuracy that is needed will depend on the specific goals and stakeholder opinions;
- Engagement: Who do we need/want to engage?

- Both private partners (e.g. sensors on houses) and public partners (e.g. sensors on lamp-posts etc.). For engagement of private partners, websites where people could express their interest were tested (together with emails and social media in order to guide people to the website);
- Both active engagement and rather passive engagement can be used. Different levels of engagement can be used in order to reach different goals (e.g. awareness in general with displayed information versus active citizen science). For empowerment, more active engagement is needed. *(Additional comment: Think about the ladder of engagement (inform - consult - involve - collaborate - empower) and ask yourself which levels are most appropriate for different partners and/or different goals.);*
- Challenge mentioned:
  "We don't know yet how the participants are going to use the data." (example from Edinburgh) versus "We have good/strong NGOs who know what they want." (example from Ostrava) versus "People are not always aware of air quality problems." (example from Oslo);
- Perception based monitoring can also be used when trying to get "critical mass" (and policy might listen to complaints if there are enough people) and in order to find perceived('!) hotspots (which might also be interesting to know about and to look for possible reasons for this perception).

Remaining challenges:
- Scaling-up:
  "Up till now, we have been talking to people who are aware and interested, but how to open up to the wider community?" (e.g. we don't want to empower only 20 persons). Important to think about representativeness and interesting ways for crowdsourcing in order to scale-up;
- Expectations:
  These also need to be managed.This also works both ways: local authorities also wanted to place sensors in a specific place to see if the complaints where "appropriate";
- Finally, we summarized things that had been discussed in the meeting (and some new insights) into a schematic overview:
  - Different data sources: the data-source-spectrum consist of perception based data on one end, less accurate but reliable sensor data somewhere in between and high quality sensor data on the other end;
  - Different strategies are needed to bring different kinds of data (with different quality)to stakeholders, which can be individuals, groups of individuals or NGOs (e.g. more strongly organized than 'just' groups) and the entire community. If the right strategies are chosen and data are communicated correctly (taking into account expectations and risk communication issues), all kinds of data sources can be useful, it only depends on what you do with these sources;
  - All sources can be used for different aims on different levels (e.g. individual behaviour on one end of the spectrum, political changes on the other);
  - Additional: Actually some arrows in Figure 7 are still missing, because for instance achieved outputs on the community-level might of course affect individual behaviour etc.
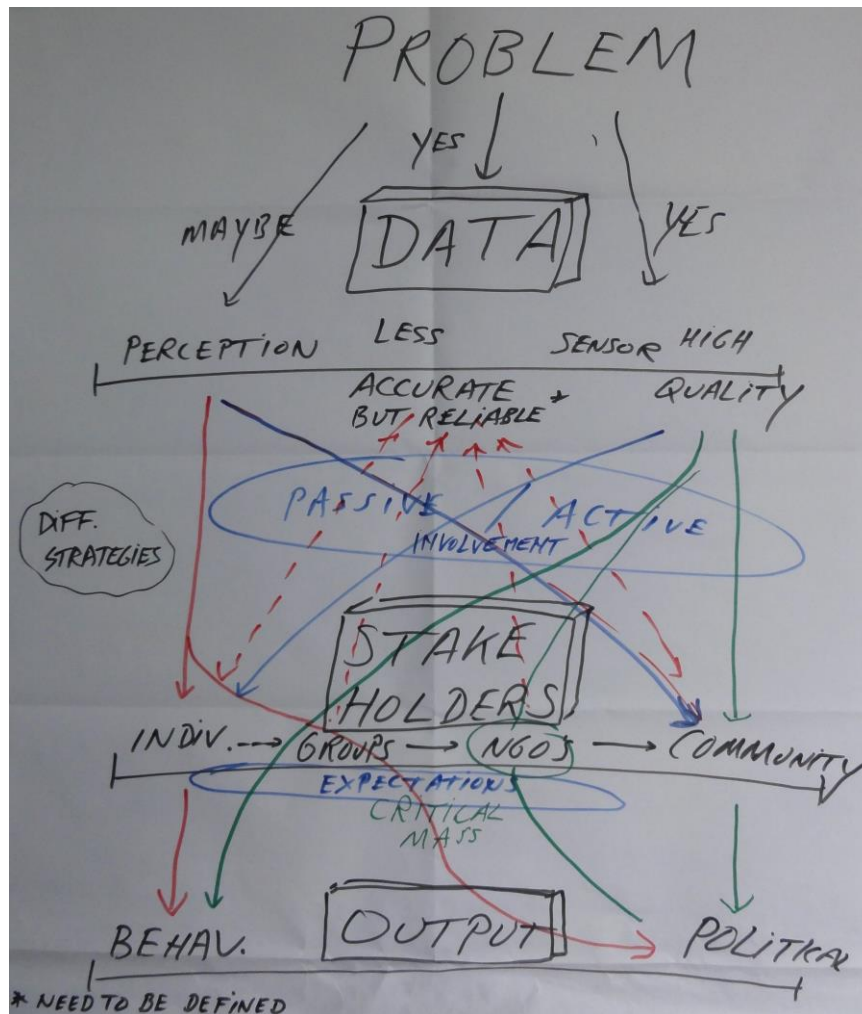
Figure 7.Notes from group 2 – schematic overview

Other issues discussed included:

Data quality:

- Too much enthusiasm at the beginning: expectation management;
- Using proper expressions: not measurement, but rather scanning;
- Focus on meaning (using categories – good air quality, poor air quality, rather then exact numbers);
- Learning how to measure and learning about uncertainties in scientific processes can be also a way of public empowerment because it can equip people with arguments, and can facilitate progress without waiting for perfect data to be collected;

Using experience with children in order to reach out to adults

Strategies in selection target groups:

- Prior to contact with particular stakeholders we should carry out careful stakeholders analysis: why we have decided to involve them in the project, what are the benefits from their involvement, what are the risks, what are the strengths and weaknesses, threats and opportunities. This has to been done across the EIs, due to the uncertainties in the products of the work and what can be offered to the stakeholders from the study.

Security:

- Agreement with participants;
- Who has responsibility for devices.

Personal sensors: we don't know what to promise.

4.3.3 WP2: Perception monitoring

A presentation on perception monitoring was given as an introduction to this session. Following the presentation, the meeting subdivided into three discussion groups.
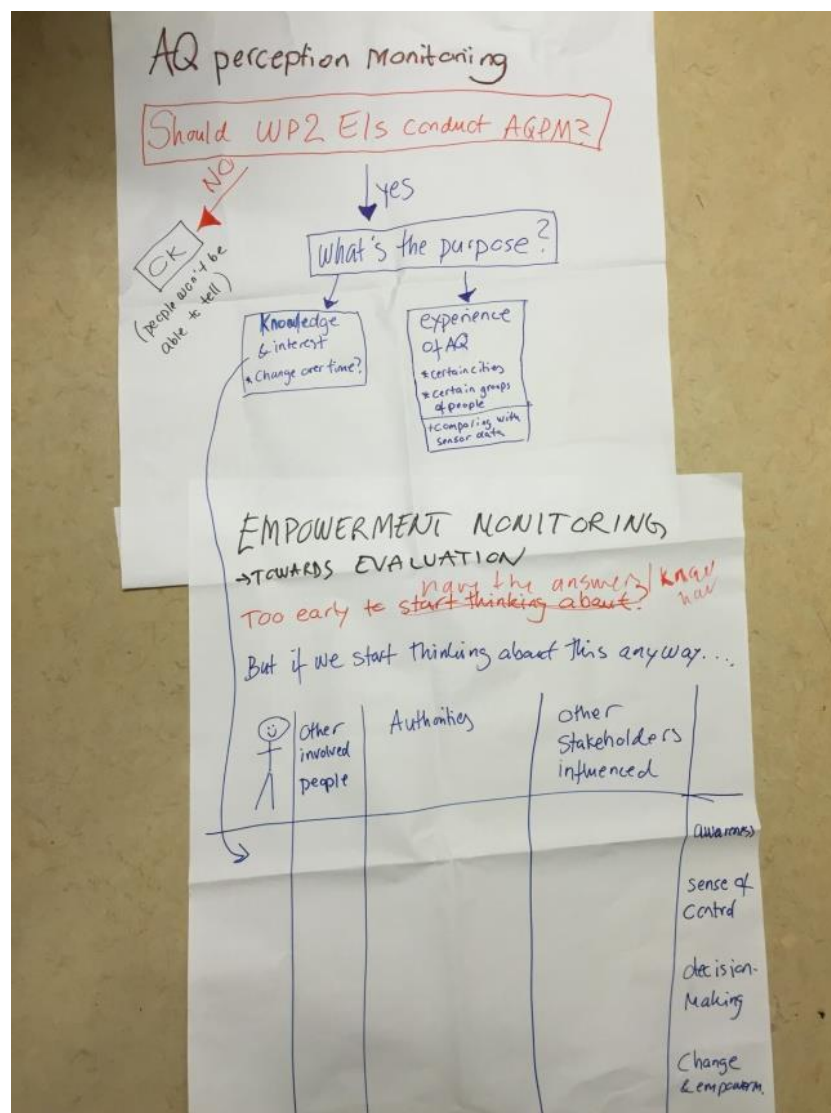

Figure 8. Notes from group 1 – Air quality perception and empowerment monitoring

First group discussed:

- Air quality perception monitoring: first assess whether it makes sense;
- If not: then fine;
- If yes: define purpose;
- Empowerment monitoring: Towards evaluation of EIs;

- Different stakeholders: individual participants, other involved people, authorities plus external stakeholders not explicitly involved in EI;
- Extent of empowerment: from awareness-raising to decision-making, change and empowerment;
- Still to be decided: what methods to we use to measure empowerment for different stakeholders.

The second group discussed the following issues:

- Case studies involved in this group mentioned the following activities: Barcelona: work in progress (for instance questionnaire on expectations, etc. but only a limited number of persons actually used it). Ljubljana: there were developed school case questionnaires (only for schools) and quality of life questionnaires (available on the website for everyone). Vienna: currently not working on perception based research;
- There are also existing questionnaires (e.g. National comparisons between cities that also include questions about environmental issues) and there should also be a questionnaire regarding the EU Green Capital Award. So maybe we can also see what surveys already exists;
- Maybe numbers of complaints are also monitored by local environmental services and/or police (e.g. about noise pollution);
- There exist GIS systems to map environmental perceptions/complaints (for example in Oslo). Perception data can be linked with static sensor data, for instance to inform people about the difference between their own perception and the data of the models, but the number of available sensors is a limitation;
- WP5 can harmonize the questions (based on the perception questionnaire);
- Remaining challenge:
- It is important to be sure about the exact location people scored when they answered the questionnaire (e.g. their working environment, their home environment or the environment in general). You really have to got a clue in order to interpret the answers (cf. PHENOTYPE-project);
- The (possible) roles of scientists in the EI is also relevant in perception based research;
- Due to time constraints, there hasn't been made a "poster-summary" of this discussion.

The third group held a discussion on:

Evaluating Empowerment.

- How to evaluate success, and who (us or them) will evaluate it?
- (participatory evaluation – forum discussions, questionnaires);
- User specific (based) indicators of success;
- What is it used for/expectation/reason/motivation;
- What is empowerment and how do people want to be empowered?
- Explorative interviews: focus groups/surveys;
- Will the information change our way of work (lessons learned);
- Is there consultation of citizens?
- Questionnaires before and after participating in the project.

Air quality perception monitoring

Questions:

- Is it important?
- Who is responsible?

- What does the information mean to individuals?

Questions asked only once:
- What do you know about…?
- How does air quality affect your health?

Questions asked continuously:
- Please report your current symptoms;
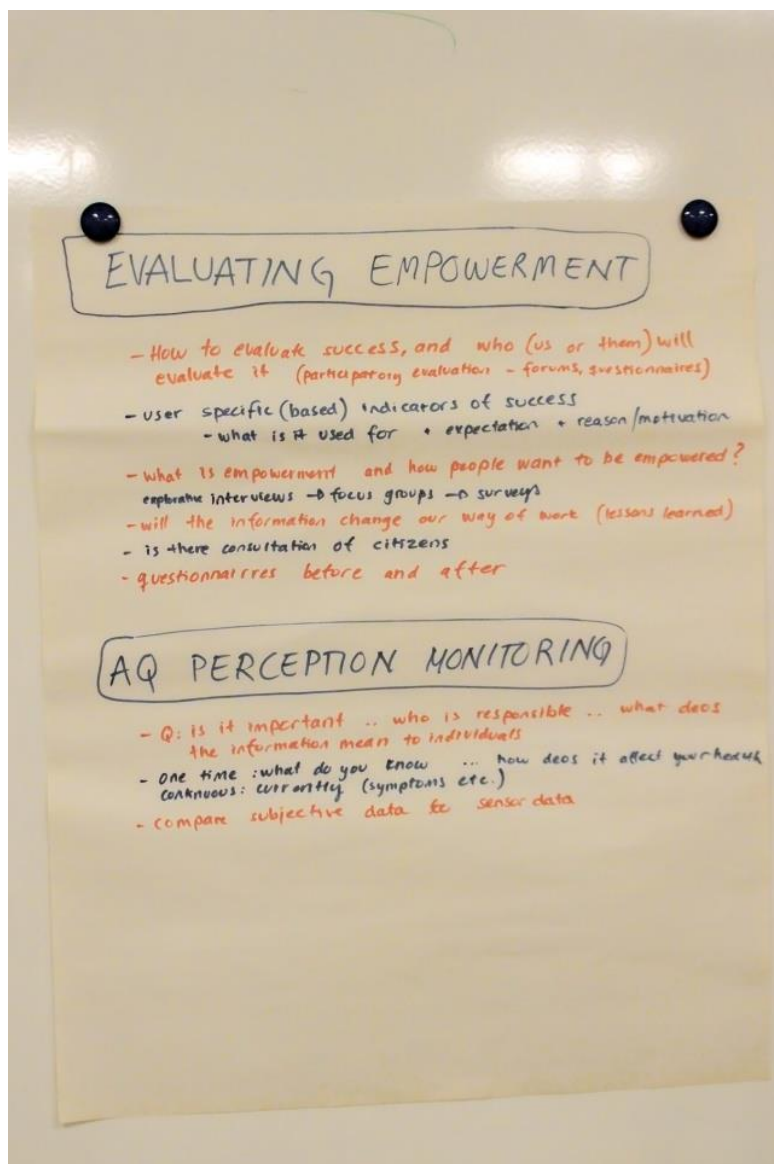- Compare subjective data to sensor data.

Figure 9. Notes from group 3 – Air quality perception and empowerment monitoring

4.3.4 WP2: What does WP2 expect from WP5?

The first group gathered additional feedback from the LOs' experiences with the WP5-forms and the WP5-deliverables:

Positive:

- The forms make you think of different aspects that we didn't cover yet and/or things that were not in our minds (for example representativeness);
- Fruitful way of filling in the forms in Vienna: A first Skype-meeting is used to go through one or two of the WP5-questionnaires in order to explain questions that are not clear and/or to discuss some of the questions on a more general level. LO makes a first draft of the filled-in WP5-form. Written feedback on this draft is given by the WP5-contact-person and then more thoroughly discussed during a second Skype-meeting. Second draft-version is prepared by LO and final feedback is given by WP5-contact person (leading to final version).

Negative:

- Difficult language (so some of the LOs did get lost in the social science language or they did not always understand all the questions);
- Available time in the project is limited, so it would be better to have shorter questions;
- Added value of all questions is not always clear.

Recommendations:

- Fill in the WP5-forms together with the EI-contact-persons in WP5;
- What to do when not everything is clear yet in this phase (e.g. we are not sure yet what we are going to do exactly because of the outstanding technical problems with the sensors)?
- Shorter questions/questionnaires;
- Wording (e.g. no jargon) in order to find a common language;
- Importance of very practical support (e.g. developing and making available content from other types of questionnaires, such as the Oslo-perception-questionnaire);
- Difference between rather general questionnaires and very specific questionnaires.

About the WP5-deliverables:
- A summary is very important;
- Follow-up is needed in upcoming months. Remind LOs to add major changes in the EI-strategies/actions when these occur (e.g. in a re-edited version of the existing WP5-forms: "living documents-idea");
- It can be helpful to connect WP5-forms to different paragraphs with relevant information in the deliverables.

4.3.5 WP2: Empowerment, solution-oriented strategies

This section started with an introductory presentation, followed by division into subgroups for discussion. Three scenarios were put forward for the discussion groups:

Scenario 1

To what extent should we be involved in approaching policy makers, as part of the empowerment?

The local authority is interested in measuring technologies but not too much enthusiastic in publishing data. Furthermore, the local authority insists on control over data access. A good relationship with local authority gives a good chance to change local policy but it might restrict access to data for ordinary citizens? How should we deal with this situation?

General questions: What are risks and benefits in relation to communication with policy makers? How do we see our role – as scientist and case-study leaders – in the EIs?

Scenario 2

How could we make us sure that everyone's opinion is being listened equally?

We communicate predominantly with leaders of a local NGO who are also very active in local politics. However, we are not sure whether their views represent the entire community's perspective. How should we deal with this situation?

General questions: How can our ability of involved citizens to represent wider views be optimized? How can we deal with opposite opinions?

Scenario 3

Will (the availability of) sensors lead to a greater involvement of citizens? What alternatives do we have?

Citizens are disappointed with sensors – there are delays in installation and sensors do not measure what citizens demand. What should we do in order to keep people involved in the project?

General questions: What possibilities for public empowerment do we as experts have beside of sensors' deployment? In what ways are sensors irreplaceable?

The first group produced the following diagram from discussing the scenarios:
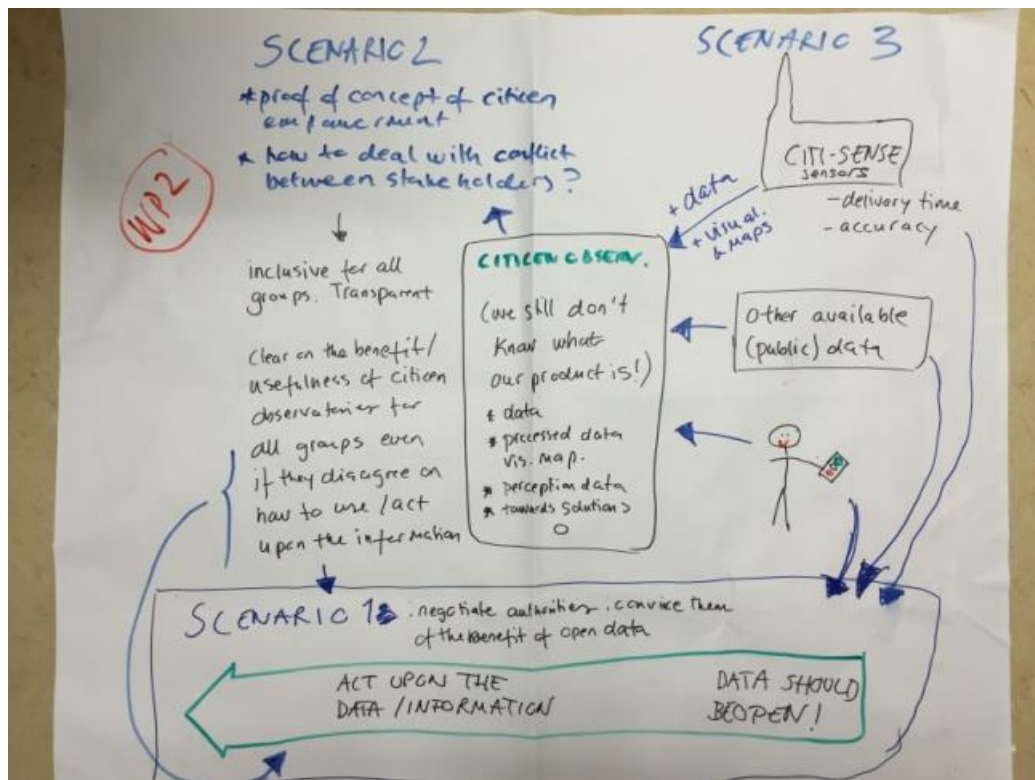

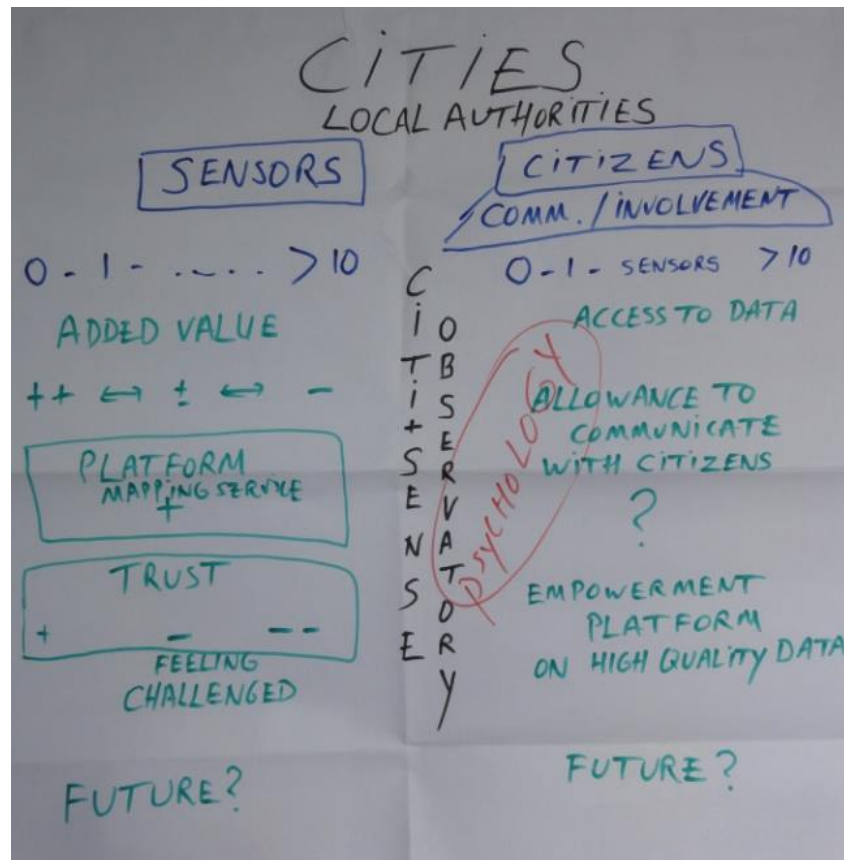**Figure 10. Notes from group 1 – analysis of scenarios 1-3**

Figure 11. Notes from group 2 – analysis of scenario 1

The second group discussed scenario 1:

- Some case-studies have to follow the hierarchical structure (top-down rather than bottom-up approach);
- What about different roles of scientists, dependency on local authorities regarding data access and agreements with them about not publishing the information (e.g. "playing by their rules")? Possible question: Are we the right actor to set up these EIs (if there are too many restrictions regarding communication, presenting data to people, creating awareness, etc.)?
  (Additional comment: On the other hand: do we risk to become sort of another "employee" for local government paid by the EU (e.g. we are doing for them what they tell us to do, even if that does not lead to our own CITI-SENSE-goals of empowerment)?). These are important questions in considering the roles of the EIs in the debate on AQ and decision making;
- Is what we are selling good enough? The visualisations and other apps are useful, but what about the sensors? For some aims/achievements, it might be too early?
- Added value might increase if the existing measuring network from the local authorities is limited (e.g. only a few static sensors in the previously existing network);
- The level of trust is also important: if local authorities feel strongly challenged by the CITI-SENSE-project, they will probably not allow a lot empowering actions (for instance restricted communication with citizens about the results)?
- Psychology may play an important role;
- Time will tell what is possible;

- Possible recommendation: you might test the sensors in close cooperation with local authorities (but you can be restricted by their agreements) and at the same time build a citizen's platform (to see how far you can jump with the basis ideas), but only based on relative values for air quality-measurements. It is also recommended to use a disclaimers then.

4.3.6 WP2: Plan of collaborative actions, forward planning and timing

This session has been summarised along with the similar session for WP3 later in this report.

4.3.7 WP3: EI updates from an engagement and empowerment perspective

The aim of this session was for each EI to note up to three things that were going well in their city and three challenges that they were facing. All attendees at the meeting then considered the positive issues and the challenges and wrote suggestions for the EIs on post-its. Some suggestions general to all EIs were also provided. A summary of the positive and negative issues and of the responses provided at the meeting are shown in Appendix D.

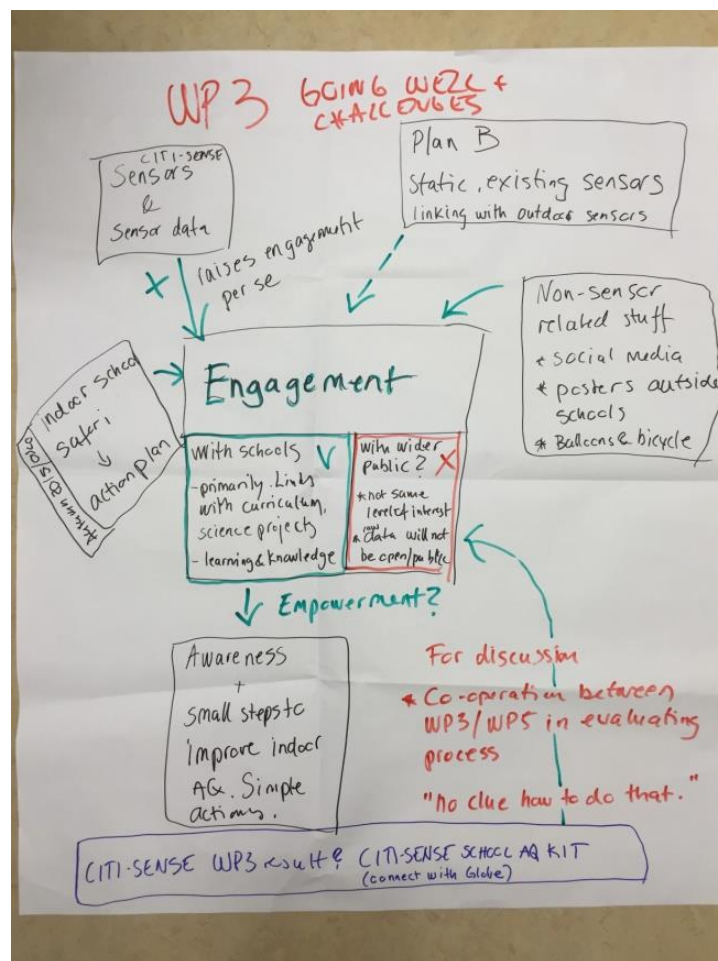### 4.3.8 WP3: What can different EIs learn from each other?

Figure 12. Notes from group 1 – what is going well and what are the challenges?

The first group discussed the following issues:

- Engaging school participants in general works well. The sensors and the sensor-data per se raise engagement, and LOs have plans for using back-up solutions if CITI-SENSE sensors fail;
- Challenges primarily relate to the accuracy of the CITI-SENSE sensors, the data flow and engaging a wider public. The latter also because data from CITI-SENSE sensors will not necessarily be public.
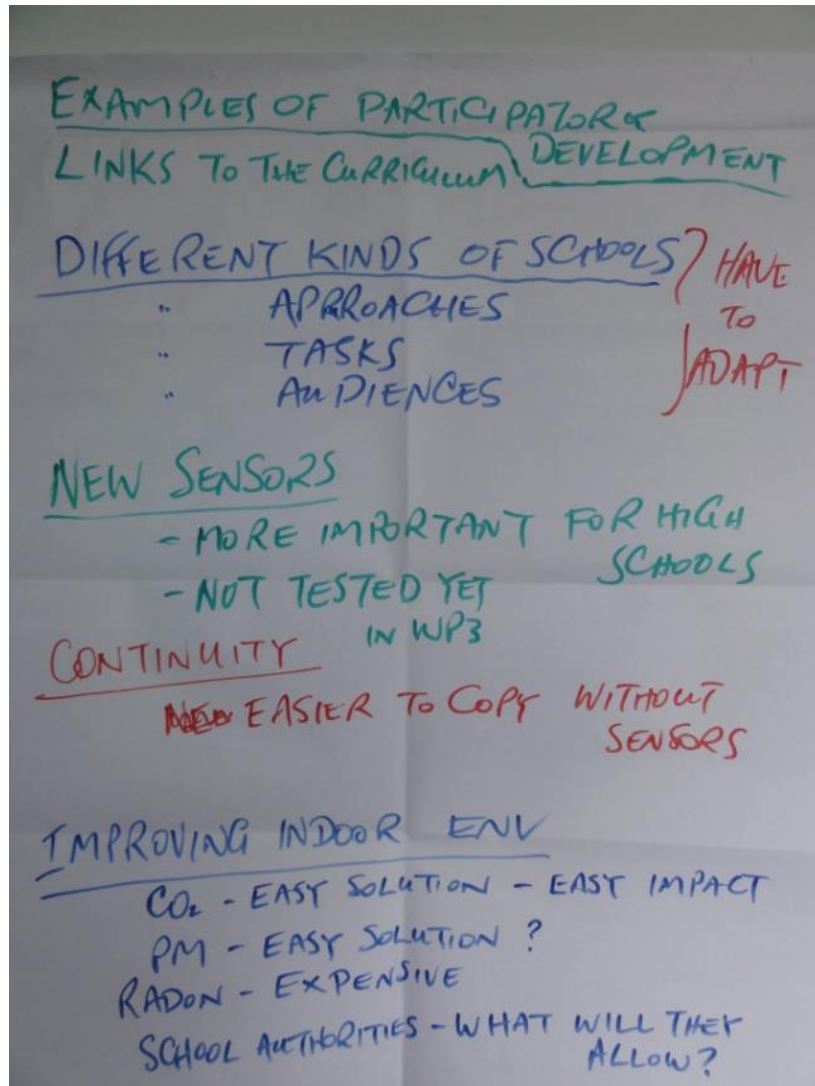
Figure 13. Notes from group 2 – examples of participatory development

The second group discussed these issues:

Positive:

- In Ljubljana a lot of things are going on and are now running quite well, even without the sensors (although of course they would also like to receive the sensors that are delayed). At the moment, there is a survey (in order to find the best locations to place the sensors). We also did a poster assessment: 24 students were willing to join and posters (with messages about health, own behaviour, etc.) were put on the fences in front of the school. *(This can already create some awareness.);*
- Referring to the challenges (of air quality) can also be a "selling-point" for what we are doing;

- In Ljubljana we have an example of "participatory product development": an app (visualization of data) has been developed by students. This was part from an international competition (with students visiting the USA). This can mean that there might be already people who are influenced/empowered to some degree (because some of the students who got interested in the app-development might continue to work together in the future and they might also be intrested in related jobs afterwards).

Negative:

- Sensors are delayed. We actually haven't seen the (new) sensors in the schools, they haven't been tested in the school, etc;
- There is no EU-standard for all indoor air pollutants. Colour-codes have to be decided, but currently we don't even have an appropriate data stream;
- Different types of schools (elementary, secondary, high schools, etc.) mean different audiences, different approaches/strategies, different tasks, different management, etc. For younger children, you also need the permission from parents. For them, it is important that we are able to show more about what we will exactly do;
- What about continuity? (e.g. is this discussed yet in all the cases?);
- "Continuity can depend on the local people involved (for instance one engaged teacher), in combination with the support and resources that are given";
- "We have been careful with raising expectations (e.g. not promising too much from the beginning). Continuity will probably depend on further developments";
- "Continuity should be considered and teachers should be involved in this. Each teacher can modify the students' curriculum to some degree (but in respect to the national curriculum)";
- Will it be an useful approach to avoid using sensors, so that approaches can be replicated more easily to other schools for instance without funds?
- Primary schools: sensors are not necessary (Ljubljana);
- High school students: sensors are necessary (Ljubljana);
- Can it be interesting for WP3-cases to work together with WP2-cases more strongly?
- In Ljubljana, we do this and WP2 really saved us regarding the sensors. They also gave us new ideas;
- In Belgrade, the schools have to allow us to work together with the WP2-case. Currently there are some concerns about security issues. But there might be interesting opportunities;
- Teaching and learning about air quality seem to be fine in general. But what about improving indoor air quality (e.g. environmental decision-making based on the work we do in the school cases)? We have to take this in mind! (e.g. creating impact as a very important part of the empowerment process);
- Question: "But how will they react (for example if even in a rather new school where it should be fine, air quality appears to be not very good)? The schools want to educate students, they don't need a lot of "noise" about problems that they might not be able to solve?";
- "Knowing about the problem might be worth the trouble!".

Recommendations:

- If people have other good ideas to do in schools, please share them;
- CO_2 might be a relatively easy-to-manage problem in schools, also easy to adopt in school policies. Maybe here we can find good examples of small decision-making-processes (based on measurements and on informed teachers who know what to do, when and why) in order to improve at least some aspects of indoor air quality;
- Guidelines for "good school design" (also related to air qualitye.g. ventilation rasters in doors, etc.) are available.

4.3.9 WP3: Empowerment and solution-oriented strategies

This section started with an introductory presentation which is available on Confluence, followed by a group discussion. Three scenarios were put forward for the discussion:

Scenario 1

To what extent could results from school cases influence the public empowerment on the community level?

We have got interesting results from school cases which might be interesting and useful for citizens and local authorities. How should we approach policy makers or citizen groups and how should we communicate this issue within schools?

General questions: What are risks and benefits in relation to communication with policy makers? How do we see our role – as scientists and case-study leaders – in the EIs?

Scenario 2

How could we deal with different opinions and different expectations?

Headmasters are not willing to measure indoor pollution and are much more interested in less controversial parts of the project. How should we deal with this situation?

General questions: How can our ability to meet with the project goals be optimized? How can we deal with opposite opinions?

Scenario 3

Will (the availability of) sensors lead to a greater involvement? What alternatives do we have?

Schools are disappointed with sensors – there are delays in installation and sensors do not measure accurately. What should we do in order to keep people involved in the project?

General questions: What possibilities for public empowerment do we as experts have beside of sensors' deployment? In what ways are sensors irreplaceable?

Conflicts can arise at different stages in the process, and might become more difficult to solve at later stages. For example, if a school objects to measuring indoor air quality, the solution would be relatively simple: choose another school instead. At the next stage, if a school does not want data to be public, the LO will need to respect school's decision. For the school EIs, not making air quality raw-data publicly available might also be the best solution, as raw-data might not make much sense if not linked with where sensors are located at different times.
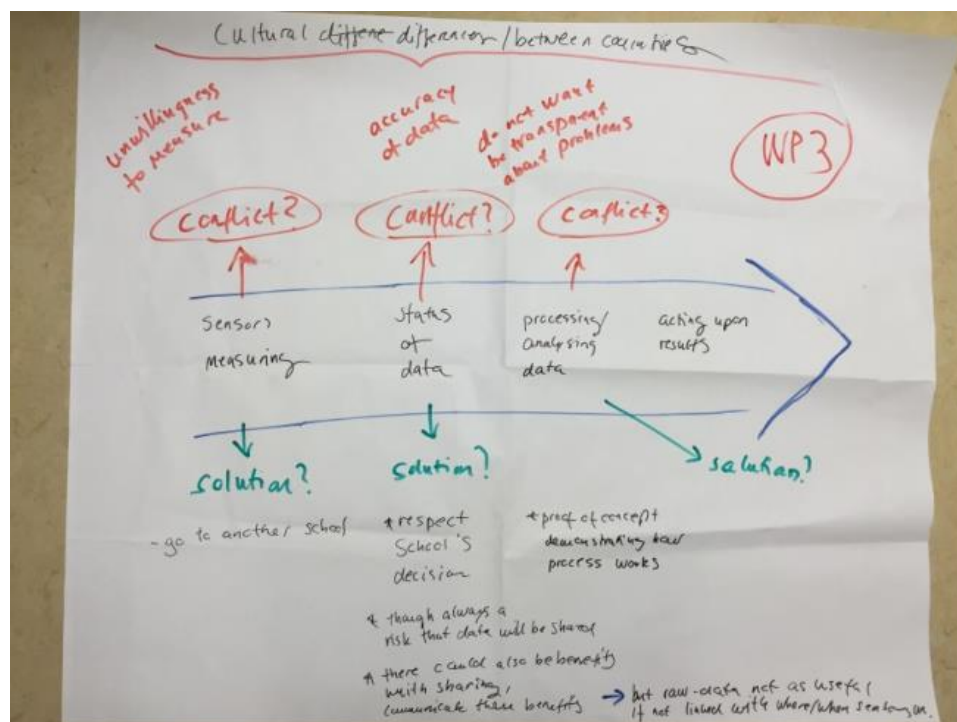
Figure 14. Notes from group 1 – examination of potential conflicts

Other things to consider:

- Different opinions don't always mean conflicts;
- It might be a good idea to "monitor opinions" (similarly as to what we also do with perception based research);
- If people are not informed properly, they might also get uncomfortable. Transparancy is also an important issue;
- How we communicate what we are doing is also important: do we see our local case studies as "learning projects" (research) or do we see the cases as integral part of the wider process (policy-making?). And what is the relation to "citizen observatories" (versus a limited educational project)?
- When you are going from measuring problems to solving problems (solutions), new challenges will appear (for example discussions about cost-effectiveness of actions);
- What about our own roles (as researchers)? Do we only present the results of the measurements and is the development of an action plan not up to us? (e.g. it is up to the schools to decide what actions to do next, and we have no role there?).

4.3.10 WP3 Communication Strategy

School EIs need to plan communication strategy for three different stakeholders and purposes:

- Internal communication with school participants, perhaps with an aim to set up a sustainable process of communication where school stakeholders discuss environmental issues and how to solve these also beyond the time-frame of CITI-SENSE. Leave it to the kids (and teachers) to decide what specific tools to use. Facebook groups is not always feasible because not all schools allow use of Facebook at school;
- Between EI schools: participants at some of the schools have shown an interest in what happens in the other school EIs. Blogs and Skype could be means to faciliate sharing and communication across schools;

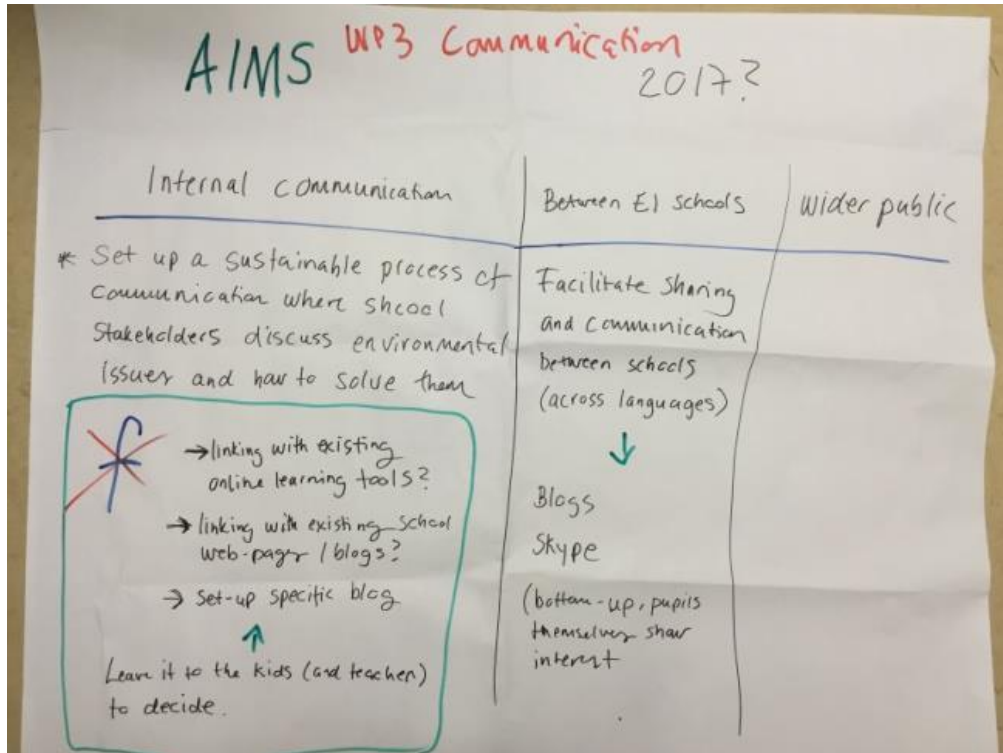- Wider public: There is also a need to think of how to communicate about the school EIs to the wider public.

Figure 15. Notes from group 2 – examination of communication

Other issues discussed:

- Different levels of communication: (1) with stakeholders within school; (2) with schools (teachers, pupils, students, janitors, cleaning persons, etc.); (3) outside schools;
- We have to know what we want to communicate with whom and what are their preferences => afterward we can choose a right communication tool;
- Don't forget old-fashioned means of communication like talking – they are crucial to build trust;
- Examples of communication with school: (1) Google groups for sharing documents; (2) paper works; (3) Facebook – if the school is used to it (it's necessary to be realist in terms of using Facebook amongst teachers, it's also time-consuming); professional community – newsletter of teachers' union or teachers professional associations;
- To ask school what they need and what they prefer.

4.3.11   WP3: Perception monitoring

Air quality

School EIs show good progress on working with perception monitoring of indoor air quality with a three-fold strategy:

- Running survey set up by EIs using CivicFlow: short and visual. Techical issues still need to be solved with CivicFlow;
- Standardized forms in schools with items typically used for indoor air quality experiences;
- Pupils create their own surveys, using Google Forms, pen and paper or Civic Flow.
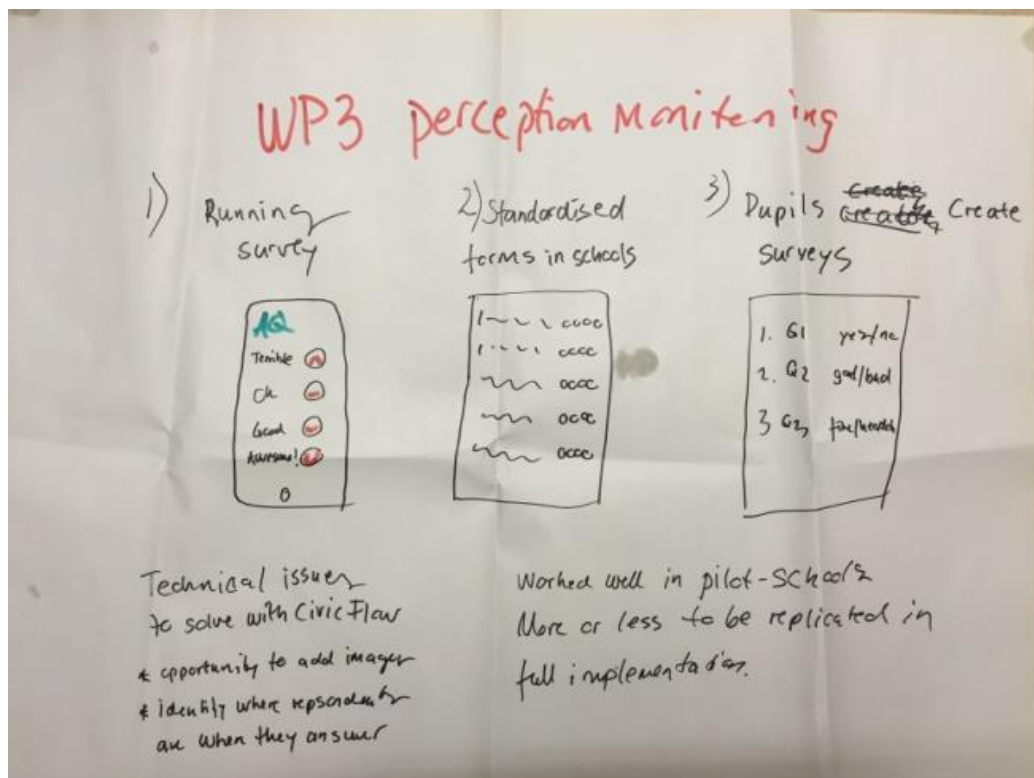
Figure 16. Notes from WP3 on perception monitoring

Other questions/ideas mentioned during the discussion:

- Can we only use standardized surveys (an method which is often related to scientific publications), or do we also have other options? (Also standardized risk perception questionnaires are available);
- Can we try to find correlations between measurements and perceptions?
- A touchscreen with smiley's in front of the class (similar to the "survey-tools" sometimes used in airports to measure customers' satisfaction) would be great, but do we have the resources? (Or are there cheaper alternatives?);
- The students can use perception surveys as an exercise in "mapping the school" (e.g. question: "what do you perceive to be the most problematic class-rooms in this school"), but will they also go towards "problem-solving" later on?
- We can use different starting points to address problems: Educational approach: learning in order to create awareness. This is what we are currently doing the most? Staff-oriented approach (e.g. the other way around): find areas to improve and then try to find resources to solve problems. This has been done outside of CITI-SENSE, but do we like to see this also happening within CITI-SENSE?
- Perception monitoring is also linked with "participatory evaluation" of what we are doing: if we really want to measure the success of what we are doing in the case-studies, we should also ask the students;
- Possibilities to do so: surveys with open questions, interviews, focus groups with pupils, etc. possible criteria to ask about: awareness raising, methods, problem-solving capacity, etc.;
- Questionnaires: (1) well-being; (2) how do you feel about it;
- Survey in local languages;

- Time: how often should we analyse data (every two weeks?), how often should we measure, what is the right time for measurement; should we track extremes or should we focus on the normal periods?
- Place: where should we measure perceptions?
- Pupils: should we measure the same group of students over time or should we measure everyone who is willing to be measured?

Empowerment monitoring

How do we capture data on engagement and empowerment? There is a need to clarify who collects data and a need for close co-operation with WP5.

Ideas generated:

- LOs preferrably need to take notes;
- Remember: pupils also create reports/posters/form the content that is of value when assessing the empowerment process;
- Additionally, there is a need to gather qualitative data from pupils: surveys with open questions, focus-groups and interviews. Note: we should avoid gathering much more data than we will be able to analyse. There are several EIs and the amount of data will be ample.
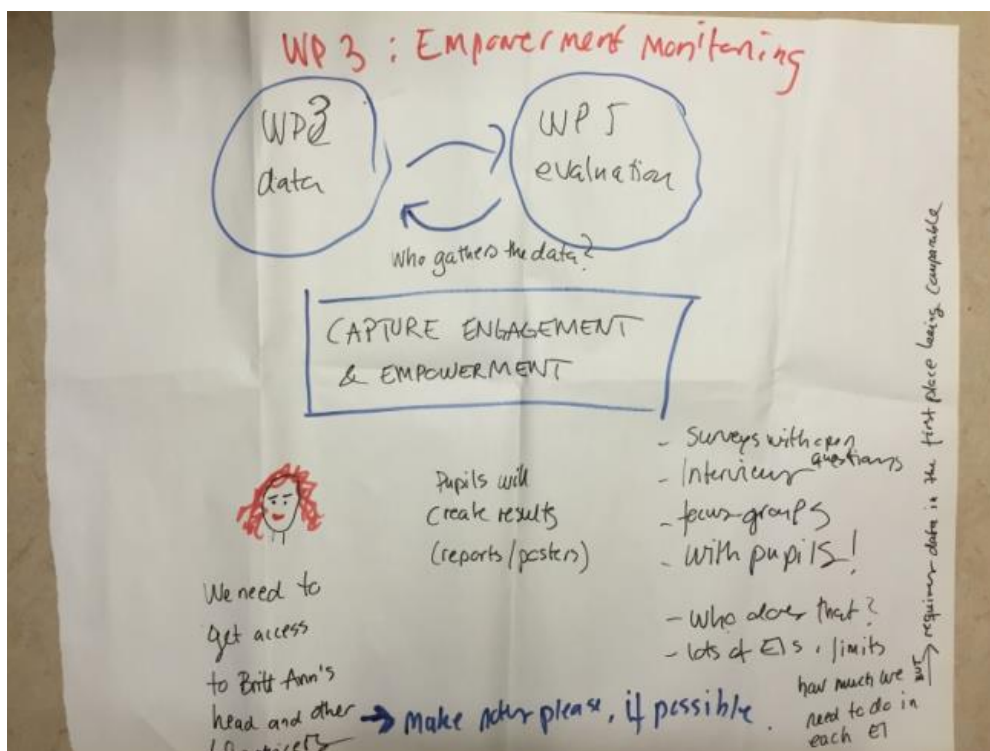

Figure 17. Notes from WP3 on empowerment monitoring

Other issues discussed

- How power is distributed (different branch of school is responsible for teaching, different for building maintenance etc.);
- Comparison of perceptions before and after implementing changes;
- Measure the level of awareness before and after;
- Perceive the school as a system of rules – changes in rules might be also indicators for the level of empowerment.

4.3.12 Communication between WP3 and WP5

Each LO was asked what would help them in the transfer of data on engagement to WP5:

- *Edinburgh:* Better to use interviews (by telephone or face-to-face) rather than questionnaires. It is useful to use the WP5 contact person and to do it via discussion, recording the interviews on standard forms. Be aware of the use of technical language and jargon which is not always understood;
- *Oslo:* It can be difficult to understand exactly what is being asked for. They will need help from the contact person – a combined effort helps target the responses to the correct questions. It would be helpful to have the WP5 people as part of the WP3 team at telecons etc.;
- *Oslo:* Good to meet and engage with the schools, the WP3 and WP5 people together – although this is not possible everywhere because of language issues. Interviews are much easier than forms or questionnaires. Could be interviews directly with the schools with much simpler questions;
- *Belgrade:* Good for WP5 to attend meetings to remind WP3 to discuss more than just technical aspects – WP5 as 'ambassador' of engagement issues;
- *Ljubljana:* Agree with others that interviews are the best approach;
- *Ljubljana:* WP5 should tell WP3 <u>how</u> to record empowerment.

There was then open discussion on the recording of empowerment and the aims of the work in the schools:

Recording of empowerment

- The forms are only for preparation – for evaluation need different questions: a working group to discuss this agreed between WP2/WP5;
- WP3 need to know the minimum to be recorded;
- Need an engagement plan – Who? How? Need advice on what is relevant.

Aims of the work in schools

- Each EI should state what is the aim of what they are doing, the aims are then documented and measureable and all activities then lead towards achieving these aims;
- The general aims expressed in the DoW are very vague and can be tailored to suit what is being done which is more focused. This needs to be recorded somewhere with the reasons for the more limited aims;
- Aims in schools are more for raising awareness not changes in environment. For learning and facilitating learning (both pupils and teachers);
  - How to incorporate information on the environment into the curriculum;
  - Raising awareness – changing the actual environment is more difficult and may not happen;
  - Responding to the needs of the people in the schools;

- General aim is to create Citizens' Observatories – how does this fit into this aim – needs to be answered at some point? different roles? pupils as citizens;
- Should every city have a website with an area for anyone to comment/observe/opine but with a disclaimer that we can't deal with these issues? – then anyone can be a citizen – BUT the project cannot include everyone – it's a defined project which includes schools/individuals who have agreed to participate and is not intended to be representative;
- There is empowerment of schools in that they are doing different things with sensors than we originally envisaged;
- Was it ever envisaged that school data would be shared?

4.4 Forward Planning

During the meeting, two forward planning sessions held – one for WP2 and one for WP3. These identified a range of priorities and working groups were set up to address:

- Participatory evaluation;
- Perception monitoring;
- Local website content support;
- Data capture on empowerment.

5. Engagement and empowerment in the main study

At the completion of the Oslo meeting, a plan was set up for implementation of the main study. This included participatory evaluation, perception monitoring, and data capture on empowerment. The aim of the next phase of the work following the Oslo meeting was to put these plans into action, and to provide the relevant tools and methodologies for successful engagement and empowerment in the EIs. The current chapter of this report describes how this is being achieved, between the Oslo meeting and the project consortium meeting in Barcelona in March 2015 and subsequent to the Barcelona meeting.

Following the Oslo meeting, there was improved one-to-one collaboration between the EIs of WPs 2/3 and the designated WP5 contact – and this local collaboration is an essential element of delivering the project.

Progress on the many topics identified at Oslo for joint working between WPs 2/3 and WP5, and sometimes other WPs also, was more varied. For some, such as participatory evaluation, substantial progress was made; others lay more fallow.

The CITI-SENSE full consortium meeting in Barcelona 10-12 March 2015 was an opportunity to review, consolidate and to re-assess priorities. This was done throughout the meeting (many of the engagement and empowerment issues are cross-cutting across CITI-SENSE as a whole), in special sessions involving WPs 2/3 and WP5 specifically, and in a follow-up meeting on the morning after the main meeting (13 March), when some participants had left but many had been able to stay on.

The working groups functioned much better afterwards, helped by the fortnightly WP5 GoToMeetings which now are opened to the EI location officers from WPs 2 and 3 too, any of whom chose to attend.

The notes below summarise some of the plans and progress, towards methods that the EIs can employ in the main implementation.

5.1 Perception monitoring / questionnaires

Perception monitoring can be carried out for a variety of reasons, for example to influence behavioural change, to record perception at a particular moment in time or to record a more general measure of quality of life. Within CITI-SENSE, we recognise that perception monitoring will provide important contextual information for the project. The results from the perception monitoring will be used together with sensor data to compare perception of air quality across locations and for raising awareness, knowledge, and for encouraging participation.

It is important within the perception monitoring that there should be a level of consistency in what is recorded in the different locations. However, we also acknowledge that there will be some variability in what each of the locations might want to record, depending on what activities they are undertaking. We therefore propose that within the wider activity of perception monitoring, there should be a 'core' or 'common' set of information collected in each city, with supplementary information to be collected by cities as needed.

Since the Barcelona meeting, there have been two major initiatives, both of which are still under development. The first initiative is aimed towards recording real-time perception of air quality and the second is aimed at the collection of more in-depth data on people's need for information of knowledge about air quality and other topics.

Real-time perception

Information on real-time perception of air quality will be collected using a mobile app, designed specifically for the CITI-SENSE project. This app is now available to the general public, and not be

restricted to those individuals actively participating in the EIs. It is available for free download for both, both Android and iOS. The app records the individual's location, and then asks for additional information such as age, gender and education. Afterwards, the users are asked to input a colour code reflecting their current perception of the air quality environment. If the user records a perception different from "good-green" the user will be asked to suggest the pollution sources. It is also possible to upload photographs. The information gathered using this app can also be used to create air quality maps.

In-depth data

Collection of more in-depth information on perception will be done using a questionnaire. This will include questions about air quality knowledge, perceived health effects and topics such as governance and empowerment. The questionnaire has been designed in close collaboration with the LOs. Early versions of the questionnaire have been circulated to the LOs and tested on citizens and feedback from these exercises is being incorporated in the final version. One of the key challenges is to collect sufficient data without making the questionnaire too long to complete. The final version of the questionnaire comprises a core set of questions to be used in all locations and a range of optional questions which each location can opt to use or not. The final version of the questionnaire has been translated into all relevant languages for the locations, and is now available online (accessible through the locations' CO web portal) and in some cases it is also distributed in paper format.

5.2 Co-production (co-design) and Participatory Evaluation

Co-design (co-production)

One of the achievements of the CITI-SENSE full consortium meeting in Barcelona in March 2015 is that, in discussion between WP5 and WPs2/3, we realized that we need to pay more attention to "co-production" of the methods and tools for CITI-SENSE. Not only co-production across WPs within the project, but also co-production with citizens and other stakeholders.

Here, co-production means to produce jointly with stakeholders (citizens, participants, local authorities, NGOs , etc.) the methods we plan to use (i.e. what we are trying to do and how we are trying to do it), rather than to develop these in isolation. Or more formally, it is "the development process for a product, a service or an organization (for instance an entire initiative such as the EIs) where design professionals empower, encourage and guide users to develop solutions for themselves. Co-design encourages the blurring of the role between user and designer, focusing on the process by which the design objective is created". This kind of process starts from the idea that by encouraging the trained designer and the user to create solutions together, the final result will be more appropriate and acceptable to the user. It is generally recognized that the quality of design increases if the stakeholders' interests are considered in the design process. Co-design is a core principle of CITI-SENSE in that it is part of empowerment. More pragmatically, when it is integral and there is time to do it, it leads to better results, because it automatically requires some kind of "participatory-evaluation-by-co-design" (e.g. improving relevance, user-friendliness, etc. along the way of developing things). Interestingly, the CITI-SENSE TAG had independently identified and recommended that the project should pay more attention to this aspect, given its importance for engagement and empowerment.

In mid-March 2015 we developed a list of possibilities, knowing that there would not be time or resources to implement them all, but developed also from the viewpoint that it is useful to list areas in CITI-SENSE where there is in principle *potential* for co-production, even if in practice not all of that potential is realized. These included the location plan for static sensors; apps and visualisation of

sensor measurements; plans and apps for sensory perception (cf. perception monitoring, short questionnaire); the longer air quality questionnaire; tools for participatory evaluation; and web pages.

We noted that this list can be extended; that we need agreement of whoever from CITI-SENSE is in charge of the topic/working group; and that LOs will influence prioritisation. Indeed, more generally on how we might take the work forward, we agreed that:

- We need to create spaces where people can share their ideas confidently;
- We won't be able to co-produce everything (there isn't enough time now) but we can still try to involve stakeholders as much as possible;
- We will try to harmonise on the tools to be co-designed though the way in which users are involved will vary from one location to another;
- WP5 will gather information on the co-production process so that we, and others, can learn from it;
- For co-production, CITI-SENSE should have a basic prototype to engage and interact with stakeholders for feedback. This should always include a note describing the aims of the tool and how we expect it to be used.

Participatory evaluation and its links with co-design

Participatory evaluation is "an approach to the evaluation (of a project, a product, a service, etc.) which provides for the active involvement of the stakeholders: providers, partners, beneficiaries, and any other interested parties. All involved decide how to frame the questions used to evaluate the program, and all decide how to measure outcomes and impact. It is often used in international development. Participatory monitoring and evaluation is not just a matter of using participatory techniques within a conventional monitoring and evaluation setting. It is about radically rethinking who initiates and undertakes the process, and who learns or benefits from the findings".

Also here, the same aspects such as relevance, user-friendliness, etc. will be evaluated (in order to improve them in a next version). Participatory evaluation can cover a wide spectrum, e.g. from "evaluation by users only at the end stages" (looking back) to "pro-active evaluation by users from the very beginning and along the whole process" (what will be linked more closely with co-design already).

Examples of the similarities and differences

If co-design is principally about looking forward (together) while something is being developed, and participatory evaluation is principally, though not exclusively (e.g. a user needs evaluation is looking forward), about looking back (together) on our experience of using it, both perspectives are valid and important for most topics. However, the two sets of issues do not overlap greatly, except that (i) there is a co-design aspect to the methods of participatory evaluation; and (ii) there is a participatory evaluation part to the extent to which the project has used co-design.

The relationship is much closer, however, if both co-design and participatory evaluation are seen as ongoing processes throughout the project; and in practice this is what often happens. Two practical examples from CITI-SENSE help to illustrate the linkage.

At the Barcelona meeting there was an active discussion among participants about the Citizens' Observatory website being developed by NILU. From one viewpoint participants were asked as users to evaluate the current (early-stage) version of the website. But partly by encouragement (pull), and partly by a wish to ensure that the website was successful (push), we began to make constructive suggestions, acting increasingly as co-designers to co-create a website that fitted our needs, based

on our own experience of what works in other contexts and our own creative contributions (e.g. text, images, etc.). This feedback led the designers to improve the website.

What Ljubljana did with the students developing a visualization tool, was to a high degree co-design, encouraging them to find tailored solutions themselves. This worked, even though some of them were only interested in the "mathematical/technological challenge" and not particularly in air quality issues. These students automatically evaluated in a participatory way what they were doing of course. Ljubljana's schools were also much more involved in local website contributions, which made it more relevant to them.

From this viewpoint, co-design necessarily involves aspects of participatory evaluation especially when CITI-SENSE comes with a first proposal about method or tool or whatever it is that is to be evaluated. The main difference is that participatory evaluation does not necessarily require that users are really actively involved in the design process itself. However, it is helpful when evaluation includes constructive proposal for improvement and this is the beginning of co-design, if timescales allow the possibility of modification and improvement.

The way forward

In the end, both approaches want to influence positively the same kind of issues (such as user-friendliness, relevance, understandable output, etc.), and to do so by engaging participants actively, and so within CITI-SENSE they will be developed closely together.

5.3 Visualisation, uncertainty assessment, risk communication

There have been separate initiatives on these three aspects but we recognise that they are closely linked and so they are considered here in relation to one another. All three relate to various aspects of communication but, because communication is such a wide topic embracing other issues also, we have chosen not to use that even more inclusive topic label when describing them.

Visualisation

Visualisation is about appearance, about how things look like, and as such there is a visualisation dimension to just about everything developed in CITI-SENSE, certainly to everything that is public-facing including websites, reports and other resources. There is also a visualisation dimension to the tools of CITI-SENSE, whether these be sensors and platforms, or questionnaires (in print or as mobile phone apps), or recording forms to be used by the project team. And that visual dimension is important to the acceptability and use of the tools and resources.

Within WP5 we have sought to contribute to a narrower set of issues, i.e. how CITI-SENSE will organise and work with the project's sensor-based measurements and communicate these (possibly after linking with other data) to various stakeholders – to participants (especially those who carry personal sensors), to policy makers in cities, and to the general public, local and international.

This visualisation work is led by NILU (WP6), as part of the development of the products of CITI-SENSE. WP6 works closely with WP2/3 on what is needed, and with WP7 on what is possible. WP5 contribution has been intermittent but mostly has involved working with WPs 2/3 to get a view of what citizens and policy makers want in the various cities and schools.

Uncertainty

Some work is happening within WP6, using advanced quantitative methods to assess and represent the uncertainties implicit in the sensor measurements, especially those for WP2. While recognising the importance of this work, we in WP5 think that users of various backgrounds (citizens, citizens'

organisations, policy makers, the media) might need something simpler – unless the communication aspects of the more advanced methods get resolved elegantly.

Also, there is an uncertainty dimension to many other aspects of the project. We envisage, for example, that participating citizens and others may wish to be informed about the health implications (for themselves and for public health more generally) of air pollution as measured by the CITI-SENSE sensors. In particular, citizens who carry individual sensors may wish to know what the pollution they have measured may mean for their health. Inevitably, there are uncertainties in whatever understandings can be communicated (see also Risk Communication below).

Following various discussions and recognising the necessities, communication will be intensified shortly, involving WP6, WP5 and others to consider these aspects in particular.

Uncertainty is a cross-cutting issue which arise across all aspects of the project, from the delivery time and likely performance of sensors right through to the representativeness of individuals who participate in perception monitoring. We make no attempt to systematically tackle this breadth of issues, leaving that to those people involved with the topic.

Risk communication

The need to communicate clearly and effectively about risks, especially about risks to human health, has been established. WP5 has prepared some material to help with this and identifies links to other, established websites. The lead is being taken by WP5, in conjunction with WP9.

5.4 WP5 comparative (across-location) analyses and data gathering

To ensure that we have structured information to include in comparative (across-location) analyses, tools will be developed or updated for the Location Officers to use together with their WP5 contacts to record their location activities. The comparative analysis reported earlier in this deliverable (Chapter 3) reported on the use of standard forms during the pilot phase of the study – these forms were developed by WP5 and discussed in D5.2. The LOs understood the benefit of using these tools, but were also concerned that they were technical and could be time-consuming to complete. The level of detail recorded in them varied hugely between locations and EIs.

We acknowledge the need and importance of reviewing this process and of considering how best to streamline the data gathering, while ensuring, as far as practicable, consistency across locations. We have held some discussions about how to progress this but we have concentrated first on the other issues (perception monitoring, co-design, participatory evaluation etc.) so that they are ready in time for the implementation of the EIs.

5.5 Other topics

Data agreements

Some of the data to be gathered under CITI-SENSE is considered personal data under European law; in particular, data from individuals who use personal monitoring sensors about their location during the period(s) of monitoring. Different countries involved in the project have different regulations and conventions about the agreements necessary for gathering, storing and using such data, including 'exporting' them to be stored outside of the country in which they were gathered.

Since mid to late 2014, CITI-SENSE has been attempting to address these issues and provide guidance and a template which they can be adapted by the various LOs according to local circumstances, later translated and used. This work has been led by NILU (WP1) and U-Hopper (WP6/7), with involvement of others, including WP5. The specific WP5 interest has been that the

draft agreements should be not only clear and accurate but also easy-to-read and accessible, or at least not to be too long, or too legalistically written, that (potential) users would find them deterrenting to participate.

It has been difficult to achieve simultaneously these multiple desirables, but the collaborative working group eventually settled on a version that was distributed to LOs as a template for guidance. Some of the cities considered that the template was still too long and have adapted it further. There is good liaison between cities on this, facilitated among other things by the fortnightly WP2/3/5 GoToMeetings.

Communicating best practice in cities

IOM had circulated links to an index, developed by the NGO Friends of the Earth Germany, listing various measures and ranking cities according to how many had been implemented and to what degree: see http://sootfreecities.eu/. The ranking had been based not on pollution reductions achieved, but on what measures the cities had tried to implement – and because there is no threshold / safe level of particulate air pollution, it is in the interests of public health to reduce air pollution, whether current concentrations are considered high or low. IOM had found it helpful, from the viewpoint of empowerment, to have examples of what could be done and had been done in particular cities.

In discussion within WP5, and with WP9, we agreed that there was a lot of useful information in this FoE Germany initiative; that we did not wish to focus on city rankings; but that CITI-SENSE could usefully take forward the idea of identifying and communicating good practice from the participating cities, and schools, in what has been tried and been found successful in building the coalitions necessary to develop and implement effective policies and measures. This is a communication issue where we hope that WP9 can and will take the lead. There is a need also to co-ordinate with the development of websites, i.e. with WP4.

Ecosystem services and nature-based solutions

Human life depends on and is sustained by the well-being of multiple and diverse forms of life on earth, and by the well-being of the planet as a whole and in its multiple dimensions. This dependency has long been recognised for example in the need for clean water, for direct human consumption, for irrigation, and multiple other uses. Its recognition has been intensified in recent years as the unceasing exploitation of the earth's resources risks depleting important non-renewable resources and, through global warming and associated climate and other disruptions, threatening long-standing balances with unknown but generally destructive major implications.

"Ecosystem services" is a branch of science that seeks to recognise explicitly the dependence of human life, health and wellbeing on the material (physical, chemical and biological) well-being of the earth. It recognises that clean air is not only important for human health, it also affects other living things, and material objects such as buildings. Perhaps most importantly of all, some air pollutants that are damaging to human health also contribute to global warming. There is within WP5 an interest in identifying and highlighting the multiple co-benefits of cleaner air, as part of empowerment / of building effective coalitions for change.

Similarly, in terms of detailed measures that could be implemented, there is an interest within WP5 in "nature-based solutions" http://ec.europa.eu/research/environment/index_en.cfm?pg=nature-based-solutions, i.e. as far as practicable in involving citizens and policy makers in considering and as far as practicable giving priority to measures which enhance the sustainability of the living environment.

This dimension has not had major priority because of other competing needs, but it is progressed at least intermittently; and it is intended that, as other aspects (e.g. to do with sensors) get resolved, its role can be clarified and developed further. In a major step towards achieving that, VLAGEW INBO (WP5) has prepared a working paper on "CITI-SENSE, air pollution and urban green". This overviews the links between urban green, urban heat islands and air quality and considers what can be done within CITI-SENSE. It includes an example from Ljubljana where two student nature days were organised, using an ecosystem services approach. It is likely that efforts in CITI-SENSE will focus on particular cities such as Ljubljana and Vitoria (where there has already been engagement from this perspective); and perhaps from other cities too.

Scottish case study

The objective of the Scottish case is to identify to what extent different social groups could identify with the idea of a Citizens' Observatory and would be willing to participate in one. It assumes that participants in the CITI-SENSE EIs may not be representative of the general population and so the case study in Scotland is designed to provide information (from one country) on the feasibility of 'rolling out' the idea of a Citizens' Observatory so that it becomes a mainstream activity, not one limited to particular – and possibly privileged – social groups. IOM is the lead partner in this study.

The overall aim is to involve people from diverse social groups in a limited way, as a means of engagement, of finding out to what extent the ideas are accepted and welcomed and to determine what are the barriers of participation and how these might be overcome. The purpose of this is not environmental change but it is to engage people's minds in relation to the environment in a helpful way. We plan to do this by:

- designing approaches to individuals and groups at different levels of intensity, so that the results of saying 'yes' at any particular stage imply an increasing level of commitment;
- contacting various organisations, and to use a variety of approaches, in a structured way;
- recording at each stage and to track response rates, as far as this remains practicable, and the reasons for response; and
- forming an evidence-based view of the opportunities for 'rolling out' the idea of a Citizens' Observatory to various groups in society, identifying the opportunities and barriers, and suggesting ways in which the barriers may be overcome.

Work to date has included the development of study materials, identification of potential groups to be approached for recruitment and a detailed recruitment plan. The main implementation of the study will take place over the next 9-12 months. Two types of groups will be included in the study:

- Communities of location, e.g. geographical, areas of cities;
- Communities of identity, e.g. older people, cyclists.

We would like to include individuals with or without an interest in the environment, people from both rural and urban environments, people of various ages and those that are familiar with the idea for environmental change and those that are not.

Recruitment will be targeted at different levels (not just Edinburgh):

- *National*

Approach to national organisations that have networks of local groups that meet, for example Age UK in Scotland;the purpose here is to get agreement in principle from the national organisation that local groups can be contacted by the project team, with a view to discussing with them the idea of a citizens' observatory, what is involved in participating in it, and how the local group might want to be involved.

- *Regional*

Contact local groups and set up meetings. The purpose here is to get agreement in principle for a local meeting to discuss the idea of a Citizens' Observatory, what is involved in participating in it, and how the local group might want to be involved, and make arrangements for setting it up.

- *Local*

The local meeting group.

We plan to use a mixture of communication methods to recruit companies, groups, people at a national, regional and local level using phone calls, e-mails, letters, via already established personal contacts, personal visits etc. A draft communication plan is shown in Figure 5.1.

Communication plan for contacting National Organisations for communities of identity

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                              ┌─────────────────────┐
                              │  National/Regional  │
                              └─────────────────────┘
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Email	Phone	Letter
In the email include intro to project, ask about local groups, include project information sheet as attachment, ask them to get in touch if they are interested	During the call introduce the project, identify if they are interested in helping, if they are interested what local group do they identify, where is the group, group contact deailts (email/phone)	Send covering letter and information sheet asking them to get in contact if they are interested in helping the project

Email branch:

- Positive response
  - Ask for details of local group contact point (could be email/phone)
    - Contact local group (email/phone)
      - Positive response
        - Identify - what the group is, where it is, contact details, have they got a change in mind
      - Negative/no response - record why no response/barriers
- Negative/no response - record why no response/barriers

Phone branch:

- Positive response
  - Contact local group (email/phone)
    - Positive response
      - Identify - what the group is, where it is, contact details, have they got a change in mind
    - Negative/no response - record why no response/barriers
- Negative/no response - record why no response/barriers

Letter branch:

- Positive response
  - They contact us by email/phone - through this identify - what the group is, where it is, local group contact
    - Contact local group (email/phone)
      - Positive response
        - Identify - what the group is, where it is, contact details, have they got a change in mind
      - Negative/no response - record why no response/barriers
- Negative/no response - record why no response/barriers

Communication plan for contacting Local Organisations for communities of identity and communities of locality
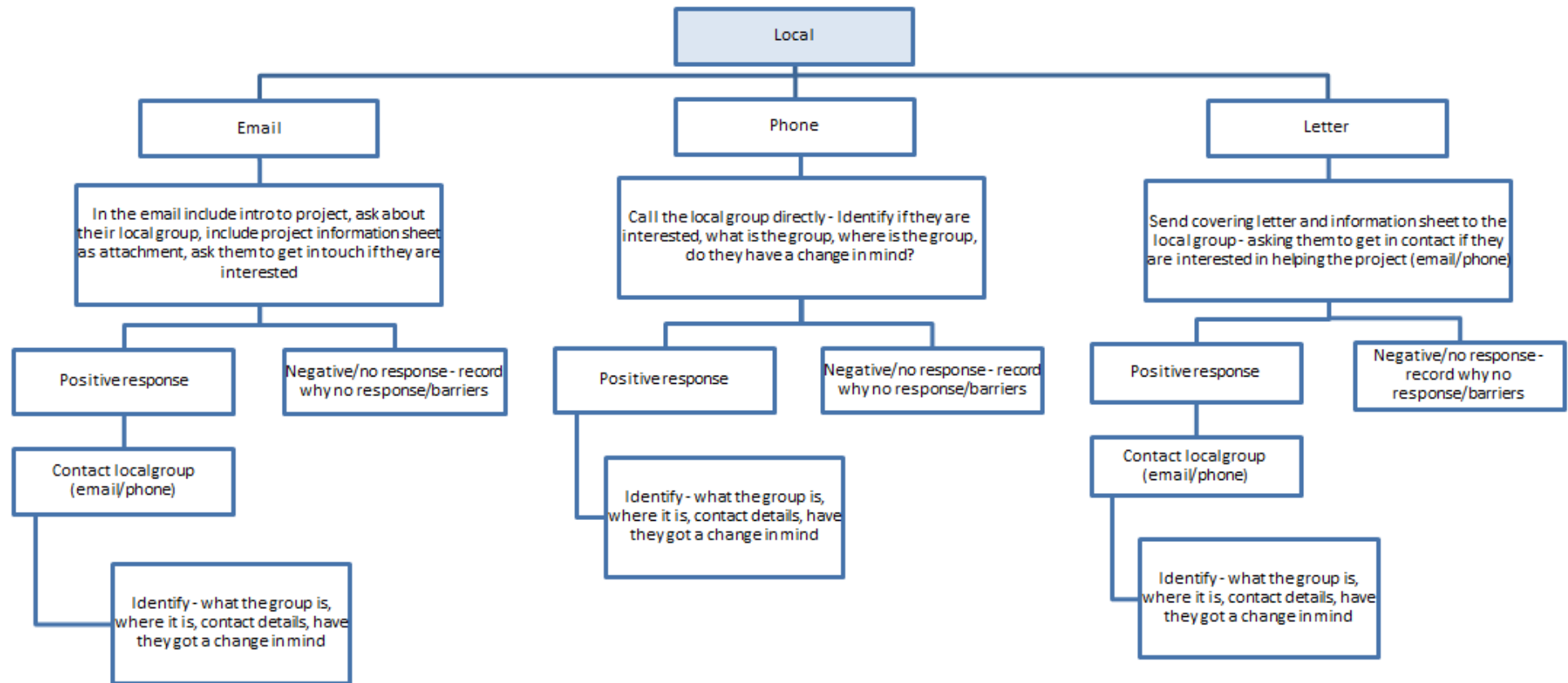

Figure 18 Scottish case study communication plan

6. WP5 Publication Plan

Based on the main research questions of WP5, we identify the following potential publication topics:

Focus paper	Research Question	Time
CITI-SENSE as a learning organization: main focus on interdisciplinary collaboration on engagement and empowerment issues within WP5 and between WP5 and WP2-3	**How can we design & implement citizen participation and empowerment? Comparative analysis & learning**	Mid 2016
CITI-SENSE as a trandisciplinary empowerment initiative: main focus on empowerment of citizens within the EIs	**How can we assess the quality of the EIs and generate general lessons? Comparative analysis**	Mid 2016
CITI-SENSE as an environmental governance empowerment initiative: citizen empowerment in environmental decision making policy processes	**How can we design & implement better decision making? Comparative analysis**	Mid 2016
CITI-SENSE as empowerment inspiratory: empowerment lessons dissemination to other cities	**How can we facilitate local learning and dissemination based on EI activities?**	Mid 2016
CITI-SENSE takes into account perception research: EIs collecting perception data	**How can perception research add to citizen science and empowerment?**	Mid 2016
CITI-SENSE and representativeness of citizen's participation	**How can citizens from a diversity of social backgrounds be involved in citizen science?**	Mid 2016
CITI-SENSE and solutions: how to open up a problem oriented expert community to solution orientation by means of citizen involvement	**How can we incorporate a problem solving perspective in environmental health citizen science?**	Mid 2016
CITI-SENSE communicator: how communication contributes to citizens empowerment in environmental health issues	**Communication of results and the use of social media**	Mid 2016

Appendix

Appendix A. Barcelona Meeting - Overview of the Empowerment Initiatives introductions

Barcelona

Figure 19 The Barcelona state of affairs

Barcelona EI (CREAL) Engagement:		
Most important challenges for the empowerment strategy; Most pressing questions, worries, needs.		
Administration *CSIC* *Generalitat* *Ajuntament*	Peers / 3rd-parties *CitizenSqKm* *Smart Citizen* *uAbureau*	Public *Followers (social media)* *Participants (direct/indirect)* *Users (future)*
Challenges		
• Maintain interest/support/trust • Communicating effectively (language, terms)	• Balancing mutual interests • Finding synergies	• Identifying wants&needs • Providing wants&needs
Questions/worries/needs		
• Losing interest/support/trust with data ill-represented, poor/irregular communication – how do we best represent info? – when&how should we update them?	• Giving too much/little resources/recognition - need official project affiliation • Not maximising added-value - repeating old work	• Misintepreting wants&needs - how to know what is really wanted, and what is needed? • Failure to satisfy wants&needs - how to maintain interest if not delivering results, services?

Beograd

Figure 20: the Beograd EI state of affairs

The aim of the pilot (as described in D3.1):

The pilot study will identify user needs and develop and test a first version of the technological and information solution, as basis for a wider deployment in the next phase.

In the Belgrade pilot the possibilities of integrating the technological and information solutions at primary education level (6-15 year old pupils) within the elementary school will be explored. Also, the needs of other stakeholders will be mapped, with a special emphasis on the needs of stakeholders responsible for regulatory matters; and integration of the solutions with existing processes and systems will be tested. The outcome of the pilot case will be:

- User experiences with the technological and information solutions developed in the test case;
- Evaluation of the process and the success of the products: did access to the solution and the processes defining, producing and implementing them contribute to the aims of the Empowerment Initiative?
- Technological and information systems adaptable to schools with differing organization and needs.

Successes and points of improvement… looking backwards and forwards

Thanks to the work of the LO and all other colleagues locally involved, different successes have been achieved. On the other hand, there are also different point of attention for on-going work (looking forwards at full implementation).

Positive examples:

1) **Belgrade was able to show real time data from classrooms** for PM2.5, PM10, CO_2, CO, T and RH (relative humidity) sensors. Efforts were made to show reliable data from the end user perspective (using calibration data on the DNET data server was displayed as true values

after the calibration on the website). Comparison of data collected by static platforms and by reference instrument indicates that measurements of meteorological data (T, RH, P) gasses CO_2 and CO, as well as PM0.5-2.5 and PM10 can be considered as indicative measurements and presented on-line for schools. Sensors for RH, T and CO showed good performance and sensors for NO_2 and O_3 showed moderate performance. *(Negative: Data collected with Alphasense sensors for NO_2, NO and O_3 need to be further analysed, since correlation was low. NO sensors showed bad results.)* Prior to calibration at NILU, Vinca came to the same conclusions of sensor performance of gases during calibration in the field.
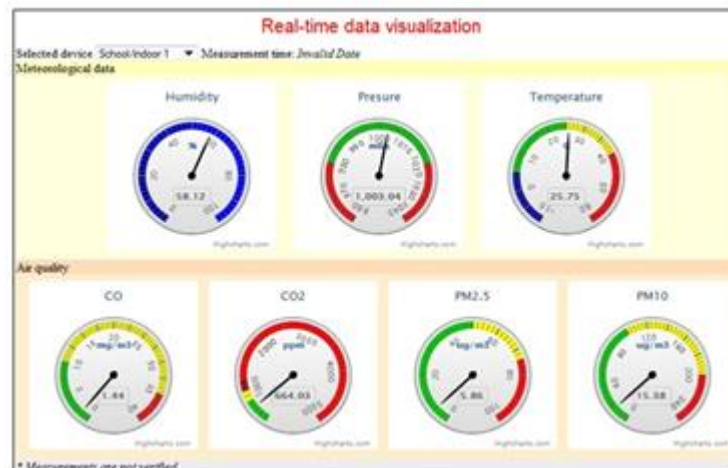

Figure 21: Example of real-time data collection

2) **A series of meetings with teaching staff will be performed** in the upcoming period in all three selected schools with the aim of preparing a plan of common activities. There will be a discussion with teachers and pupils about their own ideas for participation in the project.

Science projects are planned for main case.

- Preparing application for smart mobile telephone and/or internet presentation about indoor air pollutants in school that we are going to measure with platform;
- Exposure assessment to air pollutants when staying in the school environment;
- Study the contribution of indoor air pollutants from different sources;
- Measures to improve air pollution in school environment.

[But what exactly will be done – and how interactive and empowering this will be – is not yet really clear.]

Both positive and (potentially) negative examples:

1) **Belgrade pointed out how technical and stakeholder oriented lessons learned** go hand in hand, as they depend on one another. This is true. But this is no reason to postpone stakeholder interactions, engagement and empowerment any longer. If the technical processes are more top down rather than user-driven, a lot of learning opportunities are missed.
   PS: Technical issues have even led to some kind of "fear regarding stakeholders" (because their expectations will probably not be met)?

2) **The pilot study in Belgrade has participated in several media activities.** This is positive for creating engagement and awareness raising (and dissemination), but also negative because

this is risky when no real communication plan has been developed yet. Communication mistakes might upset stakeholders.

3) **There is a SWOT-analysis, but it for instance is not really looking for external opportunities.** Probably some (general) threats are not taken into account: e.g. (risk) communication, power issues, etc…

SWOT ANALYSIS FOR BELGRADE WP3b	
Strengths	**Weaknesses**
-new paradigm that offer low cost AQ devices as it is so call "participatory sensing" -support from Authority of Belgrade, close cooperation with Serbian Environmental Agency - possibility to perform science project with pupils in high schools	-number technical problems with devices -limitation of participants/pupils availability, presence in school (period of school year)
Opportunities	**Threats**
-enable pupils and stakeholders with indoor AQ in real time and historical data - enable pupils to understand importance of good indoor AQ and ambient AQ at all	- stakeholders and pupils not interesting if products are not enough useful, easy and attractive interpreting

Figure 22: Belgrade SWOT analysis results

Negative examples:

1) **(Very) limited information about stakeholder processes is available.** Very limited descriptions of stakeholder interactions in D3.2 'Pilot study evaluation and protocol for phase 2 (draft)'. No WP5-forms have been filled in yet (and WP3-pilot-study-log is also empty). No questions about participation, engagement and empowerment have been asked on the WP5-FAQ-page (Confluence). Nonetheless, they have been giving themselves very good scores on "documenting the engagement processes" (indicated in various KPI). Even if they have documented their process for themselves internally (within their own organization), this is not contributing to the scientific CITI-SENSE-exercise we are all involved in. Other cases will not be able to learn from experiences in Belgrade and tailored WP5-advice will be limited.

Edinburgh

Two EIs are being carried out in Edinburgh – indoor air in schools and urban outdoor air quality. Engagement issues in the two EIs are very different, and are generally more straightforward in the schools work.

Figure 23: the Edinburgh EI state of affairs

WP2: Urban Outdoor Air

Needs:

- Engage with local council to discuss/agree sites for static sensors;
- Engage with local council to discuss/agree how the sensor results will be used and disseminated;
- Identify whether there are further stakeholders e.g. general public, Scottish Environment Protection Agency etc.;
- Install and monitor sensors at each site;
- Feedback results to council and maybe more widely;
- Engage with general public/cyclists to wear portable monitors and agree format and methodology for feedback of results;
- Prepare engagement materials for council and cyclists.

Progress:

- Preliminary contacts made with local council;
- Preliminary contact made with local cycling group Spokes;
- Piloting of static and portable sensors done.

Challenges/Questions:

- Who might be stakeholders other than local council and participating cyclists;
- How best to keep engagement with the council/cyclists active while waiting for main study to start;
- How best to maintain engagement/trust between scientists and council in light of possible inaccuracy of sensor readings – the council is particularly concerned about this;
- How to convince the council of a benefit to them of the work we are doing, despite its pilot nature;

- Development of a communication plan for who to engage with (and how) if high levels of any pollutants are detected;
- How best to manage the expectations of the cyclists (who are keen to take part) as to what action might be taken in the light of any findings.

WP3: Indoor Air in Schools

Needs:

- Recruit 3-4 schools to take part in EI;
- Engage with teachers and, through them, with school pupils of various ages;
- Identify whether there are further stakeholders e.g. education authority, local council, parents, general public;
- Prepare engagement materials for schools;
- Install and monitor indoor (and also maybe outdoor) sensors at each school;
- Feedback results to school (and maybe more widely).

Progress:

- Three schools recruited for main study;
- Pilot study with indoor and outdoor sensors completed at one school.

Challenges/Questions:

- Who might be stakeholders other than teachers/pupils at participating schools;
- How best to keep engagement with the schools active while waiting for main study to start;
- How best to maintain engagement/trust between scientists and schools in light of possible inaccuracy of sensor readings;
- How to reconcile what outcomes desired by the project (e.g. indoor air levels in schools comparable across participating cities) with outcomes desired by the schools (e.g. use the sensors in various projects designed by the pupils);
- Development of a communication plan for who to engage with (and how) if high levels of any pollutants are detected at the schools.

Notes:

Although the engagement issues for the two EIs are quite different, both in the groups to be engaged with and the methods of engagement, the challenges for both EIs at the current time are similar and include:
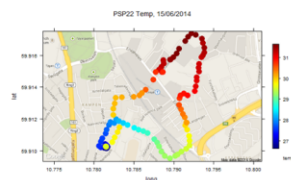
- Identification of stakeholders;
- Timing of engagement in relation to the roll-out of the main programme of fieldwork;
- Maintenance of trust and engagement taking into account issues around the reliability of the sensors;
- Ensuring that the outcomes of the fieldwork satisfy the needs of the stakeholders and the CITI-SENSE project.

Oslo (Urban Air Quality)

Figure 24: the Oslo city EI state of affairs

Available in Oslo

There are different preconditions that can facilitate the full implementation in Oslo. There are already 11 monitoring stations available in the city, measuring NO_2, NO, PM, CO, O_3 and SO_2. The measurements are publicly accessible via the web portal www.luftkvalitet.info ("air quality"). This portal provides information about air quality, air pollution, health effects and other related topics for the general public. Also the municipality of Oslo is very eager to participate and help as necessary. The LO for Oslo could already arrange some meetings and arouse interest for CITI-SENSE and a similar initiative in Oslo.

The Plan

It is planned to deploy 40 static nodes close to the 11 monitoring stations across Oslo. The final number will be agreed upon with WP8.

For the mobile sensors, different groups of volunteers shall be approached. The municipality of Oslo offered to ask traffic wardens (who are employed by the municipality) to carry personal sensors during their working hours (possibly also beyond). Since this group cannot really be considered

"volunteers" the LO will also contact the Norwegian Asthma and Allergy Association (NAAF) to find volunteers that are already engaged in this group. Further volunteers shall be approached at some later point, using neighbourhood associations or asking toddler parents in kindergartens.

The main communication medium will be the web portal and the Facebook pages of the Oslo CO. Contact to LO will also be guaranteed.

Different modes of dissemination will be used in addition to recruit volunteers and create public awareness. A good example is the annual Science fair in Oslo.

Challenges

The most important question is how to actually get in contact with volunteers. Since the pilot phase has been used to focus on sensors, it will be a challenge to develop the recruitment/engagement campaign. Not only will it be challenging to get contact to citizens and to inspire them to participate, but also to keep them interested and manage their expectations during the implementation phase.

Another issue is the data. What if we have no sensor data available – how shall we empower people then? What kind of data can be used instead? And how do we communicate the data that is available? This question leads us to the topic of communication. How do we communicate the data or the information that we obtain? How do we communicate risks?
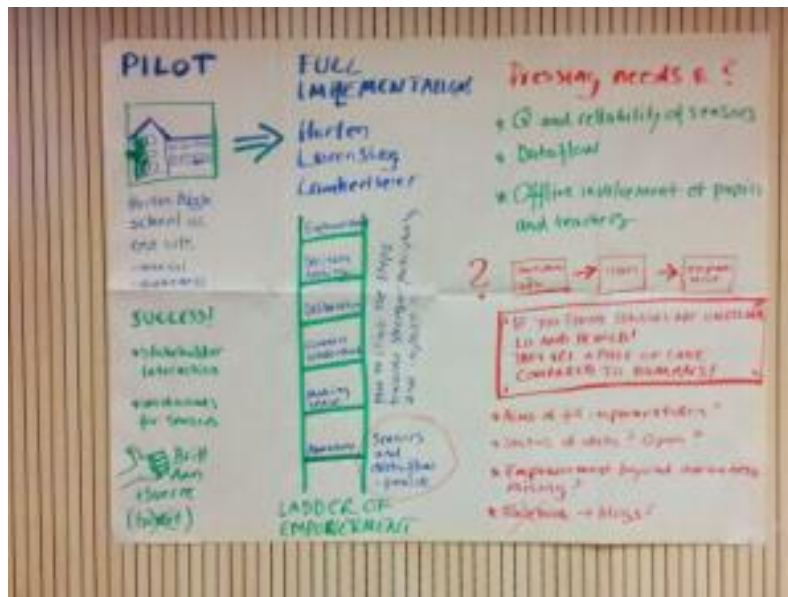
Oslo (schools)

Figure 25: the Oslo school EI state of affairs

The aim of the pilot as described in D3.1 'Pilot study protocol': "The aim of the pilot study was to identify users and user's needs, develop and test a first version of the technological and information solution, as basis for a wider deployment in the next phase. In addition, an important part of the pilot study was to test methods for engaging with the stakeholders to raise awareness of indoor air environment."

Pilot at Horten videregående skole: Successful as a result of the project team's meticulous preparations: from establishing initial contact (with county representatives, school headmaster, health and safety representative, heads of technical management and cleaning staff), to meetings with involved teachers (Technology and Science program, Biology, Physics) where the CITI-SENSE project was aligned with the school curriculum and schedule, to careful quality-assurance of sensors, being transparent about technical problems and finding two alternative off-the-shelf sensors, to preparing specific assignments for the pupils.

Full implementation at Horten, Lambertseter and Lørenskog high schools: In all schools CITI-SENSE will be implemented as part of Technology and Science classes. The procedure from the Horten pilot-case will more or less be followed in the new schools.

Focus on the initial empowerment-ladder: CITI-SENSE as a reliable source of information. More or less as a premise for climbing the steps towards participation and influence on decision-making.

Strong focus on sensors and data-flows to be up and running. Less focus on participation and empowerment.

Pressing needs and questions

The quality and reliability of sensors and ensuring data-flow are regarded as crucial as seen from the pov. of the project team. As their WP5 contact-person I concur: real-time and reliable data on indoor air-quality is at the core of the value-proposition of what CITI-SENSE offers to involved stakeholders. These data set the stage for future discussion and deliberations among a larger group of pupils and teachers. Awareness-raising as a premise for the empowerment.

Offline involvement with the pupils and teachers will probably be quite successful, yet how to engage beyond those who actively participate in the project?

D3.2 includes the following figure depicting the data flow architecture in CITI-SENSE when fully in function (adapted from a similar Figure on Confluence/Data flow):
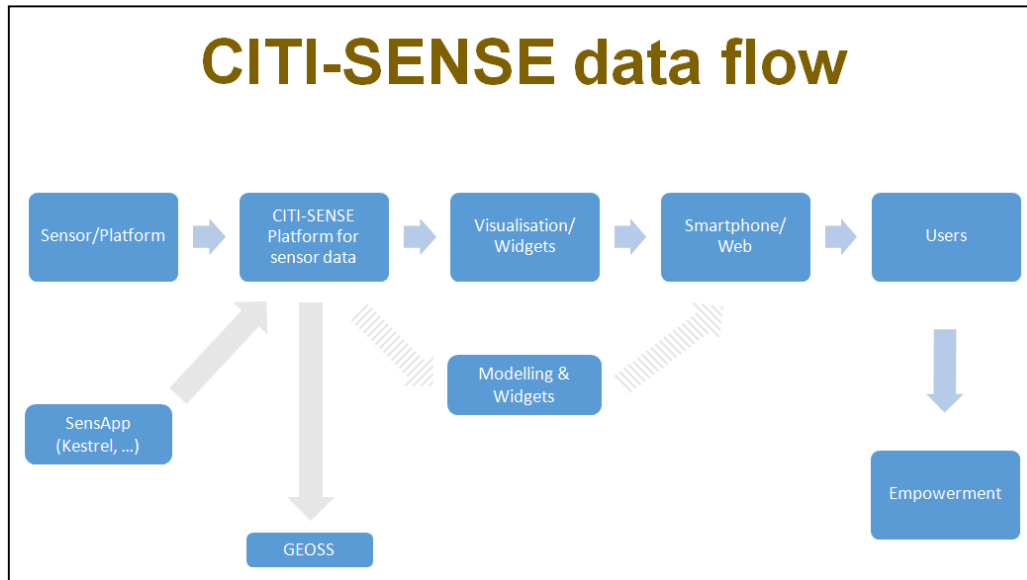

Figure 26: Diagram representing the data flow in CITI-SENSE

Of course this Figure is a simplified depiction of CITI-SENSE, and must leave out the details. As a first step towards empowerment the Figure does an excellent job in demonstrating the cumbersome way from sensors to users to empowerment. Yet, we need to think beyond citizens (or in the Oslo school case: pupils, parents, teachers, other school employees etc.) merely accessing data (which again, I completely agree that this is a necessary first step). End-users in the Oslo schools need to climb the ladder of participation: from awareness-raising and making sense of the data, via deliberation and discussion, towards the top-steps of decision-making.

How do we enable end-users to climb the steps towards stronger participation and impact?

Relatedly there is a need to think of how online means of communication can be used in the Oslo schools. We know they will have their own school-specific CITI-SENSE websites. We know Facebook is not a viable option at Horten, because the pupils are not allowed to use Facebook at school, and we do not yet know what restrictions apply to Lørenskog and Lambertseter. There is the opportunity to use blogs instead. The CITI-SENSE school portals could be extended with blog-functionality, or use WordPress or Blogger instead?

What is the status of the data? At the Oslo schools, we should encourage the data to be open. This is what could potentially spark off interest among citizens to play around with the data and create their own visualizations. Admittedly and again, whether or not data should be open also relates to whether or not the data provided are reliable and accurate.

It is difficult to identify the explicit aims and objectives of the full implementantation (reading D3.2).

Finally: yes sensors can be unreliable.

Vitoria

Figure 27: the Vitoria EI state of affairs

Preliminary note

This project (Citi-Sense) is view for the local authorities as an experimental. We do not have even a proven tool and therefore we cannot offer to a citizens a decisive space. This would be a mistake and could lead to frustration and failure of the initiative.

This is one of the first questions we must make clear to contact and invite the participation of the volunteers and other potential participants. The aim is to test the technological tools, but also the participation mechanisms, so we must be rigorous managing expectations.

Process preparation

Preparation of a draft of Citizen Participation Program that collects the objectives, strategies, and sufficient mechanisms to enable citizens and associative entities the right to participate in the process. This draft will serve as a first reference and facilitate the task of designing, planning and consensus participatory process provided for in the next phase.

The draft will work primarily internally among team Ibatuz and Tecnalia and later, once agreed and validated the proposal, presented to those responsible for the project in Vitoria Gasteiz.

How we will contact participants?

In Vitoria, initially will work with individuals previously involved in the project of Green Capital, as they are a collective plural in which we find from volunteers not associated with institutions and social groups in the city who have an interest in environmental issues.

Contact with these participants will be done through the contact information provided by the city of Vitoria. Besides this, it is considering placing individuals and groups interested in the later phases of the project, when the measurement is carried out in other public spaces

How to contact participants each moment during the project (not only initially)

- The contact will be made by mail and telephone contact once we initially contacted participants, contact information each will be collected to contact throughout the project. The most effective method is when telephone contact is a small group of people (20-30 people), the mail will support this contact;
- At times the process in which it is necessary to work with them in a group, a doodle poll will be offered to arrange a get-together in groups.

How we provide necessary information to participants (volunteers)

In relation to the participants at the first measurement, a project summary document will be prepared with the most relevant information whose maximum length is one page. This document will also make an express invitation to participate. The document will be prepared that will have information on:

- Sample definition and objectives of the project;
- Invitation to participate expressed, explaining the importance of their role in the project;
- Brief the type of involvement that will ask what they are going to have to make the participants summarized explanation;
- Approximate development schedule last areas in this first phase;
- Contact information for those responsible for the project in Vitoria Citi-Sense and Council.

How to keep participants in touch.

- To maintain contact with the participants, we have consider several spaces:
  - Continuous Mailing list information by which participants will be informed about the evolution of the project;
  - will be uploaded and allowed manterse contact the project managers of Citi-Sense in Vitoria. (consider the possibility that it is an opportunity to participate on-line);
  - Social media (not already decided) like Facebook.

How to keep participants in touch.

To maintain the motivation of the participants throughout the project, is expected to maintain continuous contact in which information is to:

- Evolution of the project (main tasks);
- Return results of their contributions;
- To value their role in the project, we show the importance of their involvement by comments and trying to show the impact of their proposals and ideas;
- Rate in the whole community of project participants, those participants more involved and more active (reward with recognition within the group the most active and engaged users).

List of proposed participatory spaces.

Throughout the process different participatory spaces are enabled. These spaces shall conform to the profile of each participant and the degree of development of the project. Initially the following types of spaces for participation (complementary measurement by sensors) are envisaged:

- Face meetings to present the project and analysis of results (evaluation phase);
- Sensors and smartphone (including specific questionnaire for volunteers who use the sensors);
- More general (and simple) Questionnaire to a wider audience;
- Open spaces to collect proposals (through portable tents);
- Personal interviews with experts.

Communication and information tools

- Information and communication web space;
- Facebook profile project for Vitoria-Gasteiz.

Synthesis of process, completion and return of results to the participants.

- Writing a final report on the results obtained;
- Workshops to present results;
- Process evaluation by reviewing evaluation indicators. Evaluation internally (people responsible for the project at the town hall) and external (participant citizenship);
- Communication actions related to the return of results. (press, TV, radio, etc.)

How we will do the evaluation?

With double assessment; for an assessment of the project and the participatory spaces launched:

- Internal: we measure the degree of fulfilment of the objectives set out in function of results;
- External: we will facilitate project users evaluation by an evaluation questionnaire in which they will be assessed:
    o Adequacy of the tools to their capabilities (usability);
    o Appropriateness of the participatory methodology to the objectives;
    o The role of facilitators of participatory spaces;
    o The extent and quality of the information provided.

MAIN QUESTIONS OR "HAVE TO DECIDE" ITEMS

1. Use or not of the general questionnaire. We have to convince the local authorities about its advantages.
2. If we use it, we have to decide if the people will evaluate every space through the city or only the "selected" 4 spaces or only ask questions about air quality perception but not focused on any place.
3. Use or not of the "participatory tents" with information and with/or without general questionnaire.

WP 3b some important WP 3b empowerment and engagement questions:

Figure 28: Key questions on empowerment and engagement

These WP 3b empowerment and engagement questions raised at the WP5 Barcelona meeting:

- Which phrases we should use to explain the stakeholders that the data from our units are only indicative?
- What if the stakeholders don't want to use your discussion platforms, whether in local web pages, or in Facebook etc.?
- How to avoid panic from false alarms? E.g. what do we do in case of media scandal and if people start pointing at us and blame us?
- What risks can the publicly visible data on web pages pose?
- Which methods we should use to make sure everyone's opinion is being listened equally? e.g. the ones shortly mentioned in D5.2?
- Do you have examples of quick-wins that we could implement?
- How should the stakeholders approach higher level policy makers and how to motivate them to make further steps to be heard?
- What sort of questionnaires/questions we should create/ask from our stakeholders?
- How do you want us to document engagement and empowerment?
- Each of the above questions exists also as a mirror page. This way a dialogue between WP3 & WP5 and WP2 & WP5 can be established to solve these issues. Please use the commenting tool to discuss. The name after each question presents a person who promised to take the main lead on discussion in each individual question.

Appendix B Social media questions - answers

- Why use social media?
    - A way to involve wider community;
    - Social media is cheap and (fast);
    - To get people to discuss on use of portable sensor;
    - Edinburgh sees two benefits: internal and external communication: (1) to expand the knowledge for wider public, (2) to share and post user experiences (example of a person reporting the use: I used my bike with my JOEY [personal sensor], this is what I discovered today…);
    - Do we want to use FB, Twitter… all, just one type?
    - Do we need social media to attract people:
        - It's a good tool for finding hosts for static monitors;
- Does each location use their own social media- do we have a policy?
    - Do we use umbrella concept, e.g. feeds from central FB page to local ones?
        - Might be too much information;
    - WP4 does it on behalf of whole project, where as local ones should focus on local issues;
    - Do we use only our FB page, or should we contribute to some NGO FB pages?
- Are the Citizens' Observatory web portals also considered as social media?
    - If we don't use social media, we still have local web pages;
    - Are they communicating with public?
        - Ljubljana has added discussion forums;
    - Will they be private for certain participants?
    - Some content can be protected with a password (there is a module for that in DotNetNuke);
- How many posts a week is enough? 2. If we invest 1 hour a week, is it enough?
- How many people are we expecting to influence in our FB pages?
    - 100 is realistic;
- Where is our citizens' observatories? In FB in local CO portals?
    - Community of people linked technologically, whose awareness is increases due to the project. Maybe with the aim on influencing policy to reduce air pollution;
    - In order to be citizens observatory, should citizens collect data?
    - It is the centralized connection between sensors and people;
- Will someone keep on running the social media also after CITI-SENSE?
    - We hope it to be self-sufficient at that point;
- With whom do we want to communicate?
    - And who will be communicating/pressing like and share buttons, as some people are worried about their privacy and won't comment even though they would be following us, how do we know the real number of people we have influenced?
- Where do we want to be in years of time?
    - Some optimistic ideas were presented at the meeting;
- Do we use our project as campaign project, what is our role? Do we want to sound like activists?
    - Do we use same methodology in each location, should it be neutral, do we want to be official or more aggressive?
    - One topic should be air pollution and health.

Appendix C. Oslo Internal Project Meeting December 2014 – WP2 Positive and Negative Aspects of the Empowerment Initiatives

Positive Issues:

ALL CITIES WP2 positive:

Post-it responses

- *Citizen feedback questionnaire;*
- *Linking local Air Quality issues with global environmental issues – could raise engagement;*
- *The benefit of identifying existing interest groups / communities;*
- *What is our THRESHOLD to feel empowered or to empower others?*
- *Participation towards decision making. Are we working on this? Examples?*
- *CO-DESIGN!!!*
- *Where is the voice of the citizens?*
- *Are we following a top-down approach? Do we listen to what the people want?*
- *How do we reap the benefit of 8 cities (Oslo to see Ostrava etc)?*
- *What do we give out to people? How will it change them?*
- *CITI-SENSE hotline for the public?*
- *What information are the citizens providing?*
- *Collect questions that people asked – FAQ.*

HAIFA WP2 positive:

- Sticking to the project timeline, being able to test and process data from (individual) pods, results are promising (in part);
- We were able to engage (to a certain degree) and link to residents, local educators (schools, kindergartens); did few public open and free events on AP/exposure.

Post-it responses

- *Why do the residents want to engage with us? What is the problem to solve?*
- *Sounds like a good start! Build further on it and try to catch signals about satisfaction and expectations along the ongoing process;*
- *Can you collect concrete feedback? Was there much/any negative press/criticism?*
- *Did you try to discuss the expectations of the citizens with them and take these into account?*

VIENNA WP2 positive:

- Contact and willingness to work together is good with the university /department of meteorology.;
- Reliable time frame for the next year is fixed.

Post-it responses

- *Is it planned to involve normal citizens?*
- *Try to open up gradually to other participants (also different administrations within the municipality) and especially citizens or groups;*
- *How fixed is the time frame? Should we make it more flexible/'organic' to handle unforeseen issues (e.g. sensor delays);*

- *Any political context it fits in? Beyond the work with students?*

BARCELONA WP2 positive:

- Local authority (i.e., CSIC) co-operative: desire for greater spatial coverage in monitoring; facilitative of linking (empowering) citizens with local authorities/government;
- Local schools and peers interested: several expressions of interest for collaboration and meetings by/with members of school communities and peer initiatives to empower citizens.

Post-it responses

- *Are there any citizens who say: "Wow! Now I feel empowered"?*
- *How does this lead to sustainability of the activities?*

BELGRADE WP2 positive:

- SFPA and city administration.

Post-it responses:

- *How transparently can you use the available data? Does it give people some power?*
- *Why are we measuring?*

EDINBURGH WP2 positive:

- Good preliminary contact with council and cycling groups;
- Setting up an Advisory Group.

Post-it responses

- *Do you need to train the members of the Advisory Group to be responsive?*
- *Why not call them 'the empowered group'?*
- *Who will be the members? A representative from all stakeholders?*
- *Advisory Group – good idea, necessary for every EI?*

LJUBLJANA WP2 positive:

- Win-win with WP3 stakeholders;
- Lots of dissemination material for and from stakeholders.

Post-it responses

- *You do a lot – Great! Share your experiences. WP2 to provide a forum (platform)?*
- *Win-wins are definitely important – sharing knowledge / experience – sharing resources – not inventing the wheel again;*
- *What is the quality of the dissemination material? Could it be improved?*
- *Sustainability issues?*
- *How do you deal with the requests of the stakeholders?*

OSLO WP2 positive:

- We have the support of Oslo City and together with them we are now in the process of empowering kindergartens to locate the static sensors and parking wardens to carry the portable sensors;
- We have created an Oslo Citizens' Observatory and we are disseminating the activities using social media. We have also been contacted by the press. The dissemination has worked and some groups have contact us to follow the project and collaborate with us. Example: Miljøagentene (http://miljoagentene.no/oslo/).

Post-it responses

- *Making the project well-known is really important. Challenge: Also be aware of the possibility of negative publicity by criticizing people. Communication plan;*
- *How is the Citizens' Observatory defined? What is it? Who is participating?*
- *What is your definition of a Citizens' Observatory? Is WP4 involved?*

OSTRAVA WP2 positive:

- Stakeholders are interested about the new technology and main project aims;
- Close cooperation with stakeholders on the project.

Post-it responses

- *What do the stakeholders want? Will you give it to them? Who are the stakeholders?*
- *How are they empowered? What power do you give them?*
- *How will you maintain interest and co-operation ? How will you gauge interest/ detect it waning?*

Challenges

OSLO

- We are not sure what is the best way of empowering a more general population (for instance, people not carrying sensors) and how to keep the motivation. For instance, what can we do if the services offered are not meeting people expectations? How to keep people interest in checking the mobile app? An finally, how to evaluate the success of the empowerment initiative?
- How shall we communicate risks? How to communicate the data is only indicative without creating disappointing and the sense the data is not useful?

Post-it responses

- *Part of the offering of the CITI-SENSE should be the expertise in the consortium. Translating this vernacular language => stories;*
- *We could use an easily-accessible feedback mechanism (such as the Google Plus or Facebook "thumbs up") or sample customer satisfaction survey;*
- *Ask people that already work with general local public for advice. Organize a Focus group discussion on this issue;*
- *Event where tools we offer (web pages, visualisation, etc.) would be advertises. Clear disclaimer;*
- *Keeping interests: Competition (make a photo of most polluted areas, air quality selfies), using webpage for gathering opinions, questions and stories;*
- *Try to introduce an advisory body with citizens members and discuss issues with them;*
- *Importance of participatory evaluation (complementary to self-evaluation) => different perception, measure overall satisfaction of participants;*
- *Simply by asking them => smaller questionnaires about expectations;*
- *interview with environmental NGOs (Who know the field);*
- *We need to be concrete and show (firstly each other)? How do we do it (meeting, apps, web pages); create feedback loop internally and externally;*
- *Facebook: Ask for citizens advisors: virtual tools; fac-to-face;*
- *Some people will be less interested in being involved in an experimental phase of the project; Others will be very interested. Right participants at the right time;*

- *You really need to have a good idea about: 1) what they expect; 2) what you can offer; 3) how to deal with different opinions => discussions with stakeholders, preparations, SWOT, etc. ;*
- *Be honest about what CITI-SENSE can do => discuss with stakeholders early what they expect and reach a combined understanding realistic awareness.*

EDINBURGH

- How to maintain engagement I trust in right of possible inaccuracy of sensors reading?
- How to convince council of benefit to them of the work and to manage the expectations of the cyclist?

Post-it responses

- *Inaccuracy and engagement: 1) Need internal discussion => position note on how to communicate it; 2) Internally: clarify externally and explain;*
- *People are pioneers. Make understand the systems will improve. People are helping;*
- *In early discussions with groups – find out from them what they would like; also what the CITI-SENSE can provide and have an agreed consensus of what the direction to take;*
- *Try to think about alternative data/information sources, for example perception research;*
- *Make it obvious (disclaim) that our sensor data is not regulatory grade (they are not accurate as reference stations);*
- *Set up joint EI's user/participants group in which to discuss these issues;*
- *Try to find citizens advisors.*

BELGRADE

- Challenge: security of mobile devices.

Post-it responses

- *Do you mean privacy?*
- *Ask for tracking device.*

VIENNA

- Difficult to find EI which are concerned with AQ in Vienna;
- First contacts often do not reply.

Post-it responses

- *WP5 could supply steps/process for successful contact with stakeholders;*
- *EI = CITI-SENSE (not stakeholder);*
- *Maybe try to fit in into other initiatives => make list of possible thematical connections => find out about people working on it;*
- *Alex, you are the EI. Let us help you to create a support team;*
- *First step is stakeholder analysis: who are relevant groups?*
- *Focus on individuals;*
- *Schools and NGOs can be more interested. Sensitive groups. It is not always easy to "tell the story" => make it personal to them;*
- *Explore different ways of getting in touch – emails, phone, in person, etc.;*
- *Contact environmental NGOs or other local initiative.*

LJUBLJANA

- When do we get data from sensors visible to our stakeholders? Currnet solutions are not sufficient enough to guarantee anonymity?
- Is it OK to focus on individual decision making rather than governmental?

Post-it responses

- *Ask the citizens what they expect and ask policy makers;*
- *Changing od individual behavior is valuable, but it is not empowerment just itself;*
- *Individual decision-making is an important outcome of the work – as well as policy makers. One aim is to empower citizens;*
- *Privacy is a big issue. Same problems in other locations too;*
- *Individual decision-making/Behavioral change/Reduce exposure are outputs of Citizens Observatories and people being aware of the air they breath;*
- *Individual decision-making = behavioral change => necessary short-term for risk minimasation but need steps-pathways to societal/policy change;*
- *Yes, please, individuals!*
- *Additional challenge is the how to make individuals responsive for problem not in their own backyard.*

BARCELONA

- Local authority (CSIC, Ajunntament, Generalitat) concerned: request for our data to be stressed as non-compliant and not replacing that of theirs; how do we obtain adequate feedback from them to know that they are happy with our work?
- Inability of providing reliable service of information (data) to citizens: sensor nodes may be damaged/stolen/vandalized; failure in system; how do we communicate that the service may be unstable, and how to maintain interest/use if service is unreliable?

Post-it responses

- *Maybe we should also communicate that sensors is also useful in clean cities to prevent a turn to the bad;*
- *What kind of data quality is required for different purposes? For example Ljubljana visualization by students (limited data sat);*
- *Need to ensure a robust system before going public. Control people expectations. Transmit they are pioneers;*
- *Sensors are not to replace current monitoring system. They are to empower people. We will see to what extent can complement routinely monitoring;*
- *Do we have to measure everything with the same accuracy? What do citizens want to measure (and can we offer this)?*
- *Reliable service. Must work it in. It never will be reliable => explain (expecting); routines in field to minimize them;*
- *Set up a kind of user-advisory group for the EI in which you can discuss these issues;*
- *Similar issues in almost all cases => main question = how do we see our roles? (collaborating with NGO's, giving support, being activist, partner of government);*

- *Do we need them to be happy about our work? 2) Clear disclaimer about the type of data we are offering (screening of pollution surfaces);*
- *Looking at the additive values of the CITI-SENSE project. Media? Councilors?*

OSTRAVA

- To define the "accuracy" of the measuring pollutants by sensors;
- How to convince/persuade stakeholders for collaboration when we are not sure about the "accuracy" of the sensor technology?
- We need to see and test the visualization product before the work with stakeholders as they would like to know what they can expect from us and sensor technology (do we know this at this point)?

Post-it responses

- *Need to identify what we have in addition to sensors. What can we offer instead/in addition?*
- *Stakeholders: design a stakeholder forum. Prepare "briefs" on accuracy. Educate. Be upfront;*
- *Accuracy: We can create a tool display "accuracy". Discuss with WP6;*
- *Visualization: Request internally. Define your visualization;*
- *We could open up a few of the final products and track (e.g. Google Analytics) the access and staying time;*
- *Why not co=design the visualization with users?*
- *Use the possible "inaccuracy" as a learning point – on the variability/reliability of measurements. Discuss the nature of the study;*
- *Does accuracy mean the same for stakeholders and for us as scientists?*
- *Co-location to try asses error, deviation ;*
- *Accuracy and Uncertainty are important. Need quality enough to people be able to take action: pollution areas/non-polluted areas;*
- *Clear disclaimer about the results would solve issue. Visualization => ask them about needs;*
- *Focus on visualizing what it is not seen until now: air pollution. => perception; linking people with environment;*
- *Explain/sell to stakeholders the added-benefits of our services (e. g. greater granularity/ spatial resolution);*
- *Sustainability of empowerment should fit in political context;*
- *Try to discuss these issues with the stakeholders, look for solutions together.*

HAIFA

- The fast change of technology (AirBase, GeoTech, Ateknea) does not support building on previous experience, as sensors change may affect previous understanding. The delays in shipment of sensors delays deployment and jeopardizes the attractively of the project to the ordinary person;
- Without familiarity of the project team with the data collection system, without tools to work on the Big Data collected, and without smartphone apps to bring the data closer to the user and enable him to interact with them, it is difficult to connect all the links again and again.

Post-it responses

- *Make disclaimer obvious/necessarily prior to data/info service used. => no room for misunderstanding/false confidence;*

- *Spending resources (time, money) as good as possible for different challenges/aims: 1) societal; 2) technological; 3) scientific;*
- *Participatory tools development (but needs also careful communication about experimental stage);*
- *Focus on empowerment;*
- *We need to learn to work with the tools we have. Perception Questionnaires. Deal with expectations;*
- *How we know what is attractive for ordinary people?*
- *Try to talk to the local people: what do they want?*
- *WP8 & SMEs (hardware suppliers) need to give concrete dates of supply. WP2 LOs could start advertising campaigns with final selected sensors platforms.*

Appendix D. Oslo Meeting – WP3 Positive and Negative Aspects of the Empowerment Initiatives

Positive Issues

ALL CITIES WP3 positive:

Post-it responses

- *What about engagement and empowerment?*
- *In what ways has it been helpful to you to work with WP2?*
- *Do you aim to help / empower people to improve the school environment?*
- *Does the project contribute to the curriculum in every school?*

OSLO WP3 positive:

- In cooperation with teachers we have identified arenas where students can allocate school time to work with indoor environmental questions;
- The activities includes processing and critical review of the data by the participants, reducing the risk of undue alarmism based on inaccurate data or wrong interpretation.

Post-it responses

- *Have/are the students creating their ownprojects/activities/questions (ANSWER: Absolutely! Well with a great deal of help they do);*
- *How does this relate to the concrete actions? And will this be achievable with changing staff etc?*
- *Really interesting. Was it difficult to achieve?*

LJUBLJANA WP3 positive:

- Many new activities at school (non sensor related) - very active students and teachers;
- Visualization and data processing by students.

Post-it responses

- *Are students involved in involving new students or pupils. Part in co-designing follow-ups in schools?*
- *How easily could other pupils learn to do the same? Is this something they have done in school-time?*
- *Nice to also look for possibilities beside the sensor data;*
- *Where does the data come from?*
- *That's real engagement impact.*

VITORIA WP3 positive:

- The implementation of the comfort indicators is and the app gives good results, although still too instable (see the consequences of this in the challenges below), is working reasonably well so far;
- The collaboration between the different disciplines: knowledge about environmental parameters and comfort indicators, development of software and knowledge about participation methodologies.

Post-it responses

- *Good to involve knowledge from different areas of expertise – shared knowledge, shared responsibilities – shared success?!!*
- *Enhora Buena! Felicidades!*
- *How about collaboration with citizens and stakeholders?*
- *Interest of other cities? Write-up in newspapers?*

EDINBURGH WP3 positive:

- Three schools recruited for the main study;
- Pilot study on indoor and outdoor air quality completed at one school.

Post-it responses

- *OKAY! First lessons learned you want to share?*
- *What is your plan for the main study?*
- *Has the pilot study outcome been communicated back to the school? If so, what was their response (is it documented)?*
- *GREAT!*
- *Parents involved? School Board? Possibility to spread out after project?*

BELGRADE WP3 positive:

- CO2, PM2.5, PM10, Meteo data promising with the device;
- Three different schools for main campaign – elementary, gymnasium, geological-hydro-meteorological secondary.

Post-it responses

- *Would be interesting to know how the parents respond to the outcome of the measurements;*
- *What else are you doing than measuring?*
- *Different age groups therefore wants and needs as stakeholders – age / concentration span / education / knowledge base;*
- *Different groups = different expectations;*
- *We pushed! (or rather, teachers did).*

Challenges

GENERAL

Post-it responses

- *Plans for involving pupils, teachers, parents in acting upon the data results, lessons learned? Then what?*
- *If you were starting all over again, what you would you do differently now that you understand the problems with sensors? Could you have done this project without new sensors?*

OSLO

- The activities are deeply embedded in the school situation, and somewhat limited by the curriculum. We have no real so far for expanding the activities beyond this scope;
- The integration with schools work limits the activities to rather short periods.

Post-it responses

- *Do limitations in curriculum also lead to limitations in empowerment possibilities? (future) How to find manageable balance?*
- *If you have to divide limited resources amongst different objectives, what are the priorities you would choose: (1) technological aims; (2) scientific aims; (3) social aims;*
- *Potential for making data and results (the pupils work) at least publicly available?*
- *Any talk about sustainability?*
- *Are the desired outcomes clean for all involved?*
- *Why not organize an event outside of school with students? Oriented to play and related to the objectives.(make participation funny);*
- *Engage other stakeholders like the staff (janitor, cleaning personal, teachers) => not dependent of curriculum;*
- *Try to convert expanding beyond schools into an educational project (civic education is important);*
- *Try to arrange longer and less frequent meetings in the afternoon when classes are off.*

EDINBURGH

- How to keep engagement while waiting for the main study to start?
- How to reconcile outcomes desired by the project and outcomes desired by schools?

Post-it responses

- *Stakeholders have different desires. Should/could we be neutral or team up with special groups?*
- *Shouldn't the overlap with each other to a high degree? (or being complementary);*
- *Lower levels of participation are also important: important, consult (about general issues, needs, etc.), collaborate in preparation;*
- *Why not ask students/schools about what they expect form us? If may offer the opportunity to maintain activity from now to main study;*
- *Expectation management;*
- *Who's engagement?*
- *Plan an implement parallel empowerment not involving main study deliverables (e.g. not questionnaires, sensors);*
- *Awareness raising campaigns of AQ issues. Preparing for main study e. g. identifying problematic classrooms;*
- *Lectures. Questionnaire, Photo Safari;[8]*
- *Do they have to be constantly super-engaged? If they anyway know when the project will really spur off.*

BELGRADE

- OPC measurement with 5 minutes resolution;
- Limited time for campaign (20/01/2015 – 15/06/2015).

Post-it responses

- *Time management about the end point and plan backwards;*
- *How about using equipment of the SINPHONIC project.*

VITORIA

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[8] http://www.innotour.com/innovation-tools/user-driven-methods/photo-safari/

- Engagement of people in the trial, adapted to how friendly the app is. Can they do the observation without support from us? If we need to be with them, instead of leaving them freedom to go to the places when they can/want;
- Engagement of municipality. They have reduced their profile in the participation in the project. Since we will have consecutive groups of people engaged in the trial, hopefully, we can increase their interest during the Trial and our goal is to have them involved in the final workshop with all participants.

Post-it responses

- *Keep them informed and stay open to dialogue and collaboration;*
- *Can you determine why they're disengaging? Do you think it's internal or external (or even intentional)?*
- *Why do they think themselves? Training session?*
- *Ask a councilor to do a walk with the equipment and have media coverage. They love that.*

LJUBLJANA

- Managing all school activities has become really time-consuming;
- We disappoint our stakeholders by not being able provide the sensors (expectation management is an issue).

Post-it responses

- *When should we start managing expectation? Proposal => First contact with major stakeholders (schools) => Contact with other (public) => Now;*
- *Do you know what they are expecting? Different groups, different expectations;*
- *Try to speak with them what else you could offer;*
- *Can a staff members/senior students take-on some roles / responsibilities? It would work towards post-project longevity.*