



# Citizen Sensing

## Stakeholder Interaction Manual

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STAKEHOLDER INTERACTION MANUAL

CITIZEN SENSING – URBAN CLIMATE RESILIENCE THROUGH PARTICIPATORY RISK MANAGEMENT SYSTEMS



## TABLE OF CONTENTS

1. INTRODUCTION	3
2. GETTING STARTED	5
3. WORKSHOP 1A: Climate-related issues and pre-conditions	7
4. WORKSHOP 1B: Risks, sensitive groups and locations and climate-related variables	8
5. WORKSHOP 2A: Sensor networks, databases and municipal tasks	10
6. WORKSHOP 2B: App requirements, critical levels and recommendations	12
7. WORKSHOP 3: Planning end-user campaigns	14
8. WORKSHOP 4: Designing end-user campaigns	16
9. WORKSHOP 5: Preparing end-user campaigns	18
10. WORKSHOP 6: Initiating end-user campaigns	20
11. WORKSHOP 7: Concluding end-user campaigns	21
12. WORKSHOP 8: Assessing stakeholder perspectives	23
13. INTERVIEWS: Assessing stakeholder perspectives	25
References	27
Appendix I - Pre-Campaign Survey	29
Appendix II - Post-Campaign Survey	36
Appendix III- Interview Guide	43
Appendix IV- Guide to using the CitizenSensing Web-portal	46



## 1. INTRODUCTION

This stakeholder<sup>1</sup> interaction manual was prepared in the ERA4CS project: Citizen Sensing - Urban climate resilience through a Participatory Risk Management System (PRMS). The Participatory Risk Management System includes an app by which end-users upload reports (weather observations, eventual impacts, level of personal comfort accompanied by comments and/or images) and a spatial-temporal visualization platform (the CitizenSensing web-portal) that allows users to view, explore and analyze the reports (see Navarra et al. 2020). The aim of the manual is to guide stakeholder interactions within the project to assess and gain deeper insight into the perceptions, priorities and reflections of stakeholders<sup>2</sup> that were involved in the co-design process and organize the end-user<sup>3</sup> campaigns.

The “Getting Started” section contains general information about participants, workshops, aims, outcomes, preparations, equipment, opening and closing workshops and communication. The following sections contain participatory exercises that could be performed with stakeholders and/or end-users to inform and guide the co-design process of CitizenSensing researchers and municipal through the set-up, testing and assessment of the PRMS. The exercises are organized under a number of workshops<sup>4</sup>. These would be performed with several participants, but the same exercises could be performed at or smaller meetings with a few people or individuals.

The workshop sections contain a number of interactive exercises that cover a number of themes:

- Climate-related issues and project pre-conditions (Workshop 1A)
- Risks, sensitive groups and locations and climate-related variables (Workshop 1B)
- Sensor networks, databases and municipal tasks (Workshop 2A)
- App requirements, critical levels and recommendations (Workshop 2B)
- Assessing possibilities for measurement/observation campaigns (Workshop 3)

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<sup>1</sup> The Stakeholder Interaction Manual contains exercises that pertain both to stakeholders and end-users.

<sup>2</sup> Stakeholders refer to representatives of municipalities and relevant authorities.

<sup>3</sup> End-users refer to citizens who have tested the project’s participatory risk management system including app.

<sup>4</sup> The content of the manual is organized under workshops. This word, workshop, will be used in the manual although the same exercises could be performed in meetings with individuals or a smaller number of people.



- Designing the end-user campaigns (Workshop 4)
- Preparing the end-user campaigns (Workshop 5)
- Initiating the end-user campaigns (Workshop 6)
- Concluding the end-user campaigns (Workshop 7).
- Assessing stakeholder perspectives: Workshop (Workshop 8)
- Assessing stakeholder perspectives: Interviews

Appendices I and II contain pre-campaign and post-campaign surveys to be conducted at Workshops 4 and 5. Appendix III contains an interview guide that could be used in Workshops 8 or 9. Appendix IV contains a guide to exploring the web-portal that could be used in Workshops 8 or 9.



## 2. GETTING STARTED

### Participants

The municipality or existing Climate Adaptation group is a key group to engage in your co-design process. This group should represent diverse climate-related perspectives and responsibilities. As the process progresses, you will identify potential groups that represent the “citizens”, hereafter referred to as “end-users” that could participate in the project to test the PRMS. When initially meeting the specific participant groups, introduce and discuss the project idea and decide on how to arrange meetings and interactions in order to perform the exercises in this guidebook. This could be through a series of workshops (as the exercises are arranged in this guidebook) or smaller meetings. In the instructions for each workshop, the target group of participants is noted.

### Workshops

The exercises that contribute to fulfil the aims and outcomes can be arranged in a series of workshops or smaller meetings, as back-to-back activities in existing stakeholders/end-user meetings or as individual meetings with key people. The most important is to fulfil the outcomes needed to guide the Citizen Sensing project - not to perform exercises that do not suit the specific case. Workshops 1A and 1B as well as 2A and 2B could be performed together if time permits.

### Aims

For each workshop, prepare a number of specific aims. These can be shared with the participants before the workshop/meeting. They should relate to the fulfilment of the workshop/meeting outcomes.

### Outcomes

The workshops are important times for participants to discuss issues and they will likely bring up more topics to the table than what is asked. This is a constructive process. However, at the end of each workshop/meeting, it is important to have fulfilled the specific outcomes in order to guide the next phase of the process, move the unperformed exercises to the next workshop if that is possible in relation to timing.

### Preparation

Select and invite relevant participants. Send the participants the workshop aims, expected outcomes and questions that will be addressed, so the participants can prepare and gather information if needed. If one cannot gather all relevant participants to one meeting, one can invite those that can. Contact the others separately and arrange separate meetings. A first meeting in this manner might also initiate interest to join upcoming workshops.



### Equipment

For example: large paper sheets, post-it notes or equivalent in multiple colours, coloured pens, tape, coloured dots or magnets, notepaper or magnetic board, recording devices.

### Opening workshops

If the participants do not know each other, start with a warm-up exercise or a round asking participants to reflect upon or give comments on a specific issue/topic.

### Closing workshops

After all the exercises have been performed, conclude the session by looking forward. Tell the participants how the gathered the information will be used and the next steps to implementing further steps in the project, including if relevant the next participant meeting.

### Communication

It is **important to stay in contact with any people or organizations you have engaged in the project and participatory processes**. Make a concrete plan of how you will stay in contact with participating citizen groups and organizations between the workshops. Even if little or no progress is being made, or if the time plan is not being followed, it is most important to keep contact with your stakeholders and end-users and inform them of any changes in progress or the time plan and how this might affect them. Strong communication is a key requirement to encourage and maintain engagement and plays an important role in avoiding conflicts and eventual problem solving.



### 3. WORKSHOP 1A: Climate-related issues and pre-conditions

#### Participants

Employees of the municipality or other authorities/organizations relevant for the workshop aims

#### Aims

To present the project and gain information on climate-related issues and pre-conditions for the Citizen Sensing project.

#### Outcomes

- Top-three significant climate-related issues where citizen sensing would benefit climate adaptation
- Related variables that could be measured for each of the three issues

#### Procedure

1. **Introduce\***: the project, 10 min. If you plan to record and transcribe the workshop's contents, ask permission from the participants.
2. **Present**: the workshop's aims, how the outcomes will be handled after the workshop, the workshop process and time plan, 5 min
3. **Reflect**: – Ask everyone to give a first reflection about if and how citizen science resulting in site-specific observations and data could be useful for handling climate variability and adaptation in the municipality, 15 min
4. **Take inventory**: When is it difficult to give advice about prioritized adaptation measures because there is insufficient information about where the events or impacts are occurring and who is primarily affected? Initiate a short brainstorming session where everyone is encouraged to share ideas, 15 min. Write them on notepaper and post them on the wall.
5. **Prioritize**: Everyone goes to the list of ideas and puts small dots on the problems that they think are most relevant to address, 5 min.
6. **Investigate**: Gather detailed information about the challenges or tips for successful mapping of the issues, 10 min
7. **Look forward**. Give information of how the gathered the information will be used, the next steps to implementing further steps in the project, 5 min

\* If the group participants do not know each other, start with a warm-up exercise.

## 4. WORKSHOP 1B: Risks, sensitive groups and locations and climate-related variables

### Preparation

Compile information and main outcomes and points from Workshop 1A. Gather any required additional information related to the main points e.g., information of ongoing initiatives that were mentioned during workshop/meeting 1A.

### Participants

Stakeholders of the municipality or other authorities/organizations relevant for the workshop aims

### Aims

- To create a risk matrix and identify potential participant groups, sensitive citizen groups and locations and climate-related variables

### Outcomes

- Risk matrix of the top three climate-related issues (severity vs likelihood of occurrence)
- List of potential participant groups, sensitive citizen groups, sensitive locations and possible variables to measure for each of the identified issues

### Workshop procedure

1. **Re-Introduce.** There might be new participants in the group. In that case repeat the aims and approach which will also remind the others. Present a summary of outcomes from previous workshops and participant interactions, 10 min. If you plan to record and transcribe the workshop's contents, ask permission from the participants.
2. **Present.** Tell about today's workshop's aims, how the outcomes will be handled after the workshop, the workshop process and schedule, 5 min
3. **Estimate.** For the three top climate issues identified at the last workshop, ask the participants to rank them (low, medium, high) for: 1) severity for inhabitants/ecosystems in the municipality and 2) likelihood of occurring (rare, sometimes, often, very often)
4. **Take stock.** Ask the participants if the municipality or other local authorities already use/employ participatory techniques in order to collect feedback from local people about their experience/perspective on extreme events or climate impacts? – If yes, what kind of feedback is of particular value to the authority: narration, photos, videos, sounds, temperature, humidity, location, other?
5. **Identify.** Make one group for each of the three issues. Ask participants to discuss and write down:
  - a. **sensitive citizens:** which groups or people are most exposed to and affected by the identified issues (e.g., people in kindergarten, elementary schools, old-peoples' homes or marginalized neighbourhoods)?



- b. **potential participants:** which organizations are related to potentially sensitive groups (e.g., neighbourhood-watch, youth, old-age or environmental organizations) that might potentially participate in the project?
  - c. **selected variables:** what could be measured or observed with sensors, texts, or photos (e.g., air quality, bacteria levels in water, air temperature, precipitation or water levels, etc.) of both direct and indirect impacts related to the issues and sensitive groups? Do not limit answers at this point to what is easy or possible.
  - d. **sensitive locations:** Which parts of the city are under greatest risk for identified climate-related issues?
6. **Share.** Ask each group to share their findings with other participants, 15 min
7. **Gather.** Discuss in the larger group and note ways to get participants to use the app and sustain their interest in the project? 15 min.
8. **Look forward.** Give information of how the gathered the information will be used, the next steps to implementing further steps in the project, 5 min



## 5. WORKSHOP 2A: Sensor networks, databases and municipal tasks

### Preparation

Compile information and main outcomes and points from Workshop 1B. Gather any required additional information related to the main points raised in the workshop.

### Participants

Employees of the municipality or other authorities/organizations relevant for the workshop aims

### Aims

Discuss and note currently used sensor networks, databases and municipal/organizational tasks that could be useful or facilitated by linkage to the PRMS

### Outcomes

- List of present systems/platforms and activities/routines of relevance
- List of current sensor networks
- List of current databases with related information
- List of current tasks (where identified variables are useful) and usage of GIS software

### Workshop procedure<sup>5</sup>

1. **Re-Introduce.** There might be new participants in the group, and it is good to remind the others about the project's aims and approach. Present a summary of outcomes from previous workshops and participant interactions, 10 min. If you plan to record and transcribe the workshop's contents, ask permission from the participants.
2. **Present.** Tell about today's workshop's aims, how the outcomes will be handled after the workshop, the workshop process and schedule, 5 min
3. **Discuss.** Ask participants to discuss and list:
  - present systems/platforms/etc. and activities/routines exist that CitizenSensing could possibly link to
  - existing sensor networks already deployed in the urban area that could be integrated with the project
  - potential sensor locations to measure identified climate variables available open-access databases to be visualized in the PRMS
4. **Identify.** Are there any specific (natural) hazard-related tasks undertaken by municipal officers or other authorities that could be facilitated by a (mobile) visual interface? - If any,

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<sup>5</sup> This information could also be gathered through individual or small group interviews with specific stakeholders.



please provide more details. Does the municipality or other local authority use any GIS software to handle climate- and resilience-related data? – If yes, what tasks are executed through such software? Could an extra web-tool displaying climate data as well as climate impacts be of added value to the municipality officers?



## 6. WORKSHOP 2B: App requirements, critical levels and recommendations

### Preparation

Compile information and main outcomes and points from Workshop 2A. Gather any required additional information related to the main points raised in the workshop.

### Participants

Stakeholders from the municipality or other authorities/organizations relevant for the workshop aims **and representatives of the citizen groups.**

### Aims

Discuss and list specific requirements for the app, critical levels of identified climate issues when messages should be sent (or tested), recommendation texts or documents where they can be found.

### Outcomes

- Specific requirements for the app
- Possible gaming/engagement app features: e.g., different levels, trivia messages, etc.
- Critical levels of the identified climate issues
- Recommendation texts sent to citizens when critical levels are exceeded
- List of barriers in present communication between authorities and citizens
- List of ways to overcome barriers
- List of how identified citizen groups currently organize group meetings

### Workshop Procedure

1. **Re-Introduce.** There might be new participants in the group, and it is good to remind the others about the project's aims and approach. Present a summary of outcomes from previous workshops and participant interactions, 10 min. If you plan to record and transcribe the workshop's contents, ask permission from the participants.
2. **Communicate.** Discuss in the larger group if and how current communication channels function between authorities and citizens, and within and between authorities responsible for the identified issues? What would have to change to enable a reliable two-way information flow? How do citizen groups want to interact with the project team and how could this link to their current meeting culture?
3. **What** factors need to be addressed when developing the phone app that interacts with wireless sensors?
4. **When.** What are critical levels of the identified climate-related challenges when higher levels would trigger the sending of recommendation messages to citizens?



5. **How.** Show a presentation of the apps. Download the apps to participants' phones. Demonstrate how the app works, how data is sent to the database and how and where messages or other information is demonstrated to participants (citizens).
6. **If.** What is the problem-solving procedure e.g., with technical components or the data integration procedure?
7. **What are** possible compensation schemes for participating citizens? Different levels, gaming, trivia (climate-related or other) messages, etc.
8. **Decide.** Make a plan with participants of how to communicate (e.g., through which media and possible meeting forms) during the project, how often, etc.

## 7. WORKSHOP 3: Planning end-user campaigns

### Introduction

Users' participation has been found to be a fundamental component in science production (Kirchhoff et al. 2013). Participatory methods to involve and engage people that have a stake in a targeted issue, such as the interactive workshops and exercises described in this manual, have been used, tested and developed in a variety of scientific disciplines and management areas including water management, risk management, resource governance, sustainable development and climate services and adaptation as a means in order to create valid outcomes. Participation with stakeholders has been found to better identify factors that may hinder good responsive management (André 2013; Pahl-Wolst 2009) such as complex relationships, lack of synchronization between groups and individuals, cultural and local traditions as well as existing and potential policies, planning and implementation (Jonsson et al. 2015) and create more valid and accepted outcomes (Wilk et al. 2018).

### Participants

End-users and/or their representatives<sup>6</sup> that are relevant for the chosen climate issues, related variables and impacts. These may include teachers, students, inhabitants in targeted neighbourhoods, senior citizens, staff of senior citizen dwellings, etc.

### Aims

To present the project and discuss and prepare the pre-conditions for end-user measurements/observation campaigns.

### Outcomes

- A detailed list of components that could be included in the end-user campaign
- A plan of when, who and how measurement/observation campaigns could be organized and performed
- A list of confirmed and potential participating organizations plus contact persons

### Workshop procedure

1. **Introduce**<sup>7</sup>: the project. Include information about what has been performed to date and of decisions already taken e.g., the identified climate issues that will be focused upon at each pilot. Focus on the issues with most relevance for the group with whom you are interacting e.g., staff of senior citizen dwellings might be more concerned about the impacts of excessive

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<sup>6</sup> Hereafter, "end-users and/or their representatives" will be stated as "end-users"

<sup>7</sup> If group participants do not know each other well, start with a warm-up exercise.



heat/cold. If you plan to record and transcribe the workshop's contents, ask permission from the participants. **10 min**

2. **Present:** the workshop's aims, how the outcomes will be handled after the workshop, the workshop process and time plan. **5 min**
3. **Communicate** a concrete suggestion to the end-users of how they could be involved in the project. Be clear to include what you can contribute, e.g., targeted lectures or seminars about climate change and its impacts, possibility to influence the types of information about climate impacts or adaptation measurements that are gathered in the project, information meetings with relevant speakers or sessions, gatherings where participants can meet, "prize ceremonies" for participating end-users, etc. Be realistic but creative in what you could offer that might interest end-users and encourage their participation. **15 min**
4. **Reflect:** Let the workshop participants sit in pairs or small groups and discuss if and how the suggestions are interesting or relevant for them. Which parts do they support? What changes would make the suggestions more relevant to the interests and concerns they have? Would they have possibility to participate in measurement/observational campaigns in 2019? What would this practically mean for them. Encourage the participants to write their points on notepaper and post them on the wall (if there are many participants). **15 min**
5. **Discuss:** Take up each of the ideas (posted on the wall) or let the end-users orally present their ideas. Make note of what they found positive, what would not work for them and ideas of how to change the suggestions. **30 min**
6. **Decide:** Review the suggestions with the group by going through the ideas that were offered and what is plausible based on the available time and resources. Make a short-list of the most relevant and realistic ideas. **10 min**
7. **Sum up.** Tell the participants how their ideas will be addressed and the next steps in the process. **5 min**



## 8. WORKSHOP 4: Designing end-user campaigns

### Preparation

Compile information and main outcomes from Workshop 1. Gather any additional information related to the main points needed in Workshop 2.

### Participants

Gather end-users that you interacted with in Workshop 1 that were positive to being involved in the planning for measurements/observation campaigns. Invite additional participants that were suggested or may have missed the Workshop 1.

### Aims

- To decide on the end-users that will participate in the campaigns
- To decide how the campaigns could link and contribute to ongoing work among end-user groups

### Outcomes

- A list of end-user groups and contact persons at participating organizations
- A list of organizational activities and interests where campaigns could add value
- A list of introductory or supporting activities to introduce or include in the campaigns
- A list of potential campaigns in relation to targeted climate-related issues

### Workshop procedure

- 1. Re-Introduce.** There might be new participants in the group, and it is good to remind the others about the aims and approach of the project. Present a summary of the project and outcomes from previous workshops and participant interactions and decisions already taken. If you plan to record and transcribe the workshop's contents, ask permission from the participants and ask them to fill in a formal consent for provided by the Project Lead. **10 min**
- 2. Present.** Tell about today's workshop aims, the workshop process and schedule and how the outcomes will be handled after the workshop. **5 min**
- 3. Identify.** Divide the participants into small groups of 2 to 3 people. It might be advisable to have people representing the same end-user group e.g., schools or other organizations sit in the same group so they can be more detailed in their suggestions. Encourage them to discuss if and how citizen science campaigns could contribute to their planned activities or interests, which climate-related events would be most relevant and what specific introductory or supporting activities (based on the list from Workshop 1) that would be most interesting. **30 min.**
- 4. Present.** Ask each group to share their findings with the participants in the larger group. **15 min**
- 5. Discuss.** Go through the ideas from each group. Let the participants share their suggestions with other groups and discuss similar requests or ideas. Document their suggestions. **30 min**



6. **Decide.** In the larger group, make a short-list of what the main campaigns would be, which climate-related issues are targeted, when the campaigns could take place and what supporting activities could be included. Designate a specific contact person(s) for each organization and/or end-user group. **15 min**
7. **Look forward.** Provide information of how the ideas from the workshop will be used and the next steps to developing and implementing the ideas. If arranging a follow-up meeting, decide on a date and time. **5 min**

## 9. WORKSHOP 5: Preparing end-user campaigns

### Preparation

Compile information and the main outcomes and points from Workshops 1 and 2. Gather any required additional information related to the main suggestions that were raised.

### Participants

End-users who will organize and/or possibly participate in upcoming measurement/observation campaigns.

### Aims

- To design a detailed work and time plan for upcoming end-user campaigns
- To acquaint participants with the main app components

### Outcomes

- Detailed work plan for the end-user campaigns
- Detailed time plan for the end-user campaigns
- Participants have a clear basic knowledge of key app components
- Problem-solving procedure

### Workshop procedure\*

- 1. Re-Introduce.** There might be new participants in the group, and it is good to remind the others about the project's aims and approach. Present a summary of outcomes from previous workshops and participant interactions. If you plan to record and transcribe the workshop's contents, ask permission from the participants and for them to sign a consent form. **10 min**
- 2. Present.** Tell about today's workshop aims, the workshop process and schedule, and how the outcomes will be handled after the workshop. **5 min**
- 3. Prepare.** Put the participants in groups according to the organizations they represent. Together, make plausible work and time plans for the campaigns. Discuss, decide and document the following:
  - How will the campaigns fit and complement activities undertaken by the organization (upcoming meetings, workshops, courses, etc.)?
  - Which activities or exercises will be used to introduce the campaigns and give added learning value for the participants (e.g., lecture, seminar, serious gaming, or other)?
  - When will the campaigns take place? Will they relate to eventual weather warnings from relevant organizations e.g., national weather office or similar?
  - When will campaigns be started and completed (according to how they fit with the work and interests of the organization and the timing of targeted climate-



- related issues)?
  - When and how will adaptation measures/recommendations be sent/shown to end-users (if applicable, e.g. (i) When identified critical levels of climate-related elements are exceeded (ii) When alerts from national/regional/local authorities are issued?
4. **Share.** Ask each group to briefly summarize and share their plans with the other participants. **10 min**
  5. **Introduce.** Demonstrate the latest version of the app (on screen or by having participants exploring the app directly on their telephones) explaining how it works and its main components and functions. If the participants will download data from sensors during campaigns, tell them about how this works. Explain the components e.g., how the data is collected and stored in accordance with the European privacy laws. **30 min**
  6. **Solve.** Designate a main contact person at each organization that can communicate with the Citizen Sensing team in case of technical issues or need for support. **5 min**
  7. **Conclude.** Sum up the main points from the workshop and inform participants of the next steps in the process including how and when communication will take place with the contact persons. **5 min**

## 10. WORKSHOP 6: Initiating end-user campaigns

### Preparation

Compile information and main outcomes and points from Workshop 3. Gather any additional information related to the main points raised in the previous workshop.

### Participants

Campaign end-users

### Aims

- To introduce the PRMS focusing on the app features, campaigns and problem-solving procedures
- To perform introductory activities of the campaigns
- To assess initial knowledge, awareness and engagement in climate-related events and their local consequences.

### Outcomes

- Completed pre-campaign survey
- End-users are capable of using the app

### Workshop Procedure

1. **Introduce** the PRMS system, the campaign aims and approach. **10 min**
2. **Ask.** Conduct the pre-campaign survey (Appendix I) to identify initial knowledge, awareness and engagement in climate-related events and their local consequences.
3. **Perform.** Start with an introductory activity as decided upon in Workshop 3. This could be a lecture on climate adaptation, a seminar discussion urban adaptation, a relevant film or video clip or a serious game. **30-45 min** according to activity type.
4. **Train.** Guide the participants through the features and options in the Citizen Sensing App. Demonstrate how the App works, how data is sent to the database and how and where messages or other information is demonstrated to participants (citizens). Explain what data is stored and how in accordance with European privacy law. Allow adequate time to demonstrate all the elements and also take questions from the participants. If time allows, get participants to access the app on their own phones. At the end of this component, the participants should feel confident to use the app independently and be able to guide others in how it can be used. **45 min**
5. **Relate.** Ask participants to share any eventual concerns they have. **15 min**
6. **Answer.** Address their questions and concerns. **10 min**
7. **Conclude.** At the end of the workshop, end-users should be confident in understanding the objective of the PRMS, how to use the app and the problem-solving procedure. **10 min**

## 11. WORKSHOP 7: Concluding end-user campaigns

### Introduction

Evaluation of the Citizen Sensing campaigns will be done according to a number of key themes found in previous studies of use and learning from educational Apps, social media and citizen science programs. The themes are knowledge/learning, control, civic awareness, perceptions/expectations and motivation and users' values (Jordon et al. 2011, Hirsh-Pasek et al. 2015, Whitling and Williams 2013; Hallikainen 2015). The questions in the post-survey (Appendix II) have been designed and categorized according to these themes.

### Preparation

Compile and review outcomes and points from Workshop 4. Gather any required additional information related to the main points to be taken up in the workshop.

### Participants

Campaign end-users

### Aims

- Share and discuss encountered problems and lessons learned during the campaign
- To assess acquired knowledge, awareness and engagement in climate-related events and their local consequences during the campaign

### Outcomes

- Completed post-campaign survey
- List of points to address and solve before the next campaign begins (if relevant)

### Workshop Procedure

- 1. Introduce.** Thank the end-users for the participation in the campaign. Go through the aims of today's workshop. **10 min**
- 2. Ask.** Conduct the post-campaign survey (Appendix II) to assess acquired knowledge, awareness and engagement in climate-related events and their local consequences. Discuss key points from the surveys among participants. **45 min**
- 3. Experience.** Ask the participants to individually reflect upon if their experience during the campaign helped them to answer: what are climate-related issues that affect their area/city, what are relevant adaptation responses to the climate-related issues, what are climate-related issues and adaptation measures in different parts of their city and the other pilot cities, what motivated them to use the app, have they engaged with other people (not participating in the campaign) and discussed the information and the use of the PRMS including the app? **15 min**



4. **Share.** Ask the participants to share any key points that they should like to raise. Ask the participants if during the campaign, they were able to solve any problems that arose. The participants can give examples if they wish. **25 min**
5. **Decide.** If the participants will be involved in another campaign, make a priority list of points to address. Agree on how to communicate (e.g., through which media and possible meeting forms) on changes to these points before the next campaign. Share any information you have about the next campaign with them, and ideas of how eventual problems will be addressed. **15 min**
6. **Conclude.** In case this workshop is the last time you meet this group of end-users, ensure that you thank them once again for their participation and how this project will proceed and results will be used and disseminated (e.g., web-site announcements, briefs, etc.). **5 min**

## 12. WORKSHOP 8: Assessing stakeholder perspectives

### Introduction

Stakeholders' assessments of the Participatory Risk Management System (PRMS)<sup>8</sup> are an important part of the Citizen Sensing project. They aim to determine if and to what degree the PRMS has potential usefulness for relevant organizations and sectors. The assessments focus on key factors related to successful design co-design processes and enhancement of knowledge systems: legitimacy and relevance<sup>9</sup>, credibility<sup>10</sup> and transparency.

### Participants

Stakeholders that have been involved in the co-design process and/or are relevant for the risk management system and pilot context. These could include representatives of the municipality, municipal services, local and regional authorities and agencies, businesses, etc.

### Aim

- To assess the Participatory Risk Management System (PRMS) with regards to legitimacy, relevance, credibility, transparency and use potential

### Outcome

- Documented stakeholder assessment of the Climate Service i.e., PRMS

### Workshop procedure

1. **Introduce\***: the PRMS. Include information about what has been performed to date in the project, the workshop's aims, how the outcomes will be handled after the workshop, the workshop process and time plan. If you plan to record and transcribe the workshop, ask permission from the participants and get consent forms signed (if not already done in previous interactions). **5 min**
2. **Present**. Tell about the workshop's aims, the workshop process, agenda and how the outcomes will be handled after the workshop, **5 min**
3. **Guide**: If the participants have not tested the app, ask them to open it and look through the contents and if possible, even make a report. It might be to have the app open on your phone to guide the participants through the contents and options and to better answer potential questions. Ask questions about if and how the app content contributes to legitimacy and transparency of the process and outcomes (Appendix III). **20 min**

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<sup>9</sup> Legitimacy and relevance relate to the degree that the process and service reflects respect towards participants' different values and priorities and are unbiased in collecting and relating this information (see e.g., Cash et al. 2003, Hegger et al. 2012, Djentoning & Meadow 2018, Cash & Belloy, 2020).

<sup>10</sup> Credibility refers to the scientific adequacy of the technical evidence and arguments (Cash et al. 2003; Hegger et al. 2012)

4. **Demonstrate:** Open the CitizenSensing web-portal (see Appendix IV) and log in (without sharing the login details with participants). Choose your pilot city. Demonstrate to the participants how to filter reports for different time periods, campaign groups and city locations. Set the chosen time period. Choose specific weather event types and level of comfort or choose "all". On the map, you can zoom in and click on specific reports to show more information (e.g., the weather event type, reported climate impact, level of comfort and the username of the reporting team, a photo and/or text comment). **10 min**
5. **Explore:** Look at different time periods, weather events and city areas at the stakeholders' preference. Look at the reports made at these times and locations and discuss their usefulness. Ask questions about if and how the reports in the web-portal contributes to relevance, legitimacy and credibility (Appendix III). **20 min**
6. **Ask.** If time permits, ask and discuss additional questions (see the optional questions in Appendix III) to gain more detail about relevance of the PRMS and potential changes for improvements. **20 min**
7. **Sum up.** Tell the participants how their responses and the workshop outcomes will be used and the next steps in the project. If arranging a follow-up meeting, decide on a date and time. **5 min**

\* If group participants do not know each other well and time allows, you could start with a warm-up exercise.

## 13. INTERVIEWS: Assessing stakeholder perspectives

### Participants

Stakeholders that are relevant for the chosen climate issues and pilot context. These could include representatives of the municipality, municipal services, local and regional authorities and agencies, businesses, etc.

### Aim

- To assess the Participatory Risk Management System (PRMS) with focus on usability, potential and challenges

### Outcome

- Documented stakeholder assessment of the PRMS

### Interview procedure

#### Preparation

- Ask the respondent(s) to test the CitizenSensing app on their phones before the interview. Remember to also show the sensors and the option that users can 'refer to a sensor'.
- If the respondent has not tested the app, be prepared to do it together (simultaneously) during the interview.
- Acquaint yourself with the Web-portal and select a number of uploaded reports that you can show on a shared screen during the interview. Make note of during which periods there are

#### Interview

- 1. Introduce\*:** Briefly introduce the project and information of what has been performed to date. **5 min**
- 2. Present.** Present the aim of the interview, particularly how the interview responses will be handled. Ask the respondent to sign the consent forms. If you plan to record and transcribe the interview, ask for permission. Ask the respondent for some information about themselves (Appendix III). **5 min**
- 3. Guide:** If the participant has not tested the app, ask them to open it and look through the different options and even make a report. It might be useful that you also have the app open on your phone to guide them to the different features and to better answer questions. Ask questions related to the legitimacy and transparency of the app content (see Appendix I). **20 min**
- 4. Demonstrate:** On a shared screen Open the CitizenSensing web-portal and log in (without sharing the login details with participants). Choose your pilot city. Demonstrate to the participants how to filter reports for different times, campaign groups and locations in the city. Set the time range with start and end date to show reports during a particular time period.



Choose specific weather event types and level of comfort or choose “all”. (See Appendix II for a brief guide to using the web-portal). **10 min**

5. **Explore:** Ask the participants if they would like to explore specific time periods, weather events or areas of the city in more detail. Look at the reports made at these times and locations and discuss their usefulness. Ask the basic questions related to the relevance and credibility of the reports (see Appendix I). **20 min**
6. **Ask:** If time allows, continue with additional questions to gain more details on their perspectives on the relevancy of the app and web-portal material (see Appendix I). **20 min**
7. **Sum up.** Remind the participants how their responses will be recorded and used and if and how any additional communication will take place. **5 min**



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## Appendix I - Pre-Campaign Survey

Table 1 presents **generic** questions that can be asked at the pilots. **Questions in white boxes should be asked at all of the pilots.** Questions in blue boxes can be asked if the pilot team wishes. Additional questions can also be added.

The wording and language of the questions can/should be altered to suit the targeted end-user group, e.g., (school children/adult students/senior citizens/general public in specific neighbourhoods).

Questions	Response Options
Basic information	
Age	Boxes to tick
Gender	Boxes to tick
Education	Boxes to tick
Climate change is	Please indicate 1-6  1. Not occurring 2. Occurring but not human induced 3. Occurring 4. Human induced 5. Do not know (DK) 6. Do not want to answer (DA)
Indicate your <u>agreement</u> towards the following sentences <ul style="list-style-type: none"> <li>• Climate change results from natural causes</li> <li>• Climate change results from human activities</li> <li>• Climate change is a serious problem to population and society</li> <li>• Concern about climate change is exaggerated</li> <li>• The consequences of climate change are well (known?)</li> </ul>	Tick all the boxes that are relevant
Knowledge/Learning	
1. To what extent do you consider yourself to be informed about climate change?	Please indicate 1-4  1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent
2. To what extent do you think that climate change relates to your life and personal actions?	Please indicate 1-4  1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent

To what extent do you consider climate change to be a problem?	1-4 Not a serious problem to It is a serious problem
Classify your <u>degree of concern</u> about Climate Change having in mind the <u>consequences</u> that they might have for you	1-4 Not worried to very worried
<p>3. Which climate-related events are you concerned about for yourself of other people in your city?</p> <ul style="list-style-type: none"> <li>● Increase in days with extreme heat</li> <li>● Increase in days with extreme cold</li> <li>● Increase in heavy rainfall</li> <li>● Increase in strong wind</li> <li>● Increase in periods with strong drought</li> <li>● Increase in strong hail</li> <li>● Increase in forest fires</li> <li>● Increase in coastal erosion</li> <li>● Increase in storm surges/overtopping</li> <li>● Other _____</li> </ul>	Tick all boxes that are relevant
<p>4. Which climate-related events have you personally experienced?</p> <ul style="list-style-type: none"> <li>● Increase in days with extreme heat</li> <li>● Increase in days with extreme cold</li> <li>● Increase in heavy rainfall</li> <li>● Increase in strong wind</li> <li>● Increase in periods with strong drought</li> <li>● Increase in strong hail</li> <li>● Increase in forest fires</li> <li>● Increase in coastal erosion</li> <li>● Increase in storm surges/overtopping</li> <li>● Other _____</li> </ul>	Tick all boxes that are relevant
<p>5. Which climate impacts are you concerned about?</p> <ul style="list-style-type: none"> <li>● Increase of floods</li> <li>● Increase in landslides</li> <li>● Decrease of drinking water quality/quantity</li> <li>● Aggravation of respiratory, circulatory and allergic diseases</li> <li>● Increase in contagious diseases from warmer climates</li> <li>● Destruction of crops</li> <li>● Damage of buildings</li> <li>● Damage to infrastructure (roads, bridges, pipes, ...)</li> <li>● Falling trees</li> <li>● Failures in supply (energy, water, gas, etc.)</li> <li>● Other _____</li> </ul>	Tick all boxes that are relevant
<p>6. Which climate impacts have you personally experienced/witnessed?</p> <ul style="list-style-type: none"> <li>● Increase of floods</li> <li>● Increase in landslides</li> <li>● Decrease of drinking water quality/quantity</li> </ul>	Tick all boxes that are relevant

<ul style="list-style-type: none"> <li>● Aggravation of respiratory, circulatory and allergic diseases</li> <li>● Increase in contagious diseases from warmer climates</li> <li>● Destruction of crops</li> <li>● Damage of buildings</li> <li>● Damage to infrastructure (roads, bridges, pipes, ...)</li> <li>● Falling trees</li> <li>● Failures in supply (energy, water, gas, etc.)</li> <li>● Other _____</li> </ul>	
<p>7. To what extent are you knowledgeable about climate adaptation?</p>	<p>Please indicate 1-4</p> <p>1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent</p>
<p>8. To what extent are you aware of appropriate climate adaptation actions that could be taken?</p>	<p>Please indicate 1-4</p> <p>1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent</p>
<p>9. Which proactive climate adaptation actions do you think are important in your city?</p> <ul style="list-style-type: none"> <li>● Plant shade trees</li> <li>● Repair cracks in basement and roofs</li> <li>● Install blinds in windows</li> <li>● Install awning on windows</li> <li>● Install air-conditioner/fan</li> <li>● Clear gutters, drains and pipes</li> <li>● Ensure that hard surfaces lean away from buildings</li> <li>● Ensure that house is well-drained</li> <li>● Ensure that water can infiltrate the soil</li> <li>● Minimize hard surfaces around the house</li> <li>● Collect rainwater</li> <li>● Cultivate plants on building roofs (green roofs)</li> <li>● Install technical solutions to stop backflow from toilets/drains</li> <li>● Remove valuable items from basement</li> <li>● Install ventilation in attic</li> <li>● Minimize watering of lawn</li> <li>● Store water for emergency situations</li> <li>● Build roof over basement steps</li> <li>● Fill gaps in doors and windows</li> <li>● Ensure shade in backyard e.g. umbrellas</li> <li>● Store sensitive medicines cooler than 25+</li> </ul>	<p>Tick all boxes that are relevant</p>

<p>10. Do you know about/have come across any recommendations about appropriate personal climate adaptation actions from Civil Protection during extreme climate events?</p>	<p>Yes No DK DA</p>
<p>11. If yes (on #10), which type of recommendations. Where did you access them?</p>	<p>Free text</p>
<p>12. Do you usually respect and follow Civil Protection warnings and recommendations?</p>	<p>Yes No DK DA</p>
<p>Who should take <u>responsibility</u> for climate adaptation measures and gather/disseminate relevant information to inhabitants?</p> <ul style="list-style-type: none"> <li>● EU</li> <li>● National government</li> <li>● Regional Development committees</li> <li>● Municipalities</li> <li>● Companies</li> <li>● Mass media</li> <li>● Environmental groups (NGOs)</li> <li>● Universities</li> <li>● Citizens</li> <li>● Others---- please specify</li> </ul>	<p>Tick all boxes that are relevant</p>
<p>13. What kind of climate information would you like to have access to from weather/climate service apps?</p> <ul style="list-style-type: none"> <li>● Warnings of occurrence of extreme events</li> <li>● Indications on how to avoid dangerous spots</li> <li>● Recommendations on how to act in case of extreme events</li> <li>● Information about assistance/aid available in case of extreme events</li> <li>● Information on preventive actions to reduce impact of extreme events</li> <li>● Other _____</li> </ul>	<p>Tick all boxes that are relevant</p>
<p><b>Trust</b></p>	
<p>14. Where do you currently obtain information about extreme climate-related events and/or adaptation recommendations on personal actions?</p> <ul style="list-style-type: none"> <li>● National authorities</li> <li>● Municipality</li> <li>● Television</li> <li>● Radio</li> <li>● Internet/sites</li> <li>● Social media</li> <li>● Newspapers</li> <li>● Smartphone apps</li> <li>● Others- please specify</li> </ul>	<p>Tick all boxes that are relevant</p>

<p>15. Do you trust in climate information and adaptation recommendations on personal actions from:</p> <ul style="list-style-type: none"> <li>• National authorities</li> <li>• Municipality</li> <li>• Television</li> <li>• Radio</li> <li>• Internet/sites</li> <li>• Social media</li> <li>• Newspapers</li> <li>• Smartphone apps</li> <li>• Others- please specify</li> </ul>	<p>Tick all the boxes that are appropriate</p>
<p>Would you be willing to use an app to provide information on extreme events you witness?</p>	<p>Yes No DK DA</p>
<p><b>Perceptions/Expectations</b></p>	
<p>16. To what extent do you believe that you can influence other people's ability to adapt to impacts of climate-related events by taking personal actions?</p>	<p>Please indicate 1-4</p> <p>1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent</p>
<p>17. Have you personally taken any climate adaptation actions in response to extreme weather events in the past year?</p>	<p>Yes No DK DA</p>
<p>18. Which of the following actions, if any, have you or someone in your household undertaken in the last year?</p> <ul style="list-style-type: none"> <li>• Plant shade trees</li> <li>• Repair cracks in basement and roofs</li> <li>• Install blinds in windows</li> <li>• Install awning on windows</li> <li>• Install air-conditioner/fan</li> <li>• Clear gutters, drains and pipes</li> <li>• Ensure that hard surfaces lean away from buildings</li> <li>• Ensure that house is well-drained</li> <li>• Ensure that water can infiltrate the soil</li> <li>• Minimize hard surfaces around the house</li> <li>• Collect rainwater</li> <li>• Cultivate plants on building roofs (green roofs)</li> <li>• Install technical solutions to stop backflow from toilets/drains</li> <li>• Remove valuable items from basement</li> <li>• Install ventilation in attic</li> <li>• Minimize watering of lawn</li> <li>• Store water for emergency situations</li> <li>• Build roof over basement steps</li> </ul>	<p>Tick all the boxes that are relevant</p>

<ul style="list-style-type: none"> <li>● Fill gaps in doors and windows</li> <li>● Ensure shade in backyard e.g. umbrellas</li> <li>● Store sensitive medicines cooler than 25+</li> <li>● Other _____</li> </ul>	
<p>19. Which climate adaptation actions have you carried out in connection to an extreme climate-related event?</p> <ul style="list-style-type: none"> <li>● Seek out green/shady areas in the city</li> <li>● Seek out drinking water</li> <li>● Increase water intake</li> <li>● Put on sunscreen (30+ SPF)</li> <li>● Avoid to drive in culverts</li> <li>● Choose suitable clothing</li> <li>● Help small children, elderly, etc. to increase water intake and choose cool environments</li> <li>● Avoid direct exposure to the sun</li> <li>● Avoid physical exertion</li> <li>● Cover windows with gardens/cloth/papers to block sun/cold</li> <li>● Avoid driving/walking in low-lying areas in heavy rain</li> <li>● Open windows at night to cool air</li> <li>● Be aware of body conditions e.g. higher temperature, pulse, etc. and react</li> </ul>	Tick all boxes that are relevant
<p>20. Have you influenced anyone to also take adaptation actions (e.g. jointly in your household or in another place or context)?</p>	Yes No DK DA
<p>21. If yes (#20), whom have you influenced and concerning which types of actions?</p>	Free text
App User Profile	
<p>22. How many apps are presently on your phone (excluding those that come with the phone/are there by default)?</p>	Give ranges e.g. 1-5, 6-10, 10-20, 20-30, 30-40, 40-50, 50-60, above 60
<p>23. What mobile apps do you use weekly?</p> <ul style="list-style-type: none"> <li>● Weather</li> <li>● Social media</li> <li>● News</li> <li>● Music</li> <li>● Health</li> <li>● Transport</li> <li>● Risk management preparedness</li> <li>● Other _____</li> </ul>	Tick all the boxes that are relevant
Motivation and Users Values	
<p>24. What are the benefits of using different types of apps?</p> <ul style="list-style-type: none"> <li>○ social interaction</li> <li>○ finding general information</li> </ul>	Tick all the boxes that are relevant



<ul style="list-style-type: none"><li>○ finding specific information</li><li>○ learning new things</li><li>○ passing the time</li><li>○ entertainment</li><li>○ sharing knowledge with others</li><li>○ convenience</li></ul>	
25. Your opinions are very important. If you consider that any relevant aspect related to Climate Change was not approached in this inquiry, please write your comment	Free text

Thank you for your responses!

## Appendix II - Post-Campaign Survey

Table 2 presents **generic** questions that can be asked at the pilots. **Questions in white boxes should be asked at all of the pilots.** Questions in blue boxes can be asked if the pilot team wishes. Additional questions can also be added.

The wording and language of the questions can/should be altered to suit the targeted end-user group, e.g. (school children/adult students/senior citizens/general public in specific neighborhoods).

Questions	Response Options
<b>Basic information</b>	
Age	Boxes to tick
Gender	Boxes to tick
Education	Boxes to tick
Climate change is ...	Please indicate 1-6  1. Not occurring 2. Occurring but not human induced 3. Occurring 4. Human induced 5. Do not know (DK) 6. Do not want to answer (DA)
Indicate your <u>agreement degree</u> towards the following sentences <ul style="list-style-type: none"> <li>• Climate change results from natural causes</li> <li>• Climate change results from human activities</li> <li>• Climate change is a serious problem to population and society</li> <li>• Concern about climate change is exaggerated</li> <li>• The consequences of climate change are well (known?)</li> </ul>	Tick all boxes that are relevant
<b>Knowledge/Learning</b>	
1. To what extent do you consider yourself to be informed about climate change?	Please indicate 1-4  1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent
To what extent do you think that climate change relates to your life and personal actions?	Please indicate 1-4  1. Great extent, 2. Considerable extent, 3.

	Moderate extent, 4. Slight/no extent
To what extent do you consider climate change to be a problem?	Please indicate 1-4  1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent
Classify your <u>degree of concern</u> about Climate Change having in mind the <u>consequences</u> that they might have for you	Please indicate 1-4  1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent
Which climate-related events are you concerned about for yourself of other people in your city? <ul style="list-style-type: none"> <li>● Increase in days with extreme heat</li> <li>● Increase in days with extreme cold</li> <li>● Increase in heavy rainfall</li> <li>● Increase in strong wind</li> <li>● Increase in periods with strong drought</li> <li>● Increase in strong hail</li> <li>● Increase in forest fires</li> <li>● Increase in coastal erosion</li> <li>● Increase in storm surges/overtopping</li> <li>● Other _____</li> </ul>	Tick all boxes that are relevant
Which climate-related events have you personally experienced? <ul style="list-style-type: none"> <li>● Increase in days with extreme heat</li> <li>● Increase in days with extreme cold</li> <li>● Increase in heavy rainfall</li> <li>● Increase in strong wind</li> <li>● Increase in periods with strong drought</li> <li>● Increase in strong hail</li> <li>● Increase in forest fires</li> <li>● Increase in coastal erosion</li> <li>● Increase in storm surges/overtopping</li> <li>● Other _____</li> </ul>	Tick all boxes that are relevant
Which climate impacts are you concerned about? <ul style="list-style-type: none"> <li>● Increase of floods</li> <li>● Increase in landslides</li> <li>● Decrease of drinking water quality/quantity</li> <li>● Aggravation of respiratory, circulatory and allergic diseases</li> <li>● Increase in contagious diseases from warmer climates</li> <li>● Destruction of crops</li> <li>● Damage of buildings</li> <li>● Damage to infrastructure (roads, bridges, pipes, ...)</li> </ul>	Tick all boxes that are relevant

<ul style="list-style-type: none"> <li>● Falling trees</li> <li>● Failures in supply (energy, water, gas, etc.)</li> <li>● Other _____</li> </ul>	
<p>Which climate impacts have you personally experienced or witnessed?</p> <ul style="list-style-type: none"> <li>● Increase of floods</li> <li>● Increase in landslides</li> <li>● Decrease of drinking water quality/quantity</li> <li>● Aggravation of respiratory, circulatory and allergic diseases</li> <li>● Increase in contagious diseases from warmer climates</li> <li>● Destruction of crops</li> <li>● Damage of buildings</li> <li>● Damage to infrastructure (roads, bridges, pipes, ...)</li> <li>● Falling trees</li> <li>● Failures in supply (energy, water, gas, etc.)</li> <li>● Other _____</li> </ul>	<p>Tick all boxes that are relevant</p>
<p>To what extent are you knowledgeable about climate adaptation?</p>	<p>Please indicate 1-4</p> <p>1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent</p>
<p>To what extent are you aware of appropriate climate adaptation actions that could be taken?</p>	<p>Please indicate 1-4</p> <p>1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent</p>
<p>Which proactive climate adaptation actions do you think are important?</p> <ul style="list-style-type: none"> <li>● Plant shade trees</li> <li>● Repair cracks in basement and roofs</li> <li>● Install blinds in windows</li> <li>● Install awning on windows</li> <li>● Install air-conditioner/fan</li> <li>● Clear gutters, drains and pipes</li> <li>● Ensure that hard surfaces lean away from buildings</li> <li>● Ensure that house is well-drained</li> <li>● Ensure that water can infiltrate the soil</li> <li>● Minimize hard surfaces around the house</li> <li>● Collect rainwater</li> <li>● Cultivate plants on building roofs (green roofs)</li> <li>● Install technical solutions to stop backflow from toilets/drains</li> <li>● Remove valuable items from basement</li> <li>● Install ventilation in attic</li> </ul>	<p>Tick all boxes that are relevant</p>

<ul style="list-style-type: none"> <li>● Minimize watering of lawn</li> <li>● Store water for emergency situations</li> <li>● Build roof over basement steps</li> <li>● Fill gaps in doors and windows</li> <li>● Ensure shade in backyard e.g. umbrellas</li> <li>● Store sensitive medicines cooler than 25+</li> <li>● Other _____</li> </ul>	
<p>Do you know about/have come across any recommendations about appropriate personal climate adaptation actions from Civil Protection during extreme climate events?</p>	<p>Yes No DK (Do not know) DA (Do not want to answer)</p>
<p>If yes (#10), which type of recommendations and from where did you access them?</p>	<p>Free text</p>
<p>Do you usually respect and follow Civil Protection warnings and recommendations?</p>	<p>Yes No DK DA</p>
<p>Who should take <u>responsibility</u> for climate adaptation measures and gather/disseminate relevant information to inhabitants?</p> <ul style="list-style-type: none"> <li>● EU</li> <li>● National government</li> <li>● Regional Development committees</li> <li>● Municipalities</li> <li>● Companies</li> <li>● Mass media</li> <li>● Environmental groups (NGOs)</li> <li>● Universities</li> <li>● Citizens</li> <li>● Others---- please specify</li> </ul>	<p>Tick all boxes that are relevant</p>
<p>What kind of climate information would you like to have access to from weather/climate service apps?</p> <ul style="list-style-type: none"> <li>● Warnings of occurrence of extreme events</li> <li>● Indications on how to avoid dangerous spots</li> <li>● Recommendations on how to act in case of extreme events</li> <li>● Information about assistance/aid available in case of extreme events</li> <li>● Information on preventive actions to reduce impact of extreme events</li> <li>● Other _____</li> </ul>	<p>Tick all boxes that are relevant</p>
<p>What climate information did you access with the PRMS?</p> <ul style="list-style-type: none"> <li>● Warnings of occurrence of extreme events</li> <li>● Indications on how to avoid dangerous spots</li> <li>● Recommendations on how to act in case of extreme events</li> <li>● Information about assistance/aid available in case of extreme events</li> </ul>	<p>Tick all boxes that are relevant</p>

<ul style="list-style-type: none"> <li>• Information on preventive actions to reduce impact of extreme events</li> <li>• Other _____</li> </ul>	
<b>Trust</b>	
<p>Where do you currently obtain information about extreme climate-related events and/or adaptation recommendations on personal actions?</p> <ul style="list-style-type: none"> <li>• National authorities</li> <li>• Municipality</li> <li>• Television</li> <li>• Radio</li> <li>• Internet/sites</li> <li>• Social media</li> <li>• Newspapers</li> <li>• Smartphone apps</li> <li>• Other _____</li> </ul>	Tick all boxes that are relevant
<p>Do you trust in climate information and adaptation recommendations on personal actions from:</p> <ul style="list-style-type: none"> <li>• National authorities</li> <li>• Municipality</li> <li>• Television</li> <li>• Radio</li> <li>• Internet/sites</li> <li>• Social media</li> <li>• Newspapers</li> <li>• Smartphone apps</li> <li>• Other _____</li> </ul>	Tick all the boxes that are appropriate
<p>Would you be willing to use an Application to provide information on extreme events you witness?</p>	Yes No DK DA
<b>Perceptions/Expectations</b>	
<p>To what extent do you believe that you can influence other people's ability to adapt to impacts of climate-related events by taking personal actions?</p>	Please indicate 1-4  1. Great extent, 2. Considerable extent, 3. Moderate extent, 4. Slight/no extent.
<p>Have you personally taken any climate adaptation actions in response to extreme weather events in the past year?</p>	Yes No DK DA
<p>Which of the following actions, if any, have you or someone in your household undertaken or initiated in the last year?</p> <ul style="list-style-type: none"> <li>• Plant shade trees</li> </ul>	Tick all the boxes that are relevant

<ul style="list-style-type: none"> <li>● Repair cracks in basement and roofs</li> <li>● Install blinds in windows</li> <li>● Install awning on windows</li> <li>● Install air-conditioner/fan</li> <li>● Clear gutters, drains and pipes</li> <li>● Ensure that hard surfaces lean away from buildings</li> <li>● Ensure that house is well-drained</li> <li>● Ensure that water can infiltrate the soil</li> <li>● Minimize hard surfaces around the house</li> <li>● Collect rainwater</li> <li>● Cultivate plants on building roofs (green roofs)</li> <li>● Install technical solutions to stop backflow from toilets/drains</li> <li>● Remove valuable items from basement</li> <li>● Install ventilation in attic</li> <li>● Minimize watering of lawn</li> <li>● Store water for emergency situations</li> <li>● Build roof over basement steps</li> <li>● Fill gaps in doors and windows</li> <li>● Ensure shade in backyard e.g. umbrellas</li> <li>● Store sensitive medicines cooler than 25+</li> <li>● Other _____</li> </ul>	
<p>Which climate adaptation actions have you carried out in connection to an extreme climate-related event?</p> <ul style="list-style-type: none"> <li>● Seek out green/shady areas in the city</li> <li>● Seek out drinking water</li> <li>● Increase water intake</li> <li>● Put on sunscreen (30+ SPF)</li> <li>● Avoid to drive in culverts</li> <li>● Choose suitable clothing</li> <li>● Help small children, elderly, etc. to increase water intake and choose cool environments</li> <li>● Avoid direct exposure to the sun</li> <li>● Avoid physical exertion</li> <li>● Cover windows with gardens/cloth/papers to block sun/cold</li> <li>● Avoid driving/walking in low-lying areas in heavy rain</li> <li>● Open windows at night to cool air</li> <li>● Be aware of body conditions e.g. higher temperature, pulse, etc. and react</li> </ul>	<p>Tick all boxes that are relevant</p>
<p>Have you influenced anyone to also engage in taking adaptation actions during the PRMS campaigns (e.g. jointly in your household or in another place or context)?</p>	<p>Yes No DK DA</p>



If yes to the question above, whom have you influenced and concerning which types of actions?	Free text
<b>App User Profile</b>	
How many apps are presently on your phone (excluding those that come with the phone/are there by default)?	Give ranges e.g. 1-5, 6-10, 10-20, 20-30, 30-40, 40-50, 50-60, above 60
<p>What mobile applications do you use weekly?</p> <ul style="list-style-type: none"> <li>● Weather</li> <li>● Social media</li> <li>● News</li> <li>● Music</li> <li>● Health</li> <li>● Transport</li> <li>● Risk management preparedness</li> <li>● Other _____</li> </ul>	Tick all the boxes that are relevant
<b>Motivation and Users Values</b>	
<p>What were the benefits of using the Citizen Sensing App/PRMS (if any)?</p> <ul style="list-style-type: none"> <li>● Social interaction</li> <li>● Finding general information</li> <li>● Finding specific information</li> <li>● Learning new things</li> <li>● Passing the time</li> <li>● Entertainment</li> <li>● Sharing knowledge</li> <li>● Other _____</li> </ul>	Tick all the boxes that are appropriate (alternative: rank each of these by importance?)
Your opinions are very important. If you consider that any relevant aspect related to Climate Change was not approached in this inquiry, please write your comment	Free text

Thank you for your responses!

## Appendix III- Interview Guide

BASIC QUESTIONS	Response Options
<p>In which section/division of the municipal organization do you work?</p> <p>Please shortly describe your area of responsibility and related tasks.</p>	
<p>Did you participate in one or more meetings/workshops as part of the Citizensensing project?</p> <p>If yes, have you had the same role since the first meetings/workshops of Citizensensing project?</p> <p>If yes, what do you remember as the key priorities and goals in the project?</p> <p>If yes, what do you remember as the key priorities/interests for your municipality/division related to the project?</p> <p>If no, hop to next question (and inform them about the co-design process).</p>	Yes/No
<p>ASK THE RESPONDENT TO: (if they have not already done so)</p> <ul style="list-style-type: none"> <li>• MAKE AN APP REPORT (and scroll through the different options)- [You may have to lead them through the process.]</li> <li>• You may want to have the app open to discuss features</li> </ul>	
<p>Do you think the content/terminology in the app in any way <b>excludes</b> or disadvantages its use and/or the collection of data/information from any particular groups of citizens (based on gender, age, language skill, socio-economic level, etc.)?</p> <p>If yes or no, could you provide more details.</p>	Yes/No
<p>Do you think the app allows for <b>transparency</b> about collected data and information?</p> <p>If yes, could you provide more details. [e.g., Does the app easily allow citizens to see each other's responses, transparency of the data collection process?]</p> <p>If no, why not? How might it?</p>	Yes/no
<p>Share the screen and show examples on the web portal.</p> <p>Choose a particular time-period and look at some reports that people have shared. [Maaik, you could show some examples that were submitted in English]</p>	



<p>Do you think the type of collected data/information to be <b>relevant</b> to your organization for planning and decision-making?</p> <p>If yes, could you provide more details.</p> <p>If no, why not? How might it?</p>	<p>Yes/No</p>
<p>Do you think the collected data/information to be <b>credible</b> (credible defined as scientifically adequate)?</p> <p>If yes, could you provide more details.</p> <p>If no, why not? How might it?</p>	<p>Yes/No</p>
<p>Do you think the <u>integration of sensors</u> could be important for the collection of data/information that is <b>relevant</b> for your organization?</p> <p>(e.g., validating urban heat islands, etc.)</p> <p>If yes, please give details.</p> <p>If no, why not? How might it (with some adjustments)?</p>	
<p>Your knowledge and opinions are very important to us. Please share any additional comments.</p>	<p><b>If the respondent is willing to answer more questions, save this question until the end!</b></p>
<p><b>ADDITIONAL QUESTIONS</b></p>	
<p><u>Which app functions</u> do you think most important for collecting information that is <b>relevant</b> to your organization?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Submit a report – what type of weather event/impact?</li> <li><input type="checkbox"/> Submission of images/text (in particular, in addition to the first point)</li> <li><input type="checkbox"/> View other people’s reports – is this important that residents can see other reports? Why? Why not?</li> <li><input type="checkbox"/> Explore and comment on sensor data</li> <li><input type="checkbox"/> List of Adaptation recommendations sent when reports are submitted</li> <li><input type="checkbox"/> Other _____</li> </ul>	
<p><u>Which particular functions of the web portal</u> do you consider <b>relevant</b> for your organization?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Explore submitted reports by weather event/impact?</li> <li><input type="checkbox"/> Explore submitted images or text (in particular, in addition to the first point)</li> <li><input type="checkbox"/> Explore specific time ranges (e.g., during a heat wave)</li> <li><input type="checkbox"/> Other _____</li> </ul>	
<p><u>What particular reports (shown on the web portal)</u>, do you consider <b>relevant</b> (or could be) to your organization?</p> <p>If yes, give details.</p>	<p>Yes/No</p> <p>Explanation</p>



If no, why not? How might they be (with some adjustments)?	
What changes might you suggest for the app to allow for collection of more relevant, inclusive or credible data/information?	
What changes might you suggest for the app to allow for collection of other types of information and encourage greater citizen inclusion and awareness?	
<p>Would you consider the app/system to be <b>relevant</b> tools to encourage and allow communication between citizens and your organization?</p> <p>If yes, could you provide more details.</p> <p>If no, why not? How might it?</p>	Yes/no
Which citizen groups would you suggest as suitable groups to engage with the app?	
Your knowledge and opinions are very important to us. Please share any additional comments.	

## Appendix IV- Guide to using the CitizenSensing Web-portal

1. Open the Web-portal and sign in to use the full version. If you do not have access rights to the full version or want to use the version with limited data access, skip signing in and select one of the pilot cities by clicking a corresponding city name in the graphical interface. (Fig 1)
2. Set the time range with start and end date to show reports during a particular time period. (Fig 2)
3. Choose a specific weather event type from the list or choose “all”.
4. Choose the level of comfort from the list from positive- high to negative- high or choose “all”.
5. Zoom in on areas where you want to explore the reports in more detail.
6. Click on specific reports (icons on the map) to gain more detail e.g., the weather event type, reported climate impact, level of comfort and the username of the reporting team. The reports may even include a photo and/or a text comment.

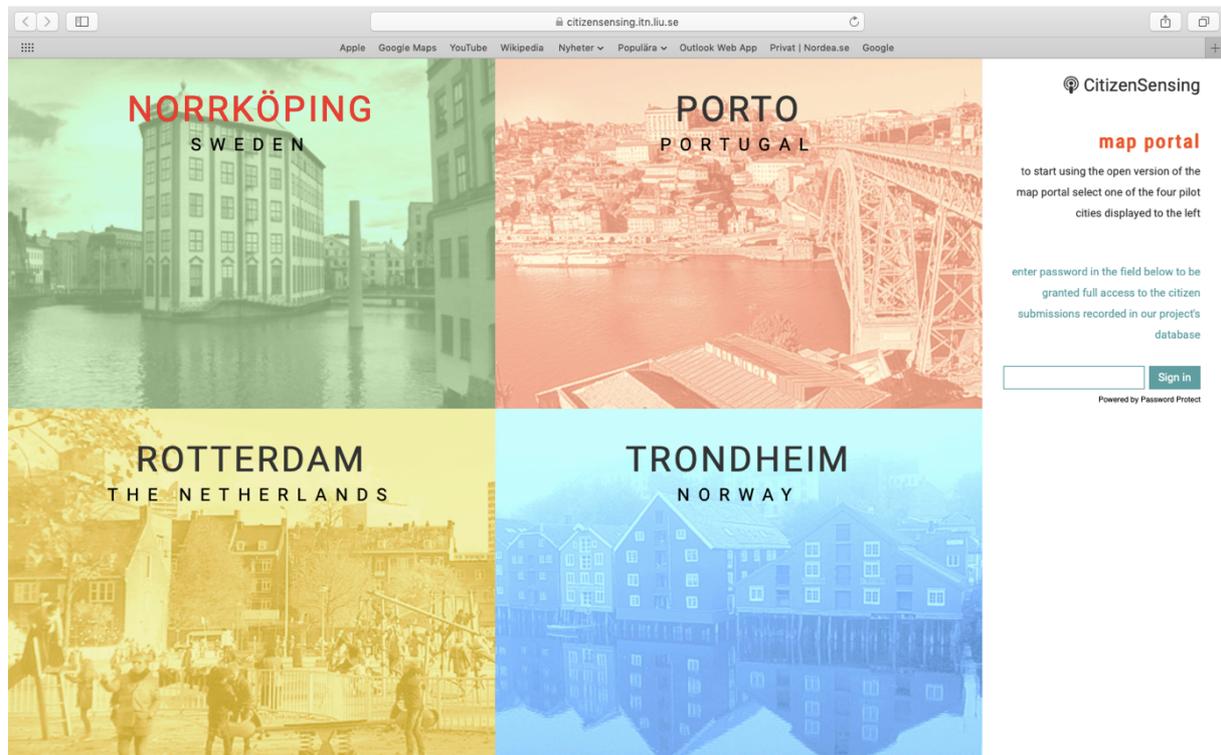


Fig 1. Screenshot of the entry page of the CitizenSensing Web-portal. The cursor has been placed on the Norrköping pilot (Red text).

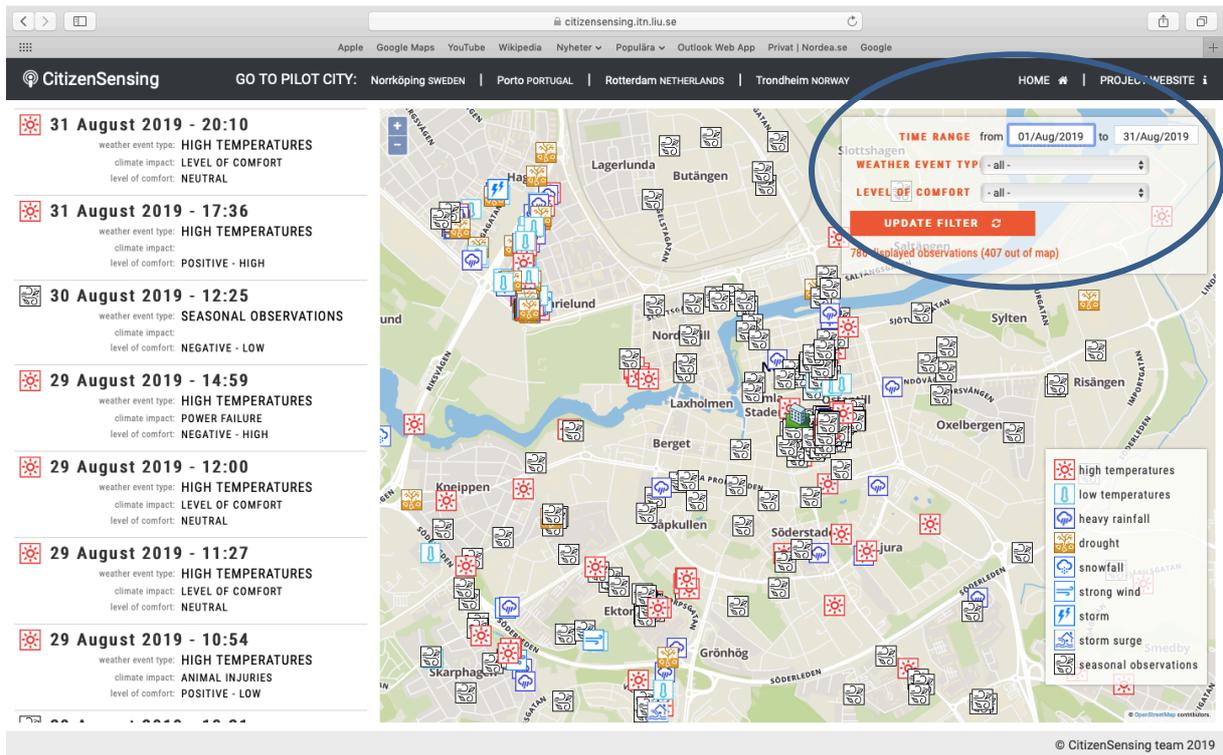


Fig 2. Screenshot of a map of Norrköping showing end-user reports for all weather event types and levels of comfort for August 1-31, 2019.