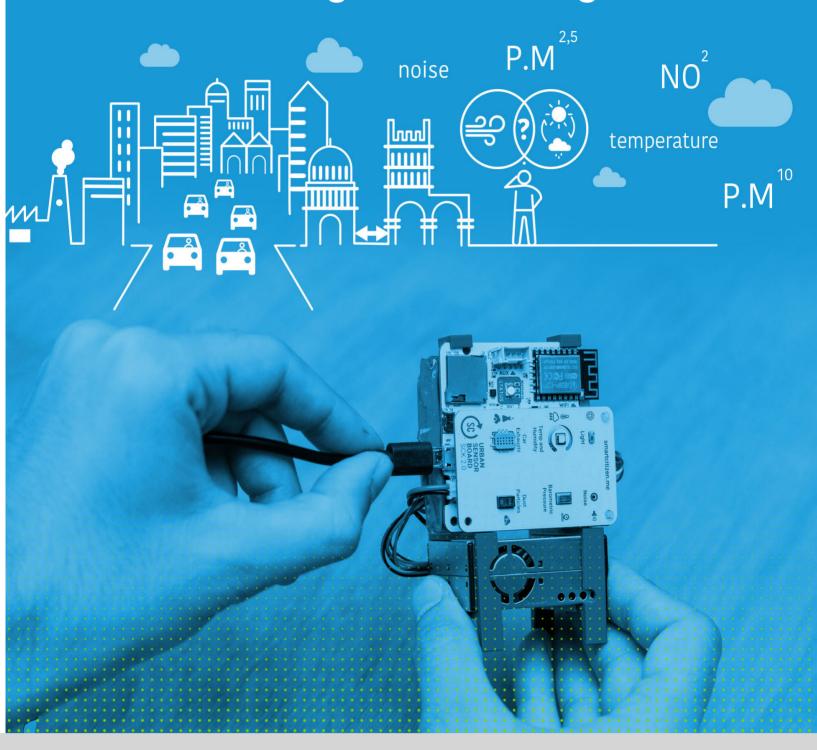
# ISCAPE CITIZEN SCIENCE GUIDE

An actionable guide for Living Labs.









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#### **CONTENT**

CITIZEN SCIENCE GUIDE A guide created for the iSCAPE Living Labs	4
WHY CITIZEN SCIENCE	
What is citizen science and why is it relevant	6
WORKSHOP PREPARATION How to make your Citizen Science workshops a success	7
iSCAPE CITIZEN SCIENCE - WORKSHOP 1. Sensing your city	10
WARM-UP EXERCISE Air Quality Superhero worksheet template	12
WORKSHOP INTRODUCTION High-level structure	14
GET TO KNOW YOUR SENSOR KIT High-level structure	15
EMPATHY MAPPING Exercise	16
PLAN YOUR DATA COLLECTION High-level structure, Sensing Checklist and pollutant table	18
ADVICE AND TIPS Successful data collection	21
iSCAPE CITIZEN SCIENCE - WORKSHOP 2.  Make data tangible	24
WORKSHOP PREPARATION How to make the second Citizen Science workshops a success	26
WORKSHOP INTRODUCTION High-level structure	27
FROM RAW DATA TO TANGIBLE DATA Exploring the power of visualisation	28
STORYTELLING THROUGH DATA How to make data tangible and worksheet template	30
REFLECTION & ACTIONS Planning next steps	32
IMPACT OF CITIZEN SCIENCE During the iSCAPE project and beyond	34
DATA & FEEDBACK COLLECTION From participants and facilitators plus templates	36
APPENDIX Smart Citizen Kit step-by-step-guide by IAAC Workshop checklist	39

#### CITIZEN SCIENCE GUIDE

#### A guide created for the iSCAPE Living Labs

This document was developed for the EU funded iSCAPE project (for more information go to iscapeproject.eu¹). After implementing the iSCAPE Citizen Science framework in six European cities we decided to adjusted the content slightly to be used by everyone (e.g. Living Labs, community groups, SME's and local authorities) who wants to work/explore low-cost air quality sensors and citizen science methodologies. This guide provides a brief introduction to Citizen Science as well as a comprehensive step-by-step structure for two connected Citizen Science workshops covering everything from finding the right space and reaching out to citizens, to delivering the workshops and planning next steps for citizen-led solutions to environmental problems.

This guide is a walk through for the early stages of establishing a citizen science community. If you or your team are already active in Citizen Science, we hope this guide provides further inspiration relevant to your projects. For those new to Citizen Science however, we would recommend you follow the structure and timings to ensure consistency across the experiment (data sets, feedback collection and documentation of the workshop materials). We also encourage users to deliver a 3rd, 4th and many more Citizen Science workshops that build on, or are an extension of, previous workshops.

Best practice for engagement should be developed over time, as more is understood about the audience. The iSCAPE citizen science framework is an example how Citizen Science can work, but each Living Lab needs to find its own way to continue the air quality monitoring activities e.g. through workshops, one-to-ones or in small groups.

The iSCAPE workshop results informed scientific papers and inspired the Living Lab communities to engage in future Citizen Science activities and air quality campaigns (see iSCAPE website).

#### **About iSCAPE**

iSCAPE is a European Research and Innovation project that works on integrating and advancing the control of air quality and carbon emissions in European cities, in the context of climate change. It does so through the development of sustainable and passive air pollution remediation strategies, policy interventions and behavioural change initiatives. Find out more at <a href="issapeproject.eu">issapeproject.eu</a><sup>2</sup>

#### The iSCAPE Cities

There are 6 cities included in the iSCAPE project: Bologna (Italy), Bottrop (Germany), Dublin (Ireland), Guildford (UK), Hasselt (Belgium) and Vantaa (Finland). All of these cities formed a LL and introduced one or more air quality interventions as part of the project.

High-level outline of the iSCAPE CS framework: two workshops with data collection and visualisation in between.



#### WHY CITIZEN SCIENCE?

#### What is Citizen Science and why is it relevant for citizen-led environmental projects?

There is no universally accepted single definition of Citizen Science. Two of the most often quoted definitions are presented below, and both clearly emphasise the importance of the involvement of non-scientists drawn from the general public. The iSCAPE Citizen Science framework, specially created for a task in the EU project, is a tool by which the Living Labs can engage the local community (non-scientists) and thereby build an iSCAPE Living Lab community around the issue of air quality.

#### In 2004, Bruce Lewenstein of Cornell University three-part definition3:

- **1.** The participation of non-scientists in the process of gathering data according to specific scientific protocols and in the process of using and interpreting that data;
- **2.** The engagement of non-scientists in true decision-making about policy issues that have technical or scientific components; and
- 3. The engagement of research scientists in the democratic and policy process.

#### In 2013, the Green Paper on Citizen Science suggested that4:

Citizen Science refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources.

#### Why is it relevant for iSCAPE and other Living Labs?

The aim of Citizen Science is to undertake research and discovery which involves active and thoughtful contributions from non-scientists. Their contribution is often realised during crowd-sourcing, data analysis and data collection. They can contribute because the research tasks are broken down into digestible components that anyone can perform. The participation of the public in these projects demonstrates that 'everyday' people want to and are able to make a valuable contribution to science and in the case of iSCAPE also to their local community.

For us the (iSCAPE) Citizen Science workshop is a tool to build the iSCAPE Living Lab community, the workshop also aims to increase the engagement of the local community around air quality.

- 3: CitizenScienceCenter: http://www.citizensciencecenter.com/about-citizen-science/
- 4: The Conversation Blog: https://theconversation.com/explainer-what-is-citizen-science-16487

#### WORKSHOP PREPARATION

How to make your Citizen Science workshops a success:

#### THREE GOLDEN WORKSHOP RULES

- **1. EASY TO ATTEND** People lead busy lives: having the workshop at a place that is easy to get to and at a time that is suitable will increase the number and variety of participants.
- 2. MAKE IT FUN AND ENTERTAINING The participants are probably studying or working full time, the workshop should show them something they didn't know or teach them a new skill.
- 3. MAKE IT MEMORABLE SO PEOPLE COME BACK If the workshops stay in peoples minds, they will talk about it with others and promote your Living Lab or organisation! This also means they are more likely to return to the second or even third round of Citizen Science workshops.

#### **RECOMMENDATIONS BASED ON THE ABOVE RULES**

#### When and where should the workshop take place?

We recommend having workshops in the evening, ideally between 5pm – 8pm (alternatively Saturday daytime); this will offer flexibility for a broad range of people to attend. However, do adjust the time to your local needs. Try to reach diverse participants e.g. businesses, local authorities, researchers as well as citizens.

#### The Space:

- Try to create a comfortable atmosphere and avoid cold, dark or noisy spaces.
- The right space will impact positively on the number of people attending and, just as importantly, returning to the next event.
- Have enough seats, tables and workshop materials for everyone always plan for more rather than less.
- Consider people without cars especially when they are interested in air quality a bus or train station should be nearby. You could also collaborate with a local theatre, library or school that might be able to provide a free space.

#### How to spread the word:

- First of all set up an event on Eventbrite (or similar) this allows you and others
  to share and promote the workshop and it will attract people who are actually
  interested in air quality and Citizen Science (via the Eventbrite recommendation
  feature).
- Eventbrite can be easily shared on social media and the sign-up numbers will give an indication how the marketing of the event went. Based on those figures you can adjust the promotion and communication strategy.

#### **Refreshments:**

- Besides creating an interesting and insightful workshop, make sure you provide
  participants with nice snacks and beverages advertised on the Eventbrite. Having
  drinks and nibbles at workshops increases both attendance and return rates. Don't
  worry that people come just for the catering a welcoming atmosphere is the surest
  first step to engage your audience.
- Recommended snacks and beverages: Crisps and cheese plus some healthy snacks such as carrot sticks with hummus. Red and white wine, some bottles of beer, alternatively juices, water, tea and coffee. An informal drink and snack with fellow participants helps the warm-up phase.
- The number of people signed up gives you an indication of how many people will actually turn up, which helps with the overall workshop and shopping preparation (always prepare for a drop-out rate of 25-40%).
- A small buffet table (for the snacks and beverages) also enables conversations between participants who are not placed on the same table.

#### **Workshop materials:**

- For the citizen science workshops, we recommend having a dry run with some people outside the organisation before the final workshop, so you can gather feedback to improve the workshop delivery.
  - Translate the worksheets if necessary you could translate each of the number / bullets on the worksheets and have a small translation on the side.
- Print materials **one day** before the actual workshop.

#### **Documentation & Gathering Feedback:**

- Photograph the sessions try to use a high quality camera (or mobile phone) so pictures can be shared on a website or social media. Don't forget to ask for consent this can be mentioned at the start of the workshop and (get in touch with parents when working with young people).
- Document and collect the worksheets photograph or scan the worksheets, organise them perhaps using Google Drive or Dropbox.
- Use Twitter, Instagram, Facebook and Medium to share the outcome of the workshops with the general public (get to know your audience to find the right channels).
- Use the simple feedback sheet provided to collect feedback from facilitators after the workshop (see page 37 and 38).

#### Piggybacking on other events:

- Use every opportunity to collaborate with partners to reach a wider audience and get citizens excited about your Living Lab/projects and Citizen Science workshops.
- It's a great opportunity to get local authorities and stakeholders involved. Invite them to join the Citizen Science workshops - reach out in advance so they can plan ahead.





## **iSCAPE - CITIZEN SCIENCE WORKSHOP 1.**

#### **SENSING YOUR CITY**



#### **ISCAPE CITIZEN SCIENCE**

Workshop 1 – Structure and step-by-step guide.

This workshop framework helps Living Labs gain a better understanding of what Citizen Science is and how to deliver workshops using the <u>Smart Citizen Kits</u><sup>5</sup> (see more quidance on page 39) as well as other low-cost air quality sensors.

Workshop title: Sensing your City – Citizen Science Workshop 1

Time: Approx. 3 hours

Approach/ methods: On-Boarding | Planning | Sensing (part 1)

Number of participants: minimum 5, maximum 20

#### **AGENDA - Workshop 1**

Recommended timings: 17:00 - 20:00

- 1. Arrival and Networking (should start 30min before the actual event)
- 2. Warm-up Exercise Draw your air quality superhero / another fun ice-breaker (10 Min)
- 3. Presentation Introduction to Citizen Science (20 Min)
- **4. Empathy Mapping –** Getting a better understanding of cities and citizens affected by air pollution (30 45 Min)
- 5. Get to Know Your Citizen Kit Introduction to the low-cost sensor (30 Min)
- 6. Sensing Checklist Plan your data collection! (30 45 Min)
- 7. Advice and Recommendations for Successful Data Collection (10 Min)
- 8. Closing of the Session Questions and what's next (15 Min)
- 9. Gather Feedback online or offline (10 Min)

#### **WARM-UP EXERCISE**

#### Draw your Air Quality Superhero (10 Min)

This exercise helps the participants into the right mindset and makes them think differently about 'how to control or tackle polluted areas within their city'. If you have a selection of ice-breakers or warm-up exercise, choose one you feel comfortable with.

The facilitator should reassure participants that the drawings don't need to look good - it's designed to kick-start the thinking process and get them focused on the subject area.

There are many positive benefits to be gained from drawing such as improved oreativity, memory, communication skills and, most importantly problem solving skills.

Besides that, the exercise is a fun start to get to know other participants. It also communicates that in the end all of the participants are air quality superheroes because they are motivated to initiate change and take part in your workshop.

You can find the air quality Superhero worksheet template on the next slide, we recommend it is printed in A3.

You can download the worksheet templates here: https://drive.google. com/file/d/1GcN75IvUCfXxnenFcdETr0DXqa88cvr/view?usp=sharing



SUPERHEROES

QUALITY

Everyone has a skill-based superpower (The facilitators will give you some examp

2. Think about your skills and abilities.

4. Stick your drawing on the wall. Use

3. Draw your superpower. (5 min)

Draw your air quality superpo

What air pollution challenge do you want to solve?







#### WORKSHOP INTRODUCTION

#### Slide presentation + interactive questions (15 Min)

It is recommend that Living Labs / organisations new to citizen science follow the iSCAPE Citizen Science framework to ensure consistency across the experiment (data sets, feedback collection and documentation of the workshop materials). More experienced teams can pick and mix elements of this guide.

#### High-level structure of the first workshop: On-Boarding | Planning | Sensing part 1

- · Welcome everyone introduce the facilitators (name, role)
- Introduction to your Living Lab / organisation (why Living Labbing / its focus e.g. controlling air quality etc.)
- Go through the Agenda, ensure that everyone understands the structure of the next three hours, and most importantly, be clear what the outcome will be in the end.
- Get to know the participants by starting a conversation:
  - Why are you here today?
  - Why are you passionate about air quality?
  - When and where did you hear about Citizen Science? (Gather answers from a few people spend no longer 5 Min on this).
- Introduction to the subject area 'Citizen Science' and 'Air Quality' with a local example. This will give participants a better understanding of the subject area, raise awareness around air quality and provide participants with an example they can empathise with.
- Explain why Citizen Science and why it's important for Living Labs and the community (i.e. them).
- How to use the Smart Citizen Science Kit (or other sensor).

#### **FACILITATOR NOTES:**

Distribute notebooks to participants if you have the resources for this. Highlight the importance of documentation when collecting data, which can be in note form, photos, sound or air quality data.



#### **GET TO KNOW YOUR SENSOR KIT**

#### Slide presentation & hands-on learning (30 Min)

Prepare a slide deck that fits requirements, which includes an introduction to the Smart Citizen Kit. Decide whether if you want a hands-on sensor introduction should take place before or after the Empathy Mapping exercise.

#### **High-level slide structure:**

- Examples of how to use the citizen kit (e.g. where and how it has been used before).
- What can the Smart Citizen Kit do? Provide examples and explanations about how pollutants can impact health e.g. Nitrogen Dioxide No2
- · What kind of data can the low-cost sensor record?
- What are the limitations? Do they need wifi? Battery charging?

Explain what will be done with the collected data in the next workshop – introduction to data analysis, visualisation and storytelling.

It is advised that the sensor kits are assemble beforehand, as this will save time and ensure correctly working sensor kits. However, if there is enough time and facilitators to assist the teams, it is possible to assemble the kits with the citizen scientists after the 'Sensing Checklist' exercise.

Find a detailed Smart Citizen Kit guide on page 39.



#### **FACILITATOR NOTES:**

Have post-it notes and pens ready on the tables. Facilitators try to answer individual questions and note them down so the answers can be shared later on or integrated in future workshops.

#### EMPATHY MAPPING

#### Exercise (30 - 45 Min)

Through this exercise the Living Lab finds out if their local community is aware and directly affected by air pollution or not. There might be two types of participant:

- Those who are aware of the issue around air pollution and already active in tackling the issue.
- Those who are aware of the issue, but less concerned, as the quality in their city is perceived to be good.

It's important that the participants are engaged in the subject area. This works best if they have had some personal experience with air quality issues or heard about specific examples / research studies that demonstrates the impact of pollution.

#### **Encourage short discussion with their table neighbour:**

- 1. Start the exercise by asking participants if they can recall a recent newspaper article or social media post that focused on air pollution?
- 2. They should discuss this for 2 5 minutes with their table neighbour.
- 3. Invite someone to share the example they talked about.
- 4. For the next exercise (empathy mapping) it's important to create empathy with those most affected by air pollution in cities, such as young children, older people, people with asthma or other lung related illnesses that affects their breathing.

We recommend inclusion of a worksheet example for every stage of the workshop on your slide deck - this helps participants know what to expect.

#### **FACILITATOR NOTES:**

For the empathy mapping we prepared two research questions.

- 1. Should the location of a bus stop take into account near-by traffic light systems?
- 2. Where are the air pollution hot-spots in your city? (Where are citizens most exposed?) Let the participants form teams organically and of encourage them to have one team lead who will take ownership the sensor.



O You can download the worksheet templates here: https://drive.google. com/file/d/1GcN75IvUCfXxnenFcdETr0DXqa88cvr/view?usp=sharing



**EMPATHY** 

collaboratively, take notes and have fun! This exercise with the people that are affected most severely by polluted air. Work together with your team, discuss the questions will bring you closer to the issue area and empathise

pollution:

air β

specific situation where a citizen is affected

on

1. Focus

Research question:

feel close to Focus on a specific person you i (maybe a friend or even yourself)

**HINK** 

00

would you do it? Discuss in your team











#### PLAN YOUR DATA COLLECTION

Slide presentation & exercise (30 - 45 Min)

#### What you should communicate in your slides:

- Communicate that short experiments are better than long-term experiments, with low-cost sensors made for short and agile data collection (long-term data collection is more suitable for fixed sensor stations).
- Living Labs share the date of the second workshop (approx. 3 weeks after the first workshop), which gives citizen scientists two weeks of data collection and your Living Lab / organisation one week of analysis. The analysis could be done by the citizen scientists dependant on experience.

#### **Plan Your Data Collection!**

The previous exercise should help participants gain a better understanding about specific situations, areas and times when air quality affects citizens. The research question and an understanding of the subject area will determine what kind of data collection (beside the sensors) the participants choose and what kind of tools or methods to apply.

For the iSCAPE workshop, participants were provided with two research questions. It was however found to be more beneficial for the participants to self-initiate the research questions/interests.

Two research questions were provided because it allowed for similarities in the data sets to be highlighted, and sped up the decision-making process during the workshop. However, the space made for broader self-initiated inquiry should be carefully considered to ensure the validity of any further comparisons.

Some citizen scientists during the iSCAPE project were eager to design their own (air quality) monitoring experiments (indoor and outdoor pollution), which could be included in the research question and 'Sensing Checklist' structure (see page 23).

#### Overview of steps to follow for the 'Sensing Checklist' exercise (see template on the following page)

- 1. Teams decide on a **team lead** who will register the citizen kit on the platform (recommended after the exercise).
- 2. Facilitators hand out the 'Sensing Checklist' worksheet (printed in A3).
- 3. Remind participants to work collaboratively and plan their sensing phase around their usual daily responsibilities (e.g. work, university, family).
- 4. At the end of the workshop the teams present /exchange their sensing checklist with each other and discuss.

#### **FACILITATOR NOTES:**

Always think about how information should /could be collected that can supplement your sensor data e.g. such as taking notes, collecting feedback, recording sounds or taking photographs.

Explain and set up the Smart Citizen Kit after the exercise, plan enough time for questions and make sure every team lead is confident with the technology.



#### Pollutant table; PM10, PM2.5, Nitrogen Dioxide and Ozone

The below <u>tables</u> should be included in the slide decks or printouts presented to each team, and can be used when analysing and comparing data.

# PM<sub>10</sub> Particles Based on the daily mean concentration for historical data, latest 24 hour running mean for the current day. Index 1 2 3 4 5 6 7 8 9 10 Band Low Low Low Moderate Moderate High High High Very High µg/m³ 0-16 17-33 34-50 51-58 59-66 67-75 76-83 84-91 92-100 101 or more

PM <sub>2.5</sub> Pa	rticles									
Based on t	he daily	mean c	oncentra	ition for histo	orical data, la	test 24 hour	running	mean for	the curr	ent day.
Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
μgm <sup>-3</sup>	0-11	12-23	24-35	>36-41	>42-47	>48-53	54-58	59-64	65-70	71 or more

litrogen Dioxide										
Based on the hourly mean concentration.										
Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
μg/m³	0- 67	68- 134	135- 200	201-267	268-334	335-400	401- 467	468- 534	535- 600	601 or more

Ozone										
Based on 1	the runn	ning 8-h	ourly mea	an.						
Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
μg/m³	0- 33	34- 66	67- 100	101-120	121-140	141-160	161- 187	188- 213	214- 240	241 or more

20

#### **ADVICE AND TIPS**

#### Successful data collection

Having created their Sensing Checklist, teams share helpful tips and tricks for successful data collection:

#### **DATA**

- Ensure the Smart Citizen Kit is fully charged (battery lasts around 24h)!
- Avoid direct sunlight exposure and, in general, locations with variable conditions, for instance, direct sunlight during the morning and shade during the evening.
- Avoid placing the Smart Citizen Kit next to big machines, such as air conditioning or others. They generally affect the temperature, humidity and noise readings.
- Check the <u>Smart Citizen Platform</u><sup>I</sup> to see what the data looks like and what data is being collected e.g. see if the sensor is still working.

#### **COLLABORATION / APPROACH**

- A minimum of two locations is recommended, one more polluted and one relatively less-polluted area. This ensures different parameters to compare and contrast.
- To ensure good teamwork, teams should arrange the times they are available to measure together or share the work and collect data individually.
- Document data collection; note of time, traffic, buildings, parks and the general surrounding area. If you feel there is anything different or interesting, document it (e.g. smell, air colour).
- Using the sensing guide created with the team, stick to timings, location, date to guarantee consistency (note down changes).
- Share a link to the Google sheets good for teams to communicate and share data.

#### **Closing of the workshop - should include:**

- Thank all the participants and facilitators
- Share the Google doc so participants can ask questions and get support. Alternatively provide an email address from the workshop organisers.
- Communicate the exact amount of time they have for the data collection making sure that everyone is available for the second workshop, and highlighting the importance of their attendance.
- Arrange a physical meeting point for the teams and the Living Lab / organisation to solve potential technical issues prior to the second workshop, and assist with uploading of the datasets.
- Stick to the schedule and don't forget to join the next workshop, where the process of data analysis, visualisation and storytelling will be discussed.

#### **NOTES**

 •••••

You can download the worksheet templates here: https://drive.google. com/file/d/1GcN75IvUCfXxnenFcdETr0DXqa88cvr/view?usp=sharing

# DATA FOR PLAN Work together with your team, discuss the questions collaboratively, take notes and have fun! **CREATE YOUR** CHECKLIST SENSING

person who registers will help you). 1. Before you start your checklist, agree on one the Citizen Kit on the platform (the facilitators

2. In which city are you going to collect data?

3. What is your research question: (based on the previous exercise)

uld you like to use in addition to the sensors? always think about collecting information that sensor data. What methods woul
 When collecting data a can supplement your se

**Collecting Feedback** 

Recording Sounds Taking Photographs 5. What do you think is the biggest barrier when collecting your data? How could you avoid it?

6. What time do you think you will need to collect the data? Discuss with your team how you want to split the collection or how you will work together.

Week 1: Di	Neek 2: Di
Day:	Day:
Time:	Time:
Day:	Day:
Time:	Time:
Day:	Day:
Time:	Time:





6 25 Killy	0
. 9.6 kohm	no2
• <b>7</b> ug/m³	PM1
4 <b>12</b> ug/m³	PM 10
<b>■</b> ng/m3	PM 2.5
∘ 100.7 ⊍	light
· 101.7 KPa	barometric pressure
(1) (2) (3)	humidity
<b>8</b> 4	temperature

**Circle** the data that you would like to explore further, ask a facilitator if you have any further questions.

8. Create a map of the area where you want to locations you want to investigate.

collect data. Think about the

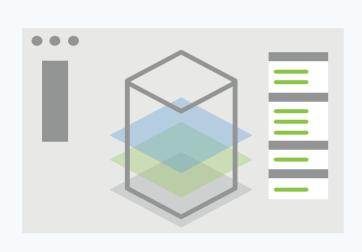






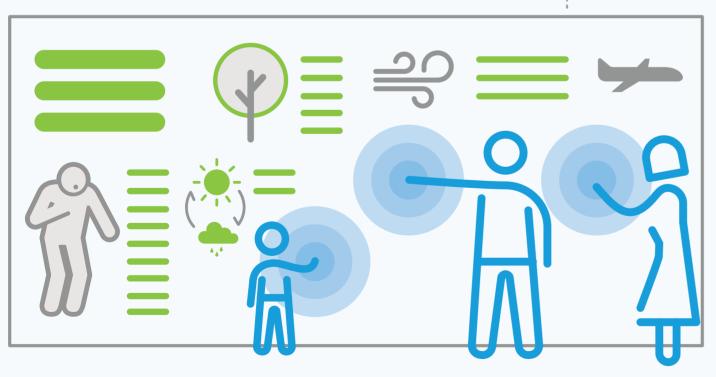
## **iSCAPE - CITIZEN SCIENCE WORKSHOP NO. 2**

#### **MAKE DATA TANGIBLE**









#### **ISCAPE CITIZEN SCIENCE**

Workshop 2 – Structure and step-by-step guide.

This is the structure and content for the second iSCAPE citizen science workshop. As with the first workshop (page 9), it is recommended to follow the iSCAPE Citizen Science framework in the second workshop. This ensures consistency among data sets, collected feedback and documentation of the workshop material. After you have run a few Citizen Science workshops it is possible to alternate and integrate learnings according to location/Living Lab. Living Labs are also encouraged to deliver a 3rd or even 4th citizen science workshop building on the previous two workshop results.

Workshop title: Understand Your Data - Citizen Science Workshop 2.

Time: Approx. 2-3 hours

Approach/ methods: Sensing (part 2) | Awareness | Action | Reflection

Number of participants: minimum 5 - maximum 20

#### **AGENDA - Workshop 2.**

Recommended timings: 17:00 - 20:00

- 1. Arrival and Networking (should start 30 Min before the actual event)
- 2. Introduction Welcome back and short updates from the data collection (20 Min)
- 3. From Raw Data to Tangible Data Data awareness & processing overview (45 Min)
- 4. Reflection & Action Debate with stakeholders (30 45 Min)
- 5. Closing of the Session (15 Min)
- 6. Gather Feedback Online or offline (10 Min)

#### **WORKSHOP PREPARATION**

#### What needs to be prepared before the second workshop:

- 1. Exchange contact details with the team leads who will oversee the data collection and will 'own' the sensors during the monitoring period. It is recommended to do that to ensure the team is collecting data, and that they will take care of the sensors and return to the second workshop session.
  - 2. Find suitable local data visualisation examples for the presentation to increase empathy and authenticity of the workshop.
  - 3. Agree with your Living Lab / organisation as well as the citizen scientists the time needed to process and prepare data sets (ideally visualised) for the second workshop. For iSCAPE, visualisations were created based on each team's air quality data (see <a href="mailto:page-29">page-29</a>). However, citizen scientists could create their own visualisations through open platforms such as <a href="mailto:datawrappers">datawrappers</a> or <a href="mailto:RawGraphs">RawGraphs</a>.
  - 4. Print materials and familiarise facilitators and team leaders with the findings of the first workshop and data collection.
  - 5. If participants are not English speaking, translate the worksheets if necessary, perhaps translating each of the number / bullets on the worksheets with a small translation on the side.





#### WORKSHOP INTRODUCTION

Slide presentation + questions to participants (20 Min)

It is recommend that Living Labs / organisations new to citizen science follow the iSCAPE Citizen Science framework to ensure consistency across the experiment (data sets, feedback collection and documentation of the workshop materials). More experienced teams can pick and mix elements of this guide.

#### High-level structure of the first workshop: Sensing (part 2) | Awareness | Action | Reflection

- Welcome back all participants and new-comers (re-introduce the facilitators)
- · Quick recap of what happened during the last session.
- Go through the agenda and ensure everyone is aware of the structure of the next 2-3 hours and most importantly what the ideal outcome should be.
- Assign any new-comers to existing teams.

#### **Knowledge sharing:**

- 1. Facilitators instruct each team to stand up and report very briefly (2 Min) on their sensing experience and data collection with the Smart Citizen Kit.
- 2. Ask them if they experienced any difficulties (technical issues), what kind and why?
- 3. Did they gain any interesting / unexpected insight they want to share?

#### Data Awareness:

It's important to ensure data is not only collected and shared but understood by the participants. This session will educate participants about the value and potential of the data they collected - which then will inform opportunities and actions/ next steps for change.

#### **FACILITATOR NOTES:**

Facilitators motivate teams to share quick updates with the other citizen scientists. In case the teams are a bit shy, just start clockwise.



<sup>8:</sup> https://www.datawrapper.de/

<sup>9:</sup> https://rawgraphs.io/

#### FROM RAW DATA TO TANGIBLE DATA

#### Exploring the power of visualisation (30 - 45 Min)

Use slide deck to demonstrate how data can be much more impactful and easy to digest when visualised, and in so doing encourage participants to think differently about the data they have collected. The process of data visualisation has been simplified by creating the visuals internally rather than expecting citizen scientists to create visualisations with limited resources.

#### Data processing - slides include:

- · Explain process of each step
  - 1. Data collection | 2. Cleaning the data sets | 3. Ideation what visuals would be most relevant and suitable | 4. Using Software or code | 4. Create visualisations | 5. Storytelling.
- Introduction to some open source software to create data visualisations / analyse data see page 26.

#### Data visualisation - slides include:

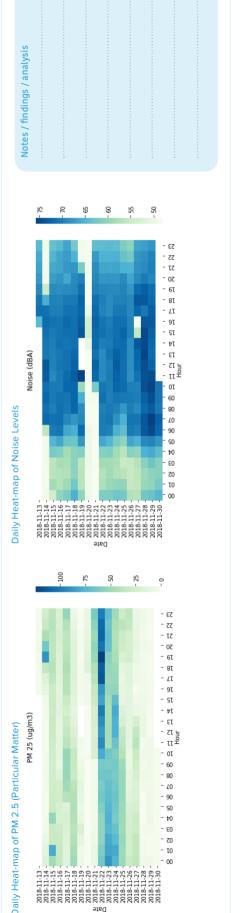
- Show the process of data visualisation.
- Communicate a range of how and how not to communicate data.

You can download the worksheet templates here: https://drive.google. com/file/d/1GcN75IvUCfXxnenFcdETr0DXqa88cvr/view?usp=sharing





# 





team, discuss the two visualisations which are based on your data sets and write down notes on your findings. u to understand the data your team collected and explore any relationships with time (day and night) and location. Work together with your tean This exercise will help you to





#### STORYTELLING THROUGH DATA

#### How to make data tangible (45 Min)

Ensure datasets from the data collection are ready and prepared the week before the workshop! Bear in mind a data scientist might be needed to support citizen scientists with the data visualisation or preparing visuals (see previous page).

#### The focus of the exercise

"If you would have the opportunity to present your results to the city authority, how would you communicate your findings? Develop a convincing story that initiates change. Make use of all the data you collected." For the Living Lab / organisation presenting, the storytelling exercise is a great opportunity to invite local authority representatives and relevant city stakeholders to attend.

- The facilitators hand out visualisations prepared by the Living Lab or the citizen scientists develop their own visuals through the tools mentioned on page 26.
- Facilitators provide each team with their worksheet 'Storytelling Through Data' (next page) and a local story example they created prior to the workshop, this will make it easier for the participants to start the writing process.
- Participants discuss in team how they can use storytelling to communicate their
- Participants are encouraged to use data they collected (such as pictures, notes or recordings) to communicate their story using real evidence.
- Facilitators ensure there is enough time for the final presentation, discussion and feedback collection.

#### **Presenting their story:**

- Ask the teams who would like to give a guick summary of their results (try to have all teams presenting, 3-5 Min each).
- Facilitators take notes and invite questions after each presentation.

#### **FACILITATOR NOTES:**

Here is where the teams need most support from facilitators, who should encourage the teams to include a journey and users in their story. A facilitator per team/table can be very helpful to ensure the team moves in the right direction.



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the opportunity to present your re 1 you communicate your findings? hange. Make use of all the data yo

3. What data collection methods went especially well? Explain why? (5 minutes)

Taking Notes:

WHY?

Taking Photographs:

Collecting Feedback:

Recording Sounds:

# TANGIBL DATA : MAKE 0 MOH DATA THROUGH STORYTELLING

Work together with your team, discuss the questions collaboratively, take notes and have fun!

1. What does your data show? (5 minutes)

2. Did you and your team discover something you didn't know before? Have a look at your notes and data sets, are you able tan answer to your research question? (5 minutes)

v or notice to see already

#### **REFLECTION & ACTIONS**

#### Planning next steps (30 Min)

This section shows how to encourage participants to stay in touch with the Living Lab / organisation and develop learnings from the citizen science workshops further. This could be based on actions or further data collections.

Ask participants for feedback and next steps that would encourage them to stay engaged and potentially get involved in citizen science related projects.

#### Questions that stimulate a conversation (personalise according to audience):

- What did you enjoy most, and why?
- Is there something you would like to change or see differently executed, why?
- How would you like to expand/ continue the (iSCAPE) Citizen Science work?
- Did you discover anything unexpected during the Citizen Science workshops?
- · How would you use your findings to create change in your local community?
- What would you like to see in the future from our Living Lab / organisation?

#### **Closing of the workshop - Goodbye:**

- Stay in touch, mention any other events that will happen in the Living Lab.
- Share your social media channels and website on the final slide.
- Take the chance to share news about other relevant projects the Living Lab/ organisation is involved with (if the moment feels right).
- Don't forget to collect the sensors.
- Provide sensors to teams that would like to continue the project.

#### NOTES

#### IMPACT OF CITIZEN SCIENCE

#### During the iSCAPE project and beyond

#### General:

Citizen Science has the ability to lead to a bigger global movement! It can inspire:

- Campaigns
- Policy change
- Behaviour change
- Cross-disciplinary collaborations and, most importantly, establish an independent citizen science community which builds the foundation for all the above.

#### Findings during the iSCAPE project:

#### Empowering citizens & behaviour change

Combining a campaigning approach with community-centric access to research technology and guidance (low cost sensors and citizen science activities) allows citizens to get involved and encourages the first steps towards change. The green shoots of the longer-term goal of establishing a self-sustaining citizen science community and behavioural changes also encourage citizens to reduce their own contribution to pollution.

**Guildford** – Plans in place to deploy citizen science kits for future engagement with the Guildford community, with Burpham and Merrow communities already keen to use the sensors.

**Bottrop** – Workshops judged a good 'first step' that, with further engagement and leadership (perhaps from a citizen 'expert') could make the initiative self-sustaining.

#### Driving real change and influencing policy

As well as the behavioural changes outlined above encouraging citizens to demand informed changes from their local and national government in terms of environmental policy and action, the project also facilitates further collaboration with local authorities, municipalities, community groups, relevant organisations and other universities/ academic institutions. Changing policies is a long-term process which needs strong collaborative relationships with the city and solid evidence. The iSCAPE Living Labs are working with the cities to make such an impact and this will continue after the iSCAPE project.

**Dublin** – citizen science activities planned with another district, Tallagh, in South Dublin County Council, who made contact via the FutureScope event. A series of student projects is also scheduled.

**Hasselt** – Work is currently underway to integrate citizen kits into the studies of Masters students.

**Vantaa** – Looking into loaning sensors to a university student (citizen science workshops) for a credit-scoring research project.

#### Influencing global and environmental change

Whilst the issues and concerns are affecting the whole world, the motivation for change is driven through citizen engagement and empowerment of communities at a local level.

**Dublin** – Citizen science activities have attracted the interest of other communities and national bodies, including the Irish Environmental Protection Agency.

**Vantaa** – "Living Lab" and "Citizen Science" ethos is now being used in other projects: for example, the ongoing <u>H2020 OPERANDUM14-project</u><sup>10</sup>.OpenAirLaboratory uses Living Lab interactions with citizens and stakeholders.

Projects such as iSCAPE and the <u>Making Sense</u><sup>11</sup> project clearly demonstrate how participatory citizen engagement projects foster awareness. By giving participants the capacity to 'sense' pollutants impacting their environment, they are empowered to get involved in a practical, hands-on way. Through this, they are shown to adopt a concern and ownership of the issues.

34

#### **DATA & FEEDBACK COLLECTION**

#### From participants and facilitators

#### Feedback collection via post-its

We encourage every Living Lab to plan 5 minutes for a quick feedback exercise. You can decide what works best for you from simple post-it notes on a large piece of paper, to a big paper roll or the 'two stars and a wish' cards (see next page). The main goal is to collect simple feedback stating what was good (why) and what could be improved next time (how).



#### **Collecting feedback using the feedback forms**

As well as collecting feedback from participants, it's also very important to gather findings and insights from the facilitators – it is recommended that you use the feedback template on page 37 & 38 to gather this information.

Gathering feedback is most effective when done immediately after the workshop whilst it is still fresh in the minds of all those that took part, and the detail still easy to recall. These simple initial findings and observations are hugely beneficial for iterating follow-up workshops and ongoing improvements.

You can download the worksheet templates here: <a href="https://drive.google.com/file/d/1GcN75IvUCfXxnenFcdET-r0DXqa88cvr/view?usp=sharing">https://drive.google.com/file/d/1GcN75IvUCfXxnenFcdET-r0DXqa88cvr/view?usp=sharing</a>

#### TWO STARS & A WISH TEMPLATE

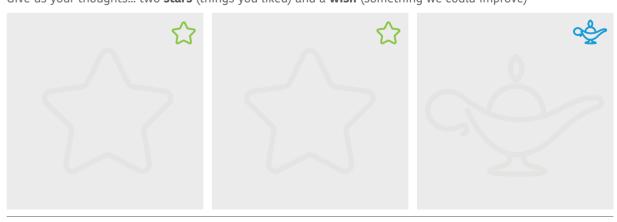
Give us your thoughts... two **stars** (things you liked) and a **wish** (something we could improve)



Give us your thoughts... two **stars** (things you liked) and a **wish** (something we could improve)



Give us your thoughts... two **stars** (things you liked) and a **wish** (something we could improve)





To find out more go to www.iscapeproject.eu



# **iscape Citizen Science - Workshop Reflection**

This template should be filled out and scanned by the workshop facilitators after the Citizen Science workshop. Your feedback will help the LL to improve their materials, communication and facilitation.

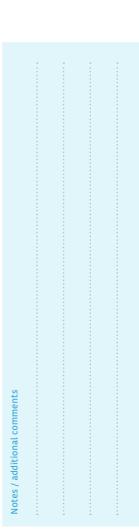
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Which workshop materials worked well? What could be improved?

# Notes / additional comments

# Workshop findings:

What are your top findings based on the workshop discussions and outcomes?



# First impression of the participants experience:

How did the participants respond to the workshop? What did they ask?

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# Unexpected findings and additional feedback:

Did the workshop generate any unexpected insights or ideas?

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### **APPENDIX**

## IAAC - SMART CITIZEN KIT GUIDE WORKSHOP CHECKLIST

#### **HOW TO USE THE CITIZEN KIT**

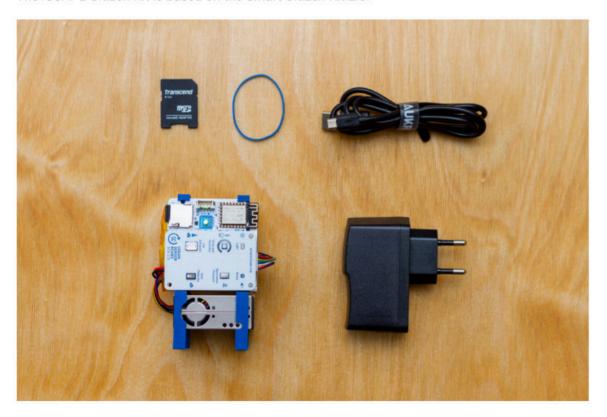
Step-by-step guide to the iSCAPE Citizen Kit, you can find the same information also online under <a href="https://smartcitizen.me/">https://smartcitizen.me/</a>

#### The Citizen Kit



#### The Kit

The iSCAPE Citizen Kit is based on the Smart Citizen Kit 2.0.



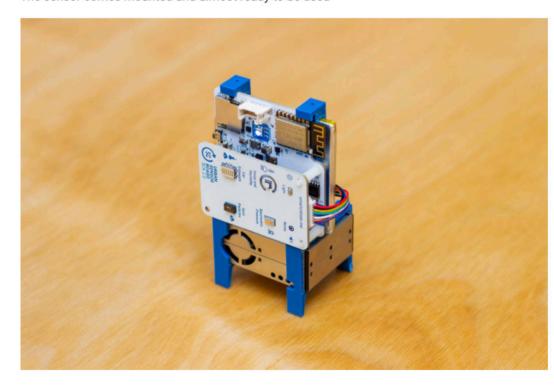
- 1. Smart Citizen Kit 2.0 with particle and battery sensor with two mounting brackets.
- 2. MicroSD card and microSD adapter to SD.
- 3. USB cable and a USB charger to charge the battery.

#### Measurements

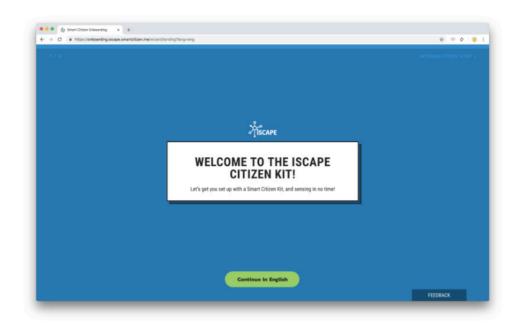
Mesura	Unitats	Sensors
Air temperature	°C	Sensirion SHT-31
Relative Humidity	% REL	Sensirion SHT-31
Noise level	dBA	Invensense ICS-434342
Ambient light	Lux	Rohm BH1721FVC
Barometric pressure	Pa	NXP MPL3115A26
Particulate Matter PM ½.5/10	μg/m3	PMS 7003

#### Instructions

The sensor comes mounted and almost ready to be used



The only thing we should do is connect the battery. The kit will light in red and we will be able to configure it by following the instructions at **onboarding.iscape.smartcitizen.me**.



After the configuration your data will be available on the SmartCitizen platform. You can explore the data there or download it using the CSV Download option.



#### Autonomy

The kit has a battery life of 12 hours. For long exposures, we can permanently connect to the USB

When we no longer want to publish or save more data for a few days we can turn off the kit. To do this, press the button for 5 seconds.

If the colors of the LED appear orange • indicates that the battery must be charged.

The battery takes about 4 hours to fully charge. When the battery is fully charged, change the orange to green •.



Remember that in addition to the colors you will have the state color of the kit: configuration, network and sd.

#### States of the Kit

#### The button

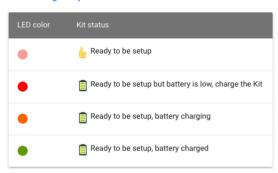
Funció	Acció del botó
ON	Push the button
OFF	Push the button for 5 seconds
CHANGE MODE	Push the button multiple times to choose: Setup ● Wi-Fi ● Pink ●
FACTORY RESET	Push the button 15 seconds for a full reset



#### Operation modes Link

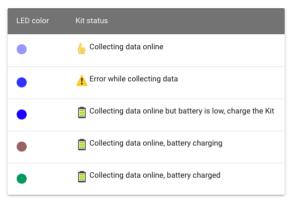
#### Setup mode

In this mode, the Kit is ready to be configured in **network** mode or **SD card** in **onboarding.iscape.smartcitizen.me**.



#### Wi-Fi mode

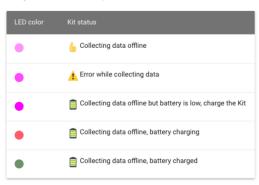
This is the standard mode for a network that requires a Wi-Fi connection. In this way, the device will publish the data every minute on the smartcitizen.me platform. If there is an inserted micro SD card, the data will be stored in duplicate.



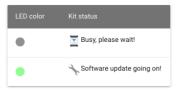


#### SD card mode (offline)

If we do not have an internet connection we can use the SD mode. In this case the device will record the data on the micro SD card. Later we can read the card using a card reader. The data can be visually spaced in a spreadsheet but also published on the <a href="mailto:smartcitizen.me">smartcitizen.me</a> platform using the UPLOAD CSV option.



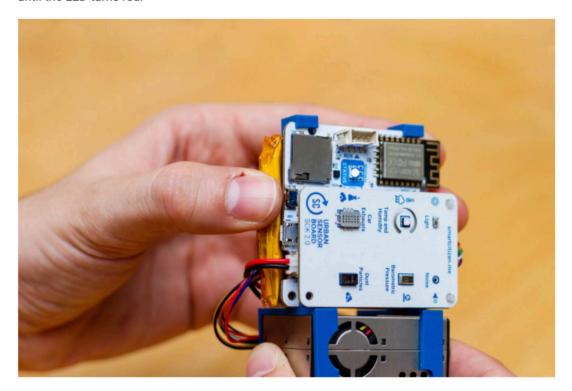
#### Especial status



#### • Troubleshooting

#### Before setup

Before configuring the Kit setup make sure the LED is red. If not, press the button multiple times until the LED turns red.



#### The kit does not respond

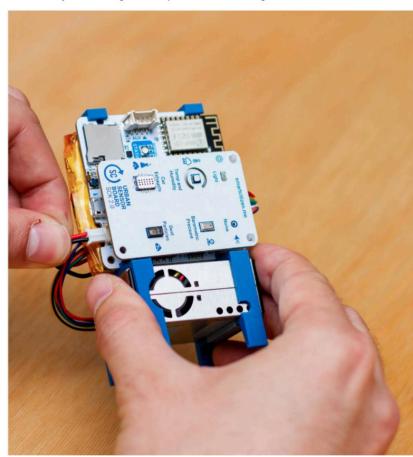
If the kit does not respond or does not work properly you can do two things:

#### Reboot your Kit

You can fully reboot your Kit by pressing the reset button located under the sensors board as seen on the picture. That will not delete any configuration, it will simply restart your device. Press the RESET button for a second. The light will go off and on and the device will start again.

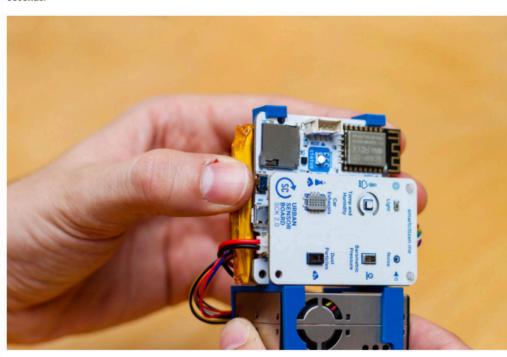


You can also perform a reboot by disconnecting the battery and the USB cable so that the kit is restarted. In this way we will not lose any data and configuration except the time in case of being in **SD mode**.



#### 1 Factory reset your Kit

You can fully reset the Kit to the default settings so you can register again your device. Press the main button for 15 seconds.



After 5 seconds the light will go off and will go on again after 15 seconds. Then you can release the button and your device will be fully resetted as a brand new Kit.

#### The LED does not turn on and the kit does not work

First of all, push the kit button. Maybe it's simply off.

If this does not work, surely the kit has been left without battery. You will have to charge it using the USB charger. Any other mobile charger will also work.

We will know that it is charging when the LED emits orange pulses and once the battery is charged it will emit green

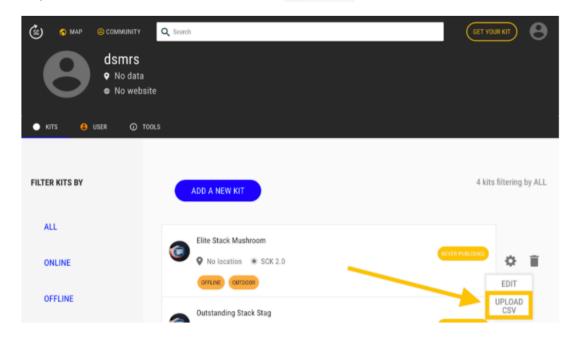
#### The kit does not store the data on the SD card.

Some SD cards may have problems over time. We can try formatting it but in case it does not work any micro SD card we buy at any mobile or computer store it will work. The size is not important and any micro SD or micro SDHC 512MB card up to 32GB will work.

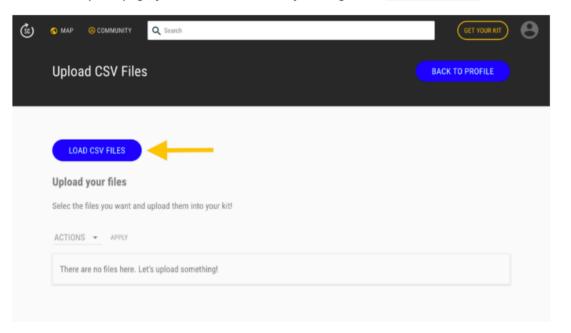
#### **CSV** Upload

Here some instructions on how to upload CSV files to Smartcitizen platform. First be sure to be logged and go to your profile.

On your kits' list, click on the wheel and then on Upload CSV.

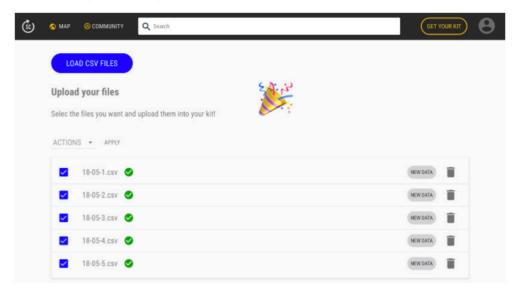


Once on the upload page, you can add some files by clicking on the Load CSV files button.



48

Congrats! You just uploaded your files CSV files on the Smartcitizen platform.

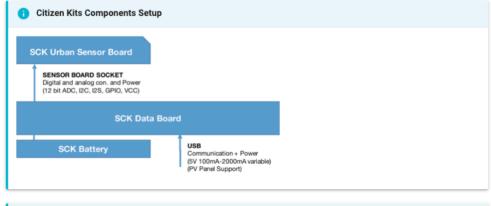


#### Technical specs

The Citizen Kit, formerly known as the Low-Cost Sensor, is aimed at providing a low-cost environmental sensor solution non-technical users can easily deploy. The design developed for the project is a complete reiteration of the Smart Citizen Kit, a piece of hardware for citizen sensing already tested in other projects for more than five years. On this iteration, new sensors had been added, and all the electronic design has been redone from the ground up to improve the data accuracy and reduce the manufacturing costs.

#### Components

The design is built around two boards the Smart Citizen Data Board and the Smart Citizen Urban Sensor Board. The first board contains the data acquisition, the power management, and the communication unit. The second contains a set of sensors aimed at the outdoor urban environment including: Air Temperature, Relative Humidity, Noise Level, Ambient Light and Barometric Pressure. The board also features a section especially focused on Air Quality including a Air Particles, a Carbon Monoxide, and a Nitrogen Dioxide detectors. This sensor while not capable of offering precise measurements can be used to understand the behavior of different urban locations especially when they are calibrated on the field using certified equipment. Both boards are later described in detail on the Sensor Components section.



Learn more

Learn more about all the components and the software inside the kit in the Components documentation section.

#### Software Updates

The SCK 2.0 has two components that need periodic updates. The SCK 2.0 appears as a USB Storage device and the new firmware can be installed on your kit by simply downloading the new firmware release and then dragging and dropping into the SCK 2.0 device root folder. The Wi-Fi module firmware is updated automatically over-the-air every time the main processor firmware is updated.

1 Firmware updates	
Update the Firmware	

#### **Dimensions**

• Dimensions: 60 x 60 x 20 mm (approx.)

• Dimensions w/ enclosure: 110 x 110 x 50mm (approx.)

· Weight: 65 gr.

· Weight w/ enclosure: 160 gr.

#### **Power Management**

#### **Battery lifetime**

The SCK 2.0 comes with a 2000mAh LiPo battery. The battery is meant to be a complete power option for short-term measurements and a backup solution when the kit it is used for long periods. The battery lifetime lifetime is dependent on which sensors are enabled or disabled:

- All sensors publishing over Wi-Fi: 12 hrs.
- · All sensors publishing on SD card: 13 hrs.
- · Without air quality sensors over Wi-Fi: 10 days
- · Without air quality sensors on SD card: 25 days

#### **Battery charging**

The SCK 2.0 has a micro USB port and can be charged like any Smartphone or Tablet using a dedicated adapter or a computer USB port. We recommend using a tablet power adaptor, instead of a computer USB port, for quicker charging. Autonomy can be extended by using a Power Bank, a 5V PV Panel, or with a through-glass induction charger (currently under development).

#### **WORKSHOP CHECKLIST**

#### Before the Workshop (one or more days)

DC	tile workshop (one or more days)	
•	Print out work templates and feedback sheets	
•	Create PPT slide deck and shape them to be suited to your team and framework (Agenda, second workshop date, facilitator info etc.)	
•	Brief facilitators, ensure that everyone has read through the framework and is comfortable with the low-cost sensors	
•	Have a dry-run with facilitators and presenters, and make sure that everyone knows what they are doing e.g. who takes notes, pictures, support the groups during the team work	
•	Have one person / student who is tasked exclusively with taking pictures with a good camera	
•	Print the two stars and a wish cards or create your own feedback method	
•	Prepare snacks and refreshments	
•	Have the room set up into group tables, no rows!	
•	Prepare name tags for the participants	
Af	ter the workshop  Have a debrief with facilitators and presenter directly after the	
Αf	ter the workshop	
	workshop, it's important to write it down whilst fresh in your mind. Use the document provided.	
•	Collect the notes and make sure you write down what the notes relate to.	
•	Scan the worksheets and share them with your colleagues as well as participants on a platform e.g. Google Drive folder	
•	Write a blog and tweet about the event!!	
ΑD	DDITIONAL NOTES	
• • • •		
		• • • • • • •





