iSCAPE Final Event

iSCAPE Sensor Development
IAAC - Fablab Barcelona

Dublin, Ireland
8 November 2019

iSCAPE SENSORS

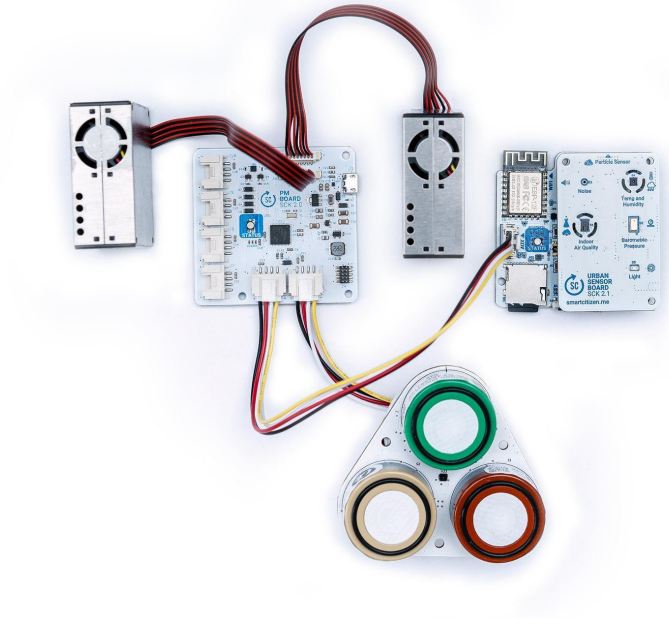
Óscar González

Calibration and sensor development

iSCAPE Sensor Development

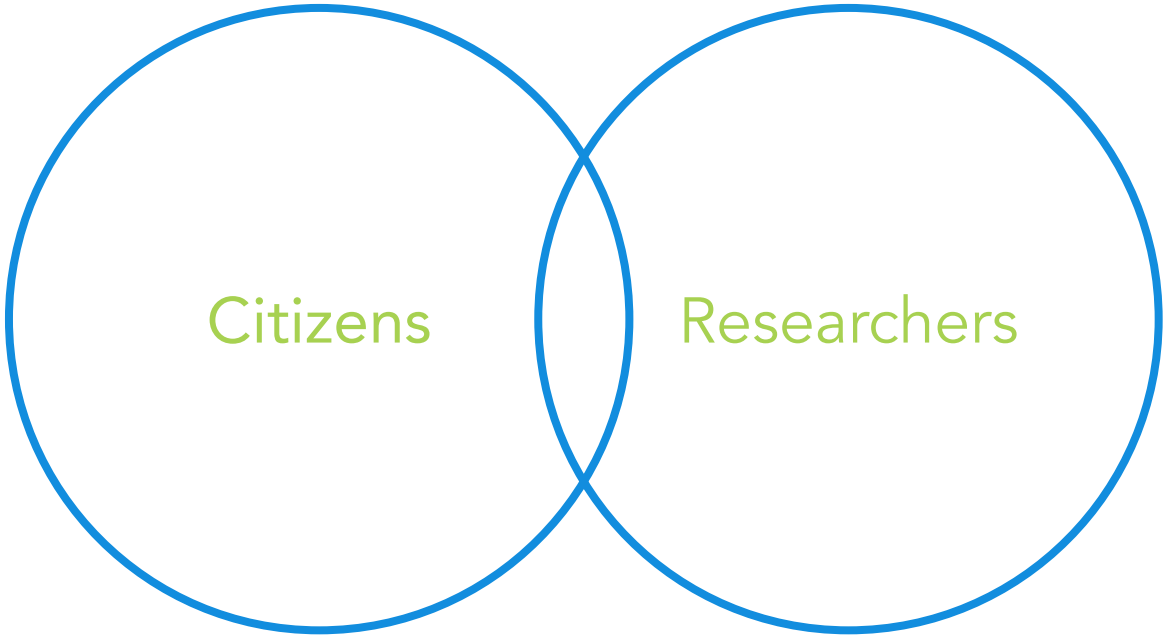
Content:

- From Citizen to Researchers
- Our journey of sensor development
- Where we are today

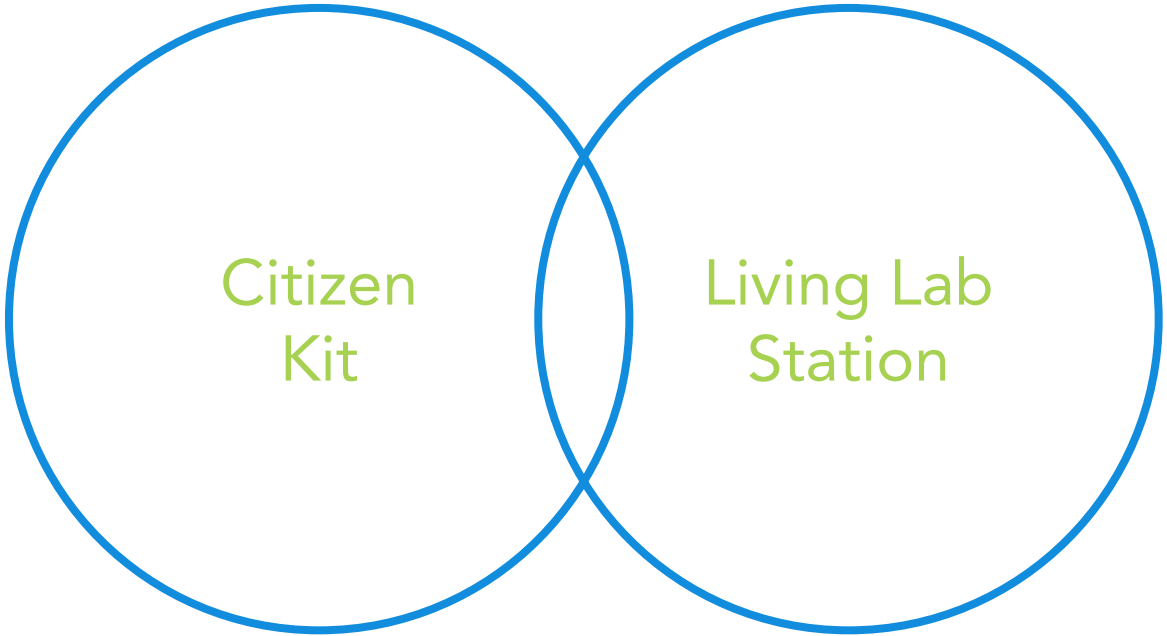



ANTIGA
CASA REUS
Fundada 1913
Aquí mesurem
la qualitat de l'aire que respires
Aquí mesurem
la qualitat de l'aire que respires

From Citizens to Researchers



From Citizens to Researchers



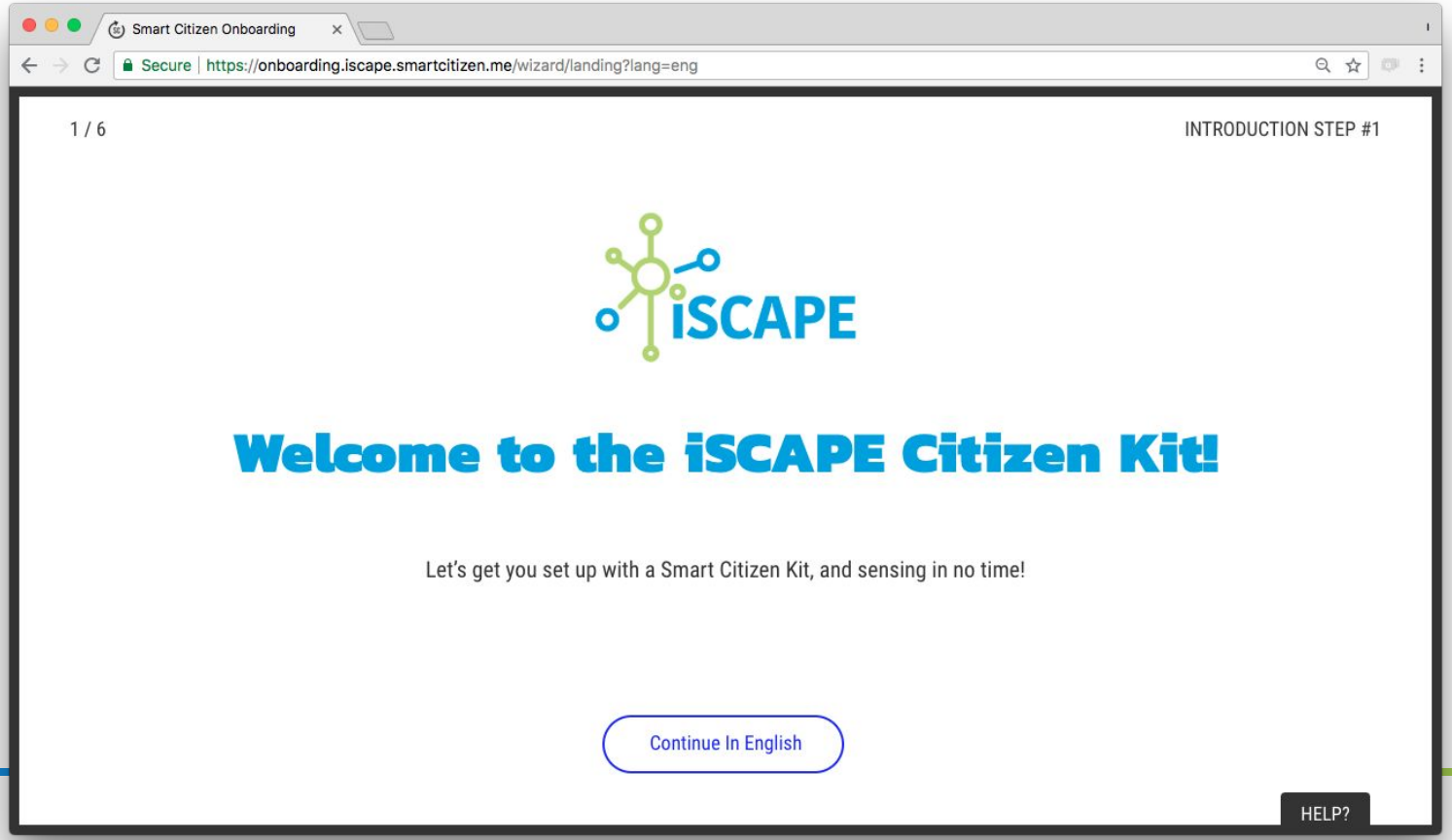
CITIZEN SCIENTISTS

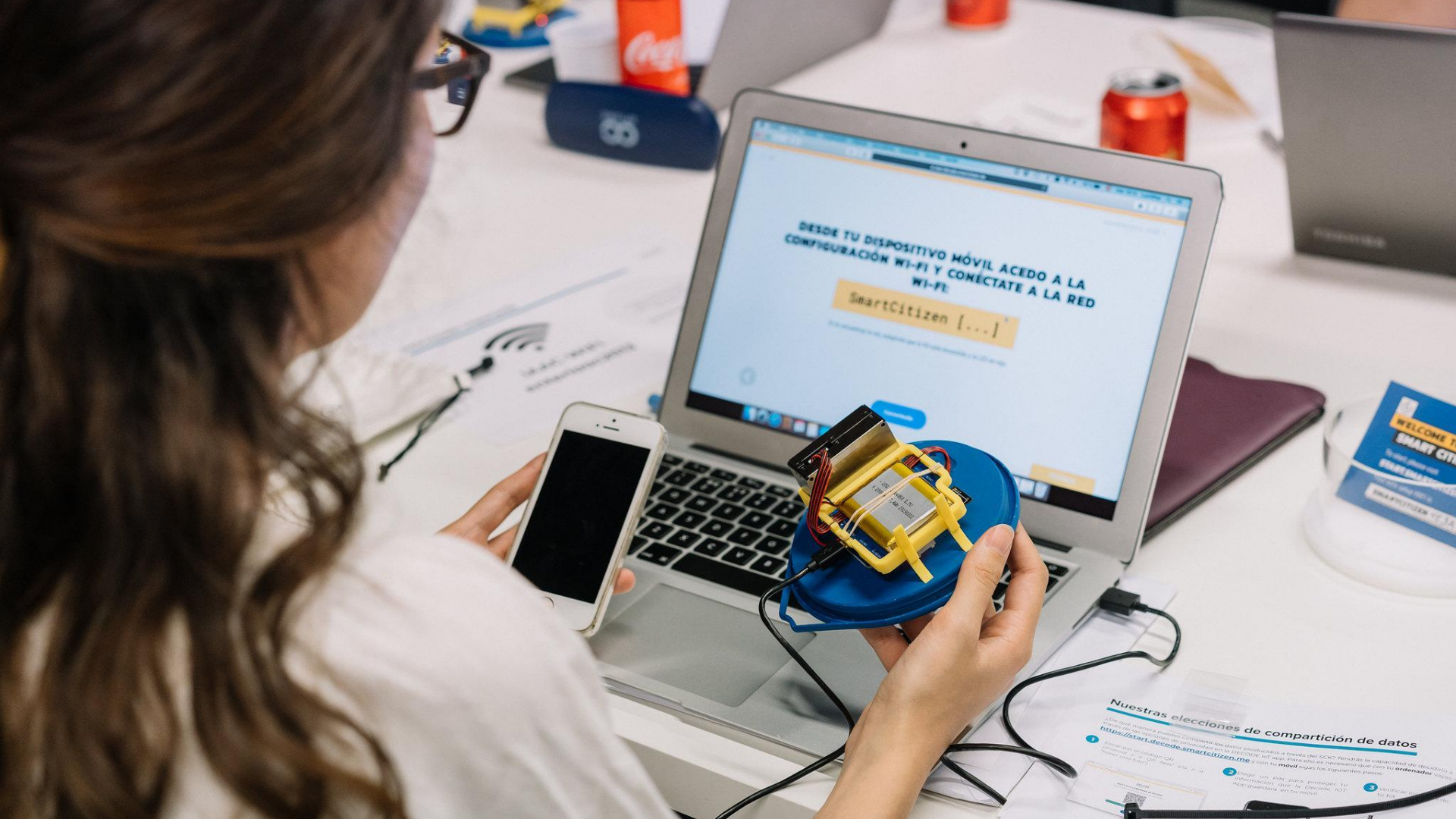
From Citizens to Researchers

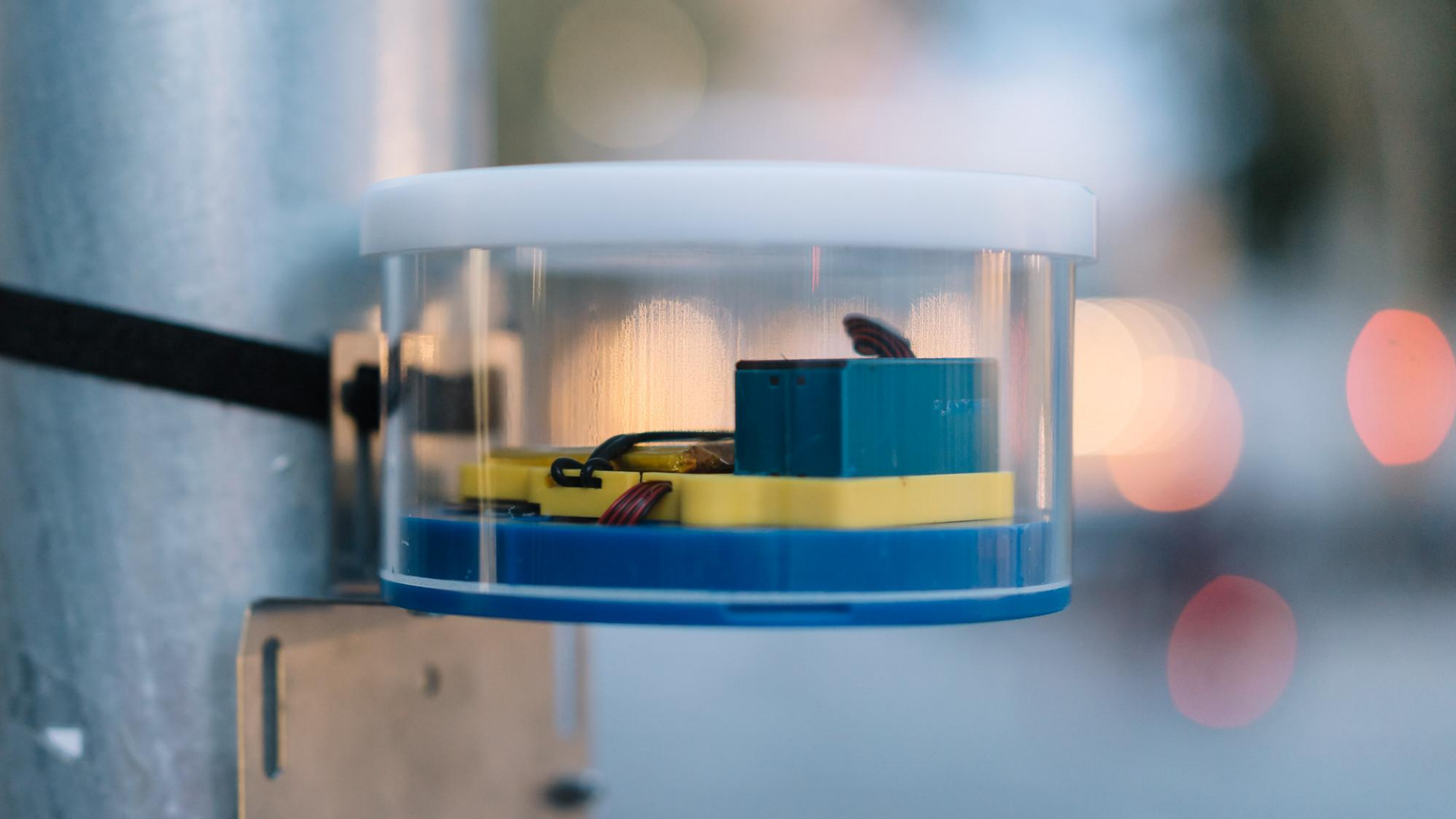
Citizen Science is about:

- Raising awareness
- Engagement
- Learning experience
- Variety of use cases
- Transparency

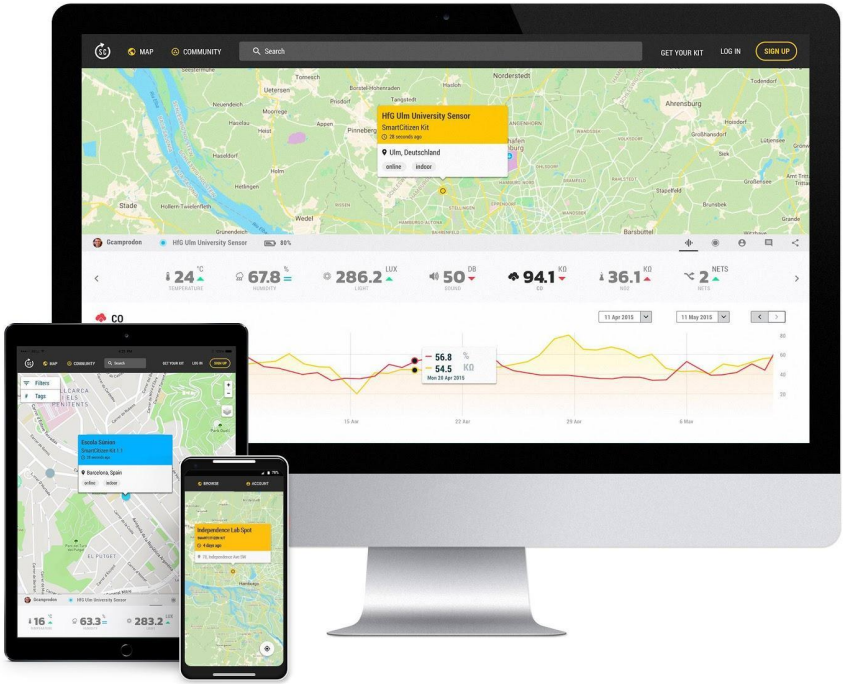
From Citizens to Researchers




DESDE TU DISPOSITIVO MÓVIL ACEDO A LA CONFIGURACIÓN WI-FI Y CONÉCTATE A LA RED WI-FI:
SmartCitizen [...]
Nuestras elecciones de compartición de datos

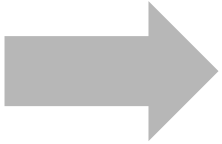


From Citizens to Researchers



From Citizens to Researchers

- Raising awareness
- Engagement
- Learning experience
- Variety of use cases
- Transparency



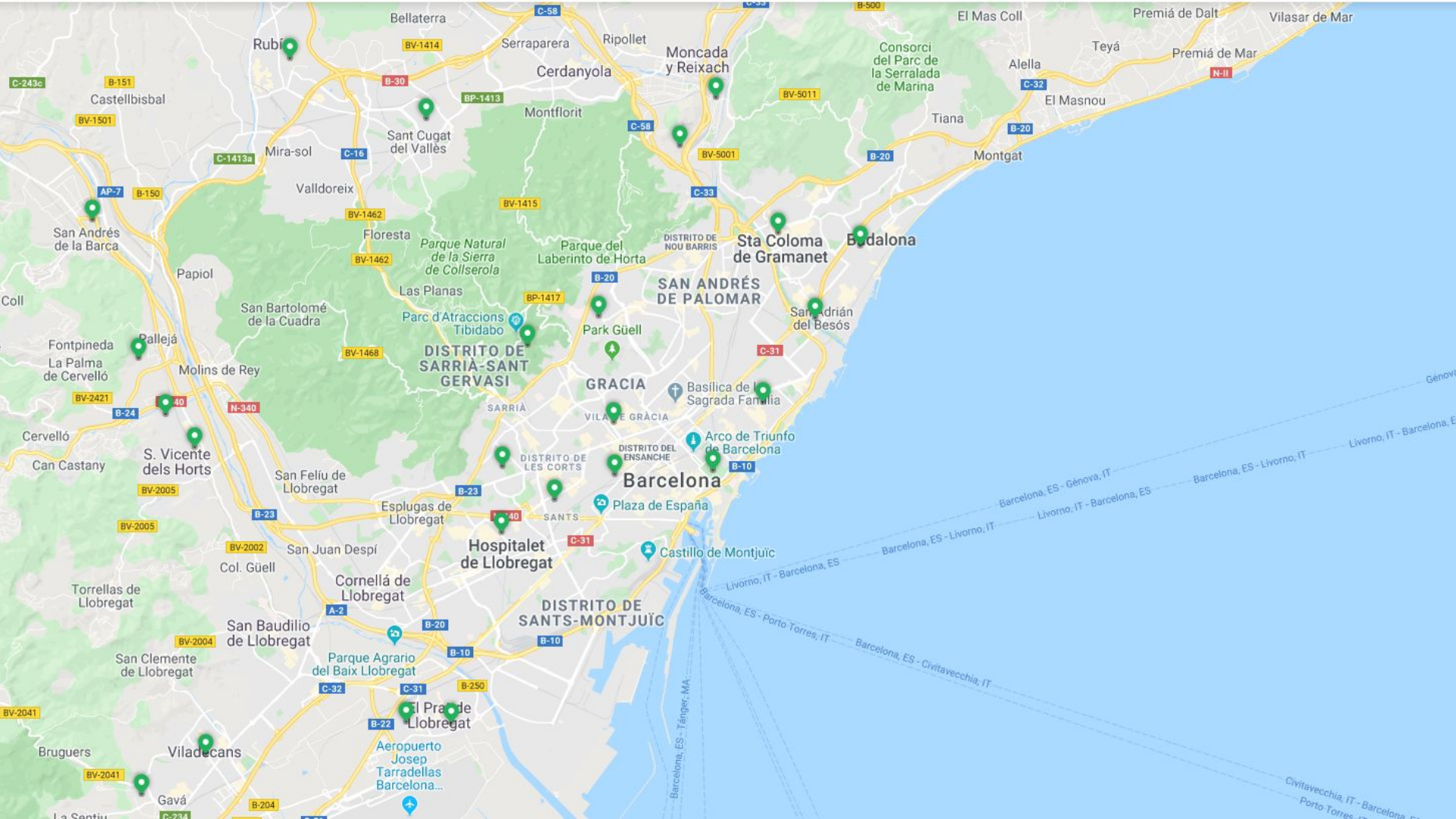
- Easy to come aboard
- Data ownership
- Flexibility
- Openness
- Sense of community

RESEARCHERS

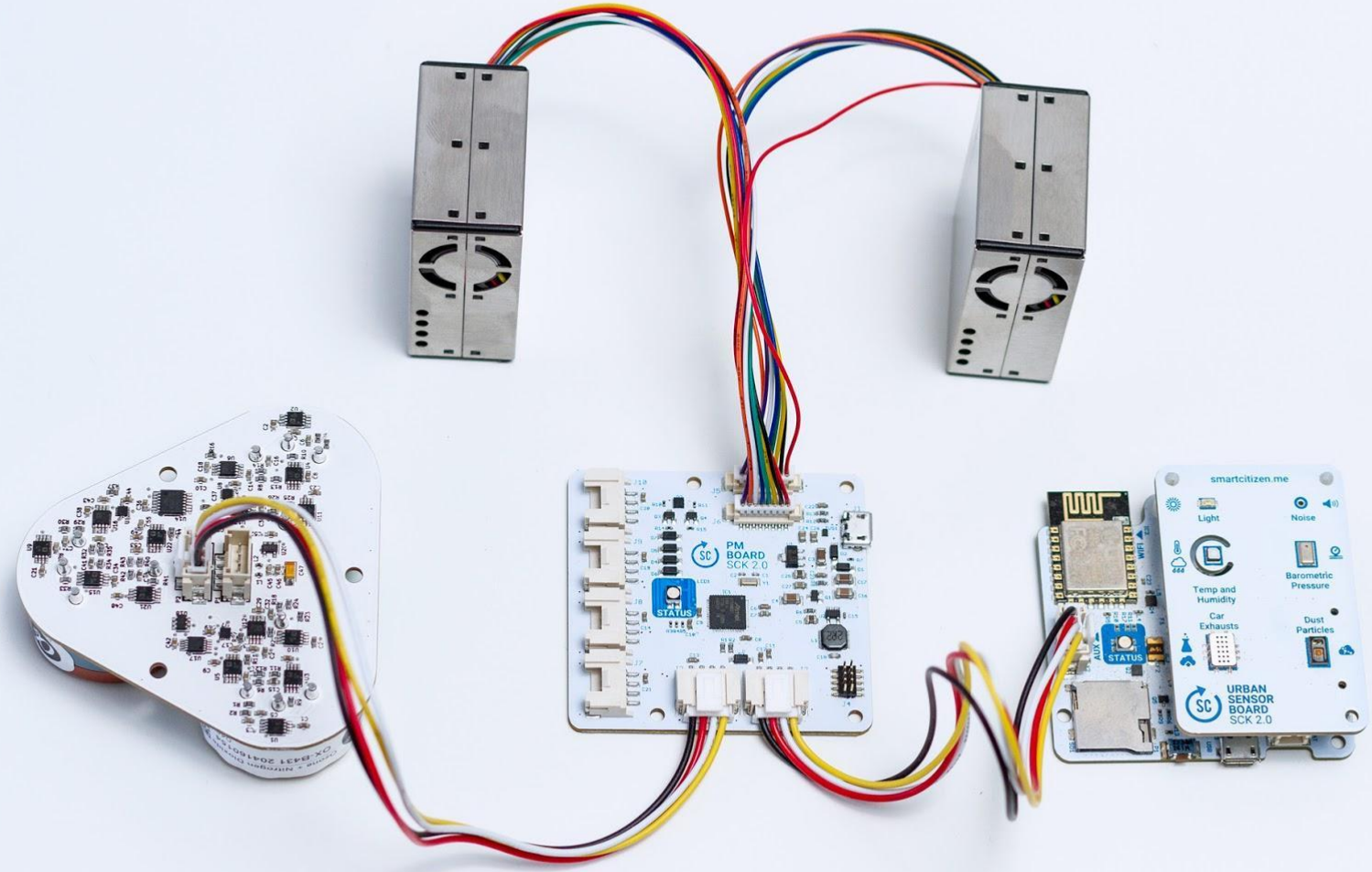
From Citizens to Researchers

Researchers need:

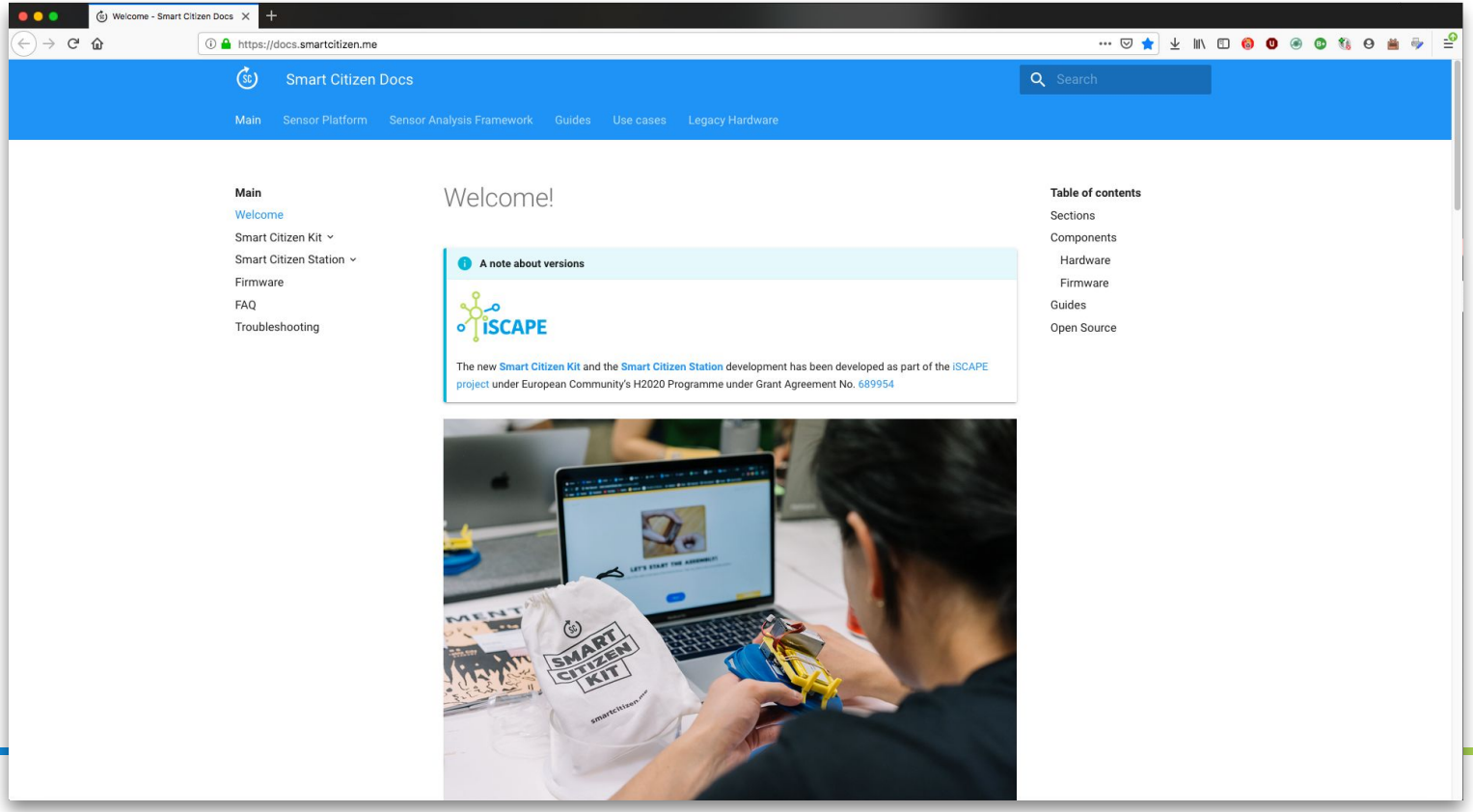
- Scientifically validated instrumentation
- Reproducibility
- Openness (sometimes they don't know that)
- Cost efficient
- Autonomy


Bellaterra
Rubí
Serraparera
Ripollet
Cerdanyola
Moncada y Reixach
El Mas Coll
Premià de Dalt
Vilasar de Mar
Consorci del Parc de la Serralada de Marina
Teyá
Premià de Mar
Alella
El Masnou
Tiana
Montgat
Castellbisbal
Montflorit
Sant Cugat del Vallès
Mira-sol
Valldoreix
San Andrés de la Barca
Papiol
Floresta
Parque Natural de la Sierra de Collserola
Parque del Laberinto de Horta
DISTRITO DE NOU BARRIS
Sta Coloma de Gramanet
Badalona
SAN ANDRÉS DE PALOMAR
Las Planas
San Bartolomé de la Cuadra
Parc d'Atraccions Tibidabo
Park Güell
San Adrián del Besós
Fontpineda
La Palma de Cervelló
Pallejá
Molins de Rey
DISTRITO DE SARRIÀ-SANT GERVASI
GRACIA
Basílica de la Sagrada Família
SARRIÀ
VILA DE GRÀCIA
Cervelló
Can Castany
S. Vicente dels Horts
Arco de Triunfo de Barcelona
DISTRITO DE LES CORTS
DISTRITO DEL ENSANCHE
Barcelona
San Feliu de Llobregat
Esplugas de Llobregat
Plaza de España
SANTS
Hospitalet de Llobregat
Castillo de Montjuïc
San Juan Despí
Col. Güell
Cornellá de Llobregat
Torrellas de Llobregat
DISTRITO DE SANTS-MONTJUÏC
San Baudilio de Llobregat
Parque Agrario del Baix Llobregat
San Clemente de Llobregat
El Prat de Llobregat
Bruguers
Viladecans
Aeropuerto Josep Tarradellas Barcelona...
Gavá
Barcelona, ES - Génova, IT
Barcelona, ES - Livorno, IT
Livorno, IT - Barcelona, ES
Livorno, IT - Barcelona, ES
Barcelona, ES - Porto Torres, IT
Barcelona, ES - Civitavecchia, IT
Barcelona, ES - Tánger, MA
Civitavecchia, IT - Barcelona
Porto Torres


34
34

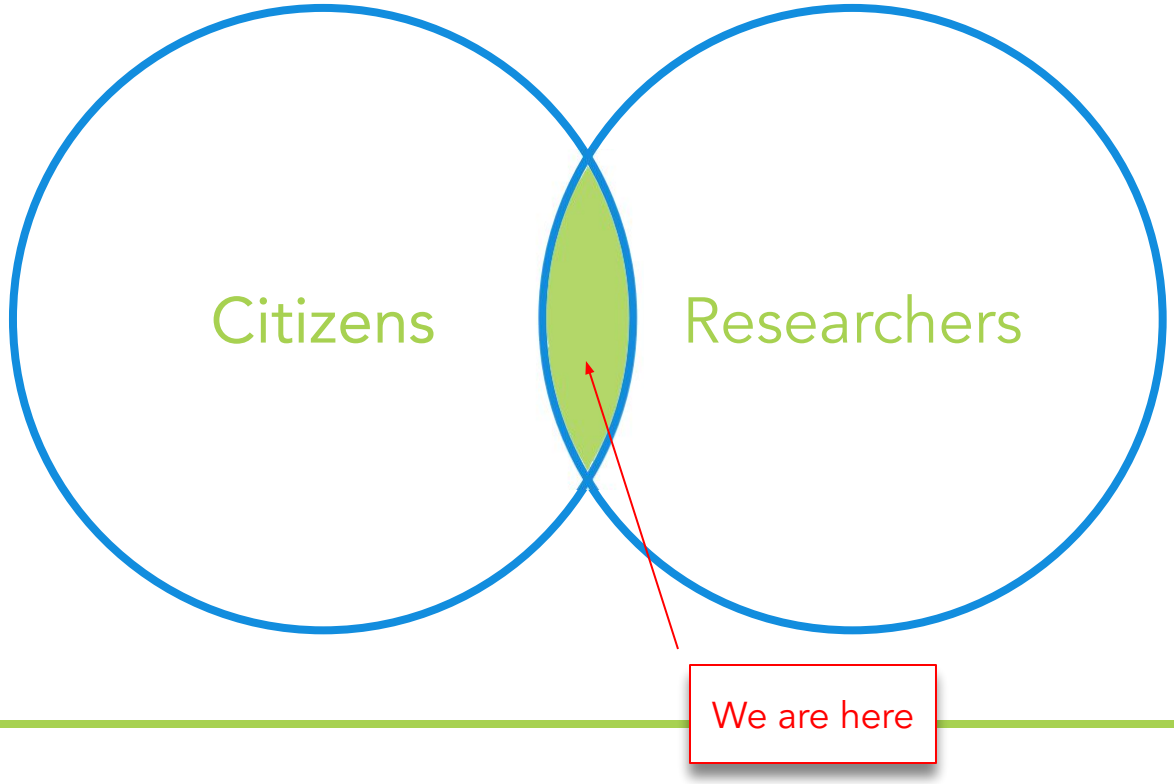

PM
BOARD
SCK 2.0
STATUS
smartcitizen.me
Light
Noise
Temp and
Humidity
Barometric
Pressure
Car
Exhausts
Dust
Particles
STATUS
URBAN
SENSOR
BOARD
SCK 2.0

From Citizens to Researchers

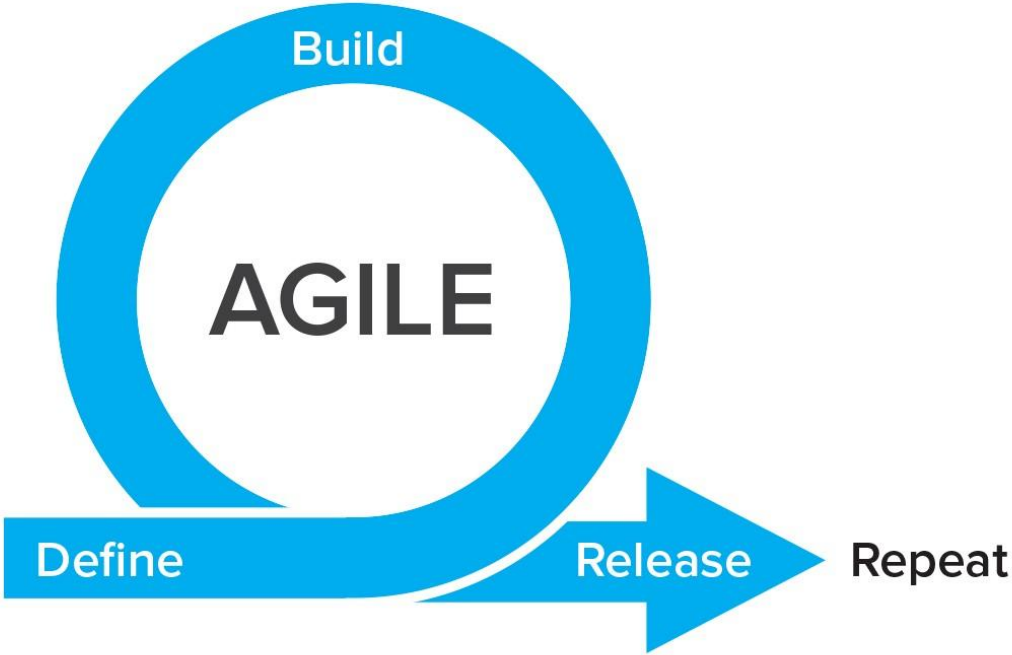


Our journey of sensor development

Our journey of sensor development



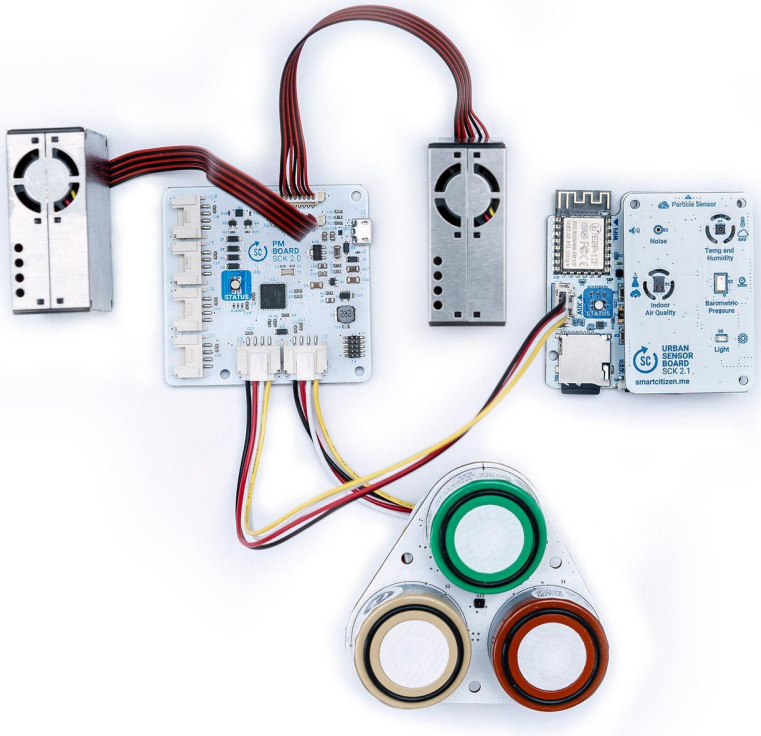
Our journey of sensor development



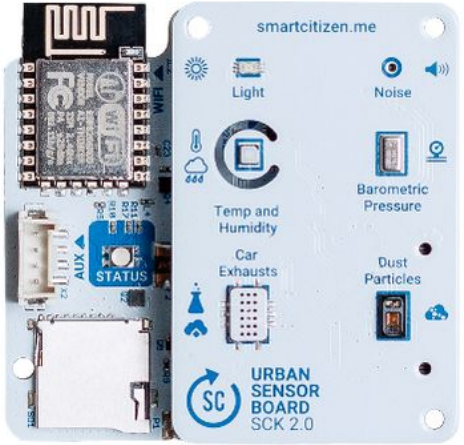
Our journey of sensor development

Our approach:

- Iterative development
- Develop, test, improve, and do it again
- Flexible
- Modular
- Open

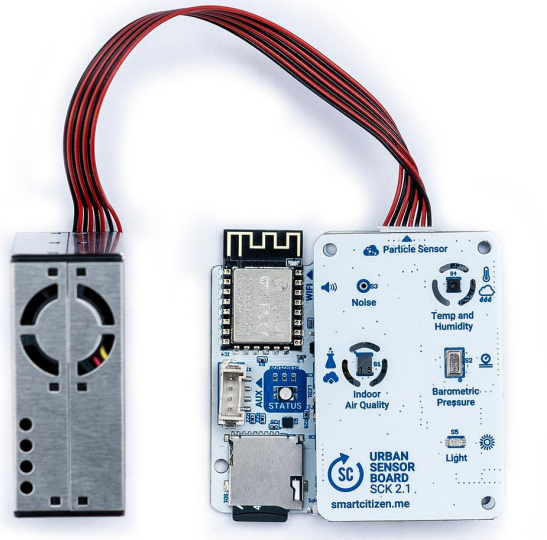


Our journey of sensor development



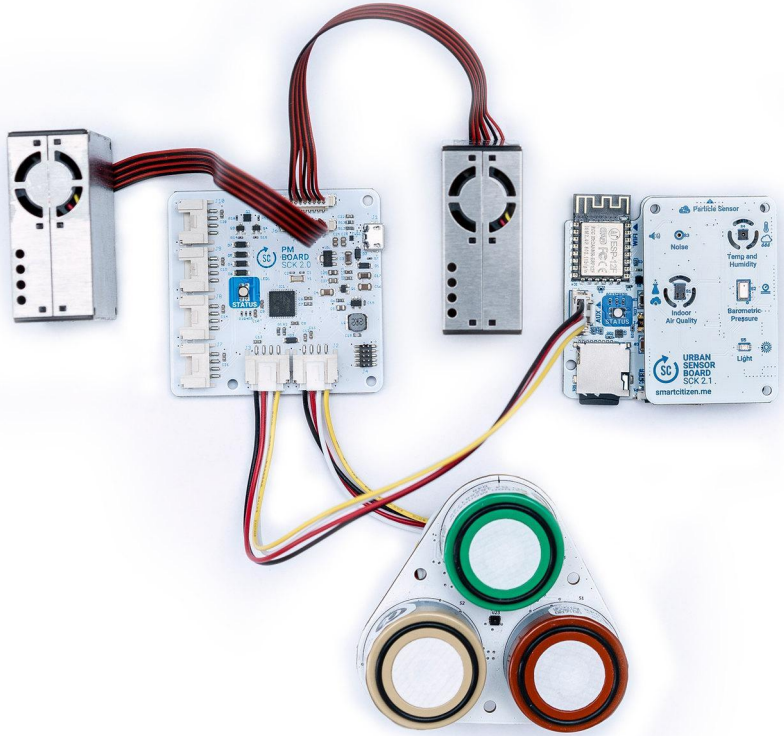
Our journey of sensor development

Measurement	Units	Sensors
Air temperature	ºC	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
Equivalent Carbon Dioxide	ppm	AMS CCS811
Volatile Organic Compounds	ppb	AMS CCS811



Our journey of sensor development

Our journey of sensor development

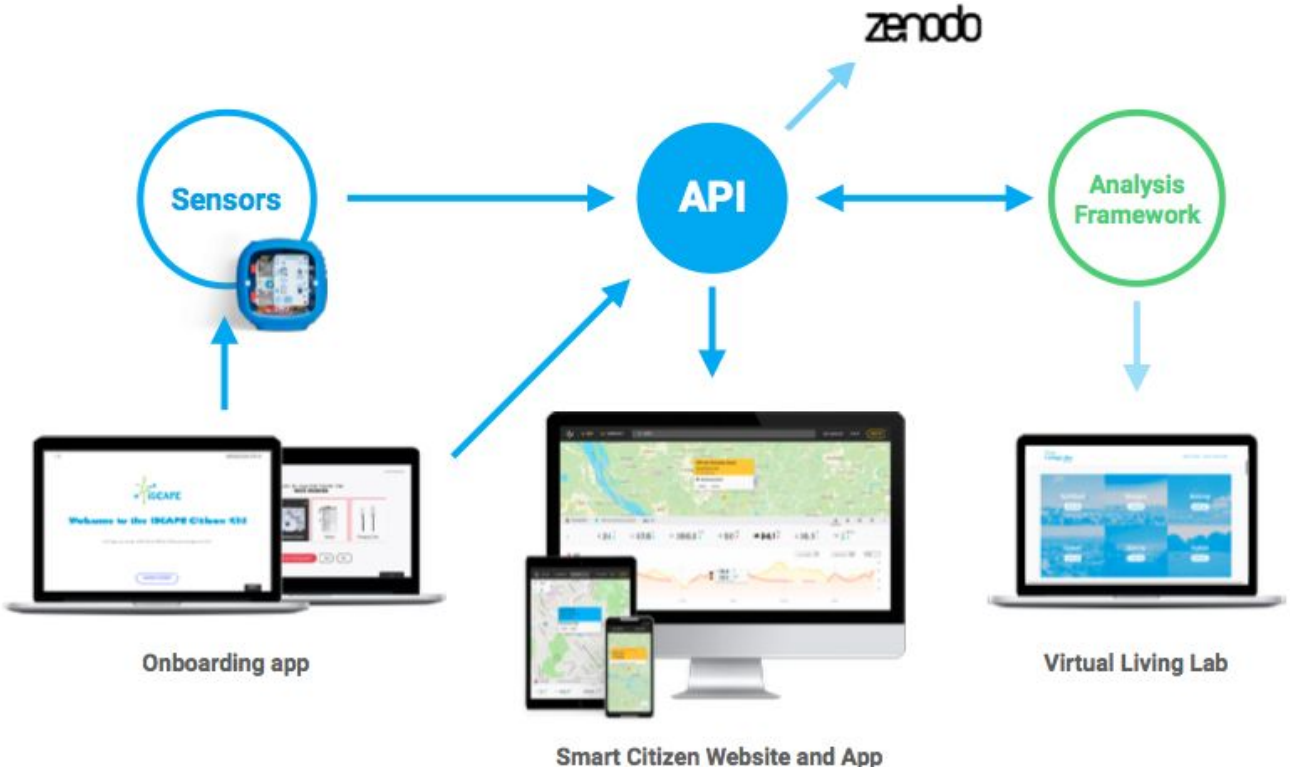


Measurement	Units	Sensor	Component
Carbon Monoxide	ppm	Alphasense CO-B4	Gas Sensor Pro Board
Nitrogen Dioxide	ppb	Alphasense NO2-B43F	Gas Sensor Pro Board
Ozone	ppb	Alphasense OX-B431	Gas Sensor Pro Board
Gases Board Temperature	°C	Sensirion SHT-31	Gas Sensor Pro Board
Gases Board Rel. Humidity	% REL	Sensirion SHT-31	Gas Sensor Pro Board
PM 1	µg/m3	Plantower PMS5003 Dual System	PM Sensors Board
PM 2.5	µg/m3	Plantower PMS5003 Dual System	PM Sensors Board
PM 10	µg/m3	Plantower PMS5003 Dual System	PM Sensors Board

Our journey of sensor development

Our journey of sensor development

Our journey of sensor development

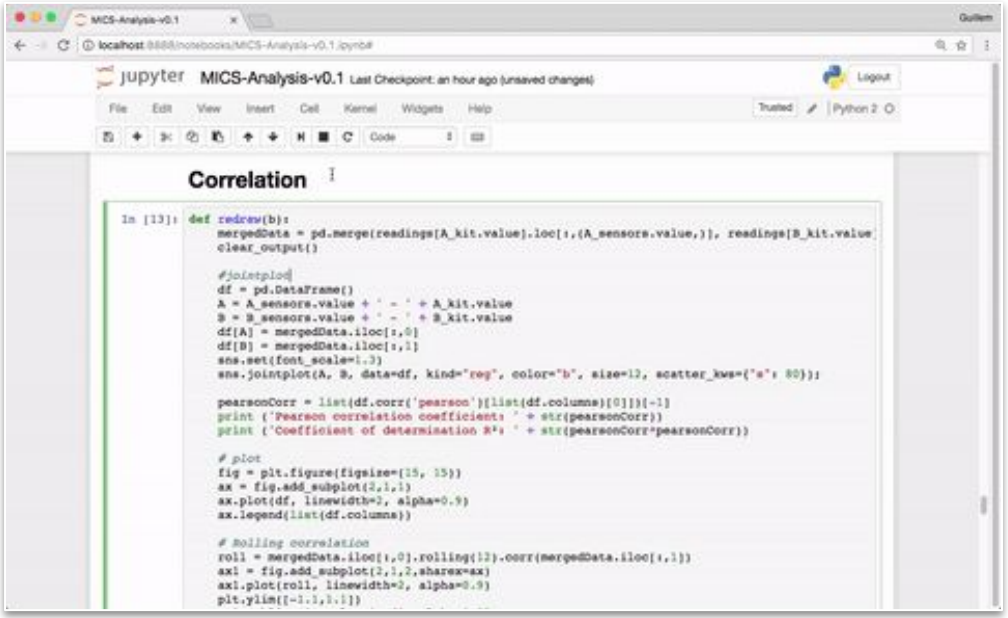


Our journey of sensor development

The importance of data analysis:

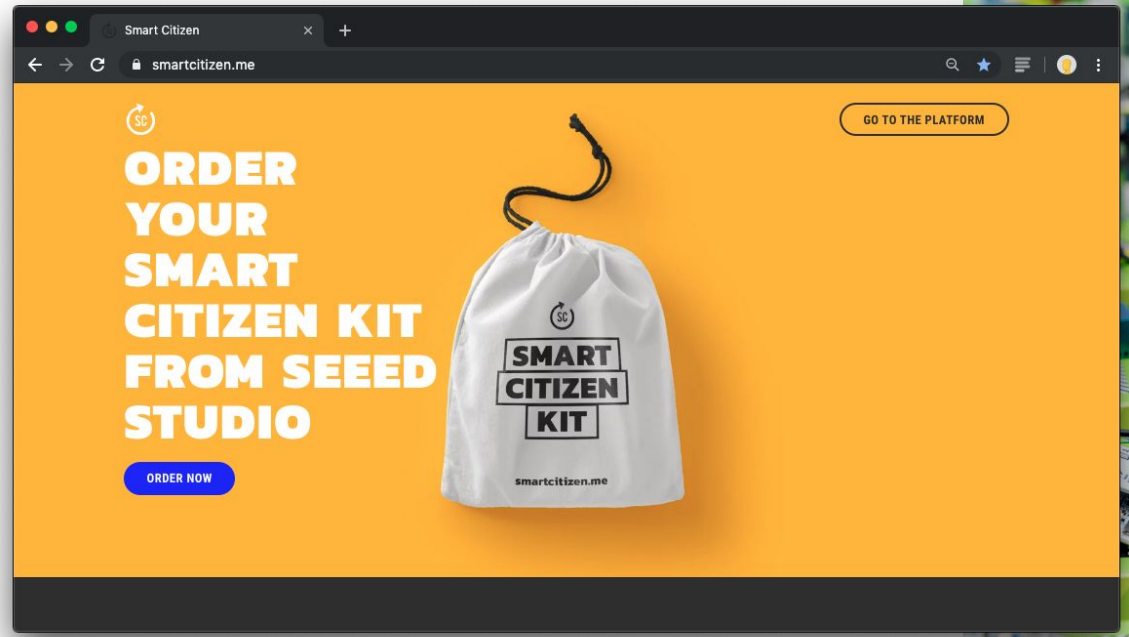
- Low cost sensors are useless without algorithms
- Understand sensor behaviour
- Improve measurements
- Understand how to deploy the sensors

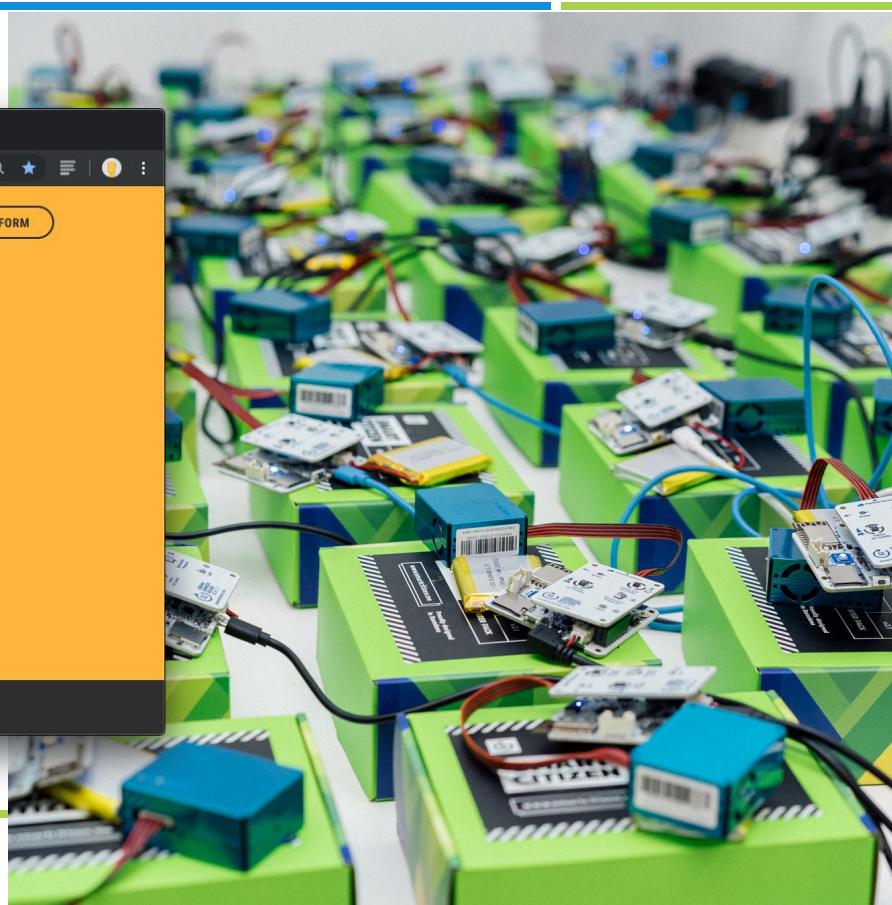
Open framework for sensor data analysis



Where we are today

Where we are today






SMART CITIZEN
KIT
v2.1
STARTER PACK
www.smartcitizen.me
Proudly designed in Barcelona
SMART CITIZEN KIT
smartcitizen.me
WELCOME TO YOUR SMART CITIZEN KIT
To start, please visit:
START.SMARTCITIZEN.ME
Your kit's setup WIFI is:
SMARTCITIZEN 28B3
ISCAPE


iSCAPE
6B61


iSCAPE
CHARLIE BROWN JR.

Where we are today

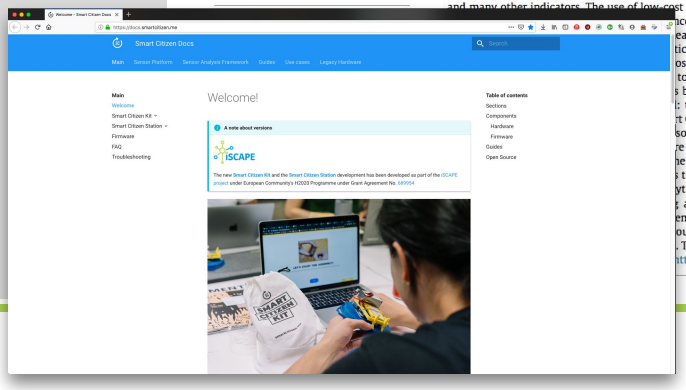
Where we are today

Where we are today

Where we are today

Dissemination:

- Special Issue on Open-Hardware for Environmental Sensing and Instruments
- Evaluation of particle size-selectivity of optical low-cost particulate matter sensors
- Online web documentation



HardwareX 6 (2019) e00070

Contents lists available at ScienceDirect

HardwareX

journal homepage: www.elsevier.com/locate/ohx

Smart Citizen Kit and Station: An open environmental monitoring system for citizen participation and scientific experimentation

Guillem Camprodon [a], Óscar González [a], Víctor Barberán [a], Máximo Pérez [b], Viktor Smári [a], Miguel Ángel de Heras [b], Alejandro Bizzotto [b]

[a] IAAC—Fab Lab Barcelona, Spain
[b] Freelance Consultant, Spain

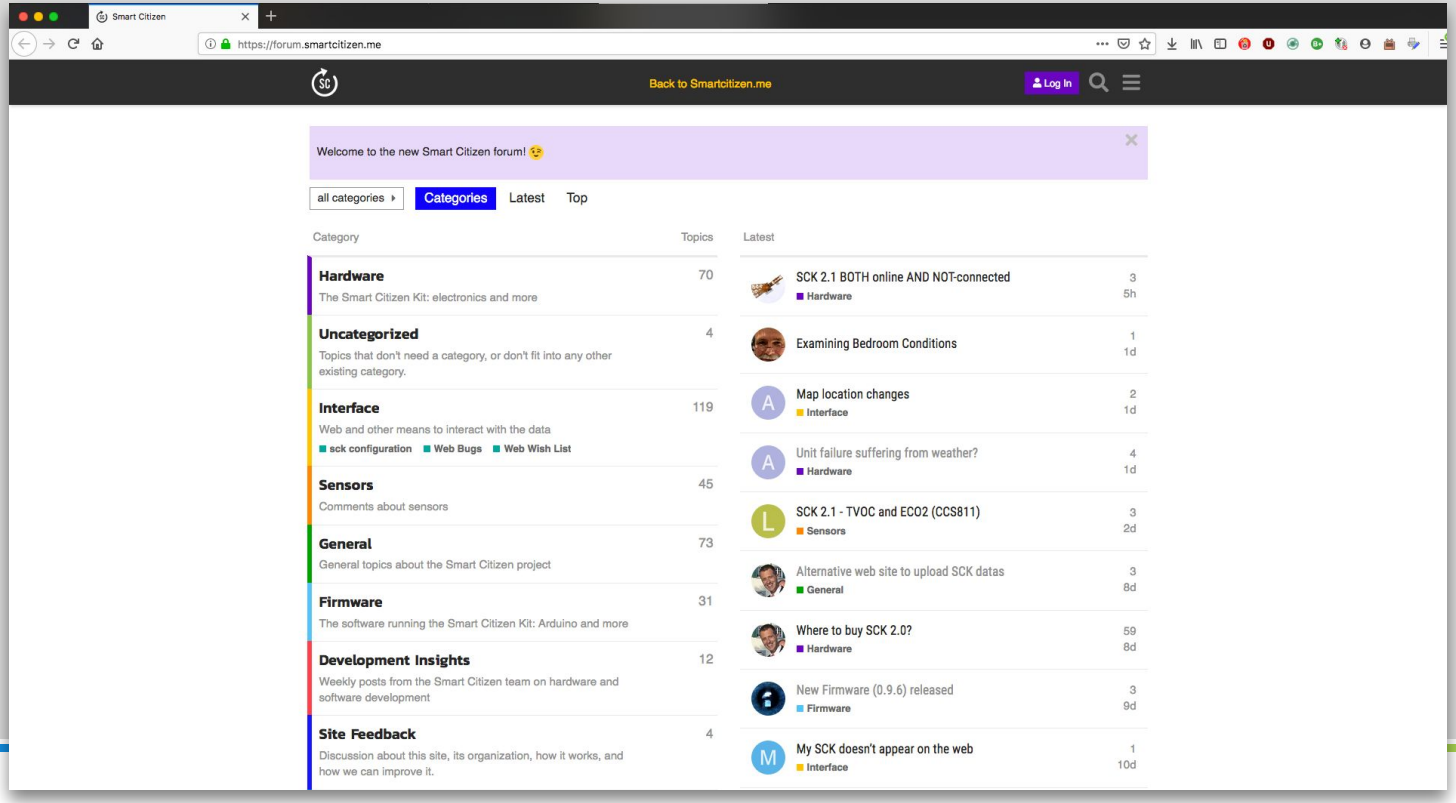
ARTICLE INFO

Article history:
Received 15 February 2019
Received in revised form 3 June 2019
Accepted 27 June 2019

ABSTRACT

In the past years, multiple research projects have explored the potential of low-cost environmental sensors for urban air pollution monitoring. However, each project has taken its own independent and in many cases, fully or partially closed approach. We present the Smart Citizen System, a flexible, easy-to-use and fully open-source environmental monitoring solution for particulate matter, carbon monoxide, nitrogen dioxide, noise levels, and many other indicators. The use of low-cost sensors in recent years has been generally
nce and educational activities, where the pri-
easurement process and raise awareness of
ticated scientific approach, where the main
ost sensing technologies. The Smart Citizen
to fulfil both needs by providing an extend-
s based on the same core components. With
: the Smart Citizen Kit, intended for citizen
rt Citizen Station, designed to serve as a more
sors. The design is based on the principle of
e components such as a dedicated storage
he core system bases its sensing capabilities
to provide a robust framework for environ-
ything open, from the hardware to the soft-
algorithms, we hope others might find it
em to focus on their project particular needs
ound-up.

Where we are today



Thank you