AIR PARIF

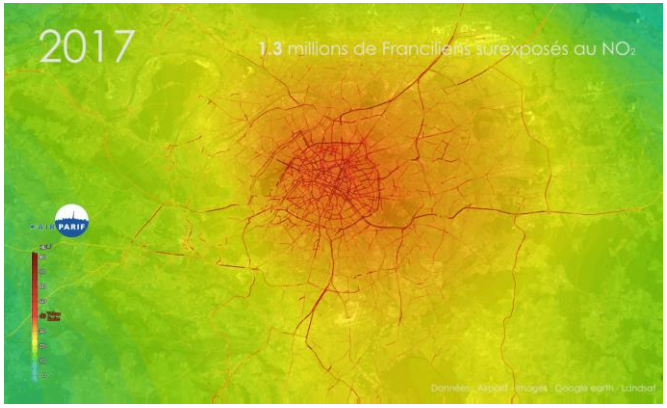
Paris regional air observatory

Navigating the Brave New World of Low-Cost Air Quality Sensing

Adrian Arfire & Pierre Pernot | **Airparif** | 13-09-2018

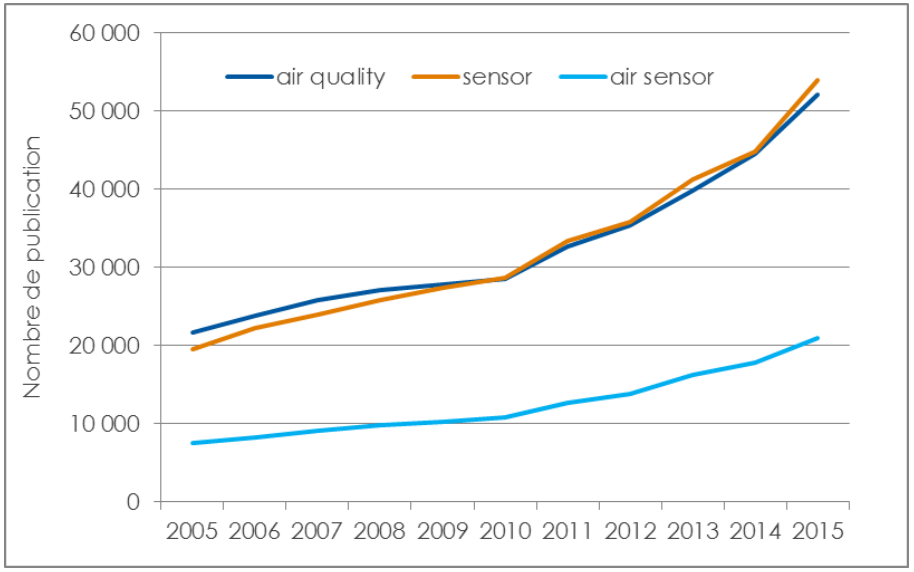
AIRPARIF, IN SUMMARY…

- **Paris region Observatory for Air Pollution**
- **Created in 1979**
- **Accredited by the French Ministry in charge of the Environment and**
- **Independant (NGO)**
- **Gathering all the stakeholders in its administration board: State, local authorities, economical stakeholders, citizen and environmental NGOs and experts,**
- **Missions:**
  - Monitoring
  - Understanding air pollution phenomena
  - Assisting the stakeholders (information, action plans and innovation)



A booming interest but not a new topic

► Increassing research works



► Great interest from the public and authorities

► A media topic

► 15 years of experimentation at Airparif concerning one hundred sensors in laboratory and on site

Integration of the emerging monitoring tools

- **Integration of emerging technologies into the current monitoring network (based on fixed stations, models, campaigns and emission inventory)**
  - Have these tools in our own network
  - Centralize external data:
    - ✓ From agglomeration communities (smart city)
    - ✓ From our partners (Industrial monitoring…)
    - ✓ From the region inhabitants
    - ✓ From the research community

- **In order to**
  - Increase the spatial and temporal distribution of the measures
  - **Improve modeling resolution**
  - Characterize and identify the sources of pollution
  - Provide individual exposure data
  - Raise awareness on air pollution

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Feedback on the microsensors performance in real conditions

↘ Not sufficiently reliable to ensure monitoring alone :

- **Good temporal dynamics** but with generally biased levels
- Need an upstream reproducibility
- **Require repeatability test to rule out faulty (and downstream) sensors**
- **Evolution of the quality of results over time (drift)** and occasional dysfunctions
- **Require correction algorithms that vary with time and location**
- **Not usable for regulatory monitoring**

↘ Their contribution to assessing individual exposure still depends on research :

- See limits above
- Less reliable in mobility (rapid variation of concentrations + humidity and temperature)
- Autonomy

↗ Good educational and awareness tools to promote action

The ideal sensor is…

- Metrologically reliable
- Cheap (investment and maintenance)
- Connected
- Smart (able to communicate with other sensors)
- Robust
- Interactive and user-friendly
- Light
- Mobile
- Multi-environment (ability to adapt quickly to a new environment)
- Autonomous
- Fine time resolution
- Esthetical…!

The ideal microsensors don't exist yet, some of them have some of the qualities above, all depends on their uses…

➲ The new way to navigate the world of microsensors :
to Challenge the brand and to connect the sensor and use

AIRLAB - MICROSENSOR CHALLENGE 2018

- **www.airlab.solutions**
  - An innovation accelerator dedicated to air quality
  - Launched by Airparif and partners at 20th September 2017,
  - Building a community that is committed to improving air quality. Large companies, SMEs and start-ups, research institutes, public bodies and individuals: each brings their own ideas, skills and resources to the table.
  - Nurturing the solutions of tomorrow and help implement them
  - Eighteen projects are in progress including the Microsensor Challenge 2018

- **The Objectifs of Microsensor Challenge 2018**
  - Answer to the demand of AIRLAB partners and of the Community for information on the performance of microsensors currently on the market, through an independent and recognized evaluation.
  - Compare different sensors according to categories in order to transparently clarify the users on the adequacy of a given product for their targeted use case.
  - Putting forth the qualities of these devices and the pathways for improvement in order to encourage innovation or technological breakthroughs and to contribute to the development of an emerging market.

THE OPERATION OF THE CHALLENGE

- **The Rules of the Challenge**
  - Conditions for participating to the Challenge (participants, sensors TRL ,…)
  - Modalities for selection, testing, and ranking.
  - Intellectual property and data property
  - Confidentiality

- **The categorie of use:**
  - Public or user Awareness for Fixed Outdoor locations (SPAE)
  - Public or user Awareness for Fixed Indoor locations (SPAI)
  - Public or user Awareness for Mobile settings (SPM)
  - Personal Awareness of Pollution (SPP)
  - Estimation of Personal Exposure (EEP)
  - Indoor Air Control for Buildings (PAIB)
  - Regulatory Compliance for Fixed Outdoor locations (CRAE)
  - Regulatory Compliance for Fixed Indoor locations (CRAI)

- **41 evaluation criteria grouped in 5 major classes with weights depending on use.**

- **Under evaluation : 31 solutions – 21 companies (1/3 foreign) – 12 pollutants**

Testing Sites and Platforms

- **Indoor Air Quality**
  - Metrology Lab at Airparif HQ

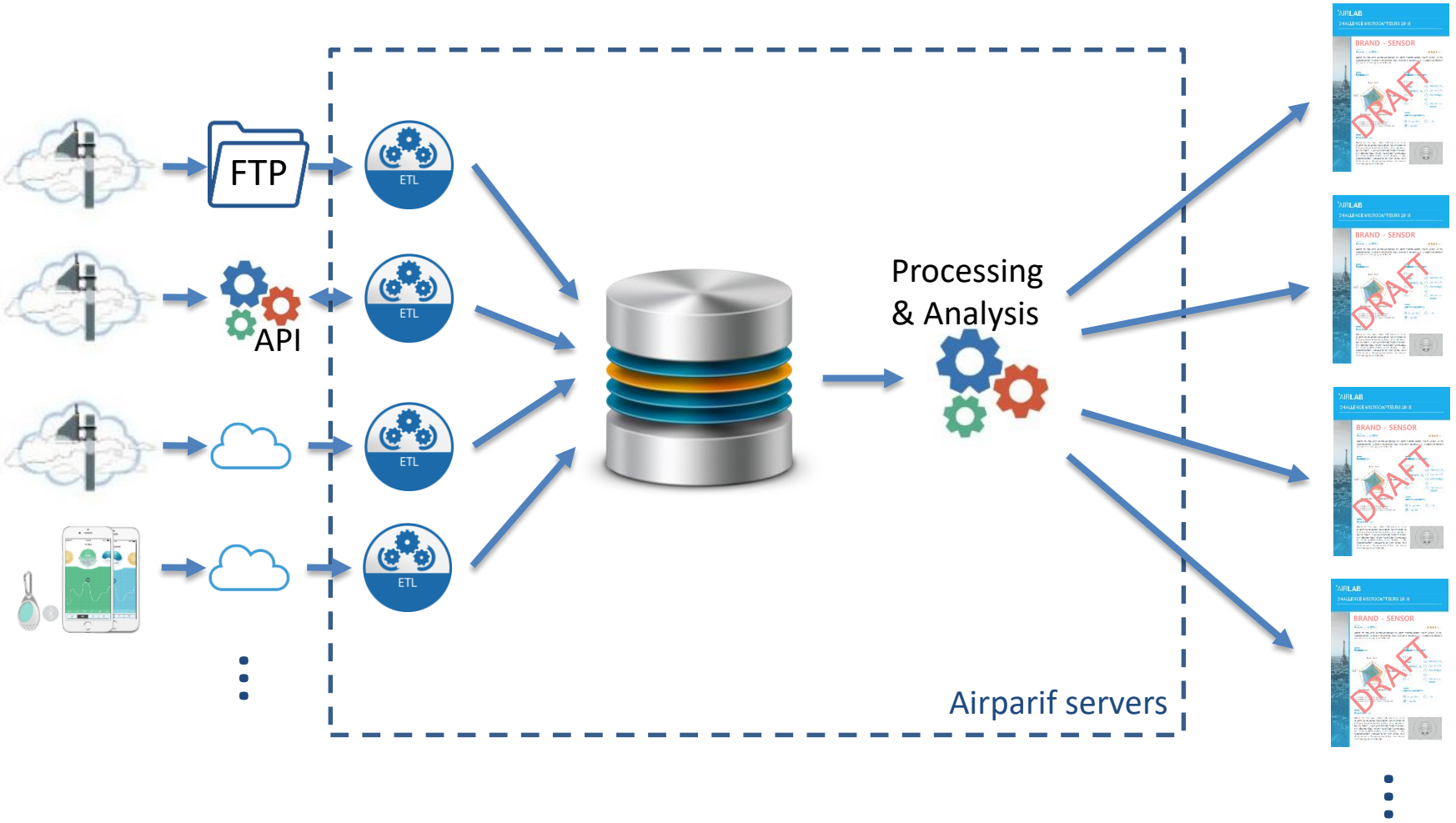
Testing Sites and Platforms

- **Outdoor Air Quality**
  - Porte Dorée station
  - Covering both near-traffic and background site characteristics

Testing Sites and Platforms

- **Mobile and portable devices**
  - Airparif volunteers
  - Tricycle testing platform
  - Equipped Airparif vehicles

Streamlining Data Acquisition & Processing



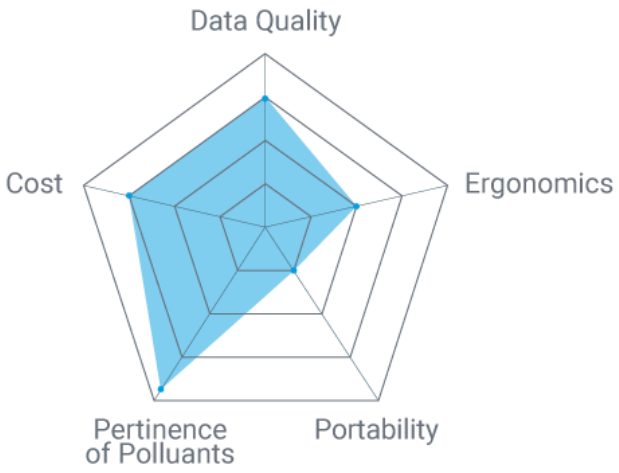
BRAND – SENSOR

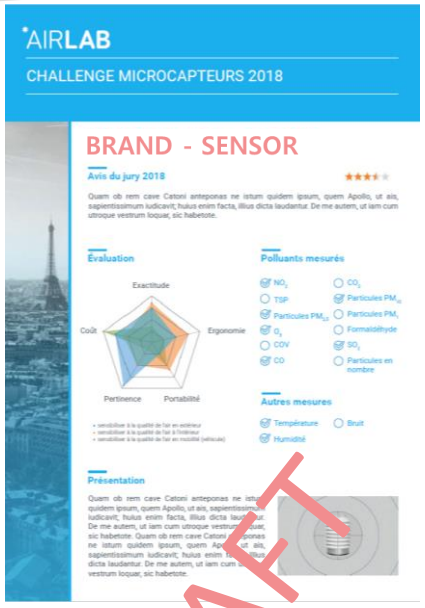
★★★½☆

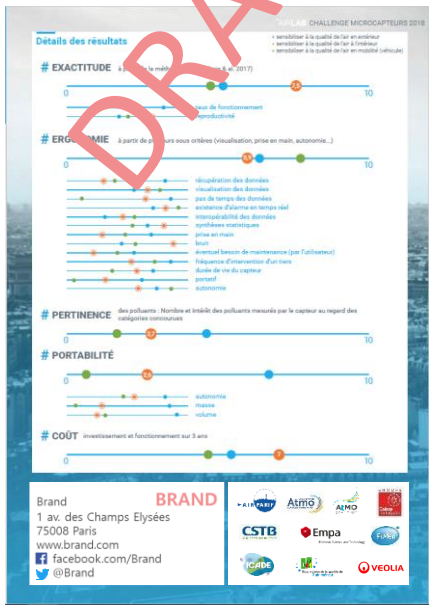
The selection board's opinion 2018

Equitis Romani autem esse filium criminis loco poni ab accusatoribus neque his iudicantibus oportuit neque defendentibus nobis. Nam quod de pietate dixistis, est quidem ista nostra existimatio, sed iudicium certe parentis; quid nos opinemur

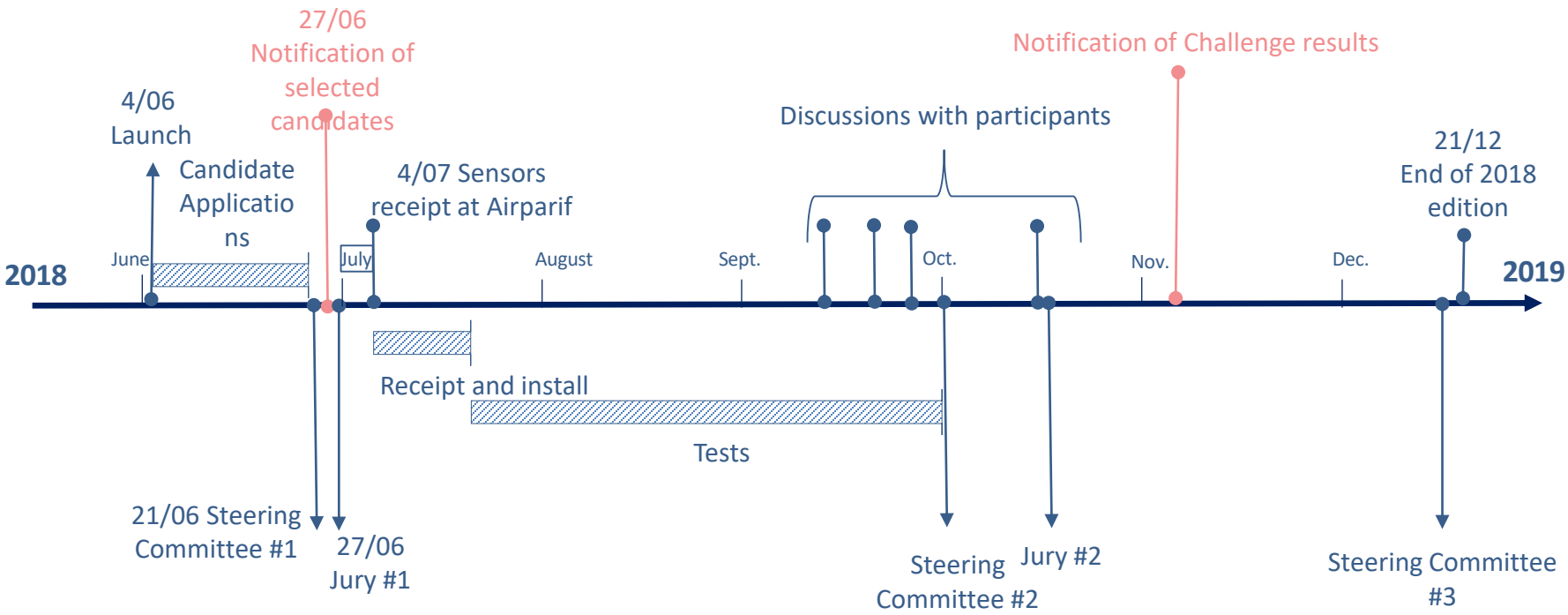
Evaluation







CHALLENGE CALENDAR



AIR PARIF

L'Observatoire au service de la Santé et de l'Action

airparif.fr

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