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The Urban Lab of Europe !

# The AIRQON project Journal N° 1

*Project led by the City of Breda*



**AIR  
QUALITY**



# The AIRQON project

The **AirQon** project aims at substituting diesel generators with an energy supply system based on Electric Vehicle (EV) batteries to provide off-grid energy for outdoor festivals and events. The solution is based on introducing an innovative technology (V2Box) to control bi-directional energy flow to and from EV batteries.

This is supported by societal innovation: building up and managing a community of EV owners willing to fuel open-air events with clean electricity. Demand and supply will be matched through an online platform and mutually beneficial incentive schemes.

The final ambition is to ensure that around 35% of all events will be utilising V2Box technology for their off-grid energy demand preventing nearly 80,000 litres of diesel to be burnt in generators yearly in Breda. The project will induce higher awareness of clean energy sources and more conscious behaviour and it will explore how the technology and its business model could be applied in other contexts (generators for hospitals, public buildings, etc.).

## **Partnership:**

- Municipality of Breda
- SBPF
- iHomer -
- Faraday Keys
- ZAP Concepts
- Kairos Events
- Breda Barst
- Buurauto
- Nissan Breda
- IRAS

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# 1. EXECUTIVE SUMMARY

The city of Breda is the epicenter of AIRQON, a solution to power events in a greener way, lessening the dependence on diesel generators and boosting the possibilities for electric vehicles, which are used for much more than transportation purposes.

AIRQON intends to implement a competitive and environmentally friendly solution, since technology is achieving the necessary maturity, paving the path for a smarter policy writing in the city, in accordance to regional, national and European air quality regulation.

Engagement is a key factor in the solution proposed. On the one hand, it is intended that event organizers play an active role, using AIRQON to power small events, or some parts of bigger ones. On the other hand, EV users are essential

to provide the necessary energy to power those events, in exchange for compensations such as free tickets or similar, by the way, dissemination and public recognition is achieved for the city and the events participated. Overall, a local action to contribute to a better air quality is put into practice, aiming to reach a feasible, viable business model, as an alternative to simply limit or force.

This Journal presents a detailed analysis of the UIA challenges in the AIRQON project, ranging their risk from low to high. According to this, public procurement and upscaling challenges present a low risk in implementation. A medium risk is identified for leadership, participative approach and monitoring and evaluation challenges. Finally, a high risk is present for cross-department working and communication challenges.

## 2. STATE OF THE ART

### 2.1. Introduction to the challenge addressed

Breda is the ninth city of the Netherlands, a country where the penetration of the electric vehicle (EV) represents between 1 and 2% of the total. This city has a significant presence of events, with around 200 a year. The size of each of them is very heterogeneous, highlighting about 20 or 30 every year with 5,000 or more attendees.

Both large and small events consist of common elements whose energy demand is relatively short, such as for small stages, stands, food courts, etc. This is where AIRQON intends to implement a competitive and environmentally friendly solution for the improvement of air quality in the city.

The main aspect that draws attention to this project is that a global issue, air quality, is tackled. It has a clear impact at the local level, so the local administration, Breda Municipality, does not simply focus on limiting, prohibiting or intervening in polluting activities such as the use of diesel generators to power those events, or parts of greater events.

Instead of that, Breda Municipality leads AIRQON to try and test firstly a technical solution as a feasible alternative with regard to air quality in the city, so that once they acquired the necessary experience, proceed to legislate and write local policy, in a way closer to the problem and more realistic at proposing possible solutions and alternatives.

This leading role of Breda Municipality provides a great value, especially when it comes to such a technological implementation. At the same time, this project is based on the participation of end users, who voluntarily, in exchange for certain compensations, agree to take part in the proposed solution. On the one hand, event organizers –a role that not only falls to the Municipality but also to third parties– try AIRQON to get power. The participating companies, in addition to the administration itself, obtain a positive image of cleanliness and environmental respect by doing so. On the other hand, EV participants are the real protagonists, and benefit from access to those events or small compensations such as discounts or beverages. These may be small gestures but sufficient to encourage participation, unlike other measures that seek to prohibit or force. Moreover, at the same time, the citizens in general benefit from clean air in their city and a better quality of life.

As stated by the European Environmental Agency (EEA), an improved understanding of air quality issues is a pre-requisite to develop effective mitigation policies, protecting human and environmental health, and identifying co- and dis-benefits of action related to air quality. Consequently, AIRQON is an extraordinary example of this, making Breda Municipality a pioneer in actively facing capital challenges of implementing air quality measures for cities.

## 2.2. How the project fits in the policy context at the EU, national and regional level?

The EEA declares air pollution as the biggest environmental health risk in Europe. It is present anywhere, no matter where you live, seriously affecting public health and the environment. It is a concern especially pressing in urban areas. Nevertheless, air quality in Europe has improved over recent decades, but the levels of air pollutants are still exceeding EU standards and the most stringent World Health Organization guidelines.

Urban policies influence the air we breathe. Given their proximity to citizens and knowledge of local concerns, EEA points at local authorities for being best placed to ensure it is made an effective transition to more livable and breathable cities. Many city-specific measures have proved to be efficient so far, but there is still much to do to empower citizens further and deliver coordinated actions across all governance levels as proposed in AIRQON.

EEA indicates in Report 24/2018, 'Europe's urban air quality — re-assessing implementation challenges in cities', that city scale actions have a considerable potential to address local sources of air pollution and encourage behavioral change to help improve air quality. These local policies must be supported through cooperation and coherent action across other governance levels (regional, national and EU levels).

Involving local administrations and policymakers at an early stage of air quality planning processes has proved to be highly successful, as it helps the implementation of mitigation measures. Breda Municipality and its leading role in AIRQON is therefore an excellent experience in this way, through real implementation where to allow regular exchange of information, needs and challenges between urban stakeholders, which is

considered very beneficial by EEA on the report above mentioned.

In fact, a multi-disciplinary and integrated approach to the future of air quality management is proposed for cities. It is important to highlight further co-benefits of air quality measures in relation to other policy areas such as health, noise and climate change, and establish future roadmaps for improved air quality. Hence, communication must be improved at local level to increase public awareness and engagement, ensuring better public acceptance of measures introduced to address poor air quality. Consistency of political decision-making over time and strong political support at the local level were also identified by EEA as important factors contributing to the successful implementation of local air quality measures.

As detailed in Section 3, AIRQON addresses air quality challenges following these guidelines, focusing on experiencing and implementing measures under real conditions for further policy making to achieve better air quality in the city. The transition towards urban models based on lower emissions, by reducing the use of diesel generators in events as here proposed, or by encouraging zero emission vehicles, to cite a relevant example, would significantly reduce direct pollutants of great relevance in urban environments (CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub>, particles, non-methane hydrocarbons, etc.) that affect the quality of life of citizens. In addition to policy, municipalities can encourage by specifically providing support via parking spaces reserved for EV (for both parking and recharging), traffic taxes exemptions, access to restricted areas, etc.

An overview of European Air Quality Indexes from EEA across Europe, the Netherlands and Breda area is presented in the following figures, for a punctual status of December 2019 as set of

graphical examples of the permanent situation experienced in those geographical areas. The measurements are classified into qualities for each of the main pollutants.

### European Air Quality Index

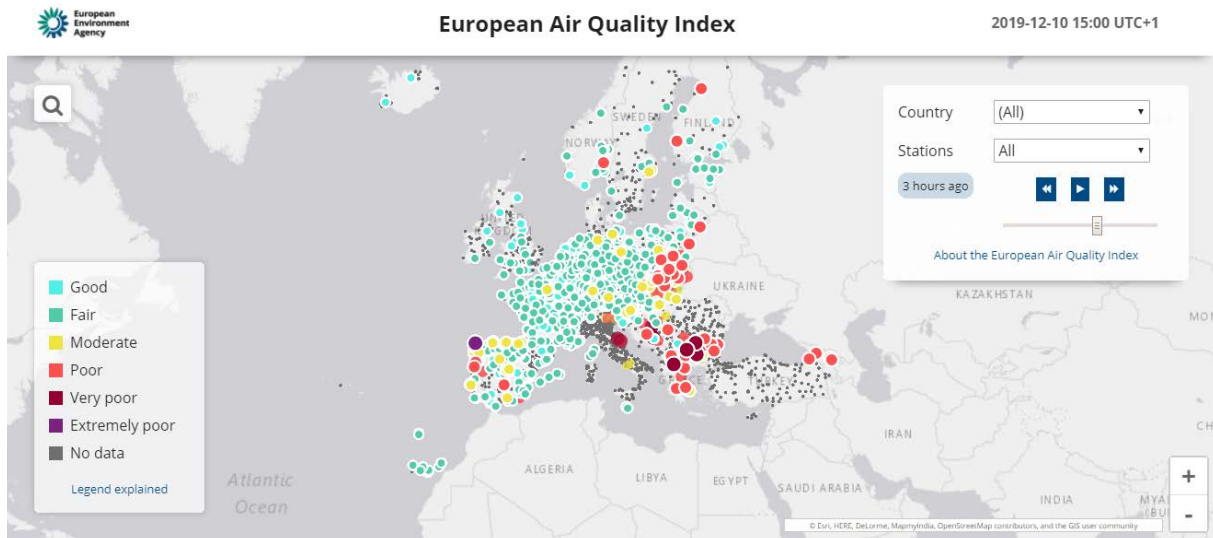


Figure 1: Overview of emissions in Europe (source: EEA)

Pollutant	Index level (based on pollutant concentrations in $\mu\text{g}/\text{m}^3$ )					
	Good	Fair	Moderate	Poor	Very poor	Extremely poor
Particles less than 2.5 $\mu\text{m}$ ( $\text{PM}_{2.5}$ )	0-10	10-20	20-25	25-50	50-75	75-800
Particles less than 10 $\mu\text{m}$ ( $\text{PM}_{10}$ )	0-20	20-40	40-50	50-100	100-150	150-1200
Nitrogen dioxide ( $\text{NO}_2$ )	0-40	40-90	90-120	120-230	230-340	340-1000
Ozone ( $\text{O}_3$ )	0-50	50-100	100-130	130-240	240-380	380-800
Sulphur dioxide ( $\text{SO}_2$ )	0-100	100-200	200-350	350-500	500-750	750-1250

Figure 2: Qualities for each of the main pollutants measured in European Air Quality Indexes (source: EEA)

## European Air Quality Index

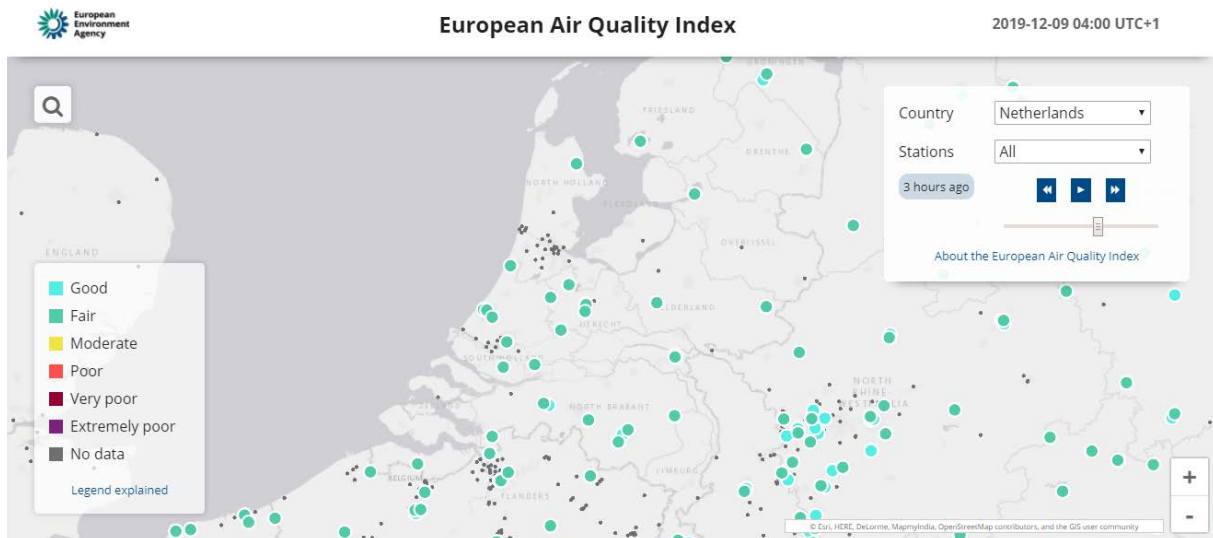


Figure 3: Overview of emissions in Netherlands (source: EEA)

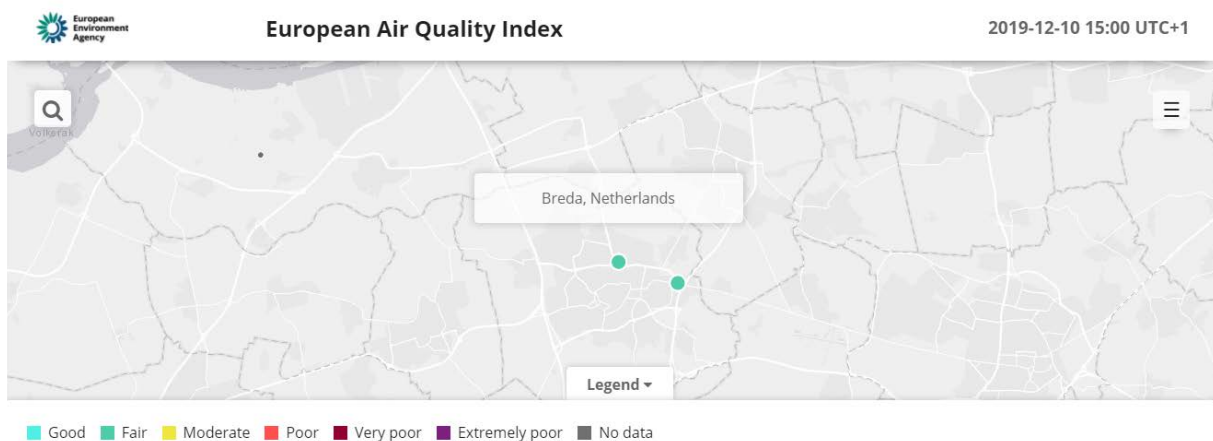


Figure 4: Overview of emissions in Breda area (source: EEA)

Further details about air quality are presented in Report No 24/2018 ‘Europe’s urban air quality — re-assessing implementation challenges in cities’, from the European Environment Agency. Regarding the Netherlands, more than 2% of the urban population is exposed to concentrations above EU standards for NO<sub>2</sub> for the period 2012-2017. Particularly in Breda, main emissions of Nitrogen Dioxides come from farming activities that take place in the areas surrounding the city. This problem may even result in the study of severe measures to limit those activities.

In addition to this, another important source of Nitrogen Dioxides emissions is road traffic. The city of Breda is surrounded by 3 important highways, A16, A27 and A58, and 2 other important routes. The impact of diesel-powered vehicles is higher, despite of consuming less fuel than gasoline, causing around four times more pollution, especially in the case of Nitrogen Dioxides and suspended particles. Furthermore, projects for enlarging the latter routes and avoid traffic jams, by the way, which worsens emissions, are temporally in stand-by due to the present level of emissions.





## 3. POWERING EVENTS

### 3.1. Introduction to the solution implemented

AIRQON takes energy from electric cars to power events in a greener way than conventional diesel generators. To do so, at least 22 cars are available for tests. Breda Municipality and Buurauto have 10 EVs each, and Leendert van den Born car dealer has two EVs. A video of the project is available in the following link: <https://youtu.be/FG84B3Rq6A8>



Figure 6: An electric van, Nissan eNV200, working on discharging mode

The key element to transfer energy from the vehicles, as suppliers, to the consumers is a called V2Box. A first version able to provide up to 3.5 kW has been tested, and a bi-directional 10 kW version of V2Box is fully available, letting both charge and discharge electric cars.

One of the V2Box consists of an upgraded version, which is combined with a battery pack. This is being tested in order to completely decouple the electric car's power injection from energy demand.

### 3.2. Events participated

Until May 2020, when phase 2 of the project is completed, there will be 20 events that have had AIRQON solution implemented. Moreover, half of them will have been entirely powered by AIRQON.



Figure 7: Bidirectional V2box charger/discharger (in red and white color), combined with a battery rack (in blue color)

Some solutions for bidirectional charge have been explored in Spain in different innovation projects, such as ZEM2ALL, and it is a widely used solution in countries like Japan. However, offgrid solutions like the implemented in Breda are less common. At present, the type of V2Box used in AIRQON for now is an indoor solution, which presents certain limitations in case of rain or high humidity. To overcome this, an outdoor solution is under development.

Not only is user engagement important, but also energy management. The distance of the user to his home determines the energy available for AIRQON. A platform will allow intercommunication of potential users, participants, and event organizers with their needs.

After that, phase 3 will begin, where AIRQON will be implemented in 50 events: 25 in Breda, 20 in Netherlands, and 5 abroad.

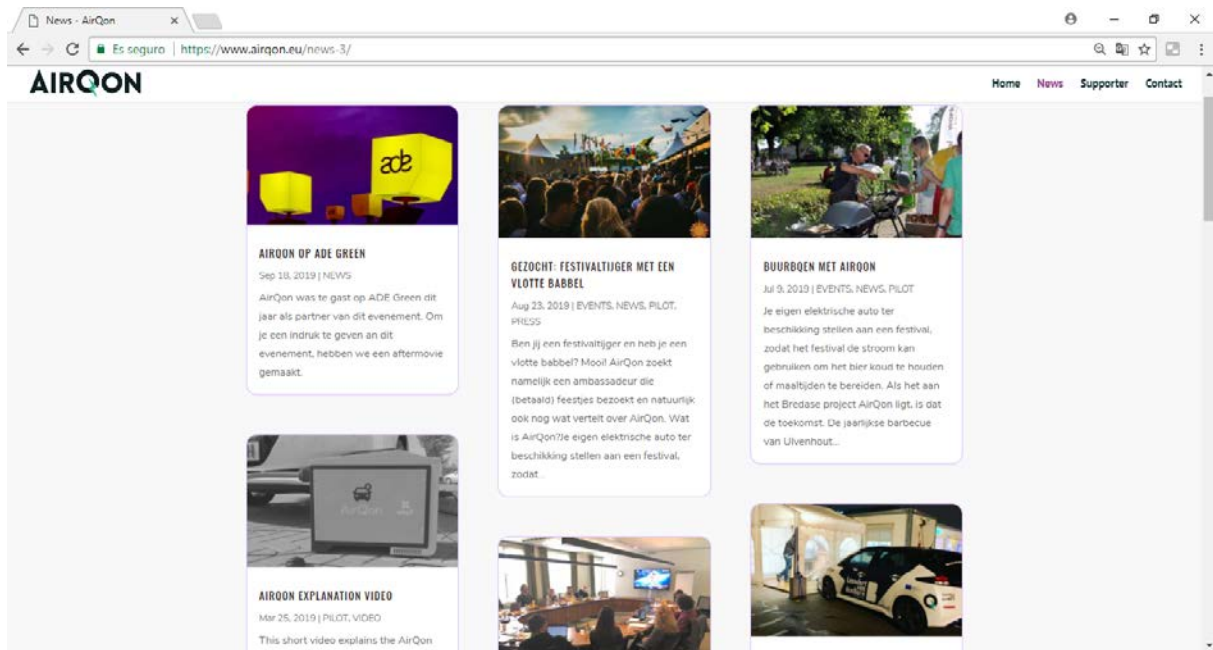


Figure 8: Screenshot of AIRQON webpage, news section



Figure 9: Dissemination in one of the events participated by AIRQON

An intense activity is performed through social media when those events are promoted. This aims to catch the attention of potential participants and future event organizers, as well as, of course, to disseminate the AIRQON

solution. For example, pages on Facebook and Twitter show the latest news and stages covered: <https://www.facebook.com/airqon.eu/> and [https://twitter.com/airqon\\_eu](https://twitter.com/airqon_eu).



Figure 10: A view of AIRQON page on Facebook

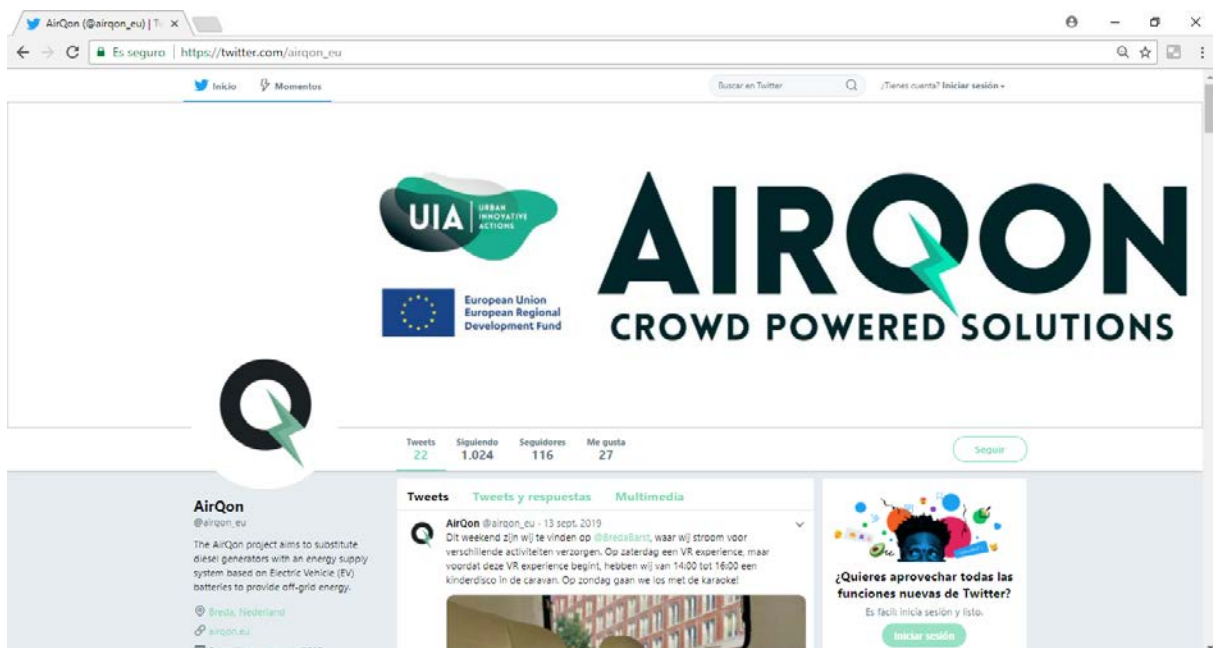


Figure 11: A view of AIRQON page on Twitter

Powering events is the key aspect of the implementation of AIRQON. The size of the event is a capital aspect, since it severely conditions

the energy demands to be satisfied, EV participants availability to do so, and event organizers' necessities.



*Figure 12: Exhibition space powered by AIRQON in Ploegendienst Winterfestival being set up*

# 4. UIA IMPLEMENTATION CHALLENGES

## 4.1. General overview

The table below displays an overview of the UIA challenges and how they are translated for the AIRQON project, indicating by means of a traffic-

light color code the level of risk against each one, according to this first journal released and the status of the project.

**Table 1: Mapping AIRQON against UIA implementation challenges**

Challenge	Level	Comments
<b>1. Leadership</b>	Medium	Breda Municipality leads this project with the aim of writing/developing air quality policy by testing/validating before solutions like AIRQON with event organizers
<b>2. Public procurement</b>	Low	Events organized by third parties. Limited number of possible providers for solutions like AIRQON
<b>3. Cross-department working</b>	High	Necessary coordination with Breda Municipality Events Coordination team. Not to threat event organizers. Positive image projection for the city and events as well
<b>4. Participative approach</b>	Medium	Breda pushes forward public-private collaboration diving deep in technical development
<b>5. Monitoring and evaluation</b>	Medium	University of Utrecht measuring impact before/after AIRQON. Important: identify how effectively AIRQON impacts, lots of aspects to be considered in air quality.
<b>6. Communication</b>	High	Important: engagement of EV owners/users, dealing with their particularities of use. Even more important for EVs and event organizers in the case of other cities.
<b>7. Upscaling</b>	Low	Strength of AIRQON: scaling-up already considered in the Project, expected for May 2020 to have completed 20 events, and 50 events in 2021 (25 events in Breda + 20 events in NL + 5 events abroad)

## 4.2. Detailed analysis

In this section, further details are presented for every UIA challenge addressed in the AIRQON project:

### ✓ Leadership (Risk level: Medium)

***Policy is the reason to be of the AIRQON project. Breda Municipality leads this project with the aim of writing/developing air quality policy by testing/validating before solutions like AIRQON with event organizers.***

The leadership of Breda in AIRQON consist of, as a Municipality, encouraging the use of the EV as an alternative for diesel generators for powering events. In other words, it is not an obligation for event organizers, but Breda Municipality tries to stimulate them in approaching this solution. They reinforce this by describing it in their local policy and by organizing events for disseminate AIRQON. Furthermore, event organizers are informed about the possibilities of this green energy when permissions are released. In addition to this, other municipal departments try to stimulate the use of alternative energy sources as well.

In such innovative project, the leadership of Breda Municipality is based on their experts, able to perform a proper project management, with a convenient background of the technical details related to Air Quality and energy, EVs, etc. Furthermore, they play a positive leading role thanks to their active involvement in AIRQON development, tests and validations, instead of simply prescribing and limiting via local policy. They give the partners of this project space where develop new opportunities. Despite of different areas of Breda Municipality being involved in AIRQON, directly or indirectly, they do not have a Research and Development department itself, but it is an obligation for external parties such as

partners in the project, which bring their expertise to its development.

Breda Municipality takes the opportunity to spread the ideas and goals of AIRQON, not only at a local level but also in regional and national levels. There is a great importance in disseminating and communicating. Breda experts do this by attending technical events and summits with the aim of telling about the AIRQON's opportunities. In addition to this, the perception of AIRQON and Air Quality issues in political leaders is appropriate, since Breda aldermen show enthusiasm about the project, which provides at the same time a fundamental support for implementing the project itself and spreading their ideas.

### ✓ Public procurement (Risk level: Low)

***The impact of this challenge is low in AIRQON. Events are organized by third parties. Limited number of possible providers for solutions like AIRQON, and limited demand.***

Effective engagement of service providers in the definition of the best service is a crucial aspect of this kind of initiatives. In AIRQON, those service providers are implied in every phase of the project, they are an active part of it. But, what about the future? AIRQON will be one of the possible technologies to be employed by providers, maybe not the only one. The project learns about the problems related to the implementation of a system like this; based on these inputs it may be possible to make it a commercial product, but this depends on many factors and, overall, it would be the target for the private partners of AIRQON.

Breda Municipality aims to stimulate the elaboration of technical specifications as much as

possible. This is considered by them as the main target to reach the objectives of air quality, at the same time this lets focus on results and creates the best conditions for innovation. Nonetheless, the partners of AIRQON, not the Municipality, are the ones in charge of shaping the technological aspects of the solution proposed, addressing, at the end, the question of its profitability. After this, policy prescription will come. This kind of approach may lead to a low risk of hyper-specification, at least from the Municipality side, because of the complexity and diversity of those technical aspects of the solution implemented.

### ✓ **Cross-department working (Risk level: High)**

***Necessary coordination with Breda Municipality Events Coordination team. Not to threat event organizers. Positive image projection for the city and events as well.***

The consolidation of effective coordination mechanisms is ongoing in Breda Municipality. It is important for air quality improvement to push from other departments, closer to day-by-day operations, apart from those related to innovation projects implementation. The key group of the urban authority to deliver effectively the integrated aspects of AIRQON are civil servants since they are able to make decisions. In particular, those from the department of Mobility and Environment are the most effective to deliver inputs from the project, since they have wide knowledge about air pollution and the latest technological developments.

An active communication, for example, by sharing measures, conclusions or insights could be a useful driver to establish that implication, as

well as organizing information sessions among municipality coworkers and event organizers. In fact, for EEA, air quality challenges for cities include how to effectively communicate air quality issues to the public, and how to achieve coherent governance across various administrative levels.

This UIA project can be linked with other existing and complementary actions delivered by other departments. In fact, AIRQON works together with other European projects in Breda by cooperating among the connected Municipality employees. Apart from those actions made in Breda in relation to electromobility, environmental and sustainable strategies, etc., AIRQON is focused on establishing strong collaboration with the department that gives permission to events.

Task forces needed to implement AIRQON are coordinated by Tom Rozendal, senior Project Manager. He leads not only Breda Municipality in the project, but also the whole consortium by establishing an open communication style, stimulating and discussing with the partners and diving deep in the technical details. This lets him make decisions to drive AIRQON to the best possible performance, based on that multiple criteria and analysis.

New technologies help this horizontal coordination and cooperation. For internal communication among partners of AIRQON, tools for collaborative project management are used, holding online meetings via Skype, sharing information and documents via MS Sharepoint and Slack, etc. For external stakeholders, social media is used via web page, LinkedIn, Facebook, Twitter, and a specific platform is being developed.



### ✓ Participative approach (Risk level: Medium)

***Breda Municipality pushes forward public-private collaboration diving deep in technical development.***

The consortium, developing AIRQON, provides an effective form of cooperation among public and private bodies. However, Breda Municipality facilitates an ecosystem for implementation, while other partners are in charge of developing the technical solutions. New ideas have to come from other parties; Breda Municipality stimulates this kind of action by setting together parties that have their own expertise in order to have the best inputs for implementing the solutions.

Maintaining the motivation and commitment of all partners is a permanent effort that is being done. Breda Municipality, as leaders, pushes firmly towards common goals, since partners agreed to work on the project, despite sometimes during the development of the project hard moments could arise, as usual in this kind of demanding initiatives. In addition to this, other benefits related can be transmitting a positive image, finding further business opportunities, having public acknowledgment, etc. often going beyond the initial objectives and scope of AIRQON!

### ✓ Monitoring and evaluation (Risk level: Medium)

***University of Utrecht measuring impact before/after AIRQON. Important: identify how effectively AIRQON impacts, lots of aspects to be considered in air quality.***

Results to be obtained in AIRQON will confirm that it is important to take some action on air quality, as a promising starting point to co-design and define further steps after completing the

project. Special attention is being paid in AIRQON to gas emissions from diesel generators, with key performance indicators to be defined to monitor them over the project and capture the degree of achievement of expected results but also the added value of the innovative approach here proposed. An example of those indicators could be the number of events that will use AIRQON technology and the diesel litters not used.

University of Utrecht will study next year the project data obtained and will make research on the reactions of citizens of air pollution. This will be very powerful to move towards the creation of an ongoing learning loop and, hopefully, the determination of permanent actions to be applied after AIRQON.

### ✓ Communication (Risk level: High)

***Important: engagement of EV owners/users, dealing with their particularities of use. Even more important for EVs and event organizers in the case of other cities.***

Communication is important in innovation projects, but even more in the case of AIRQON due to the importance of end users participation, apart from the relevance of disseminating challenges for cities in air quality as pointed by EEA.

This is the key of this project: engaging both the EV users as providers, and event organizers as demand. It must be noticed that engagement is carried out differently regarding aspects such as the event organizer size, if the event is organized by Breda Municipality or by third parties. In addition to this, engagement actions focus in the EV user side as well, regarding if participants are car owners or simply drivers, or if when events are in Breda or outside, to cite some relevant examples.

By now, the main engagement efforts are being done with fleet owners and car lease companies instead of single drivers because of the higher potential number of participants likely to be caught.

### ✓ Upscaling (Risk level: Low)

***Strength of AIRQON: scaling-up already considered in the Project, expected for May 2020 to have completed 20 events, and 50 events in 2021 (25 events in Breda + 20 events in NL + 5 events abroad)***

Since engagement is the key of this project, Breda Municipality carries out intense disseminating

and networking activities in order to communicate with all relevant stakeholders, not only at local level, about progresses, benefits and pros and cons. While events held in Breda already know the AIRQON solution, through different contacts other events outside Breda are reached. An additional effort will be done to reach events abroad to achieve a gradual scale-up and adoption of the AIRQON solution. To do so, it will be useful the help of certain stakeholders, present at national and international level.

Summing up, when should the upscaling process start? → In AIRQON, it is part of the project itself!

## 5. Conclusions and next steps

Air quality is a serious global challenge, where cities play a fundamental role in adopting local measures to improve. AIRQON, firmly led by Breda Municipality, implements a feasible, practical way to power sustainable events. This will lead to policy writing based on real experience, instead of simply limit or prohibit.

One of the key aspects being addressed is the participative approach of the stakeholders, and especially of participants. An active participation of both event organizers and EV users, with their wide diversity, is essential to put into practice this innovative solution and validate it.

AIRQON contributes to present a positive image of event organizers, not only for compliance with regulatory limits or standards, to disseminate and make awareness about sustainability and air quality issues, and to establish a strong link about the event organizers and the EV participants, as their consumers.

The role of car dealers and car fleet managers in a solution like AIRQON are open discussion topics against the rise of leasing models for mobility, in addition to other issues such as EVs' maintenance, guarantees or possible damages, even more in the case of drivers who are not owners of the car. In addition to this, the economic model of a solution like this must be carefully studied: who exactly pays and earns for the energy delivered by a car?

A new bidirectional charger is to be implemented, enlarging the technologies implemented in AIRQON to provide a solution as versatile as possible. Furthermore, a platform will be created to gather event organizers' energy necessities, EV users' availability, engagement and dissemination actions, and the provision of a sort of dashboard, among other features.

Urban Innovative Actions (UIA) is an Initiative of the European Union that provides urban areas throughout Europe with resources to test new and unproven solutions to address urban challenges. Based on article 8 of ERDF, the Initiative has a total ERDF budget of EUR 372 million for 2014-2020.

UIA projects will produce a wealth of knowledge stemming from the implementation of the innovative solutions for sustainable urban development that are of interest for city practitioners and stakeholders across the EU. This journal is a paper written by a UIA Expert that captures and disseminates the lessons learnt from the project implementation and the good practices identified. The journals will be structured around the main challenges of implementation identified and faced at local level by UIA projects. They will be published on a regular basis on the UIA website.



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