The Urban Lab of Europe!

JOURNAL

PROJECT

AirQon - Air Quality through EV Battery Connectivity

Breda, The Netherlands

TOPIC

Air quality

EDIT 12 DECEMBER 2022

BY JAVIER LEIVA, UIA EXPERT

AirQon Journal 2022: get an update about Breda's AirQon Project

See on UIA website

Executive Summary

The demonstration phase of the AirQon project comes to an end. Day after day, the commitment on minimizing the carbon footprint of events is growing, paving the path to disruptive solutions like AirQon. This crowd-powered solution not only avoids the use of diesel generators, but also enables using them in a smarter way, with smaller sizes, better performance, and shorter operation times. Furthermore, the possibilities for integrating AirQon with other greener energy solutions –fixed grid power supply points, battery packs, etc.– has been widely demonstrated.

Diesel generators are the main source of environmental pollution in events. The main categories of air quality pollutants emitted by them are fine dust (also known as PM2.5), soot (masses of impure carbon particles resulting from the incomplete combustion of hydrocarbons), and ultrafine dust (also known as Ultrafine Particles, UFP). In addition to this, noise levels are assessed as another impacting effect of diesel-powered engines.

According to data obtained from specific measurement campaigns, to anticipate some relevant figures, the presence of UFP at a distance of 25 meters due to a 15 kVA generator is twice the concentration given at the baseline scenario, which are worse than those obtained from a 100 kVA generator. PM2.5 are highly present as background concentrations in the air and are often transported over long distances; in this case, the direct impact in PM2.5 emissions due to diesel generators is not as evident as for UFP. However, the impact of soot is severe: at 3 meters, concentrations multiplied by 20 the baseline conditions for a 15 kVA generator, or multiplied by 3 in the case of a 100 kVA generator.

In addition to this, AirQon successfully pivoted to the construction sector. As in the case of the events sector, there is a strong commitment towards zero emissions and reduction of carbon footprint. In this sense, AirQon, thanks to its versatility and adaptability to the progress of the construction, brings added value by contributing to develop more sustainable business models.

Overall, an initiative of this nature responds to environmental and social challenges that involves everyone: public administrations, event organizers, attendees, industries, service providers, citizenship, academia, etc. AirQon promotes an innovative solution that is not moved by prohibition, since diesel generator emissions are not limited by specific regulations. On the contrary, fostering optimal air quality in cities is the key driver to have everyone on board.

Also, electrification of transport, the evolution of energy storage solutions and the generalization of 'mobility as a service' models, among other factors, make feasible today to materialize AirQon as a competitive, sustainable and greener powering solution.

Where are we? The present energy context

We are in the midst of a global context marked, first of all, by economic uncertainty. We can cite as examples the economic cooling due to the pandemic, followed by a post-covid demand shock recently experienced, or how we are currently threatened by inflation and the risk of economic recession in the main economies of the world. Furthermore, there is a trending scarcity of certain raw materials and components, such as chips and semiconductors.

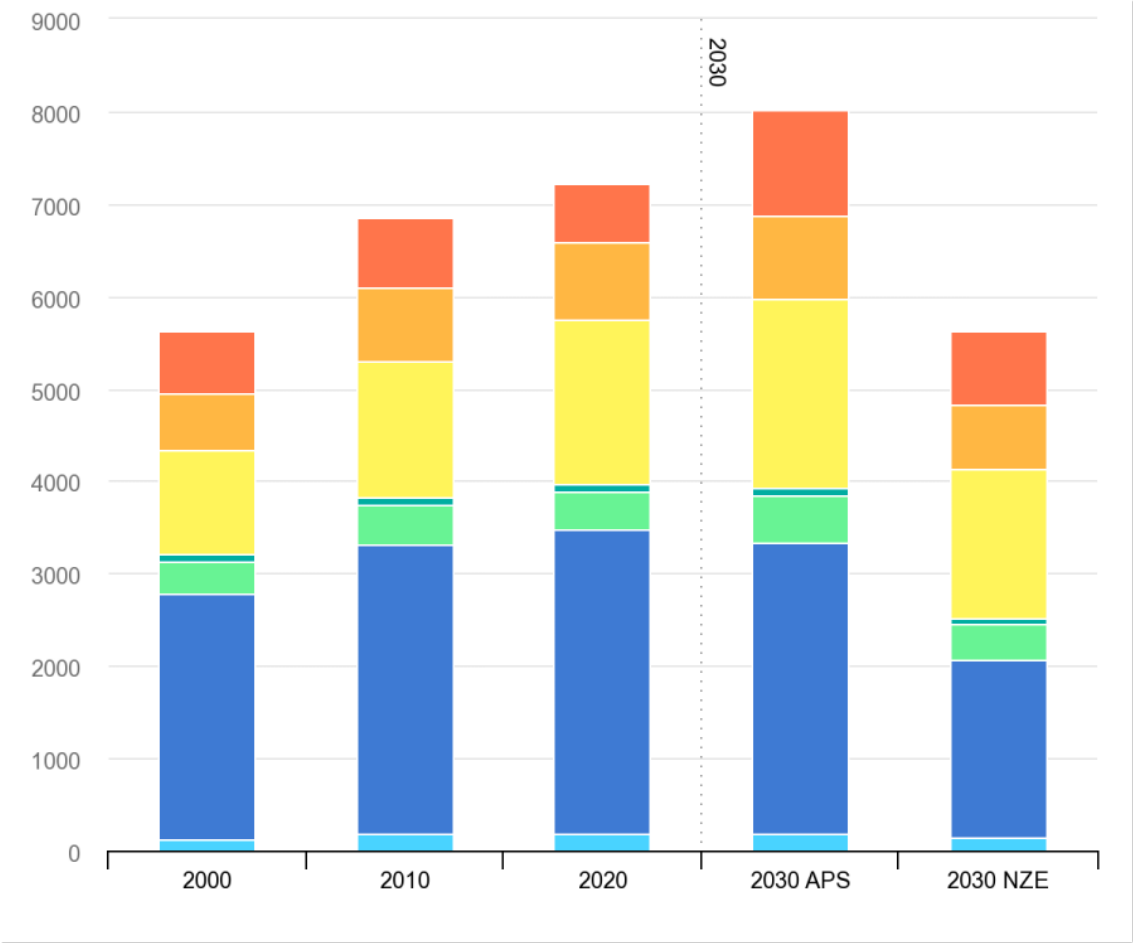
At the same time, another important factor is environmental awareness –fortunately, widely spread throughout the world– in favour of air quality in our communities as well as responsible use of natural resources. All this leads to a straight commitment towards reducing direct emissions of CO2 and other greenhouse gases; minimizing the carbon footprint in economic activities of any kind and nature; and orientating production towards recycling, reutilization and reduction of necessary resources for manufacturing.

Finally, and closely related to the previous factors, we find tensions in the energy sector. Not only in terms of prices, a fundamental factor which has experienced an increase of around 50% in the period 2008-2022 according to Eurostat, but also in terms of environmental impact (leading to the closure of coal power plants, reopening or new construction of nuclear power plants, etc.), involving as well potential situations of scarcity, unavailability and unreliability of power supply in areas such as Central Europe. All this demonstrates, in the end, how a sustainable balance must be sought for the energies to move our world, their associated costs and their environmental impact.

United Nations synthesizes very clearly this trend with the Sustainable Development Goals for 2030, covering all areas of human activity, from transport to industry, energy, homes, and even any other aspect more closely related to the development of communities, such as availability of food, education or health resources.

United Nations Sustainable Development Goals for 2030 (Source: UN. https://sdgs.un.org/goals)

Obviously, the events sector is not left out of this context, in the same way as cities, whose urban communities concentrate 55% of the world's population according to World Bank, and transportation activities, which represent more than 20% of global CO_2 emissions according to the International Energy Agency. Having this framework, AirQon is based on the pillars of commitment to decarbonization, promotion of green energy sources and design of efficient solutions in the use of resources.



Global CO2 emissions from transport by subsector, 2000-2030, considering announced pledges scenario (APS) and net-zero emissions by 2050 scenario (NZE). Colours: light blue, two- and three-wheelers; blue, light duty vehicles; light green, buses and minibuses; green, rail; yellow, heavy trucks; orange, shipping; red, aviation (Source: IEA. https://www.iea.org/data-and-statistics/charts/global-co2-emissions-from-transport-by-subsector-2000-2030)

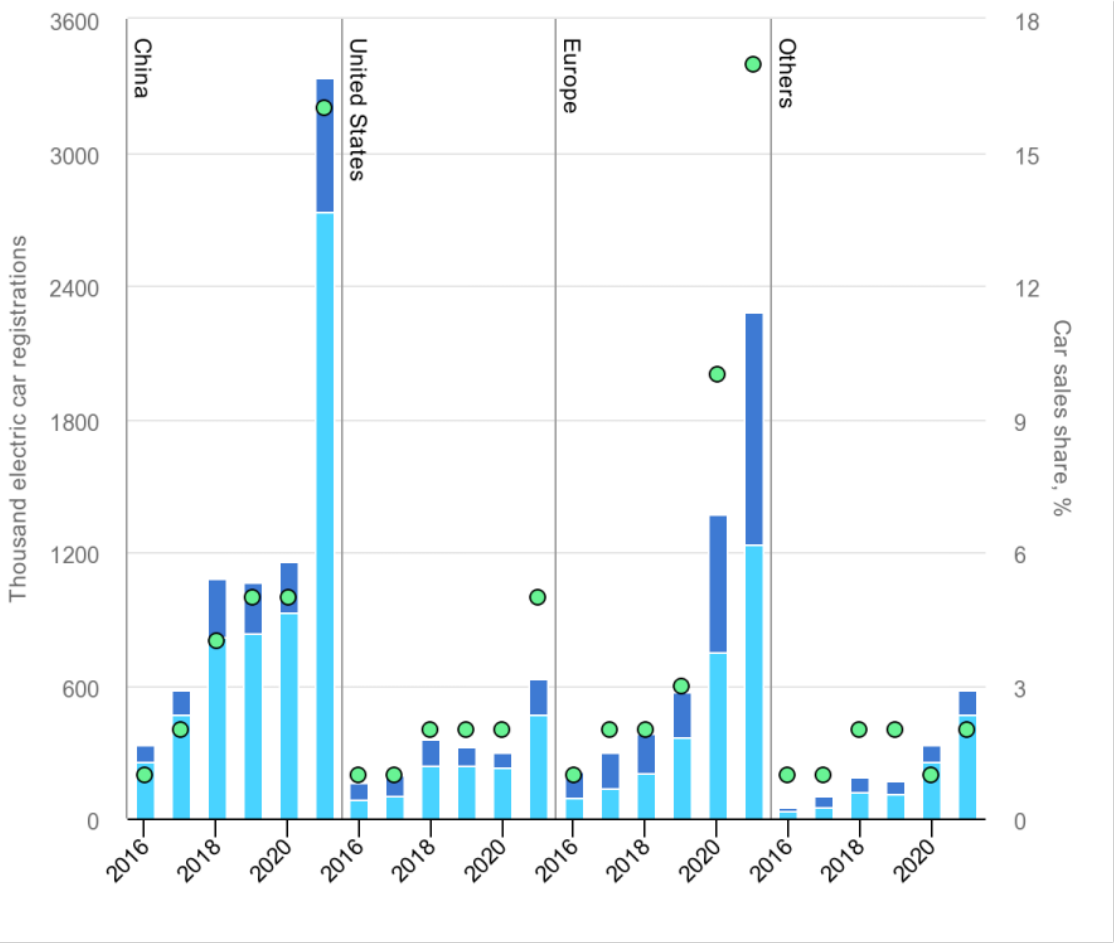
Events are traditionally linked to the use of diesel generators. Whether they are large or small events, located in the city with a distribution network available nearby or in the countryside in the middle of nowhere… Diesel generators are a constant. But an event in full swing does not have the same energy requirements as in its first days of set up, or the day when everything is finally dismantled. Therefore, the operation regime of these generators is not always the same, neither their performance –in fact, it is worse the further it operates from its nominal capacity– nor, consequently, their emissions and fuel consumption. Above all this, a fact draws attention: the lack of regulatory requirements in diesel generator emissions.

Making a simple parallelism, vehicles have different EURO regulations to limit their pollutants and promote technical development to significantly reduce the level of emissions year by year. However, for diesel generators, this absence of limits may lead to being laxer when it comes to sizing what is needed for a given event, for instance. Or being less strict in maintenance actions, or less demanding in investing, renovating or improving this equipment. In short, if there are no clear requirements, the cheapest generators are likely to be chosen, no matter what their pollution implications are.

It is therefore a must to foster alternative power solutions to those based on fossil fuels, which have a direct impact with their local emissions on the communities where the events are held. Moreover, electrification of transport, the evolution of energy storage solutions, a greater availability of distributed renewable generation solutions and the use of the local electricity network are factors that make feasible today to materialize competitive, sustainable and greener solutions like the one developed within the AirQon Project.

Where are we going? Mobility as a service

Decarbonization of transport is one of the greatest technical revolutions that we are experiencing in recent years. In little more than a decade, the electric vehicle has evolved from being a concept solution to become another option in the portfolio of car manufacturers, and a fully integrated actor in our cities.



Electric car sales are accelerating, with China and Europe setting new records. Colours: light blue, battery electric vehicles; blue, plug-in hybrid electric vehicles; green, electric car sales share (Source: IEA. https://www.iea.org/topics/transport)

The generalization of the electric car can be understood under the influence of various factors. Firstly, leasing plans are increasingly widespread models. They acted as an excellent lever to widen the electric vehicle market in countries such as Belgium and the Netherlands, where these plans cover, respectively, 95% and 80% of electric vehicles.

In the Netherlands, electric cars represent 1.5% of the 8 million nationwide registered cars. Indeed, in this country, the relevance of leasing plans is not only limited to electric vehicles, since 60% of petrol-based cars are linked to these plans as well. The increasing success of leasing plans lies in the recent difficulties for direct purchase of vehicles due to supply chain problems, shortage of certain components, etc., which ultimately leads to certain unavailability of stock. In addition to this, inflation makes it difficult for families to make high investments such as the direct purchase of a car. Furthermore, cultural aspects are present when choosing between owning or not a vehicle, as in the case of housing options.

Secondly, in the Netherlands private companies have been the first movers to switch to electric mobility, encouraged by strong tax incentives. At the same time, company cars become an opportunity to extend electric mobility, in the sense that using an electric vehicle for work purposes may lead a person to be interested in this technology for personal use. Even electric cars are used by companies as an additional incentive for their employees, or as a factor for talent attraction, in addition to the positive image projected as a sustainable, efficient, modern corporation.

Furthermore, the AirQon solution, where electric vehicles become a source of energy, materialize a dual purpose for cars: they operate as a powering tool –literally, and whether for personal or professional use, by means of individual private owners, company fleet cars, car sharing, carpooling or leasing plans or any other formula– and as a mean of transport. Indeed, in a certain way, the electric vehicle could be considered as a facilitator of energy distribution and demand electrification, thanks to these applications for vehicle-to-load, vehicle-to-grid, vehicle-to-home, etc. This significantly contributes, therefore, to the generalization of electricity as an efficient energy driver, together with the progressive growing of electricity grids.

Thirdly, and last but not least, there is a change in the mindset of end users. Mobility, supported by the aforementioned factors, has definitely become a service. For instance, the presence of electric scooters sharing services has increased rapidly to the point that, in practice, they can be found in any medium-sized city, together with bikepooling and car sharing services, plus an increase in the use of public transport. So, in conclusion, end users opt for versatility, in the sense that they can move with total intermodality, choosing the most convenient means at all times, with total flexibility

–for example, by downloading and using an app-based mobility service in a couple of minutes. In this context, the possibility of using electric cars, whether privately owned or not, as power sources significantly multiplies their potential. The future of the electric vehicle is nothing but an opportunity for a disruptive, cutting-edge solution like AirQon.

The impact of the solution. Monitoring of results

Diesel generators are the main source of environmental pollution in events. The main categories of air quality pollutants emitted by them are fine dust (also known as PM2.5), soot (masses of impure carbon particles resulting from the incomplete combustion of hydrocarbons), and ultrafine dust (also known as Ultrafine Particles, UFP). In addition to this, noise levels are assessed as another impacting effect of diesel-powered engines.

A specific living lab measurement campaign was carried out in AirQon to assess the emissions of two of the most common configurations of diesel generators used in events: 100 kVA capacity diesel generators, which correspond to medium-sized power sources, and 15 kVA capacity diesel generators, which are small-sized ones. Events are normally powered by using those capacities, or an aggregation of several units of those sizes.

Loads connected to diesel generators, replicating the energy demand of a typical event

The measurement campaign took place outdoors on the premises of the Utrecht University, in an open space located far from strong polluting sources such as highways or industries. Data acquisition was performed over 10 days in October 2020 by locating backpack kits at different distances from the diesel generators, which are the pollutant emitting sources: 3 meters, 10 meters and 25 meters. In the case of 3-meter distance, it represents the effect typically perceived by staff that works in the event itself. 10 meters is the distance for people located nearby diesel generators, as in the case of a food court powered by this kind of generators. And last, but not least, 25-meter distance reflects the effect perceived by any attendee to an event, not directly exposed to the emitting sources, as in the case of anyone in the dance areas or other similar open spaces.

Backpack (left) measuring emissions from the emitting source during the living lab measurement campaign (right)

Moreover, measurements were made considering favourable or not wind conditions, while diesel generators were connected and in operation. In addition to this, background conditions were also measured having them disconnected to determine airborne pollutants and clearly evidence the direct impact due to diesel generators and their emissions.

Throughout the whole test period, the presence of UFP due to the 15 kVA generator goes from 8,000 particles per cubic centimeter of air in the baseline scenario to 16,500 measured at 25 meters, 18,800 at 10 meters or 120,300 at 3 meters. However, the 100 kVA generator leads to lower values: from a baseline of 7,200 particles per cubic centimeter of air, to 13,000, 8,000 and 12,000 at 25 meters, 10,000 meters and 3 meters, respectively. Therefore, in both cases emissions measured at a distance of 25 meters are twice the value of those measured in the baseline scenario, which evidences the magnitude of the local impact of diesel-powered solutions.

Table 1: Presence of UFP (particles per cubic centimeter of air), considering different distances between measurement points and pollutant emitting source

Diesel generator size	3 m	10 m	25 m	Baseline conditions
15 kVA	120,300	18,800	16,500	8,000
100 kVA	12,000	8,000	13,000	7,200

The impact due to PM2.5 is lower. In the case of the 15 kVA generator, from 10 microgram per cubic meter of air in the baseline scenario, emissions raised to 12 microgram per cubic meter of air measured at 25 meters, 13 at 10 meters or 26 at 3 meters. In the case of the 100 kVA generator, emissions remained as well in the same order of magnitude: 21 microgram per cubic meter of air in the baseline scenario, 24 at 25 meters, 23 at 10 meters and 22 at 3 meters.

Table 2: Presence of PM2.5 (microgram per cubic meter of air), considering different distances between measurement points and pollutant emitting source

Diesel generator size	3 m	10 m	25 m	Baseline conditions
15 kVA	26	13	12	10
100 kVA	22	23	24	21

Soot concentration measurements showed a strong impact caused by the diesel generators. In the case of the 15 kVA generator, it went from a baseline of 0.4 microgram per cubic meter of air to 9.9 at a distance of 3 meters, which means multiplying it by 20. At 10 meters, the values were 8 times higher, reaching 2.9 microgram per cubic meter of air. And finally, the values doubled to 0.7 microgram per cubic meter of air at 25 meters. In the case of the 100 kVA generator, the values at 25 meters were three times higher than in the baseline scenario, going from 0.5 to 1.7 microgram per cubic meter of air.

Table 2: Presence of soot (microgram per cubic meter of air), considering different distances between measurement points and pollutant emitting source

Diesel generator size	3 m	10 m	25 m	Baseline conditions
15 kVA	9.9	2.9	0.7	0.4
100 kVA	3.0	1.2	1.7	0.5

Background conditions must be carefully considered. On the one hand, UFP are low in the background air and remain

fairly stable throughout the tests. On the other hand, PM2.5 are highly present as background concentrations in the air, with high variability, and are often transported over long distances, so, in this case, the direct impact due to diesel generators is not as evident as for UFP.

Measurement campaign with backpacks in progress during an event

This emission assessment is being complemented with on-site measurement campaigns during events, as in the case of Breda Barst. The goal will be to compare the data obtained in every edition, taking into account the green powering solutions adopted –for instance, the AirQon solution, battery packs or fixed distribution grid supply points–, but also any other initiative oriented to a more efficient energy planning –for example, changes in diesel generator sizing, or to combine them with batteries for peak shaving purposes–, so the impact of all these could be conveniently evaluated.

Pivoting to other sectors. Construction sites

AirQon, despite being originally oriented to events or festivals, can be suitable for supplying electricity to other relevant activities in terms of urban and environmental impact. This is the case of the construction branch, which brought an interesting opportunity for scaling up the AirQon solution, especially during the significant decrease in the number of events in 2020 due to the COVID-19 pandemic.

Construction sites normally get connected to the electricity distribution network to feed their energy demands, but sometimes the electricity network may not be accessible, or technical requirements make it unfeasible: potential risk of impact in monuments and interference with other nearby urban infrastructures such as water or gas are examples of this. This is the ideal scenario where off-grid solutions like AirQon meet the requirements in a greener way. Furthermore, AirQon fits well with construction works in those sites where there is no hosting capacity available on the grid.

AirQon being used in a pilot test with construction machinery

The maximum power delivered by the AirQon solution, 15 kW, and the battery capacity of a standard electric car, around 40 or 62 kWh, are enough for commuting and powering small machinery in a normal workday. Thanks to this, the AirQon solution has been used to power some small machinery, such as hammer drills, in construction works. Furthermore, AirQon is used as an off-grid power source for on-field technical offices that can be found in any construction sites, that need supply for lighting, air conditioning systems, laptops, etc. All this can be perfectly powered with the energy coming from crews' electric vehicles.

Moreover, AirQon applied to this sector has been incorporated to an all-in-one energy solution which consists of a large container equipped with solar photovoltaic panels on the top, wind generators, and batteries to store the energy not being consumed immediately. This equipment works as a power source plus and energy buffer, equipped as well with an AirQon device for the bidirectional connection of electric vehicles.

All-in-one energy solution where AirQon is integrated

This sustainable container can be placed in the base station of the contractor or in principal construction sites. Apart from providing power to on-site energy demands, the AirQon solution can charge the vehicle plugged in. After this, the car, already charged with renewable energy, could be used to go to another construction site and to power there any small machinery as previously indicated. In addition to this, the presence of AirQon allows to use the battery of the car as an additional buffer capacity for the global all-in-one system.

This application is interesting for construction companies also thanks to the added value of applying the AirQon solution here. On the one hand, they let them use their electric vehicle fleet for much more than just mobility purposes, and this helps them, at the same time, to become more efficient and decarbonized. On the other hand, they can improve the perception of their customers by developing a more sustainable business model. This means that sustainable construction can pay attention not only to the use of materials or the energy consumption of a building once finished, to name some examples, but also to consider greener solutions to be used from the beginning, from the early phases of the construction works.

Based on this development, a startup called Electure has been founded. Starting from a first *Minimum Viable Product*, 5 more containers have been built, fully modular, including batteries, renewable generation such as solar photovoltaic panels, a module to connect to the electricity distribution network if available, plus a biofuel generator or even hydrogen-powered generation.

In conclusion, construction sites are on the same page as events. There is a firm demand from public administrations to reduce their CO_2 emissions, but about going full-electric, going only battery powered, etc., there is not a categoric response. But for sure the solution must be driven by flexibility and versatility. Furthermore, centralizing the power source in a construction site, eventually, may lead to have a risky, inefficient working site full of wires. On the contrary, having a total dispersion of power sources is not the best option at all. Energy must be decentralized, available wherever it is needed, with complementarity between on-grid and off-grid solutions, and adapting to the progress of construction. And, undoubtedly, AirQon has demonstrated to be a perfect solution to meet all these requirements.

UIA implementation challenges. 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 colour code the level of risk against each one, according to this second journal released and the status of the project. Changes in the levels in comparison with the previous Journal are indicated in brackets.

Challenge	Observation
Leadership Challenge level 	An initiative of this nature concerns environmental and social challenges that must involve public administrations, industries and services, citizenship, academia, etc. It is also worth highlighting the expansion of the scope of the project to the construction sector.
Public procurement Challenge level 	Events organized by third parties. Limited number of possible providers for solutions like AirQon.
Cross-department working Challenge level 	An increasing promotion of sustainable strategies is being carried out within the Breda Municipality, not only oriented to events. Breda is in favour of hosting events. They attract visitors to the city and promote the growth of local economy, despite they are not only a concern of energy but also of waste or noise.
Participative approach Challenge level 	Event organizers' commitment is essential for implementing cleaner energy sources to meet zero carbon and zero emission goals. But implication of the community is key to make this possible. Technological evolution of electric cars and adoption of 'mobility as a service' models contribute to surpass barriers related to battery range.
Monitoring and evaluation Challenge level 	Measurement campaigns pointed out the strong impact of diesel generators on air quality. Environmental factors and externalities may interfere with air quality measurements, so they must be carefully considered. A great effort is made to catch and quantify the impressions, perceptions and opinions of event attendees, citizens, electric vehicle users, etc. as another important source of information.
Communication Challenge level 	The public is increasingly more familiar with innovative models such as mobility as a service. Communication is an enabler for effective engagement of the community. Recovering normal activity in the events sector has made it possible to disseminate by doing.
Upscaling Challenge level 	AirQon is applicable in events of all types and sizes and has pivoted to the construction sector with success. It stands as an alternative to diesel generators, but also as a complement to other power sources. Present and short-future technical features of electric vehicle work in favour of its applicability.

UIA implementation challenges. Detailed analysis

- **Leadership (Risk level: Medium)**

  Once again, it must be highlighted the appropriate way in which the Breda Municipality leads the project. However, it cannot be overlooked that not only an initiative of this nature, but also the environmental and social challenge that it entails, are everyone's business: public administrations, industries and services, citizenship, academia, etc.

  It is also worth highlighting the expansion of the scope of the project to the construction sector. Although it was a sector that was considered in the initial phases of the project, the outbreak of the pandemic and the stoppage in the events sector accelerated this scale-up, with outstanding results.

  Breda is firmly committed to hosting events in the city, and is at the same time strongly focused on sustainable development. The idea to combine both factors is not to promote change through prohibition or restriction, but by promoting innovative solutions such as AirQon, given that events are a source of opportunities, wealth for the city and economic development of the city and the different sectors of activity involved.

  These are all the necessary ingredients to lead properly this demanding project and drive it to success.

- **Public Procurement (Risk level: Low)**

  One of the main aspects to take into account in this regard is that Breda Municipality is not the only agent that organizes events, therefore, not everything depends on it. In any case, the Municipality promotes sustainability, as it does precisely by leading this project, and more efficient alternatives for powering events, such as by offering public fixed electricity distribution network power supply points; that is, far from a prohibition or limitation model, as in the case of other cities that directly prevent the use of diesel generators.

  It should not be ignored that providers capable of offering something like AirQon may be few, although there are progressively more options in the market for supporting green, efficient events. AirQon is a solution that continues to be very disruptive, although there are very valid and powerful sustainable solutions such as battery packs of all kinds, which can be combined with diesel generators and make their necessary size smaller, or also with the fixed electricity distribution network and finally avoid the use of diesel. Furthermore, other technologies are also arising, such as hydrogen-powered generators, able to charge batteries without local emissions at all, although they are still in a very incipient status and present strong safety implications that may condition their scale-up for events.

- **Cross-department working (Risk level: Medium)**

  This aspect of AirQon is progressively growing. An increasing promotion of sustainable strategies is being carried out within the Breda Municipality, such as, for example, adopting measures of this type in the constructions that they develop. In addition to this, mobility strategies in the city are inspired by encouraging public and non-pollutant means of transport. And also, in short, there is a commitment towards going green and electric-powered instead of fossil-based energy sources, not only for events but also for other temporary actions such as street markets, parades, festivities or fairs.

  The feeling is very good in the city because Breda is a very liveable, joyful city. Nevertheless, there are important open points for discussion like hosting a big amount of events or not, where the events should be located, the potential impact of the attendance that they imply, etc. Nevertheless, the Municipality is in favour of hosting events, which implies attracting visitors to the city and promoting the growth of the local economy.

  Actually, from Breda Municipality point of view, AirQon is not only concerning energy. It is another element of a wide strategy towards sustainability, which means that there is a strong concern about waste, noise, emissions… for most of the people living in the city, in general, so it is not just limited to an issue of using diesel generators or not in events.

- **Participative approach (Risk level: low)**

Per se, this initiative is based on participation. On the one hand, there are the event organizers, who luckily have recovered their activity after the COVID outbreak. On the other hand, the participants who collaborate with their electric cars. The former is essential with their commitment to cleaner energy sources for their events, to ensure air quality and to move towards zero carbon and zero emission goals. The latter are equally important, having that their implication is essential to have green energy for powering events.

In favour of the feasibility of this solution there is the evident technological evolution of electric vehicles. That means that we are going to surpass thresholds related to battery range, bidirectional functionalities, etc. that until now, more or less consciously, could prevent the materialization of AirQon.

To this is added the present concept of mobility as a service, which also favours disruptive technologies such as AirQon. This drives us to flexible, adaptable and evolutionary models more likely to match with crowd-sourced solutions like this. And the role of construction sector in AirQon cannot be forgotten as another field where it can be used to improve air quality in urban areas, having the adaptability of the AirQon solution to the needs of each moment in construction sites. This is therefore a new business model that brings new participants and new stakeholders.

- **Monitoring and evaluation (Risk level: Medium)**

  The different measurement campaigns performed during the development of the project point out, once again and with proven quantitative evidence, the strong impact of diesel generators on air quality. Measuring is essential to evaluate the strategies adopted, so the procedure to do so must carefully consider how environmental factors and externalities, such as traffic, weather conditions and other sources of external pollution, may interfere with air quality measurements.

  Returning to normality in the celebration of events, especially regarding those that concentrate a greater number of attendees, has allowed AirQon to continue delving into performance and emission assessment of generator. In this sense, it cannot be overlooked the fact that there is not a firm regulatory framework to limit and establish emission standards due to them.

  In addition to this, it must be highlighted the effort made within the project to catch and quantify the impressions, perceptions and opinions of event attendees, residents of Breda, electric vehicle users, etc. Personal opinion is another important source of information, so it is an aspect that must be taken into consideration for monitoring the progress and achievements of the project.

- **Communication (Risk level: High)**

  The dissemination of a technology-driven, disruptive solution like this to the general public is a challenge. Nevertheless, the population is increasingly more familiar with innovative models such as mobility as a service. In fact, communication can be an enabler for effective engagement of the community, and events are excellent moments for demonstrating AirQon, apart from using it to power them. Event organizers believe in the solution, and put it into practice. Indeed, often event organizers are partners of the AirQon consortium, which is a fundamental driver for success.

  There have been small to big events, some of them even world-class, such as La Vuelta, and in all of them AirQon has taken the opportunity to spread its benefits. Recovering normal activity in the events sector, in particular, once the COVID situation has been overcome, has made it possible to disseminate by doing, facilitating the involvement of participants and, in the end, allowing the development of a proper level of activity in the project.

- **Upscaling (Risk level: Medium)**

  Undoubtedly, this is one of the strengths of the AirQon solution. It is easily applicable in a wide range of events, of all types and sizes, as it has been evidenced throughout all the implementations carried out. It has been also applied to the construction sector with outstanding success. And above all, it can not only stand as an alternative to diesel generators, but as a versatile complement to other sustainable and efficient solutions, such as on-grid connection to the distribution network in the area, battery packs, renewable energy-powered solutions, etc.

In addition to this, the evolution in technical features of electric cars work in favour of applications like this, given the greater usability of electric vehicle batteries nowadays. The success depends, anyway, on a convenient engagement of the user community, as the crowd-powered energy solution that it is.

Conclusions and lessons learnt

AirQon continues to gain popularity and acceptance, participating in events of any nature and serving as well in construction sites.

Diesel generators are the main source of environmental pollution in events, but they tend to be oversized, no matter the real energy requirements along the preparation and dismantling works. The further they operate from their nominal capacity, the worse the performance and emissions will be.

AirQon has been successfully incorporated to an all-in-one energy solution, gathering solar photovoltaic and wind generation and batteries to store the energy not being consumed immediately. This equipment can operate as a power source plus an energy buffer, equipped with an AirQon device for the bidirectional connection of electric vehicles.

Increasing electric vehicle sale shares, generalization of ‘mobility as a service’ models and technology evolution are drivers that pave the path for this crowd-powered solution. The future of the electric vehicle is an opportunity for AirQon.

Air quality

See on UIA website