



The Urban Lab of Europe!

JOURNAL

PROJECT

DIAMS - Digital Alliance for Marseille Sustainability

Aix-Marseille Provence metropole, France

TOPIC

Air quality

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Journal #4: The final year for DIAMS

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This is the fourth and last journal for the UIA project DIAMS (Digital Alliance for Marseille Sustainability). The Aix Marseille Métropole has led this four-year project which aimed to create a community around the topic of air quality in the metropolitan area of Aix-Marseille by means of new numerical tools and an exchange online platform. This last year of implementation the project is facing new challenges regarding the monitoring and the evaluation of the project; and defining and building-up the post-project community based on the best-practices learnt from the project.

Project's progress

What has happened with the project since its end date

DIAMS finished two months ago, in October 2022 with the closing meeting. Since its official end, some webinars sharing the results of the project were scheduled and well attended. More concretely, the webinar reporting the results of the comparison of air quality levels with the diversity of the pollen collected in beehives in the Métropole took place in November and that had a large turnover. Also, the webinar how to use the portable sensors available from the project have continued to be scheduled since then.

However, it's time to wrap up the project. In this last year of DIAMS, the AMP has defined the areas of evaluation with qualitative and quantitative indicators. The evaluation of the impact of DIAMS in the community and in the society can be divided into two aspects: the performance of the project and the impact of the project on the society. The latter aims to evaluate the impact on the community and the take-back-home message that beneficiaries might take from DIAMS. The AMP designed a set of questionnaires to be distributed among participants in some of the engagement activities and those were distributed at the beginning, during and after the activity.



Measurements from small sensors were linked to the biodiversity of pollen present in beehives. Results from this DIAMS initiative were presented in a webinar on 15 November 2022.

What is the project's plan for long-term sustainability?

There are two main areas for the long-term sustainability of the DIAMS community. The first, the online platform, the apps and the mathematical modelling tools put in place during DIAMS. Those are going to be maintained by AtmoSud, the association responsible of the monitoring and evaluation the quality of the air in the region including the Métropole. However, the updates associated with the update of operational system in phones and PCs might depend on extra funding not identified at the moment. At the short-term, AtmoSud is planning to share directly the expertise gain through DIAMS about the use of portable sensors with other observational networks in France. To start with, Martinair, the association responsible for the monitoring and the evaluation of the quality of air in the Isle of Martinique, is going to benefit from this expertise.

The second aspect about the long-term plans of DIAMS is the availability of the 2000 portable sensors which were built for the project. The sensors are planned to remain available for the community. Some are going to be kept by AtmoSud, others by the Métropole. The AMP plans to put the sensors available for the community and ideally through association with a defined pedagogic project with workshops and animations focusing on one aspect around the topic of poor air quality.

Generated Knowledge

Lessons learnt: the implementation challenges

Public procurement processes in local authorities and innovative projects

Public procurement processes in local authorities are slow and need to be planned well ahead. The temporal framework in public procurement processes is often a limiting factor in innovative projects where quick solutions should be found.

One of the solutions found by the local authority to speed up the public procurement processes was to launch the call for tenders and call for services through another partner in the consortium.

That is something that future innovative projects should consider. In general terms, the procurement processes in public institutions not fully respond to the needs of innovative projects, with slow time frames whereas innovative ideas need a fast turnover. The leading team at the AMP found a partial solution by launching the call for services and call for tenders through one of the partners but this is not fully desirable as a solution. Despite it showed to work for UIA DIAMS, this means that the procurement process is led by another institution rather than the leading team at the local authority with its implicit risks.

Working in partnership with all the partners of the consortium

The Participative approach for co-implementation was the most challenging aspect of DIAMS in the first three years of the project. The origin of the challenge was mostly associated with the strong personality of one of the partners which was the leading one at the proposal stage and led most of the writing of the project. As indicated in Journal #3, the AMP tried different approaches to overcome this which were unfruitful. The exclusion of the partner was not evident as the DIAMS proposal was well designed around the partner and many tasks were assigned to it.

Many contingent plans for risks along the implementation of a project can be designed at a first instance. However, the non-cooperative behaviour of one of the leading partners is difficult to plan.

Working with a non-collaborative partner is difficult and slows the delivery of the project without mentioning the deterioration in the ambiance that might create among the consortia.

Lessons learnt: communicating air pollution

The use of portable sensors to engage with citizens

One of the innovative aspects of DIAMS was the use of small sensors available for local authorities, associations, and general public to increase the knowledge about air quality and promote sustainable behaviours. The UIA DIAMS consortium made available two thousand small and portable sensors for the community. The sensors measured concentrations of fine particles and measurements were displayed on a telephone app. Data was also upload to a data repository designed for the project. A large communication plan around the use of portable sensors were made in the territory accompanied by a website with videos, tutorials and a FAQs section. Furthermore, a webinar was designed and fortnightly scheduled; an informative book was created and distributed among users; and a call centre was put in place to respond to queries and questions.

The use of portable sensors in citizen engagement projects is a valuable and effective approach to improve public participation in environmental projects. Previous experiences in other cities suggest that the experience with the sensors, in comparison with those participants which were only provided with the traditional information (e.g., talks, dashboards, etc.) generates greater motivation among citizens. The use of sensors in a practical way and the exploitation of own-collected data created awareness of the problem of air ([Oltra et al., 2017](#)). Poor air quality is not an observable metric – except for numbers and coloured dots displayed on maps - which are not always understood by non-specialists of the field. Observing the concentrations as measured by oneself might bring closer the meaning of air pollution levels and might induce a reflexion about one's actions.

Another advantage of sensor data collected from citizen initiatives is the increase the monitoring capacity by expanding the spatial coverage of that from reference networks. These data can be used to validate numerical models which in turn can be used to identify sources or activities which might have an impact on the quality of the air. DIAMS have been using new data logged through the project framework to reduce emissions from port activities, estimated to be of 10%. Furthermore, from the sustainable and engagement perspective, environmental measurements from portable sensors can play an important role to help citizens to understand the problem and look for solutions of improvement.

Despite the power and all the support put in place to help and lead citizens in the usage of sensors, an irregular partner of usage and engagement was observed. The degree of engagement depended on the personal interest. It was also observed that whenever citizens belonged to a group with all members using the portable sensors at the same time, citizens kept highly motivated and keeping the sensor on for longer. Those people which used the sensor on their own, logged measurements for a period not longer than two weeks or a month.

Working with schools in environmental projects

This component of the engagement project of UIA DIAMS was proved to be one of the most efficient. Two partners were leading the engagement with primary schools and created a set of pedagogic material based on the usage of portable sensors and new numerical tools. Students had to present the material to their parents, widening the engaging capacity of the approach.

The inscription of the schools to this program was voluntary and it proved to be successful whenever the school management team was involved and engaged. The teaching community welcomed this program due to the innovative character of the content and the importance of air quality as environmental hazard. Also, teachers welcomed the new pedagogic approach, based on the use of portable sensors and data collected by students, which was innovative and new to them as well.

Engagement with industries and business

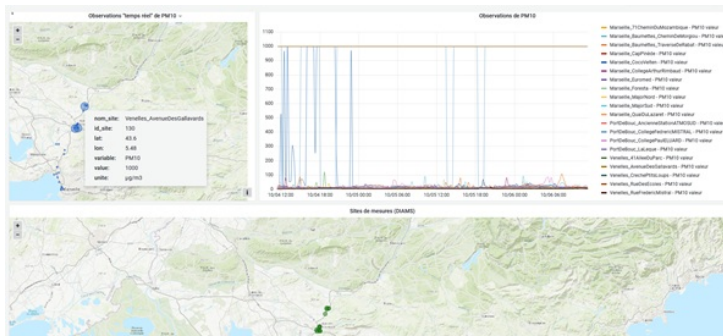
One of the main challenges regarding the communication with target beneficiaries was the engagement with business and industrial partners. This community was one of the main targets of the project as one third of emissions in the AMP are due to industrial emissions. However, industries face the challenge to be competitive in global markets and improve environmental standards might not be a priority once complying with the existing legislation.

The engagement of business and industries was weak at the start of the project and that represented a large challenge for DIAMS. Several meetings with individual industries were held during the first and the second year of implementation but they were not fully satisfactory. A new direction was then taken and DIAMS approached the [PIICTO](#) community which groups a total of 13 industries and the Great Port of Marseille. PIICTO represents an industrial platform engaged with the circular economy. The AMP delivered a series of talks, and this resulted with the engagement with 6 of the industries with one of the UIA DIAMS partners (ARIA) in the area of air pollution emission modelling.

Another big step in the engagement with industries was the cooperation between the Great Marseille Port and AtmoSud. The project with the Great Marseille Port aimed to improve the emission rates of air pollutants associated with the ship and boat manoeuvre within the port area. A numerical model was developed to improve the manoeuvre within the port to decrease the fuel consumption to eventually decrease the emission rates of ship emissions to the atmosphere. The recommendations from the numerical model was later applied in the real-world.

A new group of industries which engaged with UIA DIAMS was the biomass boiler room for the Aix-en-Provence heating network. However, it should be mentioned that this collaboration was motivated by a new piece of legislation that forces the industry sector to undertake environmental actions.

The DIAMS online platform: a new repository for air pollution



Web-interface of the UIA DIAMS online platform where data, apps and numerical models are gathered in one place. Data is available via API and usable through a [Licence Open Data Commons \(ODbL\)](#).

One of the main relevant achievements of DIAMS is the new data portal where ambient levels of air pollutants measured in the territory are gathered in just one place. Data sources include data from reference instruments collected by the association in charge of the surveillance of air pollution; and data logged by users, associations and local authorities new measurement sites within the DIAMS framework. Measurements collected by the ensemble of the DIAMS community were upload in the online platform where citizens can also find information about air quality, sensors and other numerical services that can be in turn of their interest. The added benefit of the DIAMS online platform resides in the fact that sensor data from citizen initiatives can be combined and compared with official reported data. Data can be exchanged by an Application Programming Interface (API).

Recommendations to other urban authorities who wish to implement similar innovative projects

Usage of portable sensors

One challenge associated with the usage of portable sensors in citizen-based projects is the operation and the high maintenance. The large number of portable sensors in DIAMS (two thousand) was translated in a huge logistic plan which included the calibration and regular maintenance of sensors. Cities might carefully think and plan well ahead the logistic plan of the distribution of sensors: how to deliver, how to recover the sensor from

those distributed, the time needed between two users for calibration, etc.

Another aspect that engagement projects based on the use of sensors should consider is the accompaniment and support plan to make sure that citizens are using the sensors in the right and in a significant manner. DIAMS produced a lot of material available for citizens, but this was proven not to be enough.

One of the take-home messages from the DIAMS experience is that the usage of sensors by non-specialists should be accompanied by face-to-face workshops, animations and talks. Despite the power and all the support put in place to help and promote the usage of sensors by citizens, an irregular pattern of usage and engagement was observed. The degree of engagement depended on the personal interest. It was also observed that whenever citizens belonged to a group with all members using the portable sensors at the same time, citizens kept highly motivated and keeping the sensor on for longer. Those people which used the sensor on their own, logged measurements for a period not longer than two weeks or a month. Whenever citizens found themselves to be “sampling” for the common interest for a community (whatever the size and the theme, being an interest group, a neighbourhood, an educational community in a school, etc.), the interest and the engagement of the public is longer in time and measurement campaigns are undertaken in a better way.

Engaging with industries

The engagement of industries and business is still weak in environmental projects and depends on the obligatory nature of the current legislation. In the case of DIAMS, the most successful collaborations arose from those industries which were engaged with the environment through the PIICTO association, engaged with circular economy.

Municipalities have little power to change this. Unless the national and the European legislation enforces the environmental targets and engagement for industries, municipalities might lose their competitiveness in front of other cities that put less pressure on them. However, municipalities should continue to design pedagogic plans for industries offering the opportunity to contribute the improvement of environmental actions by simple actions: by improving the transmission and the dissemination of real-time emission data; by improving the management of air quality crisis; by restoring the confidence in standard events; among other examples.

Evaluation of behavioural change associated with environmental projects

The evaluation of the impact of an environmental project which involve citizen participation is challenging. Behavioural change can be evaluated by means of questionnaires or interviews but that requires of trained staff and resources. In the case of DIAMS, the volunteer basis of the questionnaires distributed in some of the engagement activities meant that some participants did not participate in or dropped along the process. Future evaluations should try to motivate the response of this questionnaires. Including social scientists and sociologists in the team might help in the design of questionnaires and a better response from participants.

Another aspect to take into consideration when designing environmental projects with citizen participation is the action plan to reach all parts of the society. Most people mobilized and engaged in environmental projects usually have a high degree of involvement in different environmental initiatives before the development of a new project. Reaching to the sceptical part of the society might be difficult. The school project as implemented in DIAMS might be a first step to approach them. Children and young students might be a vector of change in all families.

Conclusions

Boosting education, training, public awareness, and public participation are some of the relevant actions for maximizing the opportunities to improve environmental pollution ([UN, 2015](#)). In this context, the UIA DIAMS project aimed to improve citizen’s knowledge about air quality to first increase the knowledge among all actors of the society; to eventually promote actions to reduce ambient levels of air pollutants that persist on time and on the territory.

The engagement program of the UIA DIAMS is one of the key points of the innovative project. One of the main objectives of the project was to change the lead in the governance of local air quality policies, from top-down (designed and implemented from institutions to modify or adapt the actions of citizens and society) to bottom-up (led by the society and implemented in a cooperative way between institutions and society). To achieve this, a wide engagement program was designed by the DIAMS consortium.

The engagement program of DIAMS was wide and focused on different sectors of the society (schools, citizens, local authorities, business) and different air pollution sources (transport, biomass burning, ship emissions, industrial emissions, etc.). One of the most challenging aspects of communicating air pollution is the lack of visibility. DIAMS approach using portable sensors and to promote citizens to take their own measurements makes the invisible more visible and more personal. The use of portable sensors was not just promoted to be taken by individuals but also within interest groups.

The online platform of DIAMS has been also one of the golden achievements of the project. It's a dedicated space where data, numerical services and numerical business emerge. Data in the repository belongs to the territory. Data sources include data from reference instruments and data generated by users, associations and local authorities new measurement sites. General citizen's knowledge about air quality is weak and the official online databases created by country's Environmental Agency which report the official air pollution levels are not usually the main source of information for citizens ([Canha et al, 2022](#)). The dedicated online platform centred in the Métropole can foster the interest of citizens for the levels of air pollutants that they breath. Bringing air pollution levels closer to the citizens is a first step to increase their willingness to know. There is a need for governmental stakeholders to promote the awareness of this territorial online platforms, to empower the general public with knowledge about their local air quality to induce a positive change that might induce local actions with the aim to improve the air quality levels.

One of the pitfalls of DIAMS is the lack of a proper evaluation of the behavioural change associated with the different activities deployed. Some questionnaires were distributed to participants but not in all activities. Furthermore, the participation was done on volunteer basis. A proper quantification and evaluation of the activities that resulted into a better knowledge of the problem of poor urban air quality and promoted a possible change of behaviour and routines among participants might have been interesting. Also associated with the evaluation of projects, the nature of public projects based on fixed funding, long-term impacts on the society are difficult to evaluate. Social changes are slow and sometime needs more than a decade to see the results. But in the positive side, DIAMS has contribute into promoting a change towards a more sustainable future.

Another lack of the project was the structure for a participative approach in the governance of municipal air pollution policies and measures. When DIAMS kicked-off in 2018 the AMP had a history of no more than two years and therefore the municipal structure was too young and not mature enough to incorporate such mechanisms. However, the AMP has been advancing in the legislation of local measures to improve air quality. For instance, in September 2022 the Métropole gradually implemented a low emission zone (LEZ) in the centre of Marseille. The aim of the LEZ is to reduce population exposure to road traffic emissions to protect inhabitants and professionals who are exposed to it. Such measures are not always welcomed by local residents and business; however, programs such DIAMS that engage with the knowledge of air quality might help the acceptance of such policies.

Last but not least, this type of innovative projects base on data, the consortium should prioritise that data is going to be accessible in the future. This requires a data management plan at the outset of the project ([UKOEF, 2020](#)). Just by only ensuring long-term observations of air pollutants the success of environmental policies can be evaluated ([Fuller and Font, 2019](#)).

Air quality

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