

JOURNAL

PROJECT

DIAMS - Digital Alliance
for Marseille
Sustainability

📍 Aix-Marseille
Provence métropole,
France

TOPIC

Air quality

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Journal # 3: The challenges for the UIA DIAMS project

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This is the third journal for the UIA DIAMS (Digital Alliance for Marseille Sustainability) project led by the Aix Marseille Métropole. In terms of air quality, 2021 was characterized by the reduction of recommended levels by the World Health Organization (WHO) to protect human health. For fine particles, the limit decreased from $10 \mu\text{g m}^{-3}$ to $5 \mu\text{g m}^{-3}$ as annual means. This new health guideline is based on the revision of scientific evidence. All the population in the Aix Marseille Métropole is exposed to particle levels that exceeded the WHO health threshold putting in evidence that more actions should be designed and put in place to tackle poor air quality levels to protect human health. The UIA DIAMS project is indeed a tool that might help to achieve this objective.

Executive summary

For DIAMS consortium, this year was characterized by the distribution of tasks and budget associated with the

exclusion of one of the lead partners. The collaborative approach for implementation improved within the consortium. The engagement plan with citizens and the use of portable sensors was totally reformulated and the AMP launched two types of procurement processes: call for projects and calls for tenders. The first type of call was launched to recruit associations to design and implement citizen workshops around the topic of air quality. The call for tenders were launched to look for support of the engagement program and valorization of the air quality data as part of the DIAMS project. Public procurement process in innovative projects are often seen as unappropriated due to longer time scales that responses need. The Aix Marseille Métropole found a way to accelerate the service contract processes through one of the main group lead. New metrics and approaches to account for the impact of the project activities on participants are being defined to properly evaluate behavioural change and increase of knowledge due to the project.

Project's progress

New health guidelines published by the WHO

Different legislation exists to regulate the levels of air quality and those are implemented at various administrative scales: from the European level to the very local one. The reader is invited to read [Journal#1](#) for complete details about the existing legislation.

In autumn 2021 the World Health Organization (WHO) revised the air quality guidelines and lowered the recommended threshold from $10 \mu\text{g m}^{-3}$ to $5 \mu\text{g m}^{-3}$ as annual mean for fine particles. Further, a daily threshold was set at $15 \mu\text{g m}^{-3}$. The revision of the recommended health guidelines was done to include the latest scientific evidence of the health effects associated with the exposure to air pollutants. However, there is growing evidence that there is actually no minimal level associated with no adverse health effects associated with exposure to fine particles. The WHO also revised the thresholds for other pollutants including particles with an aerodynamic diameter $<10 \mu\text{m}$ (PM₁₀), ozone (O₃), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and carbon monoxide (CO). The revision of the WHO limits sits on scientific evidence from scientific research studies which quantitatively estimate adverse health impacts and air quality levels (WHO, 2021).

More has to be done as a society to reach this overarching goal and projects such as DIAMS are needed to engage society to walk towards sustainable goals and healthy environments. However, these guidelines are not mandatory and there is a need to approach legal limits to recommended health guidelines to live in healthier cities.

Summary of the air quality levels in 2021 in the region

In 2021, ambient concentrations of air pollutants in the region increased compared to levels in 2020 – which in was an exceptional year due to Covid-19 lockdowns that benefitted the decrease of emissions and in turn of ambient concentrations. The main regulated pollutants monitored in the AtmoSud network which pose a hazard for the human health are particulate matter, nitrogen dioxide, ozone and sulphur dioxide. Trends of ambient pollutants observed in the last 20 years continued to decrease in 2021 with the exception of ozone. This pollutant is a secondary pollutant which is formed in the atmosphere from complex chemical reactions from gas precursors.

Focusing on particles, there were no exceedances in the observed levels of PM₁₀ (particles with an aerodynamic diameter $<10 \mu\text{m}$) in the region in 2021. With the reduction of the WHO new limits in PM₁₀, still 72% of the population was exposed to large levels. However, average PM₁₀ concentrations continued to decline.

The limit value for fine particulate matter (PM_{2.5}; particles with an aerodynamic diameter $<25 \mu\text{m}$), set in $25 \mu\text{g m}^{-3}$ as an annual average) and the quality objective ($20 \mu\text{g m}^{-3}$) were achieved at all monitoring sites in the region. On the other hand, the WHO guideline revised in 2021 ($5 \mu\text{g m}^{-3}$) was exceeded for the entire region, regardless of the typology of the area concerned (traffic, urban background and industrial).

The reader is invited to read the entire rapport of air quality measurements in the regional as published by AtmoSud for details ([Atmosud, 2022](#)).

The UIA DIAMS project in the air quality context

The authorized associations for monitoring air quality (AASQA in French) are the official organizations who

monitor and evaluate the ambient air quality in the French territory. They are also in charge of the official communication of air pollution levels and episodes. In the region where the Marseille Métropole is located, AtmoSud is the AASQA responsible for monitoring, evaluation and communicating the levels of air pollution in the territory. The AASQAs in the ensemble of the French territory (including AtmoSud) supports the French government, local authorities and economic actors to evaluate the most relevant actions to improve air quality.

In the Metropolitan area of Aix-Marseille AtmoSud manages 31 fixed measurement stations scattered in the territory. Measurements from these stations are complemented by further monitoring campaigns that collect the necessary data for constraining and evaluating the mathematical models which predict the dispersion of air pollutants, from sources to the atmosphere.

The UIA funded DIAMS project (Digital Alliance for Marseille Sustainability) aims to improve the air quality information among all members of the society by producing high-definition air quality data that will be exchanged in an efficient manner to all stakeholders including main environmental policy actors, scientists and interest groups.

How is DIAMS going to achieve its goals? DIAMS will develop a platform to exchange data on air quality and digital services (apps, on-line services) so all parts of the society (comprising decision-makers, experts, citizens and economic actors) commit to develop coordinated action plans at all territorial levels (individual, local, urban, regional, national and European-wide) to combat air pollution.

On itself, the online platform aims to:

- Promote a fluid transmission of territorial data and air quality data between urban, regional and national platforms; and ensure their consistency.
- Produce and deliver high-time and spatial-resolved air quality data in the area.
- Increase the awareness and the level of engagement of both citizens and policy makers through personalized and adaptable information.
- Promote behavioural change in citizens and private sector industries in order to find innovative solutions to improve air quality.

Overview of the operational challenges during the DIAMS implementation

Leadership

In terms of the leadership we must distinguish two domains. First, the management team for the project at the Métropole, working in close collaboration with other departments within the local authority (EU department, Digital Strategy, Communication, Smart Tech and Smart City Unit), is efficient and engaged with the delivery of the project. The leadership team at the AMP is efficient and engaged with the objectives of the project, working on the delivery of actions and reaching milestones. The AMP lead team proved to adapt to challenges appeared during the implementation of the project, specially those related with the exclusion of one partner, finding new and innovative solutions to overcome them.

The second dimension of the leadership for the UIA DIAMS project comprises the political leadership at the Métropole. During the first year of implementation this represented a big challenge as local and regional elections were on the horizon and many actions were on hold, especially those related to the presentation of the project publically. The elections results in 2020 resulted into a new local government at the Métropole - although the same president remained. There was a continuity on the policies in the Métropole in terms of sustainability and in terms of air quality this include a continuation of the improvement of the public transport offer and development of soft transport infrastructure. It should be noted that Marseille, the biggest city of the Métropole, elected a mayor from the Green party. Moreover, as the project advanced on its implementation and more concrete and precise activities were completed, it was easier for politicians to engage with the project. The engagement at the political level helped the advertising of the engagement plan of DIAMS.

In this third year of implementation, the leadership challenge for the UIA DIAMS project is classified as low.

Public procurement

The procurement challenge is high for DIAMS. Procurement in public institutions such as the AMP is a slow process and the criteria to choose the provider for a service is not always based on terms of innovation. The economic criterion (known as pricing) is usually one of the criteria which prevail.

Multiple procurement processes were started for DIAMS, specially associated with the exclusion of the partner in charge of the largest part of the engagement project (see section 4.4): animations on air quality; animations in schools; logistic management of the air quality sensors; financial monitoring of the DIAMS project; call for projects to mobilize citizens around air quality; research convention for artificial intelligence and digital, etc. In order to make the procurement process more dynamic and agile, some of the procurements were launched by the DIAMS partners, notably AtmoSud, and not the Métropole.

That is something that future innovative projects – not only in France but elsewhere – should consider. In general terms, the procurement processes in public institutions do not fully respond to the needs of innovative projects specially in terms of timing and pricing. Generally speaking, one of the criteria in public procurement is pricing and sometimes this cuts innovative services which innovation and quality are not fully evaluated in the public procurement. UIA DIAMS found a partial solution by launching the Call of services through one of the partners but this is not fully desirable because the procurement process is then led by another partner rather than the leading team in the local authority.

The leading team at the AMP is designing a platform named “Innovation platform”. This platform intends to be a way that private companies could approach in an easier way to the Métropole and offer their services and processes. That will allow to choose the most innovative product and service already available in the market without the need to re-design and re-create what already exists in the market.

Cross-department working

There are different departments within the AMP which are involved in the implementation of the DIAMS project. Those are the EU Service, Digital Strategy Direction, Communication Direction, Smart City Service and the Environmental Strategy Direction.

The Digital Strategy Direction is involved with the link of the DIAMS online platform and its integration with the Métropole app “My Metropolis in the pocket” (“Métropole dans ma poche”, in French). Also, the department works with the data protection compliance of the data upload in the DIAMS platform. The Communication Direction department is involved in the internal and external visibility of DIAMS: they designed the motion video, updates the information on social networks and releases press notes. The Smart City service support innovation with the organization of workshops and discussions about the construction of business models around the topic of air quality. Last but not least, the Environmental Strategy department is responsible of the visibility of DIAMS within the Métropole Climate Plan.

All the involved departments are geographically separated in the Métropole. Despite the young age of the Métropole and the geographical distance between departments, all the AMP staff showed a good level of participation, involvement and engagement with a good level of cooperation. They team works transversally with constant communication flow through phone calls and email exchanges; and fortnightly meetings every two weeks.

Therefore, the cross-department working setting at the local authority level is posing a challenge in the implementation of the DIAMS project.

Participative approach for co-implementation

The participative approach designed by the DIAMS project was well organized on the proposal form with fortnightly meetings comprising the Steering Committee, Leaders Committee and Partners Committee. A full work-package in the project proposal was dedicated to this. All meetings were in-person. Due to the change in the working patterns associated with Covid-19 restrictions meetings were then transferred to online platforms. That resulted into shorter and more concise meetings which were welcomed as an advantage.

Currently, the AMP holds a meeting with each of the partner every 15 days. Thematic meetings with the involved partners are scheduled responding to the needs of the project. Despite this formula appears to be a more flexible and agile compared to the one as described in the project proposal, the DIAMS team have not found an efficient formula to share documents between the involved partners. Different formulae have been tested: documents on Google Drive, on-line editable documents, etc. However, in all the subjects, a lead on the theme is needed to

complete the action.

In previous Journals the Participative approach for co-implementation was the most challenging aspect of DIAMS due to major discrepancies between one of the lead partners and the rest of the consortium. The discrepancies arose in all fields of the project, from the conception to concrete actions in the project and this led to repeatedly delays in the implementation of the project and block actions and activities. This was exemplified with long and unfruitful meetings without agreement points. The DIAMS lead team at the Métropole tried as a first instance to solve the conflict with diplomacy and dialogue with this partner but a professional coach was eventually called in to facilitate communication with the partner. The conflictual behaviour from this partner was also accompanied by a lack of communication and written deliveries. Eventually, the lead team at the AMP decided to arise the issue at the UIA Permanent Secretariat and the that resulted with the exclusion of this partner at the beginning of 2021. Since then, the working environment between partners improved, with more professional relationships.

Another aspect that makes this aspect of the project still challenging is the number of partners and their diversification. DIAMS is a big innovative project and the partners are very different in background and with different ways of working. Despite the variety might be seen as an enrichment factor, it also requires a large coordination effort. The format of UIA project needs the definition of the partners at the proposal stage, with well-defined objectives and action points for all the partners. Innovative projects might benefit from more flexible definition of partners which might not need to be defined since the beginning. Specially in innovative project such as DIAMS which is based on the development of numerical tools, a market that experience rapid change, to have a fixed partner in charge to develop a specific tool might not be fully innovative or using state-of-the-art technology.

Monitoring, evaluation and measurement

This challenge might be separated in two parts. First, monitoring, evaluating and measuring the deliverables of the project, as planned by the DIAMS proposal, within the expected time frame. This is constantly done at the AMP level and it has not been a problematic challenge during the implementation of the project.

The second part, it is the evaluation and the impact that the project is creating at the community level: improvement of the air quality levels in the Métropole, change of behaviour from citizens, best practices adopted by the society, etc. This might pose a big challenge for DIAMS. The innovative nature of the project makes it very difficult to quantify the results of the project as it evolves around the creation of the DIAMS community. The proposal of the project outlined the targets that the project is willing to achieve and as well the methodology how to quantify them.

There are few metrics that might result appropriate to quantify the success of the project such as the compatibilization of the number of start-ups and services around the air quality domain; the number of data points and the increase of the air quality monitorization in the Métropole; etc. However, evaluate the level of awareness of the air quality problems in the community and quantify the effect of the DIAMS project on it may be challenging. Metrics such as the number of engaged contributors or the percentage of people in the target groups that have been reached might not be enough to capture the degree of engagement from the potential beneficiaries. In general, environmental projects face the big challenge of reaching the sceptical part of the society: for instance, those not willing to change from the use of private car to public modes of transport.

Personal questionnaires at different stages of the development of a project is sometimes seen as an appropriate approach to quantitatively assess the degree of change. However, this approach needs of a well-defined questionnaire with the correct questions and preferably lead by social scientists.

Another challenge in the evaluation of the impact of environment projects is the quantification if any possible impact is persisting over the time. DIAMS has a finite time framework and long-term impacts of the actions associated with the project difficult to monitor.

Communication with target beneficiaries

The engagement program of the UIA DIAMS is very vast and comprises different elements. The [zoom-in #2](#) details the engagement project of DIAMS. The readers are therefore invited to consult this document for further details. However, a summary can be found here.

Engagement with young students (school projects).

Various education and science initiatives around the world have integrated children as agents of change. Those provide evidence that children and young students have the potential to be catalysts for enhanced sustainability in their local environment (von Braun, 2016). These is expected to be achieved with the school project within the UIA DIAMS project. The project partner L'air et moi is in charge of the educational program that aims to engage students at the primary school level with the problem of urban air quality.

Citizen workshops

Various associations and interest groups have designed and implemented workshops around the topic of poor air quality in the Métropole. Most of the activities and workshops were designed around the use of portable sensors available from the project. These are varied in form and target audience and represent an innovative and creative way to reach citizens.

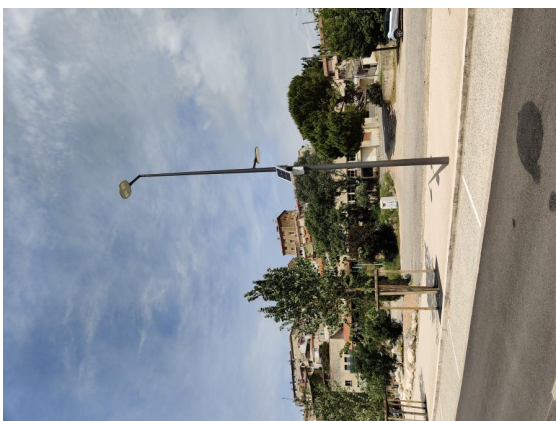


Game "Myst'air de l'Ile" (The Myst'Air of the Island) designed by the association "8 vies pour la planète"

Small sensors and phone application.

The use of portable sensors which measure air quality is a promising approach to improve public participation in environmental projects and they are a useful tool to promote change towards a more environmental-friendly behaviours. 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, generates greater motivation among participants. The use of the sensor creates awareness of the problem of air pollution (Oltra et al., 2017) which might lead in a later turn into a change of personal behaviour, structure public opinion to put pressure to local and central governments for new and tighter mitigation policies and eventually acceptance of these policies.

In 2021 about 2000 small sensors were available for the community. Data collected by individual sensors are sent to a mobile application which displays measured levels in a comprehensive way. The distribution of the sensors among citizens represent a major logistic plan including not just the transport and the delivery of the sensor to citizens but also the schedule and the calibration plan. Portable sensors are not just available for schools, citizens and/or interest group but other uses and applications have been implemented within DIAMS. Fixed monitoring stations, complementing the existing ones from the organization in charge of the monitoring of the air quality levels in the region (AtmoSud) were in six local authorities in the Métropole; the postal service equipped electric cars and vans with more than 300 portable sensors and mapped the spatial distribution of concentration of pollutants while driving within and between cities.



New monitoring station installed within the DIAMS framework at Cabriès.

Data from the sensors are feeding the online data platform created for DIAMS which is available for all citizens who participate in the project and would like to compare their data with other available data for instance. Data

from the online platform is also available for new start-ups and companies which develop service apps which help with the dissemination of air quality data in an easier and more user-friendly. Data is available under Licence Open Data Commons (ODBL).

Meetings with industrial partners. The UIA DIAMS approached different industrial partners in the Métropole to engage with the project. Several meetings with individual industries were held during the first and the second year of implementation but they were not fully satisfactory. In a redefinition of the engagement plan with business and industries, the DIAMS consortium approached a group of business grouped around the Association of Industrial and Territorial Ecology (PIICTO) with a more successful result. The industrial partners in this association are engaged with the environmental sustainability agenda (circular economy). Other industrial partners are being approached as the consortium of the Marseille port. However, the engagement with industries is challenging especially when industries engage with environmental initiatives on voluntary basis.

This challenge is medium for the DIAMS project, and the partners have been working hard to keep working on the communication with target beneficiaries.

Upscaling

DIAMS already included an upscaling project on its proposal. During the first year of the implementation DIAMS designed a communication plan with a set of adapted activities to engage the different key beneficiaries. The second year of implementation was the yet to test these activities; and the third year to scale it up. However, due to the Covid-19 global pandemic, there was a delay in the plans and activities planned for the scaling up and extension of the project.

Scaling up the DIAMS project should consider two of the main dimensions of the project : the engagement project and how it can be extended in other parts of the territory and also in other European cities; and all the numeric tools and apps which have built around it.

The activities developed with the communes within the DIAMS framework are easily scalable. DIAMS has started working in 6 communes in the Métropole and these projects can be easily sizable and applicable to other communes. A manual of best practices can be extracted from the experience. However, the time framework of DIAMS won't be able to develop them for the ninety-two communes in the territory. Also, a code of best practices can be formulated from the experience with the associations and interest group; and schools. Materials and experiences can be shared and adapted to the community targeted.

All the innovative part of DIAMS which evolve around the development of numerical models, phone apps and other numerical services are going to remain for the community, even after DIAMS. All these will be available for other cities, not just in France but also in Europe. However, the availability of the numerical tools should be accompanied with a fully designed engagement program behind if a behavioural change is expected from its usage. The topic of air pollution is complex and as a society we still need some education. Also, municipalites should be thinking as well to reach that part of the society which is not attracted by the numerical tools. Tailored engagement programs focusing on different interest groups, professionals and scopes and also different generations are needed. This requires trained staff and an adaptability of the changing society .

One aspect that partners might want to consider in the upscaling process is to define how to keep the DIAMS community alive and active once the project is finished , including the technical aspects as the adaptability to possible obsolete data servers; control of the consistency of the quality of the data entered, etc. To assure political independence, the digital platform should be sitting outside the AMP reign. The digital platform is the tool that might rest in the community as a central source of data in the territory and documents and as a space to share ideas, concerns and solutions. The consortium should think about the maintenance of the digital platform as well as how portable sensors are going to be kept and made available for schools, citizens and interest groups as well as local authorities in the Métropole. Also, how to ensure the long-term engagement of the population for air quality problems. The project partners are looking to develop an economic model to study the long-term feasibility of the different activities generated around DIAMS.

Another aspect that other cities and communities might take into consideration when adapting the best practices from DIAMS is the air pollutant that DIAMS was built around. DIAMS focused on the engagement project and the development of numerical tools around fine particulate matter ($PM_{2.5}$). Despite fine particles or $PM_{2.5}$ is one of the most harmful air pollutants to human health, ecosystems and climate, it is one of the pollutants with a large regional contribution and limited local scale emission rates. Moreover, $PM_{2.5}$ has a complex atmospheric

chemistry that might difficult to comprise the link between primary sources (those emitted directly to the atmosphere) and those generated by chemical reactions in the atmosphere from gas precursors such as sulphur dioxide (SO₂), nitrogen oxides (NO_x), ammonia (NH₃) and volatile organic components (VOCs).

Challenge	Level	Keywords
1. Leadership	Green	Operational and political leadership very active
2. Public procurement	Red	Many procurements needed, Call for project launched through the local authority. However, process is slow and based on non-innovative processes
3. Integrated cross-departmental working	Green	Good inter-department network
4. Participative approach	Green	Fluid interchange between partners and 1:1 <u>meetings</u> working in a efficient way. The partner "A Lab in the Air" was finally excluded from the project in 2021 with agreement with the UIA Permanent Secretariat and since then working relations between all DIAMS partners improved.
5. Monitoring, evaluation and measurement	Yellow	In the process for the right definition of the quantitative and qualitative parameters
6. Communication with target beneficiaries	Yellow	Good communication plan and schedule, good implementation times, difficulties arise by the Covid-19 but partners remediating.
7. Upscaling	Green	Planned in the proposal, economical model to be used

The challenge traffic light for the UIA DIAMS project.

Conclusions and lessons learnt

This third journal discusses the challenges that the DIAMS consortium has faced along its third year of implementation. One of the main challenges in previous years was associated with the discrepancies between one of the leader partners and the rest of the DIAMS consortium. The Métropole, after many attempts to smooth the problem, decided to exclude the partner. This resulted with a redistribution of tasks and budget among the rest of the partners which was done in totally transparency and collaboration.

The Métropole, after the redistribution of tasks, is working in the definition of certain qualitative and quantitative indicators to monitor, evaluate and measure the impact of DIAMS in the society, going beyond the achievements of the implementation of activities as designed by the DIAMS proposal.

It is time to think and plan the legacy of the DIAMS project in the territory and elsewhere. The upscaling on the number of initiatives, actors and territory covered by the DIAMS project was well defined in the project proposal. Other aspects that the DIAMS partnership and future projects might consider in the future is the extent of the air pollutants covered in the activities. More local pollutants such as nitrogen oxides or black carbon might help to understand the link between emissions and measurements that might facilitate the comprehension of citizens.

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