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The Urban Lab of Europe !

The AIR-HERITAGE project Journal N° 1

Project led by the City of Portici



AIR
QUALITY



The AIR-HERITAGE project

The **AIR-HERITAGE** project aims to improve the air quality conditions in Portici by developing an integrated framework that brings together citizens, urban authorities and environmental protection agencies to design and implement science based air quality policies. Core of the project is the development of high resolution pollutant mapping capability. It will be built by fusing data produced by an air quality monitoring network integrating regulatory monitoring stations, fixed stations and citizens' mobile personal exposure analysers. Data will be used to fuel a new Air Quality Policy Decision Support System. Through stakeholder involvement, groups will be trained with specific campaigns and ad-hoc tasking to cooperate as well as monitor actions during their usual mobility pattern. Citizen engagement in air quality policies will be enhanced through availability of personal exposure, feedback and targeted data sharing creating a crowd sensing social network that will become part of the city's policy making process. The project seeks to improve public authorities' capability to design efficient, responsive and participative policies.

Partnership:

- Municipality of Portici
- Italian National Agency for New Technologies Energy and Sustainable Economic Development
- University of Naples Federico II – Department of Agricultural Sciences
- Legambiente Campania Onlus
- Campania Regional Agency for Environment Protection
- Terraria Srl.

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1 EXECUTIVE SUMMARY

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.

AIR-HERITAGE, a project funded by the UIA, aims to design and implement effective, participative policies to improve the air quality in the City of Portici. More specifically, the project is developing and using an extensive air quality monitoring network, consisting of fixed regulatory monitoring stations, mobile monitoring stations and portable air quality monitors for citizens, to assess current levels of air pollution in the city. Monitoring data, along with high resolution modelling tools are being fused and will form an integral part of the Decision Support System being developed to inform policy makers and citizens.

Air pollution is a major environmental problem, affecting everyone's health. Therefore, the importance of AIR-HERITAGE cannot be emphasised enough. It aims to improve local air quality, using innovative tools and a truly participative approach. It is an exemplar project that has the potential to inspire other cities across

Europe. The question we should really be asking is: *why is my city not exploring innovative ways to design policies and measures to reduce air pollution and improve my health and wellbeing?*

This Journal presents AIR-HERITAGE and its key achievements to date. It describes the various challenges faced related to its implementation, along with measures and steps put in place to address these challenges. The aim of this journal is to inspire other cities to act and guide them to more effectively implement similar activities, by reading about the challenges faced by the City of Portici, and the solutions introduced to overcome these.

In summary, the most important challenges faced so far relate to the municipality's internal procedures, the lack of experience in implementing an innovative project, the collaboration with delivery partners, and the engagement of citizens. Solutions are not always transferable across projects, however, the processes followed to develop these solutions can certainly benefit other local authorities.

2 AIR-HERITAGE RELEVANCE TO THE EU, NATIONAL AND REGIONAL POLICY CONTEXT

Air pollution is a global concern, leading to adverse health and environmental impacts. Recognising that air quality is poor in many areas across Europe and that air pollution poses an important environmental risk to human health, the European Union has developed appropriate policies, measures and instruments to improve air quality throughout the EU. The most relevant piece of legislation, in terms of addressing air pollution at a local and regional level, is the Ambient Air Quality Directive (2008/50/EC). This sets legally binding limits and target values for concentrations of major air pollutants including particulate matter (PM₁₀), fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂).

The Legislative Decree no. 155/2010, which transposes the Ambient Air Quality Directive in Italy, along with Decree 250/2012, are the two

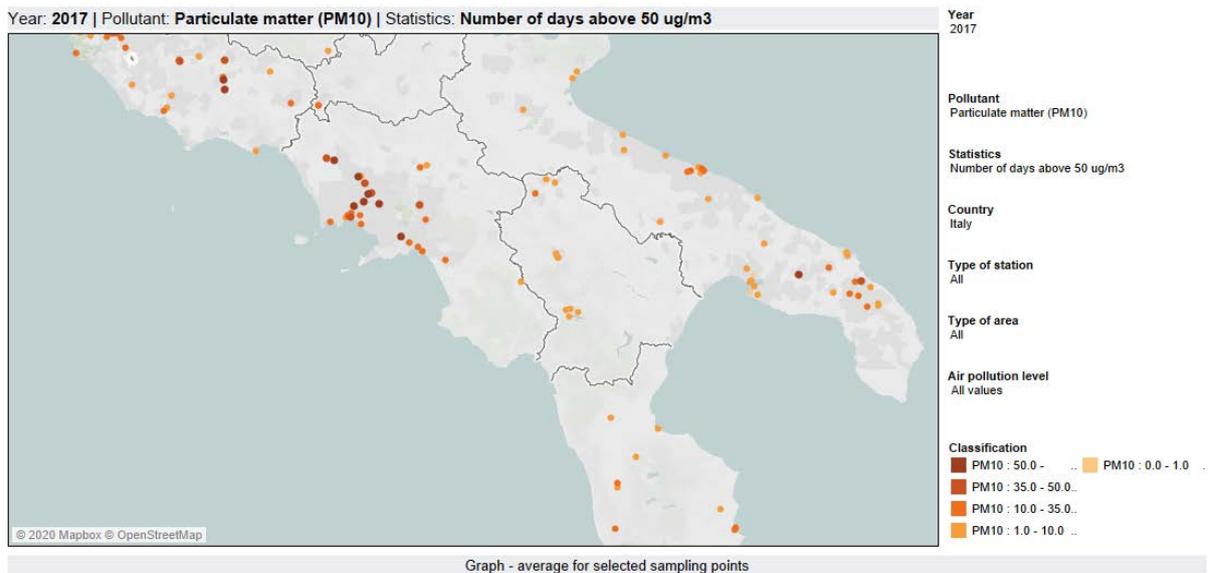
main laws that aim to reduce air pollution to levels which minimize harmful effects on human health, in particular in sensitive populations.

Even though, more than 66,000 people die prematurely in Italy each year as a result of particulate matter pollution, Italy has failed to address persistently high levels of particulate matter. In April 2017, the Commission issued a final warning, covering 30 air quality zones across Italy where the daily limit values for particulate matter have been exceeded since 2005, including zones in the region of Campania.¹ In March 2019, the European Commission launched infringement procedures against Italy for being in breach of air quality standards.² As such, it is clear that further measures need to be put in place to improve air quality in Italy, especially in heavily polluted areas.

¹ https://ec.europa.eu/commission/presscorner/detail/en/IP_17_1046

² https://ec.europa.eu/commission/presscorner/detail/en/IP_19_1475

Air quality statistics



Air pollution

Note: Dots in the last two colour categories indicate stations that do not attain the limit value for PM10 of 50 µg/m³ as a daily average, not to be exceeded more than 35 times in a calendar year.

The city of Portici is located in the south of Italy in the region of Campania, about 8 km southeast of Naples. Ad-hoc monitoring campaigns in 2017 measured relatively high average values of particulate matter and fine particulate matter.³ On the other hand, during the period 2015 - 2017, 15% of the regional fixed regulatory stations recorded concentrations that exceeded the annual EU limit value for particulate matter and nitrogen oxide, while 40% recorded concentrations that exceeded the daily limit for particulates for more than 35 days in a calendar year.⁴ Therefore, regional action is required to improve the air quality in pollution hotspots, and in turn improve citizens health and well-being.

The City of Portici is a highly urbanised area, with a high population density. The absence of any significant industrial activity in the city means that air pollution is largely attributed to urban mobility. Citizens often use cars, even for small distances, and main roads are heavily congested

during peak hours. For instance, it is estimated that 60-80% of students go to school by car, with an average distance travelled of 500m. Hence, the use of cars and other vehicles compromises the quality of life in the city, and not only from an air quality perspective.

In order to be able to develop effective policies to reduce air pollution and its impacts, a good understanding of the sources of pollution, and the variability of air pollutant concentrations is needed. Although in the case of the City of Portici, the main sources of air pollution are known, it is important to understand the spatial, temporal and seasonal variability of air pollution to effectively tackle the problem. Given the sparseness of fixed regulatory air quality monitoring stations, limited information is available on localized air pollution, so pollution hotspots can only be presumed. For example, air pollution may be worse in areas where meteorological conditions favour air stagnation

³ The campaign was carried out by Norman Research on behalf of the City of Portici.

⁴ ARPAC official database

or where vegetation is scarce, as the latter plays an important role in the removal of pollutants. Thus, the City of Portici lacks relevant data and tools to design targeted improvements and remediation policies.

On the other hand, the lack of monitoring data, combined with coarse information on air quality, result in a distorted perception of air quality issues and a lack of understanding of personal exposure to air pollution. This makes it harder to ensure that measures and policies introduced are accepted by the public. Furthermore, reduced awareness slows down the uptake of sustainable modes of transport, such as bicycles. Hence, it is important to raise awareness and engage with the public in order to trigger behavioural change and enable the implementation of participative measures.

AIR-HERITAGE aims to improve knowledge on localised air pollution in the City of Portici. More specifically, mobile air quality monitoring station,

and portable air quality monitors will be used, along with fixed regulatory stations to collect data and assess local air quality.

Most importantly, AIR-HERITAGE aims to improve the air quality in the City of Portici, by educating and motivating citizens to adopt sustainable mobility habits, and by supporting the City of Portici decision making process, so that effective, evidence-based policies and measures are implemented. In particular a Decision Support System is being developed to help policy makers identify optimal measures and policies to reduce air pollution across the city, as well as reduce pollution hotspots. This will also help communicate monitored data to citizens and drive behavioural change, which will ultimately improve the air quality of the city.

3 WORKING TOWARDS BREATHING CLEAN AIR: PROJECT UPDATE

AIR-HERITAGE combines a number of innovative and conventional activities that combined together will result in a beyond state-of-the-art Decision Support System that will allow the City of Portici to design and deliver smarter policies to reduce air pollution. In parallel, the project involves citizens to actively participate in monitoring air quality and adopt a more environmentally sound behaviour, especially for meeting their mobility needs. To date the following activities have been successfully implemented:

- Introducing and promoting AIR-HERITAGE to the general public.
- Raising students awareness of environmental issues, and in particular air pollution, and actively encouraging them to adopt more sustainable behaviours, especially in terms of transport modes used.
- Launching the air quality monitoring activities and designing the Decision Support System that will inform policy makers on the best measures and strategies to put in place to reduce air pollution hotspots.

3.1 Introducing the project to the public

On Monday, 2nd of December 2019, the first AIR-HERITAGE event was organised to introduce the project to the general public and students. The key objectives, benefits and expected results of AIR-HERITAGE were presented, whilst all delivery partners had the opportunity to present in detail their role in the project and activities being implemented. It is interesting to note that the workshop promoted a more participative character that was well received from participants, for instance:

- Professor Stefano Mazzoleni (Department of Agricultural Sciences of University of Naples Federico II) asked students to stand up and hold their breath. Anyone that could not hold

their breath anymore, had to sit down. Students that sat down were asked to confirm whether they were smokers, which was true in most cases. With this example, the importance of what we breath was illustrated.

- The Mayor of Portici, Vincenzo Cuomo, asked students “if you were the Mayor what would you do to reduce air pollution?” Students responded enthusiastically proposing several noteworthy solutions, such as converting congested streets to one way streets (e.g. via Liberta), introducing traffic zones, creating pedestrian streets, cycle lanes and cyclable streets.



Workshop in Chinese room

3.2 Students actively engaged and ready to lead the way

AIR-HERITAGE aims to involve a significant number of students, and in parallel parents and teachers, with the aim to raise their awareness on the impact of everyday choices on air pollution. To achieve this, environmental educational courses are introduced in schools, as well as numerous workshops are being organised for parents and students that further diffuse AIR-HERITAGE to the local community. Moreover, students will be involved in implementing sustainable mobility projects, for example groups of students (between 7 and 11 years old) from 9 schools will participate in pedibus, a structured walk from and to school with predetermined stops near students homes.

Students are the future of any city, so by educating and actively engaging with them, AIR-HERITAGE

is investing in a better future. Thus, a key achievement to date is that a number of environmental educational activities have already been organised in several schools. During dedicated sessions, students learn the fundamental role that every single person can play in protecting the environment and improving the air quality of the city. Students also learn about the fundamentals of air pollution, for instance sources and causes of air pollution, their personal contribution to pollution, their exposure to pollution and ways to curb air pollution. AIR-HERITAGE is presented, along with key research and other activities, and the importance of monitoring and modelling is emphasised.

During a visit to Liceo Classico Statale “Quinto Orazio Flacco”, it was evident that the students of

class “3rd C” were very interested in these environmental sessions, and follow the project with enthusiasm. It was impressive to observe how they process the information provided in a critical way and how this triggers a series of questions that even teachers are not able to answer in some occasions. Moreover, it was clear that, as a result of the knowledge gained during these sessions, students have become concerned about their contribution but also exposure to air

pollution. It was inspiring to see that students are already thinking of ways to reduce their share to air pollution and have embraced the concept of behavioural change to improve the living conditions and wellbeing of people in Portici.

Finally, it is noteworthy that students participating in the environmental educational activities are further disseminating knowledge and promoting behaviour change to other students, for example through posts in social media and other activities.

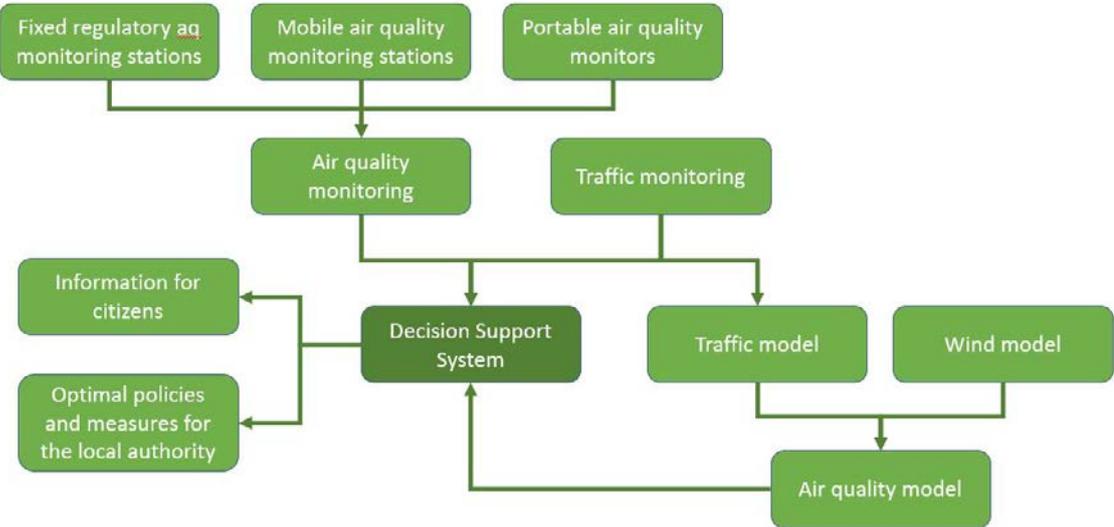
3.3 Monitoring and modelling: the way to ensure evidence-informed policy making

A key output of AIR-HERITAGE is the Decision Support System that will help policy makers take informed decisions and design efficient and participative policies to tackle air pollution. However, the science behind this system and the innovations it incorporates are worth noting. The diagram below illustrates the complexity of this system and how this brings together different scientific disciplines and policy making.

monitoring station was installed and monitored nitrogen dioxide and particulate matter concentrations. Students and other local actors are being engaged and will provide their own air quality data, recorded during daily activities using portable air quality monitors (for instance during pedibus walks).

The different activities outlined in the diagram below are all progressing well. Traffic flows are being monitored and the air quality monitoring network is being developed and used. For example, in June 2019, a mobile air quality

As the work progresses, technical challenges are expected to emerge, especially since the Decision Support System will fuse data produced by a heterogeneous monitoring network, as well as data collected on traffic flows and data produced by air quality models.



4 THE AIR-HERITAGE IMPLEMENTATION CHALLENGES

AIR-HERITAGE is an innovative urban project, funded by the Urban Innovative Actions (UIA) initiative. As with all UIA projects, it focuses on implementing innovative solutions. Seven operational challenges have been identified as

the most relevant and cross-cutting for UIA projects. Their relevance to AIR-HERITAGE is described in the sections below, along with measures put in place to address these challenges and key learning points captured.

4.1 Leadership

AIR-HERITAGE is developing and implementing an innovative, integrated framework that will help the City of Portici design smarter, evidence-based policies to curb air pollution, through a genuine participative approach. AIR-HERITAGE, has ensured, from the very beginning, the support of the city's political leadership, as this is key for implementing the project and safeguarding its success. Thus, there is a strong political will to implement effective policies to reduce air pollution.

political support to implement the best measures possible to address pollution hotspots.

It should be noted that the mayor is elected every five years, and the next elections are due in two years, before the completion of the project. As such, a potential change in leadership may be a challenge that the project will need to overcome, in order to ensure the sustainability of the outputs of the project. In particular, to ensure the continuous use of the Decision Support System to identify measures to improve air quality and assess the impact of implemented measures.

Political support is constantly being reinforced, as the AIR-HERITAGE team is working closely with the Mayor and Councillors to exchange knowledge, share successes, and discuss problems and possible solutions.

Finally, a positive administrative leadership is vital to achieve the ambitious targets set and implement measures to improve the air quality in the city. Hence, the City has put in place a strong project team, committed to effectively engage different stakeholders, local actors and the public to raise awareness and drive behavioural change, and in turn improve the quality of life of all residents.

Nevertheless, the optimal solutions that will emerge from the Decision Support System, may not be easily acceptable by the general public or local actors, and may therefore lose political support. If such a challenge emerges, this will have to be carefully managed, in order to re-gain

4.2 Public procurement

Within the framework of AIR-HERITAGE, monitoring sensors need to be procured in order to enhance the air quality monitoring network.

A key challenge faced was that, although the sensors are to be used by the Italian National Agency for New Technologies, Energy and

Sustainable Economic Development (ENEA), the City of Portici is responsible for the procurement. As such, the sensors have to meet very specific technical requirements. whilst the procurement has to comply with national and EU law on public procurement. This means that both ENEA and the City of Portici have to understand each other's needs and requirements.

This challenge was overcome by organising a series of meetings between ENEA and the City of Portici to discuss the procurement. During the first meeting. It was clear that the needs of each organisation were not well understood and communicated. As a consequence, three more meetings were organised, where legal expertise was also brought in, in order to better understand administrative/managerial needs, technical/specialists needs, and legal requirements. Once needs were identified and understood, technical

specifications were defined and the procurement call was developed using the correct legal language.

Therefore, a key lesson learnt was that in order to meet different types of needs, in this particular case, include very technical specifications in the procurement of the sensors and in parallel ensure compliance with public administration procedures and public procurement legislation, a lengthy consultation process had to be followed between the involved parties. This, in essence, helped in better defining needs and communicating them in a way that was understood by different types of organisations.

As a result, the procurement call will be launched at a European level in February 2020. The technical specifications have been signed, both by the City of Portici and ENEA to share responsibility.

4.3 Organisational arrangements within the urban authority

The City of Portici faced various problems in managing and coordinating AIR-HERITAGE. This was mainly due to the fact that the City had no experience in implementing UIA projects, and thus did not properly assess the complexity of the project and its interdisciplinary nature. In addition to this, the City had not allocated appropriate resources, in particular resources with relevant skills, experiences and competences. All the above-mentioned, coupled with the city's internal bureaucracy and the UIA reporting requirements, which civil servants were not familiar with, posed a substantial challenge.

AIR-HERITAGE aims to develop a Decision Support System to inform policy makers that combines different scientific fields and activities, such as traffic and air quality monitoring, modelling and

forecasting, whilst in parallel to actively engage citizens and local actors to contribute to the monitoring activities, but also change behaviour. As such, communication and engagement needs to be tailored to the different target groups, in particular, politicians, citizens, local actors (e.g. consumer and environmental associations and businesses), and schools. Furthermore, the coordination and implementation of activities involves different types of delivery partners, including public organisations, technical organisations, environmental associations and research institutions, which need to find a common language to work effectively together.

After recognising the complex and innovative approach employed by the project and the importance of forming an experienced and

competent project team within the municipality, that can effectively work with project partners and target groups, the City of Portici assigned

a full time AIR-HERITAGE project manager and gradually hired more experienced individuals to join the team.



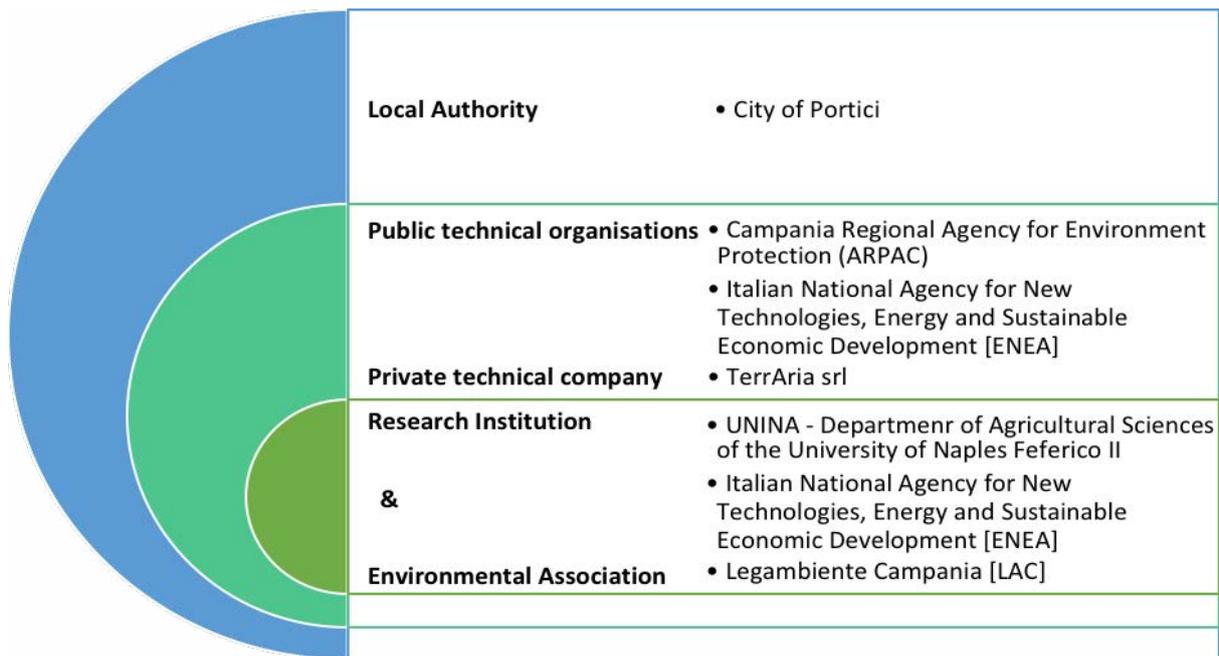
As a result, the City of Portici gradually improved in managing and coordinating AIR-HERITAGE and is now effectively delivering all integrated aspects of the project. Paramount to building an efficient project team was the fact that experienced individuals were carefully selected.

The experience gained in managing and coordinating such as complex project will remain, even after the project end. The importance of assigning a full time manager, which is supported by an appropriate, experienced team is an important lesson learnt.

4.4 Participative approach for co-implementation

As mentioned previously. AIR-HERITAGE has adopted a truly participative approach, by engaging different types of stakeholders and target groups. From project design, it taps into the collective knowledge and experience of different types of organisations by involving them as delivery partners, including public and private

technical organisations, research institutions and non-governmental organisations. Thus, the project benefits from the technical, research and stakeholder engagement expertise of numerous organisations in order to develop efficient solutions to improve the air quality of the City of Portici.



Due to the diverse nature of the delivery partners, an important challenge encountered was communication gaps. More specifically, there was a clear need to find a common language to efficiently communicate managerial, technical and political perspectives within the delivery team, and subsequently effectively communicate with target beneficiaries, including citizens, schools and businesses.

To resolve this, the City of Portici organised a series of consecutive meetings with delivery partners, including bilateral meetings. During those meetings, partners had the opportunity to communicate their needs and expectations, understand their different background, role and responsibilities, as well as coordinate and integrate efforts. The City of Portici focused on understanding the technical language of partners,

which differed between the agencies, the university and the private technical company involved. Technical partners also focused on understanding each other needs in order to be able to develop compatible compartments to feed in to the Decision Support System.

Consequently, partners established good relations with each other and an open communication channel. This ensures that everyone’s ideas, input and innovativeness are given the opportunity to thrive.

These meetings have proven to be essential for the better coordination of the project and for the co-implementation of planned activities. Therefore, the City of Portici, continues to have bilateral meetings with delivery partners every week, whilst project meetings are also organised regularly.

4.5 Monitoring and evaluation

Monitoring and evaluating air quality improvements achieved locally is essential in order to test the effectiveness of the measures and policies put in place and help improve these

along the way. Moreover, this will help test the effectiveness of the Decision Support System developed and validate political decisions taken.

Nevertheless, it is challenging to monitor and assess the impacts of behavioural and cultural change on air pollution. In order to address this challenge, a monitoring and evaluation framework has been developed. This entails:

- **Qualitative surveys:** A questionnaire has been developed and distributed to students participating in the project, so that students complete the questionnaire to assess the situation before AIR-HERITAGE. The same students will be prompted to complete the questionnaire again in six months so that behavioural changes are identified. In addition to this, the questionnaire will be more widely distributed to assess citizens behaviour.
- **Quantitative instruments:**
 - o **Traffic sensors:** These record number of vehicles to estimate traffic flows in selected streets and types of vehicles to define pollution profiles. In order to observe changes in traffic density, measurements will be taken again after the implementation of measures. To be able to account for seasonal variations in traffic, follow up measurements will be taken during the same season
 - o **Mobile monitoring stations:** These will be positioned on 3-4 streets with heavy traffic to record air pollutant concentrations.

Subsequently, these will be re-positioned on the same streets in order to observe air quality improvements and assess whether reduction targets have been achieved. To be able to account for daily, weekly and seasonal variations in air pollutant concentrations, measurements will be taken continuously for 5-6 months and follow up measurements will be taken during the same season (e.g. after 6 months).



Equipment



Mobile monitors

Hence, through this framework, the real added value of AIR-HERITAGE will be measured, whilst in parallel this will help continuously improve

the quality and effectiveness of the implementation process.

4.6 Communication with target beneficiaries and users

The key beneficiaries of AIR-HERITAGE are citizens and students, as the project aims to improve the city's air quality and as a consequence improve residences health and quality of life. On the other hand, the success of AIR-HERITAGE relies on the active participation of citizens, students and other local actors in planned activities, for example students participating in the pedibus initiative, as well as on citizens adopting more sustainable behaviours, such as using more sustainable modes of transport.

Identifying and involving local actors, businesses and associations proved to be a challenge. Although, potential actors had been identified during the project design phase, this list proved to be incomplete and insufficient. Additional actors had to be identified through existing and new contacts.

Another key challenge is to effectively communicate the science behind air pollution to politicians, citizens and students in a simple, scientifically correct way, to trigger behaviour change and ensure political and public acceptance of measures to improve air quality. For instance, conveying the adverse health impacts of air pollution, the significance of monitoring data and the need to change current practices and policies, in layman terms, whilst also maintaining a politically neutral position.

AIR-HERITAGE has a communication and a citizens engagement strategy in place, which includes the development of various communication and promotional material, as well as the organisation of different types of events, workshops and environmental educational sessions. In addition to this, a partnership agreement has been signed with headmasters of all Portici schools that

specifies key roles, main activities and the objectives of the collaboration, so that students can be involved.

In order to improve the strategy and address this challenge, feedback loops have been introduced. For example, after the workshop organised on the 2nd of December 2019, which presented AIR-HERITAGE to the general public, feedback has been sought. More specifically, students and other participants that attended the event had the opportunity to provide comments on how useful they felt the event was and what could have been improved. Key learning points, which will guide the design of future events, included:

- Events need to be tailored to target audiences. If the event aims to reach different audiences, then this should be split into different sessions, each designed for specific target groups, with focused take-away messages.
- Events that are designed for the general public should not be very technical.
- Events need to be more interactive, so that these do not end up being bland, with too many presentations and slides.
- Key messages to communicate need to be focused
- Events that have a duration of more than two hours should be divided into different parts and include short breaks.

4.7 Upscaling

AIR-HERITAGE focuses on improving the air quality in the City of Portici. If successful, then it will be essential to upscale the action, whilst in parallel ensure its sustainability.

Upscaling should focus on replicating the action in other cities around Portici, as air quality in the city is affected by nearby air pollution. Therefore, AIR-HERITAGE needs to inspire and support nearby cities to act and reduce local air pollution. The main challenge will be to replicate the monitoring activities undertaken within the

framework of AIR-HERITAGE, and in particular developing an air quality monitoring network (besides using portable air quality monitors).

A further challenge will be to ensure the sustainability of AIR-HERITAGE and in particular to sustain and extend the positive behavioural and cultural change that the project will have triggered.

The best approach to deal with these two challenges will be further considered.

5 CONCLUSION

A number of activities have been successfully completed so far. In particular, the project has been introduced to the general public, students have been actively engaged, air quality measurements are being collected and the Decision Support System is under development.

A number of challenges have been faced to date during the implementation of AIR-HERITAGE, and a few future challenges have been identified. These are summarised in the table below along with how these have been resolved.

Challenge	Description	Solution
Leadership	Change in political leadership / proposed solutions not in line with political agenda	This challenge has not materialised yet - solutions to be considered
Public procurement	Meeting technical and managerial needs and in parallel complying with legal requirements	Numerous meetings and discussions to translate needs in different contexts
Organisational arrangements within the urban authority	Insufficient resources within the municipality to implement the project	A strong, experienced project team was gradually formed within the municipality
Participative approach for co-implementation	Communication gap for bridging management, technical and political perspectives	Numerous meetings to agree on a common language and establish open communication
Monitoring and evaluation	Monitoring and assessing the impacts of behavioural and cultural change on air pollution	Qualitative surveys and quantitative instruments
Communication with target beneficiaries and users	Effectively engaging with citizens to trigger behaviour change and gain public acceptance	Feedback loops introduced
Upscaling	Ensuring the sustainability of the action and its replication in other cities around Portici	Solutions to be considered

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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