Output factsheet: Tools

Version 1

Project index number and acronym	CE1226 AWAIR
Lead partner	Arpae – Regional Agency for Prevention, Environment and Energy of Emilia-Romagna
Output number and title	O.T2.3. – Tools for population/stakeholder alert in case of SAPEs
Responsible partner (PP name and number)	Arpae – Regional Agency for Prevention, Environment and Energy of Emilia-Romagna, LP
Project website	https://www.interreg-central.eu/Content.Node/AWAIR/AWAIR.html
Delivery date	02/2021

Summary description of the key features of the tool (developed and/or implemented)

The forecasting system implemented by Arpae Emilia-Romagna is based on the so-called NINFA system which is the operational air quality model. This system consists of 3 different modules: (1) CHIMERE, which is the core component of the system, simulating transport, dispersion, chemical transformations, dry and wet deposition; (2) COSMO, which is the official limited area model used by the Italian Civil Protection for meteorological and for air quality applications for the Italian territory; (3) IBIS, which implements the statistical post-processing of data. The forecasting system produces daily maps of the major atmospheric pollutants (PM_{10}, $PM_{2.5}$, NO_2, O_3, CO, C_6H_6, SO_2) for today, tomorrow and the day after. The horizontal resolution of the air quality system is 5 km for Northern Italy, with a 3 km focus over the Emilia-Romagna region in the forecast mode. The IBIS post-processing system reaches 1 km resolution for the elaboration of data referring to the previous days (analysis mode).
In the regional territory the overall status of air quality is synthesized using an air quality index (AQI). The pollutants usually included in the definition of air quality indices are those associated with short-term health effects; in Emilia-Romagna only PM_{10}, NO_2 and O_3 are included in the definition because of the dramatic decrease of the concentrations of the other pollutants in the past decades. The computation of the index considers the construction of a dimensionless sub-index for each pollutant, namely the ratio between the pollutant concentration and the corresponding EU limit value times 100. Then, the worst sub-index is selected and this gives the value of the AQI. When the final value exceeds 100, this means that at least one of the pollutant concentrations is above the EU limits. The AQI values are grouped in 5 classes with an associated color every step of 50 and this is the way maps are represented in the Arpae official website (see References). In order to be consistent with the other FUAs only the first 4 classes were used for the AWAAIR App (0-49, 50-99, 100-149, ≥150). A preliminary analysis in Parma covering winter 2019-20 and focusing on PM_{10} showed that the forecasting system seems reasonably able to predict PM_{10} concentrations and exceedances of the daily value: this is an important result, since PM_{10} is the most relevant pollutant during winter and it determines the class of the air quality index used in the AWAIR-app.

NUTS region(s) where the tool has been developed and/or implemented (relevant NUTS level)

The concerned NUTS regions involve Parma FUA (NUTS3 ITH52). The forecasting system developed at Arpae Emilia-Romagna covers the whole Emilia-Romagna territory (NUTS2 ITH5).

Expected impact and benefits of the tool for the concerned territories and target groups

Forecasts obtained using the air quality forecasting system described before is expected to be the basis for the definition of appropriate actions and behaviors by local administrators and citizens in case of severe air pollution episodes (called SAPEs). As for administrators, the aim is associated to the most correct way to put in place mitigation and adaptation actions and warn the population against the adverse effect of SAPEs. As for mitigation actions, it is well established that the possibility of activating measures during the early stage of SAPEs can largely increase their effectiveness. Information about air quality with most vulnerable groups as specific communication target was considered of paramount importance in order to prevent health effects of SAPEs. Nevertheless, an efficient forecasting system can improve the quality of life of the whole population. The availability of the outputs from this system should be the first step for a growing number of citizens in order be acquainted with the information about air quality conditions, raising their awareness and knowledge about the issues associated with the effect of atmospheric pollution. In addition, the AWAIR app is fed by the information collected by each forecasting system in the FUAs and is expected to give warnings and suggest tips for a proper lifestyle in case of SAPEs.

Sustainability of the tool and its transferability to other territories and stakeholders

The air quality bulletin based on Arpae air quality forecasting system is issued every Monday, Wednesday and Friday in the period from October to April and determines the period when emergency measures are activated in Emilia-Romagna if the PM_{10} forecasts exceed limit values for the emission day and the following 2 days. In this respect the content of the AQ bulletin is mandatory for all the municipalities in the Region which are subject to the AQ regional plan.
The issue related to sustainability and transferability of a forecasting system should be considered as a single item. The structure of a forecasting system consists of several different models spanning different horizontal and temporal scales. In this respect, it is quite clear that the maintenance and the evolution of a forecasting system could be very difficult and demanding. Therefore, the possibility of transferring a forecasting system from a Region to another is not a straightforward task. The implementation of a forecasting system on a certain territory requires a great effort in the definition of the procedures as well as of the data fluxes between the different modules which should be considered very carefully in the planning stage. Hence, the transferability of the Arpae's forecasting system can be considered in the sense that the key components of the system can be run in whatever EU area (provided that trained professionals are available).
The AWAIR-app (named "Interreg SAPEs App") is available and freely downloadable from Google Play and from the App Store. The App will be maintained and supported for another two years after the end of the project. After this period, it is expected to run for an additional few years without maintenance, given that the forecasting systems remain stable and there are no major updates by Google or Apple.
The adaptation of the AWAIR-app based on the outputs from different forecasting systems could be far simpler: in this case, the definition of a small set of values (pollutant concentrations and/or air quality indices) in a specific place should be the first step. The most relevant issue is related to the setup of the interface between the forecasting system and the AWAIR-app itself.

Lessons learned from the development/implementation process of the tool and added value of transnational cooperation

The implementation of a forecasting system is strictly dependent on the area where the system will be applied. Environmental agencies have the key role in the management of the system itself. Generally speaking, the resources needed to implement a forecasting system are quite expensive. In addition, it is necessary a continuous discussion and exchange of information with the environmental departments of the local administrators in order to determine the best way of transferring information about the presence of SAPEs and their potential threats (at least in the short-term). The assessment of the reliability of the forecasting system was another essential key point of AWAIR, since local administrators need the most reliable information to undertake suitable actions. In this respect, the transnational cooperation started with the exchange of information related to the technical details of the different forecasting systems and was then focused on the definition of criteria for the performance assessment in order to determine whether the system may be effective and useful in supporting local administrators and stakeholders. The AWAIR project showed the importance of sharing performance assessment of the forecasting systems among partners as well as the need of frequent timing of this type of activity.

References to relevant deliverables and web-links
If applicable, pictures or images to be provided as annex

The relevant reference deliverables are:

- Deliverable D.T2.2.4 “Forecasting system - Parma”.
- Deliverable D.T2.2.7 “AWAIR-app - Documentation”.
- Output factsheet O.T2.3 - “AWAIR-APP created to inform local health instit&/or nurseries/schools/citizens” (https://www.interreg-central.eu/Content.Node/AWAIR/OT2.3-App-final.pdf).

The relevant weblink is:

- Arpae website (https://www.arpae.it/it/temi-ambientali/aria/previsioni/previsioni-di-qualita-dellaria/previsioni-di-qualita-dellaria).
- https://www.arpae.it/it/il-territorio/parma/in-evidenza-a-parma/awair

Image 1. Example of the output of the Arpae air quality forecasting system for the AQI.
Image 2. Example of a screenshot of the Interreg SAPEs App.

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Valutazioni di qualità dell'aria dal modello

La mappa mostra la stima della concentrazione di fondo relativa ai giorni precedenti, ottenuta tenendo conto dei dati osservati dalla rete di monitoraggio regionale.

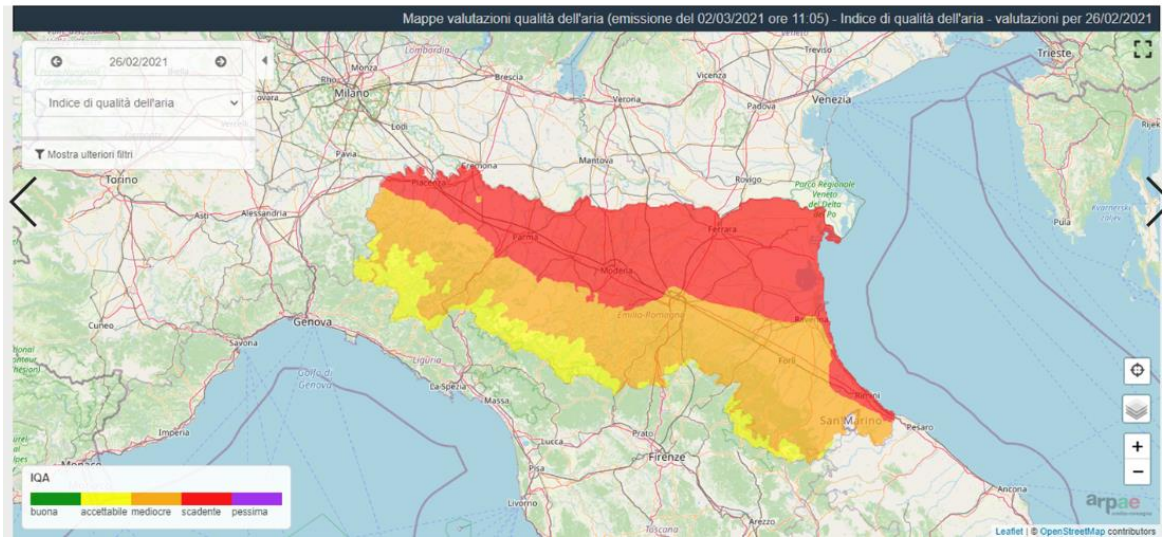
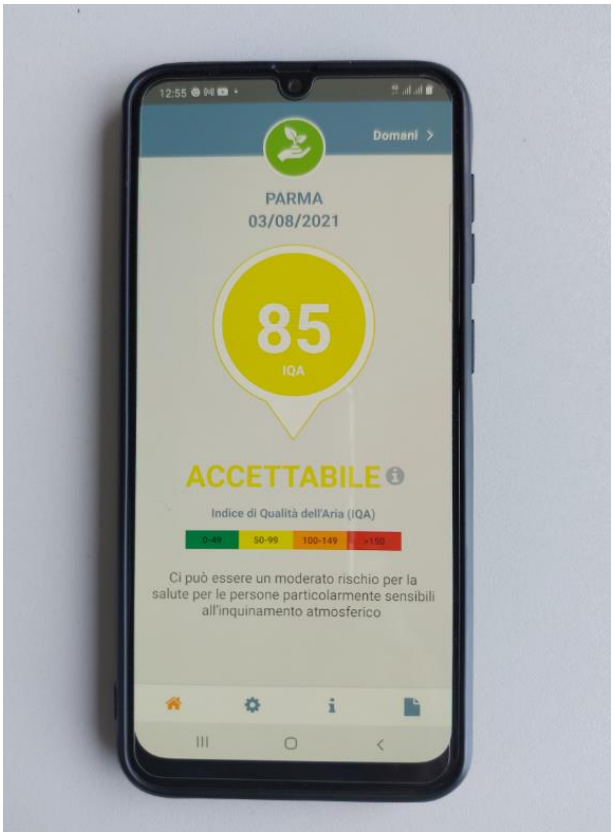


Image 2. Example of a screenshot of the Interreg SAPEs App.


12:55
Domani
PARMA
03/08/2021
85
IQA
ACCETTABILE
Indice di Qualità dell'Aria (IQA)
0-49
50-99
100-149
>150
Ci può essere un moderato rischio per la salute per le persone particolarmente sensibili all'inquinamento atmosferico