Air Pollution Network for Early warning and on-line information Exchange in Europe

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1. ABSTRACT

APNEE (Air Pollution Network for Early warning and on-line information Exchange in Europe) establishes a uniform and transposable portal on environmental information in different European regions, using air quality as the application domain. APNEE will serve citizens as well as professionals, local and regional authorities across Europe and European relevant institutes.
This portal will provide online visualisation of real-time air pollution, and special features like discussion boards, online newsletter, early warning, etc. Dissemination of information will be based on high sophisticated communication lines like mobile telephone services (SMS and WAP), multimedia, electronic panels and Internet. APNEE aims at increasing the knowledge of citizens on air quality while developing exchange of information both on local level in European cities and among European institutions. The APNEE project integrates new information technology as additional management modules in existing Air Quality Management Systems in European cities, and also serves as a reference for providing access to environmental information throughout urban agglomerations. Pivotal objective of APNEE is to implement user-friendly information services in orderto co-constitute the city of tomorrow as one step towards the information society of Europe.Only informed citizen will act in light of environmental impacts, which ultimately will improve the quality of life of the citizens in Europe. This presentation will contain the first results of multimedia information flow at the pilot sites Marseilles, Madrid, Athens and Grenland.

2. INTRODUCTION

The importance of accessing environmental information is gaining momentum in the information technology area and also creating more attention from environmental administrations in cities and different levels of government in the world. In the environmental field, the air quality modelling constitutes a key area because of its complexity and transboundary effects which makes it more desirable to optimise the access to this environmental information. Modern air quality modelling systems are used for scientific research and also for operational air quality forecasts and management. Nowadays, the air quality forecasting systems are in the so-called *third generation* level and have been applied in on-line operational mode in several cities and regions around the world (*San José et al. 1999*; *Karatzas and Moussiopoulos, 2000; AIRQUIS, 2000*). Urban air quality management and information systems (UAQMIS) are more frequently requested to include advanced capabilities of quick, effective and easy to understand environmental information. These systems are mainly based on the need of city authorities and national governments to establish a framework, which enables them to take actions, in order to ensure that air quality is improved and relevant standards are maintained in

urban areas. Nowadays, the operational air quality forecasting models are progressively entering the operational air quality scenario oriented models which means that the user is beginning to question how to avoid the air quality forecasting exceedances provided by the model and solutions to this problem. Solutions, i.e. decision on the range of potential counter measures, require an optimal air quality information system and also a much more sophisticated air quality model which accounts for the non-linearities which are inherent to atmospheric processes *(SATURN, 2000)*. Solutions will lead to take important emission reduction strategies and these actions should be not only based on an accurate physical and chemical based air pollution model but also on access to the output of these models - environmental information - in on-line mode. Solutions will include reductions of industrial, traffic, domestic emission or a combination of these emission sources. The accuracy of these procedures will depend very much on the information technology which is used to activate the emission reduction programmes and this is particularly true if emission reduction scenarios include the active participation of humans. Future mobile technology employing Internet technologies will play an important role for this development.

The APNEE contribution is focusing on the preliminary steps of the above description. APNEE will serve EU directives on information services for citizens about health threatening air pollution states. The early warning services will be based on a combination of measurements and/or modelling results compared to air quality guidelines. If the measurements or model results exceed the air quality (AQ) standards for a region/country, the system will give an alarm. This alarm will be generated automatically in the air quality management system and after approval by a local expert be transferred to the private units, via GSM or other media.
In a conceptual stance, APNEE will develop a harmonised classification scheme for a uniform categorisation of environmental data and further develop forecasting methods. Experience gained in other European funded projects where rough environmental classification schemes have been developed will be valuable for creating this harmonised environmental scheme in APNEE. Moreover, a generalised approach for requirements elicitation in cities and urban regions for the dissemination of environmental information has been elaborated and applied in the process of requirements definition *(Karatzas and Dioudi, 2000)*. In a technical stance, an environmental information portal will be developed to offer harmonised information services to citizens.

AIR QUALITY INFORMATION ACCESS BEFORE APNEE

The APNEE project started with a deep analysis and study of the state of the art in air quality information systems. This investigation has provided an overview of the actual status of air quality information systems or - in other words - how this information is provided to the citizen by the different city and regional environmental administrations. The dissemination of air quality information is today essentially restricted to monitoring networks and progressively the information includes additional features such as forecasting data. Possible ways and capabilities for distributing this information to the citizen has been progressed very much and APNEE's contribution is focusing on this matter. Figure 1 shows how the information is disseminated within the cities today. Here, information access to air quality information can be characterised by:

- low interactivity -> barrier to information access for citizens
- little details -> difficulties to understand the meaning of pollution levels resulting in barriers to take action for protection of endangered persons or to fight against air pollution
- important human intervention for data processing in air quality information access -> slowing down information flow.

AFTER APNEE

Figure 2 shows the situation after the APNEE project and how environmental information has been enhanced by improving the flow through an integrated air quality information systems (the part developed by APNEE is indicated in light-grey). Information access through APNEE will offer new quality levels of services to the citizen:

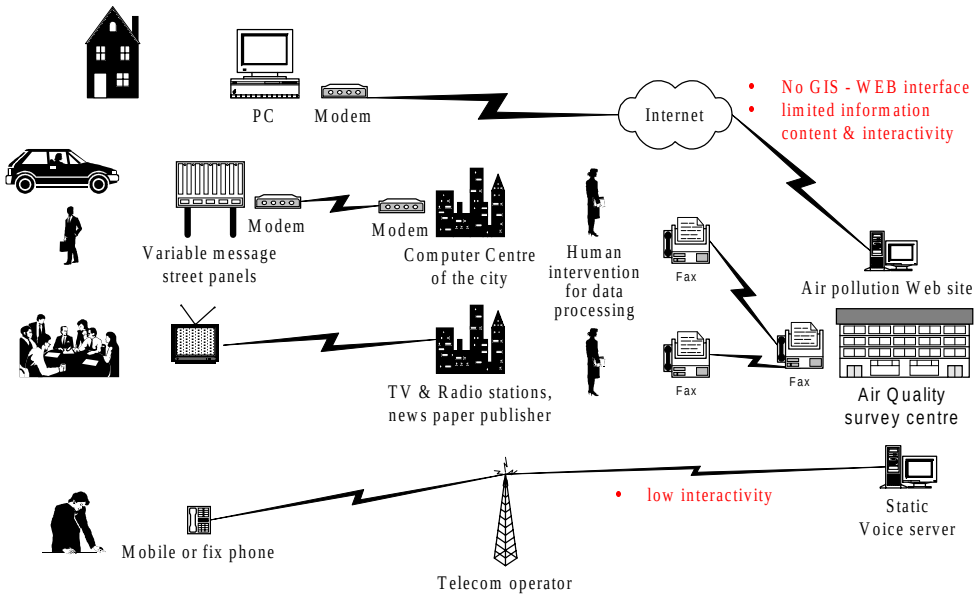

Figure 1.- Air Quality information System Technologies before APNEE.

- high interactivity and reactivity -> to eliminate access barriers for citizens to air quality information, and will bring the information directly to the citizens.
- sophisticated information presentation -> to make air pollution levels easily understandable and provides suggestions for actions on protection and fighting against air pollution.
- reduced human intervention for data processing -> to speed up information flow and gives the possibility to act before air pollution rises to a critical level.

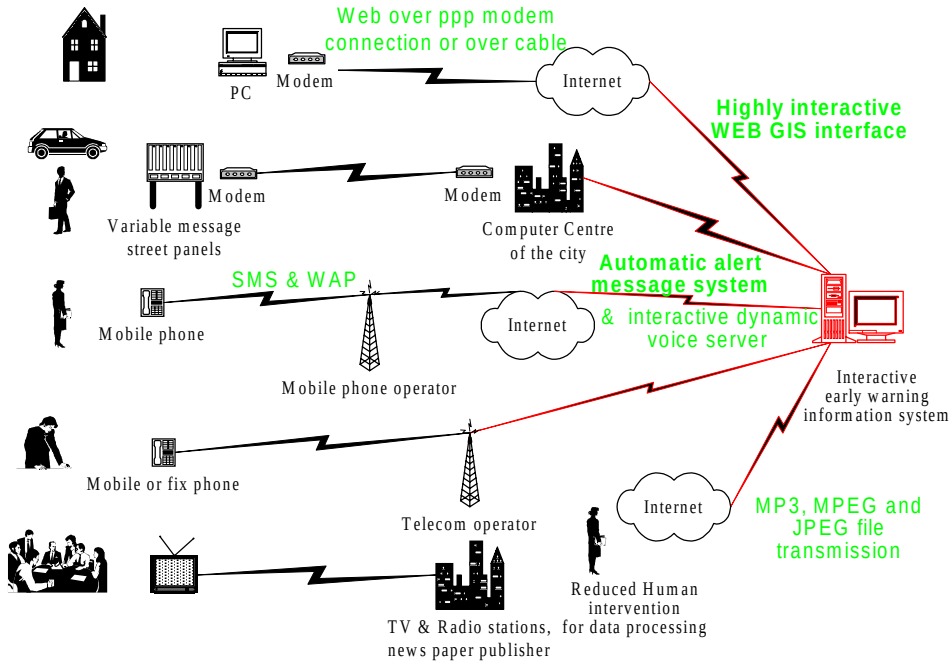

Figure 2.- Air Quality Information System Technologies after APNEE.

CONCLUSIONS

We have presented an outline of the most important innovation lines for air quality information systems fostered in APNEE. The strategic combination of air quality forecasting models, air quality

network data and new information technologies (Internet, mobile phones, SMS, etc.) will produce means with a significant added value for the European environmental city administrators since it would be possible to adhere EU directives related to air quality limits (EU/April, 1999, AQ directive). The APNEE service will provide these capabilities. Special emphasis will be put on the powerful integration of new communication technologies and air quality models. The new communication technologies will allow authorities to effectively implement such air quality directives and EU legislation. The state of the art of air quality models – in both forecasting and scenario modes – allows one to determine the contribution of each area in the model's domain to the ozone peak values in forecasting mode (next 24-48 hours). This capability will allow the city environmental administrator to focus on those areas which have a major impact on the ozone peaks. In case of an ozone alert (forecasting ozone concentrations over a threshold at a specific time of the day in the forecasting period) the determination of those "sensitive" areas will allow authorities to take appropriate actions with a major impact on the ozone concentration reduction. In order to carry out these actions, the new information technologies will be an essential enabler to reach the citizen (only those people staying in that specific area where the emission reduction is to be implemented). In addition, from a citizen and city administration's point of view, the increase of the quality of air pollution information and the way of how this information is delivered to the citizen will produce a better quality of life and a much better communication and mutual understanding between citizens and city authorities.

5. ACKNOWLEDGMENTS

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