AIR QUALITY PORTALS

Engineering Citizen-centred Service Chains for the Dissemination of Air Quality Information

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1 Introduction

In APNEE (Air Pollution Network for Early warning and information Exchange in Europe), we have been designing information services that draw upon various information channels, i.e. mobile technologies, interactive portals for the Internet, as well as street panels for municipality usage scenarios [APNEE 1999].

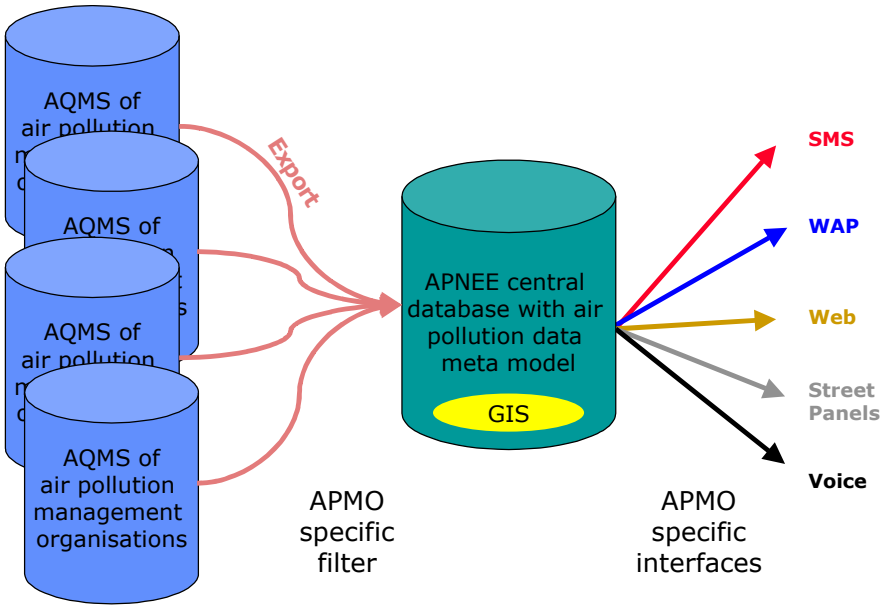
APNEE put forth a uniform information portal for information on air quality. In a conceptual stance, this uniform information portal is founded in a central repository approach. Information on air quality originating from already existing air quality monitoring and forecasting systems are uploaded according to a standardised schema, which reflects the experience on air quality information from several projects. Once uploaded, information are processed and disseminated according to individual and region-specific preferences. While different user sites share the structure and content of the information, the type of presentation varies significantly.

APNEE employs several communication channels to transmit the information on air quality to selected citizens in urban regions in a customised fashion. Customisation refers to the tailoring and processing of information content, i.e. the kind of warnings or recommendations for further actions, with respect to the user group registered, to the technical capabilities of the end-user devices targeted, and of course to the geographic location. Two dimensions for the improvement of information services have been followed: Firstly, sophisticated means for information visualisation are provided to elevate the intuitivity of information encounter [Bøhler et al. 2002]. Rather than presenting raw data of some environmental management systems, a new interaction metaphor for navigation and access in information spaces is employed. Special attention has been turned to means for visualising data in a cartographic stance and for providing interactivity amid exploration [Peinel & Rose 2001]. Secondly, information services had to mature from a passive delivery task towards a pro-active, customisable service, that orchestrates data for a specific purpose and employs appropriate information modality whilst reaching citizens, that might have even subscribed to specific profiles [Johansen et al. 2001].

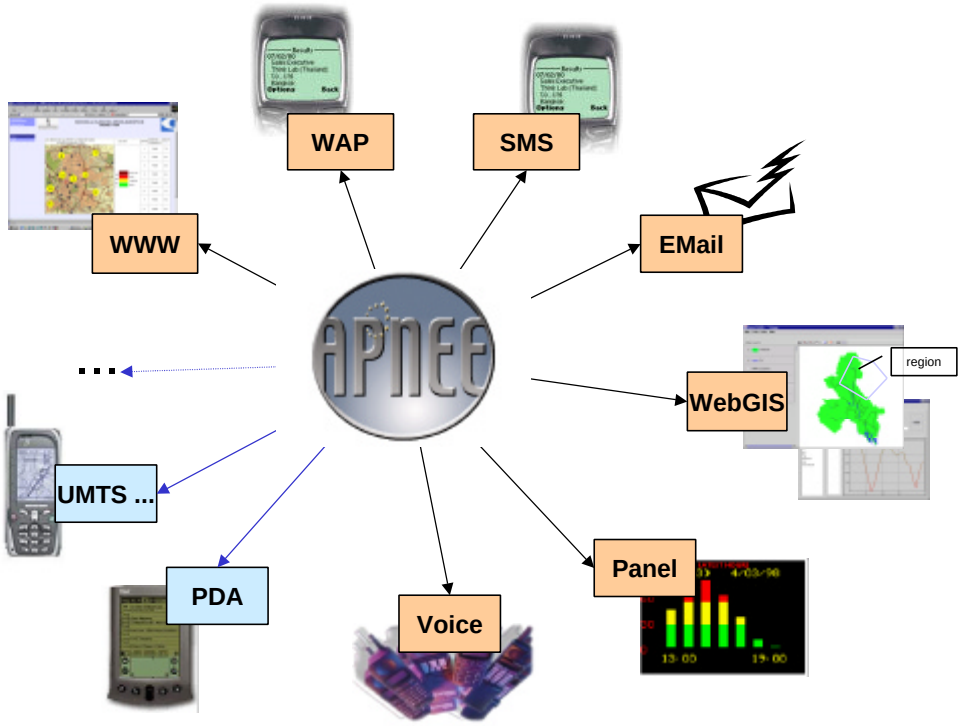
In this paper, we firstly report on the technical approach and the field trials that have been conducted to evaluate user acceptance and prepare the grounds for operating APNEE-like services at a wider scale. Secondly, we give an overview of business perspectives of such environmental services based on the experience made in APNEE as well as first experiences gained the APNEE follow-up project APNEE-TU where besides others three new commercial partners from different countries joined the consortium.

2 Approach

The APNEE solution is based on one common central system allowing new users sites as well as new interface providers to easily connect to the system.



The beauty of this approach is the ease of connecting new air pollution management organisations (APMO) to the APNEE system by building only an export filter to the APNEE central database. That is, APNEE provides in principle the dissemination core, i.e. broker platform, employing several communication channels to be used by content providers, in our case information on air quality and levels of comfort.



While the mobile interfaces have to be implemented with respect to the telecommunication providers involved in APNEE, the web solution as well as the subscription service are based on one common platform, open source and freeware for all user sites. Separation of layout and

content allows easy adaptation to new user sites reflecting their individual corporate identity as well as of course language and country specific issues.

Mobile access and street panels for new user sites are also easily connectable to the database, but individual technical architectures and modules of telecommunication providers require a little more effort for implementation.

Based on this open approach new components can be connected. "New" components include:

- Additional user sites with data sources provided by regional data providers,
- Alternative types of data to cover new information domains, such as pollens,
- Emerging devices and communication channels, such as PDA (Personal Digital Assistant) connected via GPRS.

The following table gives an overview of interfaces already implemented and evaluated in the APNEE user site countries:

Countries-User Sites/Interfaces	**Web**	**Street panels**	**Voice Server**	**WAP**	**SMS**
Norway: Grenland	✓	×	×	×	✓
Greece: Athens	✓	×	×	✓	✓
France: East of Bouches-du-Rhônes, Var and Vaucluse	×	×	✓	✓	✓
Spain: Madrid	✓	✓	×	✓	✓

✓= implemented and running, × not implemented.

3 Reflection of Field Trials

Field trials have been conducted in several European regions. The content and design of information services has proven crucial for the success. Rather than eliciting requirements from the viewpoint of city and regional authorities, the citizen should be at the heart of any requirements elicitation, although research in requirements engineering suggests to put less emphasis on the actual "end-user". On the other side, experience from extreme programming suggests to engineer services in tight co-operation with end-users. Both approaches have been trialed in APNEE, the citizen-centred one has developed extremely well. Yet, this approach also requests significant resources to interview citizens and monitor the impact of information services.

In the region of Marseilles intensive user interviews have been conducted to elicit citizen requirements. Citizens show a crisp interest in environmental information when presented appropriately. Moreover, beyond the mere dissemination of information one also ought to convey recommendations for action to be taken by citizens. Some members of the test panel also claimed that they changed their behaviour because of the information provided. Hence, evidence has been produced that a well informed citizen will change behaviour.

Yet, the design of the information services has proven resource intensive, that is the content and type of presentation was adapted in two cycles leading to the version currently available. Moreover, the field trial unveiled the need for a harmonised classification schema. The ATMO index has proven successful, because it gives a clear rating of the state of air quality ranging from 1 to 10; information is easy to understand.

A technology-driven approach has been followed in the Madrid field trial. SMS, WAP and Internet services were at the heart of the field trial. While the SMS experiment was comparable to the Marseilles one, the WAP service revealed significant differences. Similar to the Marseilles

trial, usability studies preceded the system design; the animation of environmental information on low resolution devices was the challenge in this case. Imaging the display capabilities of a mobile phone and the resolution requested for the display of a roadmap. This endeavour yielded in an iconic presentation of major traffic lines replenished emoticons presenting the state of air quality. Once designed and available in online operation, field trials were conducted in a commercial portal. High rates were achieved with relation to WAP services. The distribution of accesses shows peaks during typical break times, and before and after rush hours. Hence, people are interested to receive information on air quality and potential limitations of restricted areas. Moreover, a commercial exploitation as premium WAP services is on its way, based on a business model for bundling service in a premium service.

The experiments in Marseilles and Madrid unveiled some cultural differences. While the French trial capitalises on voice servers and the citizens rather neglected WAP services, the Spanish trial showed a preference of WAP services with exceptionally high hit rates.

4 Business perspectives

Yet, the question arises of how to finance this kind of services. Several business models have been elaborated. Services on a charged basis seem unattractive, although SMS services for traffic information and metro/subway information have proven successful in metropolitan areas. Service bundles for "greening purposes" appear as natural solution. But there is evidence that once turned into levels of comfort acceptance raises. Rather than receiving raw data, the citizen is interested in high quality information services: "give me a forecast replenished with recommendations for individual activities".

Field trials in Grenland revealed further business opportunities. Once individual behaviour is affected, citizens are voicing pricing confessions: "once this information service is in place, I would afford 4 Euro for subscribing to this service". Regardless of the pricing scale, this experience backs the experience of the Marseilles trial; people are prepared to subscribe to this kind of services on a charge basis, once they can "grasp" the value-added for their live.

The project attracted new commercial partners for a follow-up of project APNEE. These partners expressed their clear will to evaluate this environmental content for new technologies like WAP, PDAs, GPRS and UMTS. The new 2.5 and 3G mobile technologies GPRS and UMTS are currently lacking content to be successful on the market and accepted by users as startup pushing this technologies: the success of services of the 3G mobile technologies offered for example by UMTS (Universal Mobile Telecommunication System) depends strongly on structure and marketing of the service bundle, Marketing strategies have to take into account customer requirements and concrete benefits instead of concentrating on technical details (Pricewaterhouse-Coopers Technology Center, Technology Forecast 2001 –2003).

5 Conclusions and Future Work

Citizens call for timely and high-quality environmental information for reasons of comfort and health care by nature. This interest recommends an easy-to-understand and easy-to-access presentation of such information. Rather than presenting raw data in an extensive fashion, one ought to engineer customisable information services, that can be tailored to individual user groups, be it for reasons of content or be it for reasons of citizen's reachability. Based on such high quality dissemination services, even environmental information will turn into an attractive product once perceived and provided as indicators for emerging interests of citizens towards

levels of comfort. Yet, commercial content providers have to be attracted to offer this kind of services, be it as portal or messaging services. In this paper we report on the design of information services that are offered by non-governmental and commercial organisations. Field trials unveiled the preparedness and willingness of the citizen for services on a charge basis if the value-added can be "grasped".

As already mentioned, we will further investigate the APNEE approach and its services in APNEE TU (APNEE Take-Up) in the context of a take-up measure. First experiences gained in this follow-up project will round up the overall APNEE approach.

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References

APNEE 1999

APNEE (1999). Air Pollution Network for Early warning and on-line Information Exchange in Europe, IST-1999-11517 project, http://www.apnee.org

Bøhler et al. 2002

T. Bøhler, K. Karatzas, G. Peinel, T. Rose, R. San Jose (2002). Providing Multi-modal Access to Environmental Data — Customisable Information Services for Disseminating Air Quality Information in APNEE. *Journal on Computers, Environment and Urban Systems 26*, 1, 39-61.

Johansen et al. 2001

P.H. Johansen, J.E. Lindberg, K. Karatzas, G. Peinel, T. Rose (2001). Citizen-centred Information Dissemination with Multimodal Information Channels. *15th International Environmental Informatics Symposium: Sustainability in the Information Society*, Zürich, Swiss.

Karatzas et al. 2000

K. Karatzas, G. Peinel, T. Rose (2000). GIS-based Dissemination of Air Quality Information in APNEE. *6th European Commission GI and GIS Workshop, The Spatial Information Society - Shaping the Future*, Lyon, France.

Peinel & Rose 2001

G. Peinel, T. Rose (2001). Graphical Information Portals — The Application of Smart Maps in GeoNet 4D. *GeoInformatica 5*, 4, 327-344.