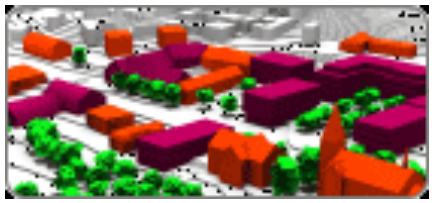
urbanAPI

INTERACTIVE ANALYSIS, SIMULATION AND VISUALISATION TOOLS FOR URBAN AGILE POLICY IMPLEMENTATION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PROJECT IDEA AND APPROACH

In the context of European initiatives to improve policy making and implementation as a more transparent and understandable process, the urbanAPI project provides urban planners with tools and intelligence needed to actively manage the urban environment. Thus, activities like issue identification, policy analysis, consultation, decision and evaluation in urban planning and land management policy become more efficient.

The main stakeholders that benefit from the urbanAPI project results relate to three different interest groups: i) planning authorities interested in software solutions and application in their cities, ii) policy makers interested in content communication and means to intervene in the urban development process, and iii) others including 'ordinary citizens', laypersons with respect to methodology, but experts in local issue identification and specification of alternative development solutions.

Enhanced ICT tools developed by urbanAPI provide planners and policy makers the information they need to better understand participatory and collaborative planning scenarios and fully expose the socio-economic and environmental impacts associated with alternative options for territorial development. Thus, conditions are created in which the political mandate and the basis for more effective management are secured. These ICT tools are structured in three urban planning contexts:

- First, urbanAPI addresses the issue of stakeholder engagement in the planning process by the development of enhanced virtual reality visualisation of neighbourhood development proposals;
- Second, at the city-wide scale, urbanAPI has developed mobile (GSM) based applications that permit the analysis and visual representation of socio-economic activity across the territory of the city, and in relation to the various land-use elements of the city;
- Finally, urbanAPI has provided ICT simulation tool applications in the city-region context addressing multiple challenges in responding to the simultaneous demands of expanding city populations for certain European cities, and declining and frequently ageing populations elsewhere. Such applications collectively provide vital decision-making aids for urban planners in the management of the territory, as well as for the associated responsibilities in political negotiation, and wider stakeholder engagement regarding the future development of the territory. Each of the participating cities has elaborated scenarios for these applications, to address a broader perspective, to learn from each other and also to be able to compare the results.

These solutions are applied in four EU cities: Vienna, Bologna, Vitoria-Gasteiz and Ruse as indicated in Figure 1:

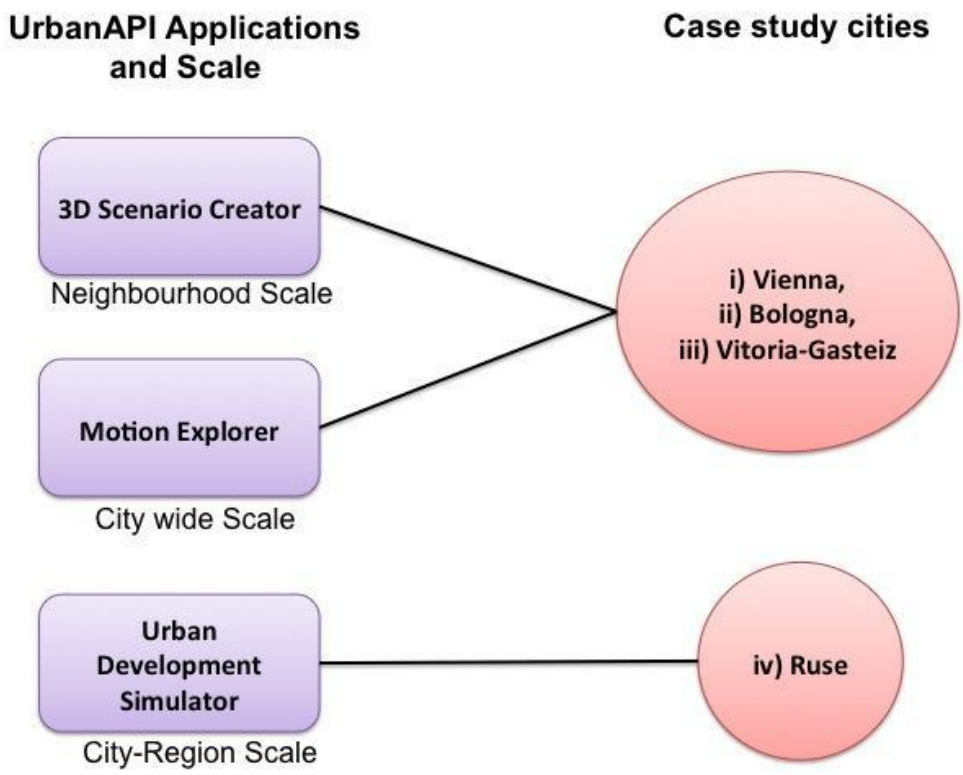


Figure 1: urbanAPI application scales and cities

Most of the cities participated in two different applications, exploring the potentials of the applications in relation to context specific socio-economic, environmental and territorial characteristics, governance structures and practices, and furthermore defining potential commonalities as a basis for the development of generic ICT applications

URBANAPI OBJECTIVES

- The project is led by objectives concerning policy making and public participation:
- to support public participation in urban planning policy;
- to enhance the transparency of planning outcomes at the local scale;
- to achieve a better identification of benefits and outcomes for the population – by exploring socio-economic interaction in public spaces;
- to conduct enhanced prediction of urban development and societal trends and possible impacts of policy measures to achieve a more sustainable implementation of local government policies.

IN ADDITION THE ICT AND POLICY MODELLING OBJECTIVES INCLUDE:

- to develop an object-oriented meta-model for the creation of policy making domain models, including a model of geometric (topological, multiple representations/scale) and functional relations (feedback, conflicts);
- to design and implement a toolkit for rapid development and deployment of participative policy making applications;
- to create a family of domain-specific rule languages enabling urban planning domain specialists to define policy models and their requirements, to integrate required data sets and to define the presentation of content to be delivered;
- to allow domain experts to use the family of rule languages to create policy support applications;
- to perform real-time simulations with interactive reaction times.

Project Progress and Achievements during the entire project period

As defined in Annex I of the Grant Agreement the project is organised in several work packages. The overall structure and the collaborations between the work packages are depicted in Figure 2.

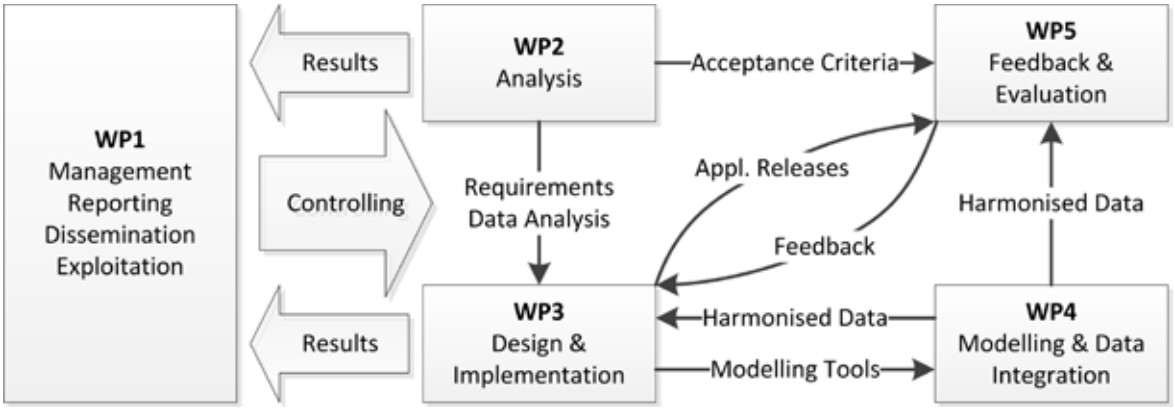


Figure 2: urbanAPI Overall Structure and Collaborations between Work Packages

At **the beginning of the project** a requirements analysis commenced with respect to each of the city partners applications. Question surveys and user workshops provided the basis for the elaboration of project goals and the identification of user needs and requirements. Furthermore, the application scenarios for each of the cities were created as the basis for the development of the urbanAPI tool sets. The results of this analysis were presented in the deliverable on user requirements, and are made publicly available on the project web site.

The city requirements provided the basis for the design and implementation of the urbanAPI ICT tool set to support the defined scenarios for the user community. In respect of the different applications and user expectations the appropriate data has been defined and acquired in order to operationalize the scenarios. Data preparation, harmonisation and integration has commenced for those data sets available from the participating cities. However, this task has proved to be more difficult than expected as some cities do not have appropriate data available, and others use proprietary data formats, so that existing standard solutions could only be partly applied, and specific solutions had to be developed.

The data management, visualisation, and interaction requirements are realized via the Fraunhofer IGD CityServer3D. A code camp held at the beginning of the development activities provided the opportunity for discussion of the integration of existing systems with the new tools, as well as integration with the applications from Fraunhofer IGD and AIT. A common urbanAPI concept was outlined, defining the client as a standard web-browser which loads a web application from CityServer3D. The web application can make use of all state-of-the-art web technologies including X3DOM to display 3D content over the WebGL-API. The CityServer3D hosts all the data required including 3D-city models, terrain models or data related to the buildings themselves. The required development and integration work for the first development cycle was completed in the **second project year.**

Pre-existing tools and development extensions have commenced and early demonstrators were realised in the **first project year** for the urban planning application in Vitoria-Gasteiz, Spain, using a 3D scenario creator, as well as application of the public motion explorer in Vienna. The third application concerning the urban growth simulation also commenced and early performance tests established. In the **second project year** the other scenarios for all three applications involving the other urbanAPI cities were developed.

Furthermore, a Web portal was developed to provide a common integration environment for all the applications developed. This can be dynamically configured to support each of the applications and all the scenarios of the participating cities where appropriate. Additionally, for the three cities 3D VR applications were developed for different application scenarios. The functionality supported includes: visualisation of the 3D city model, annotations in the 3D scene, integration of additional pre-defined objects, parallel viewing of alternative scenes, with synchronized or independent navigation.

During the **second project year**, the public motion explorer was also developed for three of cities. The quality of data that could be acquired was quite different for each of the cities. Therefore, the results are not fully satisfactory for some scenarios so far. Based on the experience gained, the consortium has defined the needs of data and their quality for reasonable usage and will follow up to acquire additional data sets to reach a higher standard for the motion explorer analysis to provide better results for the end users.

The application for urban growth simulation for one of the cities was also developed during this period and provides simulation tools for the re-urbanisation of an old industrial area addressing aspects of land use, housing and infrastructure needs, as well as commercial use.

At the beginning of the **third project year** a review and evaluation cycle with the end users of the participating cities as well as members of the Stakeholder Board was performed, for each of the scenarios. A system introduction, hands on training session and an online evaluation questionnaire was offered to all the users. Following these results and feedback from the users, a second iteration round for updates and improvements of the tool set and the applications, as well as additional functionality according to upcoming requirements was the main focus of activity during the last year of the project.

In the first year an assessment methodology was developed for evaluation of feedback in respect of both user perspectives as well as technical evaluation, to be further detailed, implemented, and applied in the review cycles. Using the assessment methodology of the project, the evaluation design process followed, which includes evaluation design for all urbanAPI tools and applications, consultation with cities, test case preparation and implementation. A detailed evaluation design for all urbanAPI applications was prepared and verified by the city partners which provides a basis to perform both technical and user evaluations.

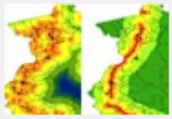
Furthermore, user evaluation was performed at the beginning of the **third year**. The results and feedback were used as basis for the second development cycle in the last project year. A second review and evaluation cycle was carried out at the end of the project.

URBANAPI SOLUTIONS

The developed urbanAPI tools cover three urban planning contexts as illustrated below:

The **3D Scenario Creator** directly addresses the issue of stakeholder engagement in the planning process through the development and provision of **enhanced virtual reality visualisations** of neighbourhood development proposals.

The **Mobility Explorer** provides mobile phone based ICT solutions that permit the analysis and visual **representation of socio-economic activity across cities** and in relation to the various land-use elements of the city.



The **Urban Development Simulator** provides ICT simulation tools for **interactive city region development simulation** addressing urban growth and densification with planning interventions.

3D SCENARIO CREATOR

The 3D scenarios **support the negotiation process for urban development projects**. Interactive control of planning interventions and presentation of the new visual effects released through changes in zoning and finally construction to help the citizens experience these impressions.

Virtual representations of planning decisions are the **most convenient and understandable solution** for presenting spatial planning alternatives to the public. Allowing interactive modifications of alternatives helps stakeholders to **understand the proposed actions** and to assess and endorse the anticipated impacts.

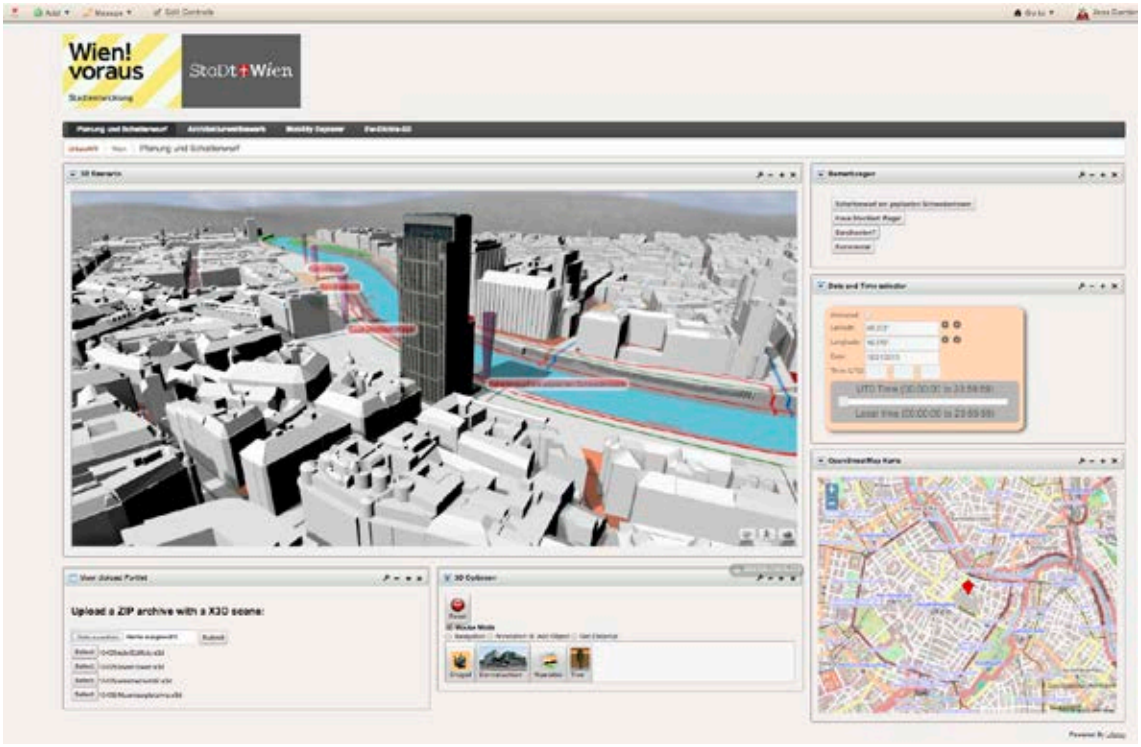


Figure 3: urbanAPI 3D Scenario Creator: Planning and shadow simulation

The users that have implemented the solution expressed their positive feedback as follows:

„To visualize projects and actions [the 3D Scenario Creator] is great and the opportunity to "change the reality" reduces the resistance to modifications."
- Bologna

„I like the simplicity of the tool and its applicability specially for participatory planning, that hopefully become a requirement for all future urban investment."
- Bologna

MOBILITY EXPLORER

The Mobility Explorer (see Figure 3) permits description of activity dynamics within a city during the day. Using this application it is possible to **interactively** assess the impact of land use and urban infrastructure as a response to population activities. The visualization is made by means of a 2D/3D web mapping client within the urbanAPI system for **full public access** to explore the sojourn/activity distribution maps over time. Larger scale explorations allow monitoring of access preferences for public places in detail.

Furthermore, opinion polls of the local population and the visitors of the web maps provides further information about the features of the public space which they find more attractive rather than others, thereby supporting city authorities in making public spaces more attractive for residents. The Mobility Explorer was developed for the cities of Bologna, Vitoria-Gasteiz, Ruse and Vienna.

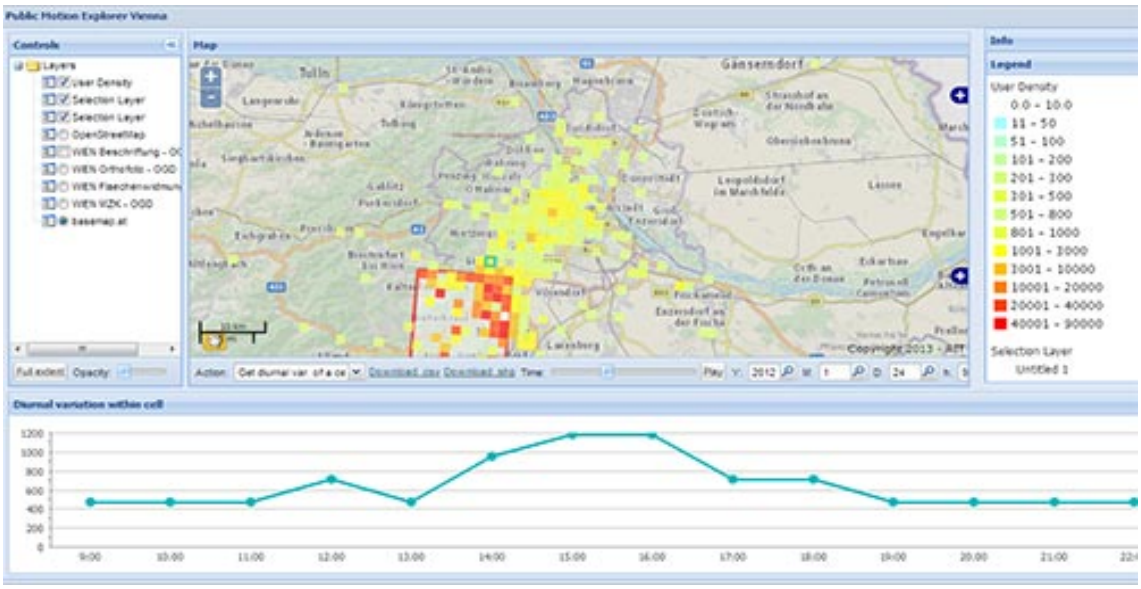


Figure 4: urbanAPI Mobility Explorer: Description of Activity Dynamics

The feedback provided by users:

„The application is easy to use and friendly to see."
- Vitoria Gasteiz

„The System is easy to use."
- Vitoria Gasteiz

URBAN DEVELOPMENT SIMULATOR

The urban regional development simulation assists in **understanding the large scale consequences of spatial planning decisions** in a complex urban system (e.g. urban growth and densification as an effect of zoning, tax regulations or traffic infrastructure development). Interactive control of proposed planning interventions and associated impacts generated by these interventions assist the public to interactively engage in planning processes and so contributing to planning decisions.

Detailed and easy understandable information about planning decisions and **full transparency about the expected impacts** support the negotiations with citizens during a planning process and finally increase public commitment to these decisions.

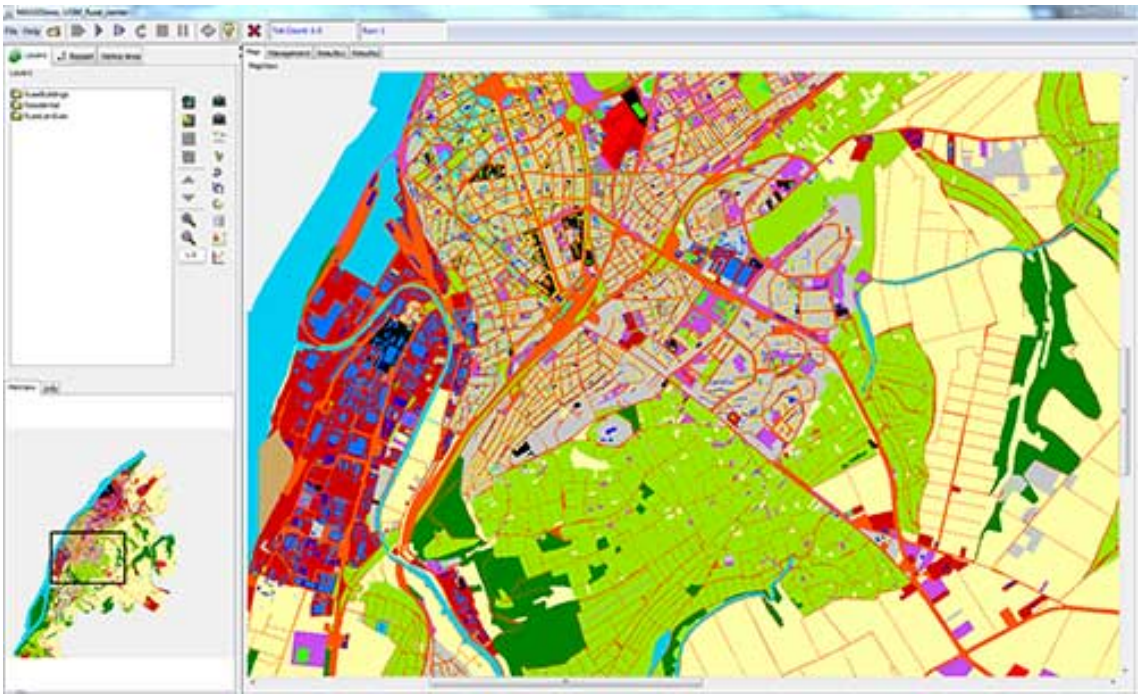


Figure 5: urbanAPI Urban Development Simulator of Spatial Planning Decisions

Feedback from our users:

„Good ideas are implemented in this system. And the system has a future."
- Ruse

The application scenarios for each partner city can be found at the following links:

- Portal Introduction: http://urbanapi.igd.fraunhofer.de:8080/introduction
- Vienna: http://urbanapi.igd.fraunhofer.de:8080/web/wien/home
- Vitoria-Gasteiz: http://urbanapi.igd.fraunhofer.de:8080/web/vitoria-gasteiz/vitoria
- Bologna: http://urbanapi.igd.fraunhofer.de:8080/web/bologna/bologna
- Ruse:http://urbanapi.igd.fraunhofer.de:8080/web/ruse

Training videos, including PortalVideoLessons and AdminVideo are published under http://urbanapi.igd.fraunhofer.de:8080/introduction.

EXPLOITATION OF PROJECT RESULTS

The exploitation of the smart tools and methodologies developed by urbanAPI was a fundamental project objective. Achieving this exploitation potential requires substantial understanding of the wider urban governance context in which urbanAPI tools and applications connect with urban governance processes, and how they contribute to the flow of intelligence necessary to support plan making and decision taking. Such understanding permits the further development of these tools and the identification of application commonalities in the urbanAPI partner cities, which can then be translated into generic applications applicable to a wide range of cities throughout Europe.

In relation to the business context, urbanAPI tools provide the following product/services portfolio:

- **Software** to be licensed (e.g. CityServer3D with extensions)
- **Development services** that includes the development of an application for a specific use (e.g. data preparation and visualisation of 3D data); including consortium partner joint developments of an upgraded and regionally tuned application (as example - UDS), following requests from the city or regional administration, after an experimental use of the urban-API application for a certain period; Thus, the application will be better linked to local specific needs and emerging challenges, which have not been assessed during the preliminary project periods, because of the complexity of the project tool and the preparedness of the administration to use it;
- **Consulting services** (e.g. giving advice on how 3D data to be generated)

TARGET GROUPS

- The key target groups of the urbanAPI tools are defined as follows:
- From a core market perspective the key target customers of the urbanAPI - ICT solutions are mostly **public entities** involved in
- urban and regional planning
- environmental management
- mobility management
- transport planning
- infrastructure planning and maintenance
- risk management; territorial and resource management
- public participation services and;
- European level: specialised agencies of the EC (e.g. such as the DG's and the EEA).

In addition **private companies** may be identified as relevant customer segments including

- planning engineers
- geomarketing companies
- environmental consultants
- transport consultants
- architectural practitioners
- mobile communication operators
- real estate developers

IMPACT OF URBANAPI RESULTS

The enhanced ICT tools developed by urbanAPI aim to offer new opportunities for the development of both intelligence sources as well as tools for decision-making support at three levels of urban governance: from neighbourhood to city region level, thereby addressing the key dimensions of the management of urban complexity. At the same time the project provides a simplified language of communication between different stakeholder groups (3D virtual reality, visualisation and simulation-based communication) developed on a common platform of communication between the different levels of governance including local (virtual reality), citywide (mobile based GSM data) and city region (simulation), thereby addressing the state of the art in relation to the necessary collectivity of city governance.

urbanAPI ICT methodologies and decision-support tools, also provide support towards SEIS and other related initiatives such as the EU Digital Agenda 2020. In addition, based on the requirements of the governance paradigm of integrated urban governance, they provide a step towards a consistent framework and context to systematise the information flows from data collection to assessment and decision-making support. These new models of governance and management in support of sustainable development require greater stakeholder engagement, partnership between stakeholders, and integration of information and analysis (cross departmental/multi-scalar), with a focus on the management of urban complexity, including management of the peri-urban (interface urban and rural), where key challenges for urban planning include issues concerning the containment of urban sprawl and the creation of the compact city.

Clearly conclusions in the evaluation process recognised the need for further development of these applications, but the strategic importance of the functioning of these tools, working in combination in an integrated manner, in relation to the decision-making process must also be recognised and endorsed as a basis for timely and well positioned RTD investments in the future development of ICT enabled urban governance.

The challenge then is how to generalise these ICT solutions, to support adoption by other cities. Based on the urbanAPI development experience it is concluded that the fundamental needs of participatory planning, collaborative decision-making and support to policy making processes remain the same for different cities. For instance, the urbanAPI tools can be applied to other cities as they provide an efficient way to analyse city data

and visualise the future city model that assists in securing public support and the identification of planning issues. Accordingly, lessons learned from the commonalities in requirements, support to participatory planning and policy making processes and comparative assessment of the applications developed in the differing project case study city contexts, can form the basis for the future development of generic ICT tools that can be utilised in the majority of the 400 plus cities of Europe with populations over 100,000, as well as other smaller cities and towns throughout Europe.

GENERAL INFORMATION

urbanAPI is an on-going small and medium scale research project (STREP) within the Framework Program 7 of the European Commission.

The project submitted to the ICT call 7, under Objective ICT-2011-5.6 “ICT solutions for governance and policy modelling” is funded by the European Commission (Project number 288577).

The project is established with nine partners from six countries to deliver the project goals and objectives. The partners include representatives from four application cities, two urban planners and policy modellers, and three development groups. The project is coordinated by Fraunhofer Institute for Computer Graphics Research IGD, Darmstadt, Germany. The project commenced on September 1, 2011 and end in November 2014.

urbanapi2 Consortium: project meeting in Vienna, September 2014

urbanAPI has established a Stakeholder Board to obtain further inputs from the community, secure evaluation and feedback on project development, and to support the dissemination of the results via the user communities.

General information concerning the project as well as a list of the publicly available results and deliverables can be obtained at the urbanAPI website http://www.urbanAPI.eu. For further information, please, contact the urbanAPI Project Office or the Coordinator.

URBANAPI CONSORTIUM

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Austrian Institute of Technology GmbH - Department Foresight and Policy Development (AIT)

GeoVille GmbH

AEW srl

City of Bologna (COBO)

Agency for Sustainable Development and Eurointegration "Ecoregions" – ASDE (City of Sofia)

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