

European Standards for Vocational Training in Urban Regeneration

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1 ABSTRACT

SATURN is the Leonardo da Vinci funded project developed by a partnership of Edinburgh World Heritage, Warsaw School of Economics, CEIT Alanova and IURS (Institut pro udržitený rozvoj sídel o.s.). The project aims to establish a framework for vocational studies in urban regeneration. One of the key questions this project raises is: what range of skills and knowledge professionals should have to enable them to define issues accurately and find the most suitable solutions for urban regeneration? The SATURN project provides a set of manuals and recommendations for students, learners, and professionals in the field of urban regeneration. The real value of SATURN comes from its practical dimension and input from practitioners actively involved in city planning and the processes of urban regeneration.

2 BACKGROUND ON URBAN REGENERATION AND VOCATIONAL LEARNING

Currently, there is a strong deficit of specialists with broad interdisciplinary skills needed in urban management (including heritage management in Central and Eastern European countries). Most professionals responsible for this domain are geographers, planners, architects, art historians and conservators. Required are broad skills such as an interdisciplinary approach, management skills, an economic background and knowledge of how to obtain funding from diverse sources. Moreover, investors operating in urban heritage areas need to have knowledge of the historic social values of these sites. The local decision makers, administrators and regulators need to have knowledge of economic and management skills and can also benefit when they can have access to broader international experiences and examples. Anyway, in practice sometimes professional knowledge, management skills, or language skills to work internationally are lacking.

Urban regeneration as a subject for vocational learning and as an academic research discipline is likely to be one of the visionary and developing fields on the horizon over the next 20 years. Projects dedicated to the redevelopment of city centres and brown field sites are becoming a necessity. The issue becomes even more complicated in the old historic cities with a relatively high public involvement. The links between conservation, urban design, coordinative and financial skills are crucial elements of any regeneration project or strategy and are still largely absent in urban heritage management standards. It is important that these problems are addressed to achieve the fastest and most effective outcome.

One of the best ways of learning and teaching is through analysing good practice. Urban regeneration is no exception. However, effective learning is efficient if the process of discovery encourages creative thinking about a problem. European unification and technological development in communication allow the efficient exchange of information between people interested in the subject. SATURN provides a platform for the exchange of views on good practice and standards in vocational teaching. One important aim of the project is to produce a set of manuals focused on examples of good practices in urban regeneration as well as a set of recommendations. The overall object is to provide centres of education with an efficient tool, which will bridge the gap between theory and practice. The SATURN project has been funded the the European Life Long Learning Programme Leonardo between 2012-2014.

3 PARTNERSHIP APPROACH

The real value of SATURN comes from its practical dimension and input from practitioners actively involved in processes of urban regeneration. It also involves vocational trainees who are not only one of the key beneficiaries of the project but also participants, which should allow the project to bring the real educational value. Moreover, SATURN involves communities living in partner cities, to ensure an even more practical dimension to the project and to test some of the ideas through a community engagement process. The SATURN blog (<http://eurosaturn.blogspot.co.uk/>) informs about ongoing activities and results. One outcome of the project are three manuals, focusing on management aspects in urban regeneration, social and economic aspects as well as technological aspect. In addition, the main product of the SATURN projects

is the formulation of recommendations and standards for professionals and teachers/trainers in the field of urban regeneration.

4 SPOTLIGHT ON DIFFERENT ASPECTS OF URBAN REGENERATION

4.1 Heritage-led urban regeneration (Krzysztof Chuchra)

Urban regeneration is multidisciplinary, requiring a broad range of expertise. However, currently there is a deficit of specialists with broad interdisciplinary skills. Moreover, the local decision makers, administrators and regulators can lack economic and management skills and also access to broader international experiences and examples (mostly due to language barriers). These are the main principles, which the SATURN project looks to address, by building a new platform, which will provide standards for vocational training in urban regeneration for students and practitioners.

Heritage can play a significant role in urban regeneration, especially in large historic cities such as Edinburgh. Projects dedicated to the redevelopment of city centres and brown field sites are becoming a necessity. The issue becomes even more complicated in historic cities with a relatively high public involvement. The links between conservation, urban design, coordinative and financial skills are crucial elements of any regeneration project or strategy, and yet are still largely absent in urban heritage management standards. These are often embodied in local planning policy frameworks, where heritage led regeneration can help to bond together relevant development policies through a range of small interventions and large infrastructure projects.

4.2 Conservation-led urban regeneration – the case of Edinburgh World Heritage

Edinburgh is a challenging historic city to conserve due to its high number of monuments and buildings of historic importance. Many of those buildings are privately owned, which makes the process more challenging, requiring well integrated approach and effort of all relevant partners operating in the historic city centre. The main reasons are:

- (a) Poor aesthetic and structural condition of historic environment (physical);
- (b) lack of funding for an appropriate maintenance (economic);
- (c) lack of knowledge and understanding to importance of repair and maintenance (social);
- (d) lack of a strategic approach to the management of historic city centres through planning policies well coordinated with strategies orientated on economic development, sustainable tourism and community engagement (structural);
- (e) low priority for the sustainable management of historic city centre (political).

	2005/06	2006/07	2007/08	Change	Edinburgh 2008
A listed buildings*	656	656	656	0	877
B listed buildings**	863	864	863	-1	2699
C listed buildings*	157	156	157	+1	1178
Total for the World Heritage Site	1676	1676	1676	0	4754

Source: Historic Scotland, as at 31 March 2008

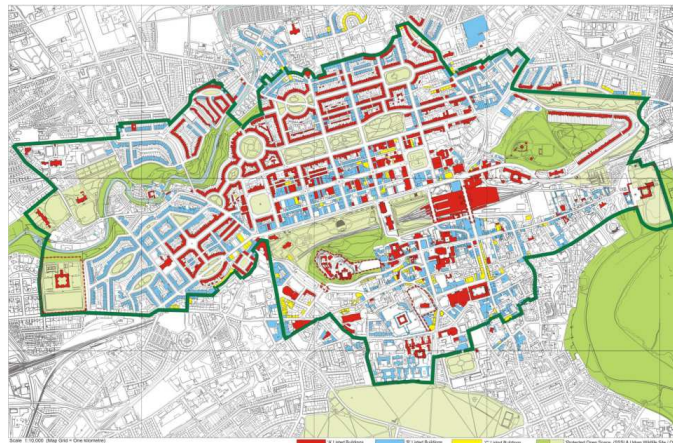
**Source: Scottish Civic Trust, as at June 2008

The Old Town benefited from a survey in 1984 showing an urgent need to develop an agenda for conservation-led regeneration in the Old Town. One of the key indicators was a significant drop of population of the Old Town from 23,000 in 1901 to 3,000 in 1981. Soon after that, the Old Town Renewal Trust (OTRT) was set up by the City of Edinburgh Council (CEC) to deliver the agenda, which had a strong regeneration orientation.

Rationalisation of heritage management and urban regeneration in Edinburgh

Since late 1970s the Edinburgh's historic centre benefits from a significant investment in regeneration with excellent results. Both organisations were well prepared to do the work and soon became community based

achieved through leadership and care to details. These became components, which reinstated civil pride and confidence in the city, triggered the successful decision to inscribe the New and Old Towns of Edinburgh to the World Heritage List in December 1995.



Map of Listed Buildings in the World Heritage Site

Soon after the inscription, in 1999, ENTCC and OTRT were merged to form one organisation focused on the entire World Heritage Site – Edinburgh World Heritage (EWH). The establishment of EWH reflected a rationalisation of heritage management in the city centre. The new organisation absorbed all functions of its predecessors with an addition of the implementation of the World Heritage Convention guidelines. The differences in the state of conservation between the both towns were reduced and a unified management would ensure a well coordinated approach. Most likely it would also mean reduced cost of management of the historic city centre for the public pocket.

The meaning of World Heritage in Edinburgh

Initially the concept was used to rationalise the way heritage was managed in the city. To an extent it had political connotations achieving positive results through set up of Edinburgh World Heritage by a merger of the key organisations operating in Edinburgh's city centre. Later on, the World Heritage Site became a 'planning issue' because often it was used by various interests groups to campaign against major developments in the city centre. From the perspective of the architectural integrity and authenticity, conservation practice and aesthetic values of the historic city centre there was a clear justification for treating the World Heritage status as a tool for monument protection.

The Old and New Towns of Edinburgh World Heritage Site Management Plan

The management plans often are perceived as conservation plans. However the practice differentiated both documents focusing the management plans on complex multi disciplinary issues against conservation plans, which often deal with relatively smaller sites or monuments. In case of Edinburgh, the management plan has a real political value as a platform where various direct and indirect interests meet. There is a range of reasons for it:

- High awareness of historic value of the built environment and World Heritage status amongst the citizens,
- Capital status of the city,
- Large, centrally located site,
- high number of various interests directly and indirectly related to the city management,
- Development pressure in the city centre,
- High concentration of historic buildings,
- Competition for public funding amongst public bodies.

In Edinburgh the Management Plan falls under planning guidance deriving from the Local Plan. It means that conservation is a part of city management and often is used as a tool in urban regeneration. Moreover, the way historic assets are managed and treated is well defined through the guidance, which in turn has to be addressed in design of new developments located in the historic environment. The principles are focused not

only on preserving the historic structures but historic character of the city without compromising standards of living.

Conservation Funding Programme (CFP)

A conservation work requires a significant investment and often property owners cannot afford maintenance and appropriate repair. Repairs of historic properties require appropriate building materials, for instance a particular type of sandstone often sourced from a particular part of the country, skills and specialists, as well as tools such as scaffolding. In case of Edinburgh the scale of required work is vast due to a high concentration of listed residential buildings.

The most neglected buildings causing hazard to citizens' health and safety fall under jurisdiction of the City of Edinburgh Council, which can issue a statutory notice to an owner. It allows the local authority to take initiative if required and become a project manager on behalf of proprietors who failed to maintain their property and organise necessary works. Still costs of the project have to be covered by proprietors, including 15% administration fee issued by the Council. The proprietors have an option to apply to EWH for a repayable grant of up to 25% of eligible works, when it comes to enforced repairs. Although it is a good system essentially, it can be easily abused by a local authority because the proprietors do not have any contractual relationship with the Council's contractors and often the final costs of repairs are higher than expected before a project starts. From the EWH perspective the statutory notice powers can be an opportunity to repair a property, which will benefit from the Council-led project, for instance by saving on costs of hiring scaffolding.

Creative interpretation of the World Heritage Convention - Edinburgh World Heritage model of management

Modern urban conservation practice becomes more complex on the both levels: practical and managerial. The practical side of urban conservation is a craft requiring a great deal of knowledge and experience to follow the best practice and conservation fundamentals. Nowadays, the technology steps in with new efficient and fabric friendly solutions such as graffiti removal by laser, doff steam cleaning system for removing paint from stonework, non invasive methods of treating dry rot, endoscopy used to define problems in parts of a building difficult to reach without structural intervention, or even work safety standards have improved considerably. Nevertheless, one of the key components in urban conservation is traditional building methods. By learning those skills one builds knowledge on why historic buildings were constructed in particular way reflected in building materials available at the time, climate or even geopolitics.

On the managerial level urban conservation evolved to a multi disciplinary specialisation. It covers disciplines such as architecture, planning, urban regeneration, construction, traditional building methods, project management, interpretation and at least few others. A structure of an organisation dealing with complex and numerous conservation and related projects should reflect this complexity.

Spatial planning

The city management practice proves that planning and monument protection can function against each other in the political terms. The planning system in the United Kingdom is well developed and relatively flexibly. It means that the system is exposed to lobbying as it is development driven. Often it causes conflicts and misunderstanding between conservation lobbies and developers. The first ones often form community groups based on the local residents or even organisations. These groups campaign against development proposals of low quality of design proposals, which are against the planning policy, erosive to the architectural character of a conservation area and/or World Heritage Site.

Developers investing in a city are obliged to ensure that design proposals are presented to the public well in advance. The outlines of a planning application for building permission have to be consulted before it is formed at the pre-application stage. There are guidelines defining the minimal period of time for public consultations; however nothing prevents developers from extending it, especially if the planned development is complex and potentially controversial. Local authorities facilitate the process ensuring the process is inclusive and transparent and that developers are advised on the planning policy framework. In case of Edinburgh the process can be challenging due to:

- high concentration of historic buildings;
- high levels of architectural authenticity and integrity;

- complex system of monument protection – the city centre is covered by the conservation areas powers as well as world heritage designation;
- relatively highly educated residents who understand the process;
- civic pride;
- high awareness of world heritage designation.

4.3 Social and economic aspects of urban regeneration (Marek Bryx)

All over Europe there are magnificent examples of urban regeneration projects, yet vast majority of them present social and economics aspects of sustainability, while ecology and green solutions are sometimes left behind. Our recent results of SATURN project and global shift toward green and eco-developments and redevelopments proved that deprived areas cannot be only renovated in order to restore social life and increase economic value of the area but should be changed in a way which will provide green and environmentally responsible solutions. Thus the issues which need to be addressed in the urban regeneration projects include not only rules of city regeneration and interdependencies existing between them; but also green technologies. Therefore, the aim of session delivered by Warsaw School of Economics team is to summarise not only the main results of SATURN project regarding urban regeneration process, but also point out new challenges and open broad discussion on eco-redevelopment and green solution in the existing building stock in the decades to come.

All over Europe there are magnificent examples of urban regeneration projects. When we look at the chart 1 we can see different reasons for making regeneration projects and programs.

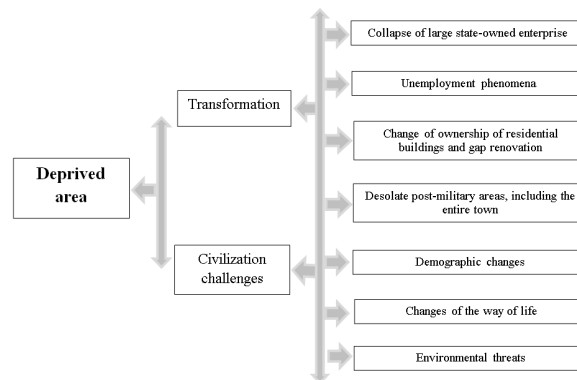
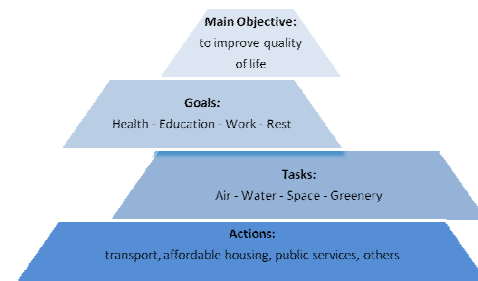


Chart1. Cause of deprived areas. Source: Bryx M: Green Urban Regeneration Projects. Manual for SGH students

When time goes by, increasingly important are the causes, not on the historical past, although they are still have their influence, but those which concern the future and challenges associated with this. The future has its name – Green or Eco city.



Pyramid of revitalization purposes. Bryx M: Green Urban Regeneration Projects. Manual for SGH students

Eco-city can be simply described as a human settlement which, as a multi structure, aspires to be a part of natural ecosystem. Aspires means to take a different action to revive, rebuild, protect or implement ecosystems inside a city. It concerns differed ecosystems but especially water, air, green spaces, spoil. When we think about areas that should be regenerated it means that one or more of these ecosystems must be

improved in regeneration process. All these systems should provide healthy abundance to its habitants and visitors.

In my opinion the objective of a city is an improvement of quality of life in the city area. Thus the green city is responsible for at least health, education, jobs and rest of its citizens. All this is only fair and refers specifically to the degraded areas. This relationship is visible in the short, but especially in a long term. To achieve these goals other tasks should be fulfilled by taking specific action by local authorities.

Proposed above a hierarchy of urban regeneration project had not referred to the general criteria of designation of crisis area which were included in the regional separate operational programs, according to Polish law represented by the document called "Guidelines for the development of local revitalization programs". Due to the above, urban areas, had to meet not less than 4 of the criteria chosen by the Regional Managing Institution, on the regional level, among 10, contained in Art. 47 section 1 of the Regulation 1828/2006, namely:

- (1) High levels of poverty and exclusion;
- (2) High long-term unemployment;
- (3) Unfavorable demographic trends;
- (4) Low levels of education, significant skills deficiencies and high dropout schooling;
- (5) High levels of crimes and violations;
- (6) High level of environmental degradation;
- (7) Low level of economic activity;
- (8) High number of immigrants, ethnic and minority groups, or refugees;
- (9) Comparatively low level of housing value;
- (10) Low levels of energy efficiency of buildings.

And areas of blocks of flats had to meet at least three criteria from four number 1, 5,7, and 9 of the above. By irony, the only criterion strictly connected with the idea of green city is criterion number 10. But it was not especially important for Polish cities because problem of energy consumption, energy efficiency of majority of old blocks of flat had been solved by special long term action and dedicated public money, earlier.

Generally, all documents defined effects that should be achieved in deprived area are concentrated on 3 aspects as it is shown at chart3:

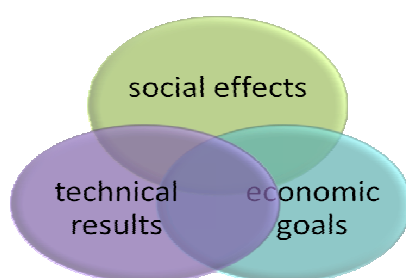


Chart 3. Results of revitalization projects expected in deprived areas

Led by my department at SGH researches and postgraduate studies of urban regeneration, to whose I included the so-called technical visits. These visits consisted of studying best practices of regeneration projects, in the places where project had been implemented. Discussing with authors of these projects our postmaster students confirmed the fact that municipalities were aware of the needs of implementation the green ideas into these projects. And partly it was done. But there was a constant problem of financing these aspects of revitalization projects. SATURN, in which many professionals were involved in, confirmed that local authorities are really endeavoring towards green changes inside the city. Thus they are as flexible as it possible to use sources in the most effective way. And also researches made by my department confirmed it too. We can say: not aware of problems helps to find financial sources but awareness induces to bend criteria to the real city needs.

It leads us to the question: Will future criteria of regional development programs include the aspects of green cities?

We should remember that Polish cities have no their own money in their budgets to regenerate deprived areas or implement new, green ideas. There are not special programs prepared specifically for these tasks. However, there will be regional programs based on EU funds, and the question is if in the new programming perspective 2020 will there be criteria empowered the idea of green cities? The discussion at the governmental level is being continued now. And I hope that it will bring expected solutions and opportunities.

4.4 GIS technologies in urban regeneration (Julia Neuschmid)

4.4.1 GIS as a decision support tool

Geographic Information Systems (GIS) is one of the most common ICT tools employed in urban management and is prevalent among both the public and private organisations which have a role in making our cities more sustainable. The main role of GIS is as a decision support tool for both technical experts and decision-makers alike. GIS allows users to conduct complex geospatial analyses combining data from various sources such as socio-economic statistics, satellite imagery and monitoring data. In this sense, GIS decision support tools function as social-technical instruments (a cross between computer and management sciences) which help users understand complex systems. GIS-based decision support applications are available for fields ranging from transportation, resource management, crime analysis, energy infrastructure, land use planning and disaster management to real estate, business development and marketing. GIS also plays an important role in informing and involving citizens in the planning process and promoting more sustainable lifestyles (Schrenk et al. 2010).

4.4.2 How GIS can be used in urban regeneration

Urban regeneration has to be considered as a dynamic process, structured through different and progressive phases rather than a single event (Gullino 2009; Kingston et al. 2005). These are analysis of the current situation, development of plans and strategies, stakeholder involvement, implementation, and monitoring. The following table shows when and how GIS might contribute to the goals of the regeneration process. The major GIS-based tools and trends in urban regeneration are described below.

Phases of Urban Regeneration	ICT / GIS Tool
Issue identification, baseline studies, identify area to be regenerated	Enquiry/reporting tool, public involvement in form of consultation, Web 2.0, crowdsourcing, mobile applications, location-based services, spatial analysis tools, visualisation tools, tracking and monitoring tools
Inventory conditions, analyse current situation	Spatial analysis tools, public involvement in form of information and transaction, visualisation tools
Analyse trends	Predictive modelling, public involvement in form of information and transaction, visualisation tools
Engage stakeholders	Community process tool, all types of public consultation, asset mapping, collaboration tool, reporting and tracking services, Web 2.0, crowdsourcing, mobile applications, location-based services, visualisation tools
Develop phase, design and (re-)develop strategies and plans	Predictive modelling, asset mapping, scenarios, simulation, visualisation tools, collaboration tools, stakeholder involvement
Explore design and development options and prioritise	Visualisation tools, consultation, deliberative involvement
Evaluate, select options, decision-making	Visualisation tools
Implement plans	Documentation of implementation, collaboration tools, community process tools, collect new data, GPS, geotagging
Analyse and evaluate, assess impacts, monitoring, control and report	Performance based planning, information and transaction, monitoring and tracking tool, spatial analysis tools, visualisation tools

Table 1: The role of ICT and GIS tools in different phases of urban regeneration (extended table based on Kingston et al. 2005)

Web Portals - Data for urban management: As the amount of spatial data available and usage of GIS has grown, many efforts have been done to share data both internally and with others. The philosophy behind this approach is that “behind a good city management there is a good information system” (Gullino 2009, 2017). Available since the mid 1990s, web portals are one of the most common applications on the Internet. Web portals present information from various sources in a unified way. City administrations rely on web portals to exchange information among organisations and also with the general public. For example with the CentropMAP portal (www.centropemap.org) the user receives maps showing regional data from different

sources together in the same view. Such infrastructures are actively supported in Europe through the INSPIRE Directive (Schrenk et al. 2010 and 2012, Gullino 2009).

The earlier part of this decade saw the rise of Web 2.0 services which rely on user-generated content from so-called “prosumers” – users and producers of information. The services range from video sharing sites to blogs and social networks such as Twitter, Facebook, Google+, etc. The age of Web 2.0 also has led to increasing use of collaboration tools in combination with web portals. Planners too have adopted collaboration tools and use them to interact with peers and citizens and assist in guiding planning processes.

GIS in spatial analysis: GIS is commonly used to conduct baseline studies, to identify issues such as an area to be regenerated, inventory conditions, and an analysis of the current situation. For example analysing the existing, including official and unofficial developments such as informal settlements; analysing social diversity and inclusion, e.g. the income and the national/ethnic background of residents or analysing the (real-time) movement such as commuting patterns of residents.

GIS and visualisation: Visualising large amounts of information interactively is one of the most attractive and useful capabilities of GIS. GIS is a powerful tool to present spatial information in impressive ways, e.g. users can take advantage of computationally intensive functions such as "draping" a perspective view over a surface (like a digital elevation model) or creating the impression of three dimensions. All processes in urban regeneration can profit from impressive visualisation. For example the area to be regenerated and its current conditions can be visualised on thematic maps. These maps can be presented to decision makers and/or to the public. In the phase when strategies and plans are developed different scenarios can be visualised to present to decision makers and also the public in the phase of stakeholder engagement. Visualisations are helpful to select between different strategies and options. Also visualized information can give a clearer picture of the current situation as it can be interpreted more easily than e.g. data and information in a tabular form. An example is 3D visualisation. Seeing and interacting with geospatial data in 3D drives insights that just aren't possible in 2D. With GIS you can visualise raster, and vector data for 3D feature, terrain, subsurface, and volumetric views. You can make virtual tours and walk around districts.

GIS and simulation: GIS can be used in the develop phase of a regeneration project for the design and (re-)development of strategies and plans. On the one hand this is useful for planners and decision makers on the other hand also for other stakeholders such as the public to be informed and involved in the regeneration project. With GIS different design and/or development options can be explored, options prioritised and decisions made more easily. As a part of development projects, people can experience the future form of the city with the help of an augmented reality application to simulate future developments. For example the Aspern Urban Lakeside project in Vienna that is one of the largest urban development projects in Europe. The application simulates the Aspern urban lakeside project and creates augmented reality solutions that can be implemented in planning and participation processes.



Figure 1: Augmented reality App simulating the construction of new houses (Source: URL 1, Aspern Seestadt; Reinwald et al. 2013)

Handheld applications (smart phone navigation, route planning, mobile GIS) – Just as the web is rapidly evolving, so too is the manner in which we access it. Smart phones are fast evolving into a platform for more sophisticated mobile GIS applications and decision support systems for planning practitioners. The recent explosion will not go unnoticed by planners and city managers. A great number of new mobile applications for cities are under development that focus on context and location-based information. An example is the LIMES App (www.limes-mobile.eu) which allows visitors to discover the ancient Roman Frontier with their mobile devices. It is a context-aware system and shows points of interests (POI) nearby on a map with

information about the specific Roman site. Additionally there is Augmented Reality component making visible the cultural heritage sites by showing destroyed buildings or situations of the Roman lifestyle (e.g. soldiers marching in the scenery). Augmented Reality technology allow to view real-world environment together with elements on the mobile application that are supplemented by computer-generated information such as sound, video, graphics or GPS data.

GIS and participation: GIS can be used in all types of public consultation, i.e. information, (real) consultation, active participation, etc. (Kingston et al. 2005). E.g. online maps used for public consultation, citizens point out problems on maps, citizens develop suggestions for improvement of areas, and crowdsourcing. Citizens provide data and information about the current situation and their requirements. This is the most common way of participation where GIS-based tools are used. The technology behind is geotagging - GPS-enabled smart phones have led to a surge in location-based services, i.e. services that present information in its spatial context. Planners are also adopting tools such as Geotagging, using the GPS capabilities of smart phones to link geographic information to photos, to assist them in their work. An example is to map emotions. GIS applications are used to capture the emotional perception of space and then to visualise the feelings at its place of origin to use this information for urban planning.



Figure 2: EMOMAP App Austria (Source: URL 2, Emotion Map)

GIS and monitoring: In the implementation phase of urban regeneration projects GIS can be used to monitor the implementation and the regeneration process of an area. With the help of defined monitoring indicators GIS supports analysis and evaluation, impact assessment, monitoring, control and reporting. A monitoring system helps planning-authorities to compare certain conditions over time, to detect changes, to evaluate, and to plan. It represents a snapshot of the country (e. g. in the form of an atlas) and functions as an early warning system. In other words it supports policy makers to make decisions and put effective measures. Orthophotos and/or GIS data can be used to monitor the development of a regeneration area over time.

5 CONCLUSION AND FUTURE POTENTIAL

One of the key challenges for a living historic city is accommodation of sustainable development to ensure appropriate standards of living without compromising its architectural distinctiveness. The issue becomes particularly complex when historic assets are based within the urban core, which requires an extensive regeneration. Conservation of heritage assets can play a leading role in those processes by strengthening the architectural character and redefining the functions of the urban space. Conservation-led regeneration can build on people's memories of a place and enable the delivery of their visions and lay the foundations for the following generations. Contemporary practice in urban regeneration benefits from the modern technologies such as GIS, which became a standard in spatial planning. Those technologies allow city managers achieving sustainable goals as they aim for efficiency, which in longer term should lead to the green, sustainable city status. Moreover, the technologies assisting the urban regeneration processes are not static as they are subject to constant development.

As the number of various ICT tools available increased over the past decades, so too did the nature of their application to urban regeneration. There are phases in the urban regeneration process where ICT and GIS are used commonly, e.g. identification of areas to be regenerated, analysis of the current situation and visualisation of the results, monitoring and change tracking, analysis of trends and scenarios, and visualisation of design options. Today, specific ICT tools that form the foundation for modern Urban Information Systems range from sophisticated 2D and 3D GIS modeling and simulation solutions, Web Portals, Collaboration Suites, and Decision Support Systems to Web 2.0 era social networking applications, location-based services and applications for smart phones and other handheld devices. The next generation of

tools will likely be based on mobile and cloud computing technologies and closely connected to the arising “Internet of Things” and Semantic Web.

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