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Biological diversity

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INTANGIBLE SMART CITY INSIDE TANGIBLE HISTORIC CITY: SMART HERITAGE AS REGENERATION OF EURO-MEDITERRANEAN REALITIES

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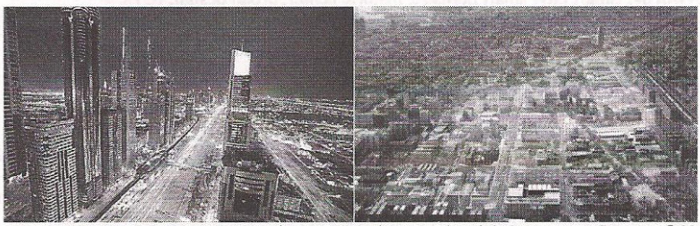
Abstract

The current European context is suggesting a new model for the construction of the contemporary city, a new vision for the regeneration of public space, not only a material infrastructure, but also a virtual one, which provides citizens with a relevant role in the rethinking of the city through new methods of participation. This is the *smart city* model, resulted by the EU interventions, beginning with *Europe 2020* and *Digital Agenda*, at European and national level. The *smart city* model thus aims to environmental security, energy management in urban environments, management of logistics and info-mobility and monitoring of environmental changes. In this context, the citizen, through the practice of *smart* citizenship, characterized by knowledge and creativity, participates in the construction of new urban spaces where people exchange information, via the physical and digital infrastructures, space for civic mobilization and political participation. The proposed research examines how this EU policy is facilitating the construction of *smart cities* that are confronted with a cultural heritage to be protected, as is already happening in some urban realities of the Euro-Mediterranean band. We will proceed by making comparisons between the strategies adopted, through the identification of the most common civic practices and of the virtual infrastructure used. Then this article will bring to light how the virtual city descends into the historic one, how these two realities complement each other and when the virtual city makes use of that historical and material one. The geographic area under consideration will include some Euro-Mediterranean urban contexts, historically consolidated, which today are putting into practice the *smart city* model. Identifying the point of contact between the two kinds of cities, material and immaterial ones, in the urban reality historically consolidated, it becomes a critical step to achieving a more conscious urban quality, to establish a process of cultural identification through the knowledge of their own historical heritage.

INTRODUCTION

The Hybridization between the visible and virtual territory has become a commonplace for much of urban population. Those who don't have the devices that allow participating to the extended city, in the virtual plane, are increasingly marginalized by tangible possibilities that now can only be known and shared through the network. The city is mutating into an extended form in which the visible and virtual dimensions are blurred. We agree that the city has been the traditional ecosystem in which have related the lives of people, as urban animals, and the physical environment that supports them. In this sense, the city has a physical dimension, that we recognize differently and a semiotic dimension that allows us to communicate and establish social bonds. The traditional city is characterized by topography of independent mosaics and linked with a center. We could say that this new urban reality is an ecosystem to which has been implemented an informational or *smart* dimension. In fact this is the name that

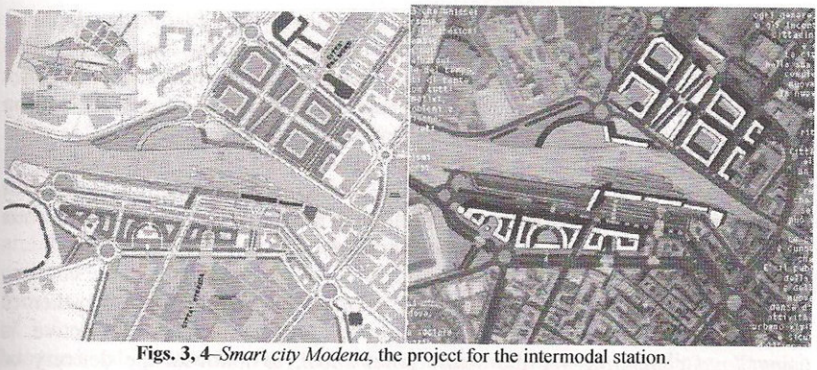
defines our new cities as *smart cities*. An intelligent model developed by European interventions, beginning with *Europe 2020* and *Digital Agenda* at European and national level. It compares with issues relating to various fields of application: technological field, on the design and application of innovative solutions (information, computer systems and *ICTs*); organizational field, related to *Living-Labs*, a set of initiatives and innovative projects on the issues of the city and environment, involving citizens in living laboratories within urban public spaces; management field, for complex organizations that use modern technologies, such as in the services and economic sector (Figs. 1, 2).



Figs. 1, 2 –On the left Hi-Tech City in New Mexico; on the right*Smart city Campus @22* in Barcelona.

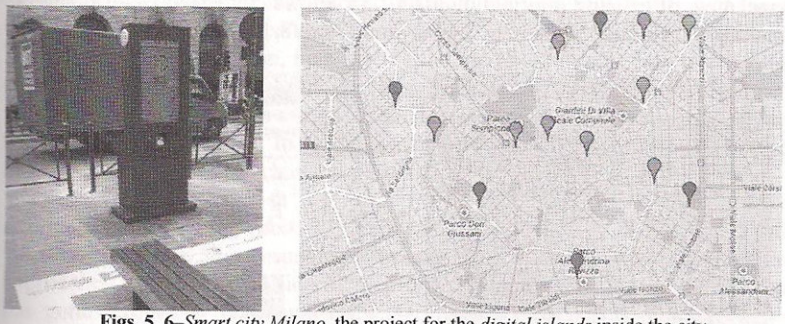
The *smart city* model thus aims to environmental security, energy management in urban environments, management of traffic through info-mobility and monitoring of environmental changes. In this context,a citizen, through the practice of *smart* citizenship, characterized by knowledge and creativity, participates in the construction of new urban spaces where people exchange information via physical and digital infrastructures, space for civic mobilization and political participation. For this reason, talking about the *smart* model, means referring to a complexity of sectors involved (housing, mobility, public services, culture, governance, energy, security, economy, environment) for which it is now necessary to understand an integration supported by the virtual network consisting in the *smart grids*.

Smart examples - However, the concept of *smart city* is a kaleidoscopic and ubiquitous idea in the new urban vocabulary. If we survey the most well-known experiences found a catalogue that might include the following examples:
The city of Modena, in Italy, began in 1979 its *smart* project that was completed with the implementation of a GIS (Geographic Information System), a computerized informative system that enables the capture and recording of information from a series of geographic data. In addition to this, a new intermodal two-faced station, that doesn't represent only a specialized service, but also the urban hinge which reconnects the northern city with the centre, passing the historic fracture caused by the railway line. In particular, we assume the functional reorganization of the entire system of traffic and parking, the reinforcement of north-south connections with a new automotive underpass and for public transport, as well as with the pedestrian underpasses system, a new urban east-west connection and an urban, social and environmental requalification of the surrounding area (Figs. 3, 4).



Figs. 3, 4–*Smart city Modena*, the project for the intermodal station.

For the project of *smart city* Milan we can find fifteen scattered points throughout the city with free Wi-Fi, multilingual information on touch-screen, electric quadricycle sharing and *smart* electric lighting called *digital islands*: the goal is to create a digital, sustainable and intelligent infrastructure. Each island has also a touch-screen totem that provides, in different languages, information about mobility, viability, artistic and cultural events (Figs. 5, 6).



Figs. 5, 6–*Smart city Milano*, the project for the *digital islands* inside the city.

The *smart*case of Ferrara is characterized by a cartographic portal design. Launched in 2003, the route has seen the birth of geographic information systems office. The result was the creation of a portal mapping for publication on web of a province's unique geographic map. A sort of big digital map articulated on 140 cards stratified and overlapping, each of which contain the necessary layers for land management. They include, in fact, the cadastral data's map, the grid of gas, water, sewers, railway lines, urban and suburban transportation lines (Fig. 7).

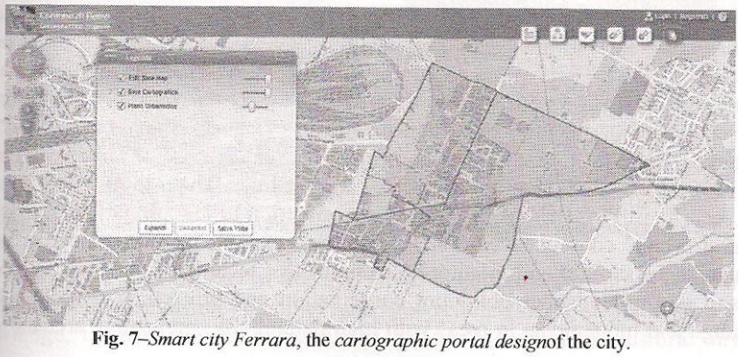
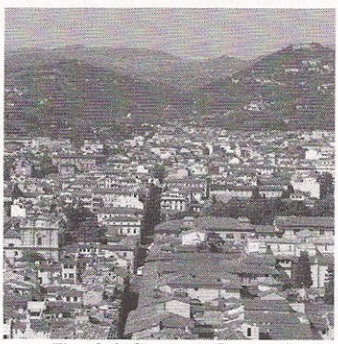


Fig. 7–*Smart city Ferrara*, the *cartographic portal design*of the city.

The projects described above show a natural propensity towards the development of computerization in the context of a *smart* territorial planning that, affecting the areas of mobility and more generally, the sharing of information, makes it easier urban management in cultural, economic and social field. The cases of Modena and Ferrara are intended to create databases that provide general information about the territorial conditions of the affected areas; the city of Milan, through a project more closely linked to mobility, sets in the reality of its infrastructure not only material but also virtual dimension, through the localization of *digital islands* that allow the involvement of citizens and tourists.

Examples of historic smart cities - In the city of Florence there are two themes faced: the first is related to*Cloud and ICT platforms*, whose objective is using*Cloud computing* for the *smart government*, to innovate the delivery of services by the local public administrations to citizens. The second issue is related to the field of *Cultural Heritage and Tourism*, whose goal is the promotion of cultural national and regional heritage, through the implementation of narrative paths digitally generated and transmitted. An integrated platform of innovative services andnew technological solutions (*ICTS*), creates a dynamic interactive management of historical heritage, also makingpossible to share the cultural and environmental heritage by focusing on customizing routes and on the enhancement of existing information assets;this allows citizens to benefit tangible and intangible cultural heritage in digital form (Figs. 8, 9).

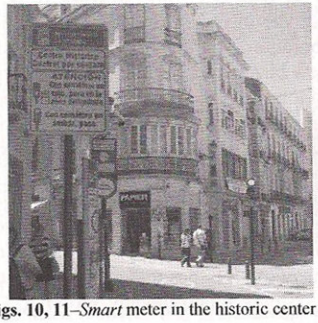


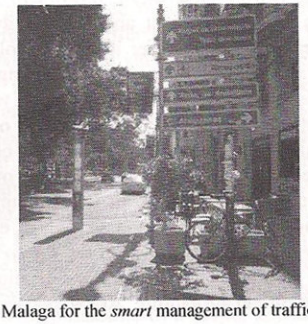
Figs. 8, 9–*Smart city Firenze*, the *smart* platform for the *smart mobility* project.

The Municipality of Matera recently decided to join the two European projects published by the Ministry of Education, University and Research, *Notice for the submission of project ideas for Smart Cities and Communities and Social Innovation*, with the aim to promote, even in the south of Italy, the development and using of technologies by citizens, businesses and administrations and to solve problems of urban and territorial scale, through the application of *smart* technology and models of integration between services. The first project involves partners from public and private research institutions operating in the country, universities and SMEs, who conceived the project proposal,*Smart Cities Underground*, aimed at the development of innovative products and services of the diagnostics imaging of the subsurface and facilities. The priority area is that of the security of the territory, with particular attention to the mitigation of extreme natural events' consequences. The research and experimentation concerns: water management; control and monitoring of networks; techniques for the monitoring of soil and groundwater pollution; conservation and protection of architectural heritage and monuments in areas with high natural risk; preventive archaeology;

Cloud Computing & Technologies; *smart government*; innovative systems for the control and management of sensors'networks and micro-sensors distributed systems; 3D virtualization and web 2.0 applications. Furthermore the historic centre of Matera, UNESCO World Heritage Site, is exposed to hydrogeological instability and it is already selected as a test area for the *smart project* in Basilicata called *Smart Culture and Tourism*. The second part of the project, entitled *Smart maintenance, conservation and restoration of cultural heritage*, aims to build new innovative products and systems for the restoration of architecture and art in general, which can be used for the consolidation of media and materials components. The project also includes the implementation of recovery techniques, from biodegradation by microbial antagonists, and methods of micro-organisms through reconstruction of calcarenite, implementation and adoption of protocols for the maintenance of historic buildings through technological software that enables taking action to restore and maintenance low impact to the environment, with low implementation costs.
The examples of Florence and Matera carry out policies to safeguard its heritage, through the creation of virtual platforms that bring out the pre-existing culture of the city, through the active participation of citizens. In this way we assist to how the *virtual city* of *smart grids* and *ICTs* descends into the material city of Italian historic centres; in the specific case of Matera, it is emblematic its *smart* and experimentalapproach for monitoring and studying the characteristics of the soil that defines the historic area known as "i Sassi". In comparison with the cases of Modena, Ferrara and Milan, here we are talking about small-scale interventions, closely related to a material city, which is made up of a heritage to be protected, with respect to the realities of new urban planning, whose principles are based on the development of *ICTs*. In recent examples, in fact, the relationship with the historic built becomes the characterizing factor of the *smart* design.

Examples of smart Euro-Mediterranean cities - The Euro-Mediterranean realities, who have accepted this proposal of urban regeneration, have followed different approaches for the construction of their intelligent models. The urban ecosystem has gone settling by deliberate decisions marked by culture, places or historic events. In the definition of the Mediterranean city,we must highlight a code consisting of few constants and many special items,like the excessive variety and characteristic fragmentation of different cities, that makes it impossible to determine an archetypal Mediterranean city.





Figs. 10, 11–*Smart* meter in the historic center of Malaga for the *smart* management of traffic.

The *smart* project for the city of Malaga, in Spain, concerns the implementation of projects about sustainable mobility and geo-referencing systems that allows knowledge, in real time, of the status of the traffic within the historic city, a

simplified management of the public transport, through the information of citizen on the locations of parking within the city. Other operations regard the limitation of traffic, in the historic centre, along with the monitoring of historic buildings' consumption and the recovery of historic buildings through innovative technologies. The organization of a sharing culture program and citizen participation are become main characteristics of the Spanish *smart cities* like Barcelona, Valencia, Alicante (Figs. 10, 11).
The project *smart city Malta* develops an example of virtual square, which offers both physical context and a virtual space in which citizens can bring innovation; it is a network organization that aims to an open innovation system. The basic idea is to achieve innovation through partnership between organizations from different subject areas, such as health, culture, tourism, clean energy and the application of *ICT*: *eco-tourism*, *e-Collaboration*, urban design, *e-Health*, etc. Another project is the regeneration of the *Square@SCM01*. Through the opening towards the coast, creates an environment in which is proposed the idea of open space of citizens' physical aggregation (Fig. 12).

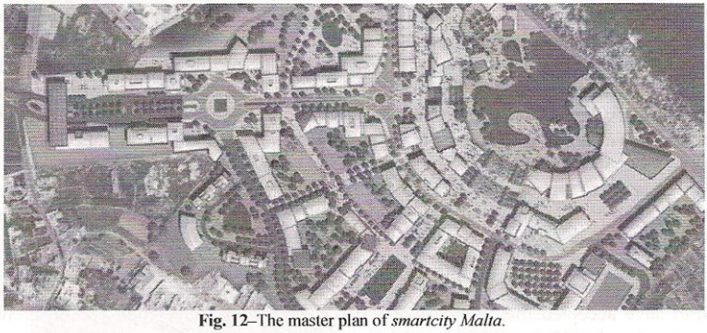


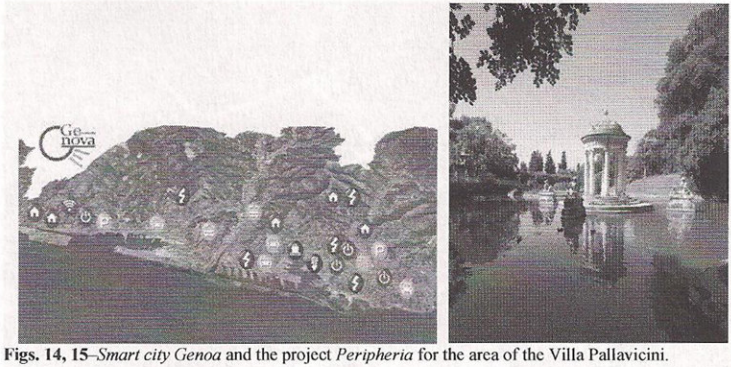
Fig. 12–The master plan of *smartcity Malta*.

The *Living-Lab Palermo* is included within the *Territorial Living Lab TLL-Sicily* and applies the Living-Lab approach to address the problems of the city, based on the co-design of innovative applications and services, maximizing the potential of new information and communication technologies. It is based on a similar initiative, *LivingLabCamp Palermo2009*, who attended Living-Lab as part of the whole *ENoLL* (*European Network of Living-Labs*) network, in order to develop ideas for management and habitability of the city. The founding principles of *Living-Lab Palermo*are: involving collaboration, sharing of common good and activation of social innovation; creating new business opportunities; exploiting the opportunities offered by new Internet technologies, through democratic access for all citizens; collaboration and sharing of resources and virtual intelligence; mutual learning as a driver of innovation; co-creation through active participation of citizens in the design and activation of new services; co-production of the same services; partnerships with Italian, European and world networks of *Living-Lab*, through the exchange and sharing of experiences and tools. The ultimate goal is the project for the revival of the *Parco della Favorita*, with the idea of making an open laboratory for research and development of all issues that may arise: paths of health, urban agriculture, Arabs irrigation systems, hippo-therapy, etc. (Fig. 13).

Fig. 13–The project for the *smart mobility* near the Parco della Favorita.

The interventions for the project *smart city Genoa* are related to the construction of *smart buildings*, that rationally integrating the power grid, telecommunications and heat in them, at the same time play a dual role of consumers and producers; public transport system of high quality and efficiency at an affordable cost in order to reduce the use of private vehicles; introduction of *ICT* solutions dedicated to sustainable mobility; info-mobility system provides information flows in both directions: constant monitoring of current and planned traffic data and communication targeted to the citizen. Other principles regard the introduction of zero emission vehicles in both the public and private sectors, for passenger and goods; using of electricity production from renewable sources planned through the development of integrated photovoltaic systems in buildings and roofs; construction of wind power, hydroelectric and biomass plants. Specifically, *Living-Labs Genoa* open to the active participation of the people through co-design and co-implementation of development activities and research in different subject areas. These are reflected in the actions of co-responsibility for a geographic area in a limited time. The *Living-Lab* project for the city of Genoa provides participation, dialogue and exchange of routes among citizens, government institutions and companies in the implementation of innovative processes. In particular, relative to the area of *Villa Pallavicini*, makes it accessible to visitors and operated museum and park, free Wi-Fi zones and several places where are placed Qr-Code with the following differences: interactive links on the official site and in the blog *Peripheria*, on the site of the *Park and the Museum* and *Urban Centre* and on the site of the *Municipality of Genoa*; historical and cultural information; thematic paths and playgrounds. Another proposed *Living-Lab* is for the *Forte di Santa Tecla*, through which regenerate vegetated areas, with the creation of free Wi-Fi zones and signage, with the support of Qr Code, identifying the main architectural elements proposed (walls, Genoese Forts, etc.) and the area of *Forte di Santa Tecla* with pedestrian and cycle paths. It is the project of retraining for the *Archaeological Museum and Park* has an important connotation from the architectural point of view, as well as botanical one. The use of new technologies facilitates, the influx of visitors, the use of museum spaces and green areas, with the possibility of a deeper knowledge and information exchange including QR Code, which contain cultural and heritage issues.

Multimedia stations are also included to facilitate the simultaneous use of different applications to provide a better understanding of heritage (Figs. 14, 15).



Figs. 14, 15–*Smart city Genoa* and the project *Peripheria* for the area of the Villa Pallavicini.

The Euro-Mediterranean realities just described, the island of Malta and the cities of Malaga, Palermo and Genoa, are *smart* interventions more targeted to safeguard a cultural heritage geographically united by a comparable history of dominations and urban developments: it is historical settlements that carry with them the complexity of the Arabic urban texture, the Roman fortresses and the successive layering to characterize the current landscape. *Living-Lab* projects, virtual tours, recovery of historic areas such as the *Parco della Favorita*, the *Villa Pallavicini* and the *Fortedi Santa Tecla*, differ the *smart* projects of these realities from *smart* European models that offer trials for virtual management of traffic and urban policy and are often far from the historical reality of the same city.

A new smart heritage model: OR.C.HE.STRA (Organization of Cultural Heritage for Tourism and Real-time Smart Accessibility) - An example of *smart heritage project*,that could be an interesting model for the urban Euro-Mediterranean realities and their heritage, is the so called *OR.C.HE.STRA project*, that aims to develop tools for enhancement of the cultural and environmental resources of a territory and the promotion and marketing of tourism. There are two programs share the technological platform and the paradigm *Social Network* to create an ecosystem where live companies, public administration, citizens and tourists. The first area of activity is to define and develop an enabling open platform on which basing intelligent services for the cultural offer: knowledge on cultural heritage offering to users, its use, conservation and preservation. Overcoming the current methods of objects' 2D/3D digitization, are introduced innovative elements such as extraction and automatic cataloging information from the digitized content (images, text, videos, etc.); standardization of data base along the entire tourism industry; analysis and correlation of information across semantic engines; publication as *Linked Open Data*, in adherence to *European* model. From the point of view of the use, you realize an intelligent open source system that enables the concept of personalized and contextualized exploration of the cultural good (*augmented* fruition), also made on the basis of an analysis of the experiential territory. The second stage of the project aims to define and develop an integrated system of services for the creation, certification, organization, monitoring and promotion of the *Tourist and Cultural Offer* and a real-time platform to support the Tourist mobility. It will be adopted a new strategic model of *Destination Management Organization* by implementing innovative forms of tools and services for the promotion and marketing of the *Cultural Tourist Offer*. The experimental platform of cultural offering will be in southern Italian towns like Lecce, Catania, Agrigento, Siracusa, Centuripe, in where you will define the

archeological and museums contexts and sites of greatest interest to be included in the experiences of popular museum that will be implemented in the platform. Through the project idea *OR.CH.ESTRA* the aim was to develop a set of technological solutions oriented to the enhancement of cultural heritage, both tangible and intangible, for the use and enjoyment of tourists, visitors and citizens, respecting the principles of sustainability and eco-friendliness.

CONCLUSIONS

Models in comparison - The European definition of the *smart* model involves six points: economy, mobility, governance, people, living, and environment. According to the *smart* experiences studied above, the *smart European cities* base their principles on the convergence of two factors. The first is relating to energetic and environmental field, this claims to be achieved through an action on cities which introduces energetic efficiency, functionality, a system of *smart* infrastructure and the safeguarding of environment. The second one is relating with more humanistic sectors and involves the collaboration that the own citizenship can give through its direct participation. In the specific we can identify common attributes among these experiences. All share a commitment to technological informational innovation and *green* technologies or whose goal is the efficient management of municipal waste, energy efficiency and transportation, or using of renewable energies. We agree that the common place of these European experiences is that of information technology and urban management (energy, waste and mobility). Moreover, the cases belonging to the group of historic cities are characterized by a public initiative that promotes the preferential involvement of the population and various urban actors, whether formal or informal. The proposal of a *smart* parameterization for the historic Mediterranean centers could include: a technology platform on which basing intelligent services, for the artistic and cultural offer, through flows of information; creation of *Living-Lab*, to activate processes of citizen participation in the preservation and transmission of knowledge and cultural heritage; identification and classification of dynamical systems and interconnection of an inherited reality by the user; info-mobility, that is limited traffic and electric vehicles in sharing; interactive dynamic management of historical heritage to share cultural heritage, through the creation of specific *routes of knowledge* and exploitation of informative assets and new technological solutions (*ICTs*); creation of new products and systems for the restoration of architecture and heritage, used for the consolidation of supports and component materials; implementation of recovery techniques and adoption of protocols for the maintenance of historic buildings, through technological software enabling to start actions of restoration and maintenance of low environmental impact; intelligent lighting and, at last,creation of intelligent buildings with dual roles of producers and consumers.

The European contribution regarding the creation of *smart cities*,during urban planning, should be taken into account regeneration models, which include people, today embedded in virtual networks. We should incorporate into the concept of historic Mediterranean city, that of *smart city*, which includes both tangible and intangible elements: civic participation, social networks, co-working, virtual networks, cultural identity, technology of connected city, historical vision, digital heritage etc. As they have been in history, historical cities should be again meeting places, cultural exchange, trade and aggregation, places to recognize the history and restore the original function through the participation and cooperation of citizens.

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