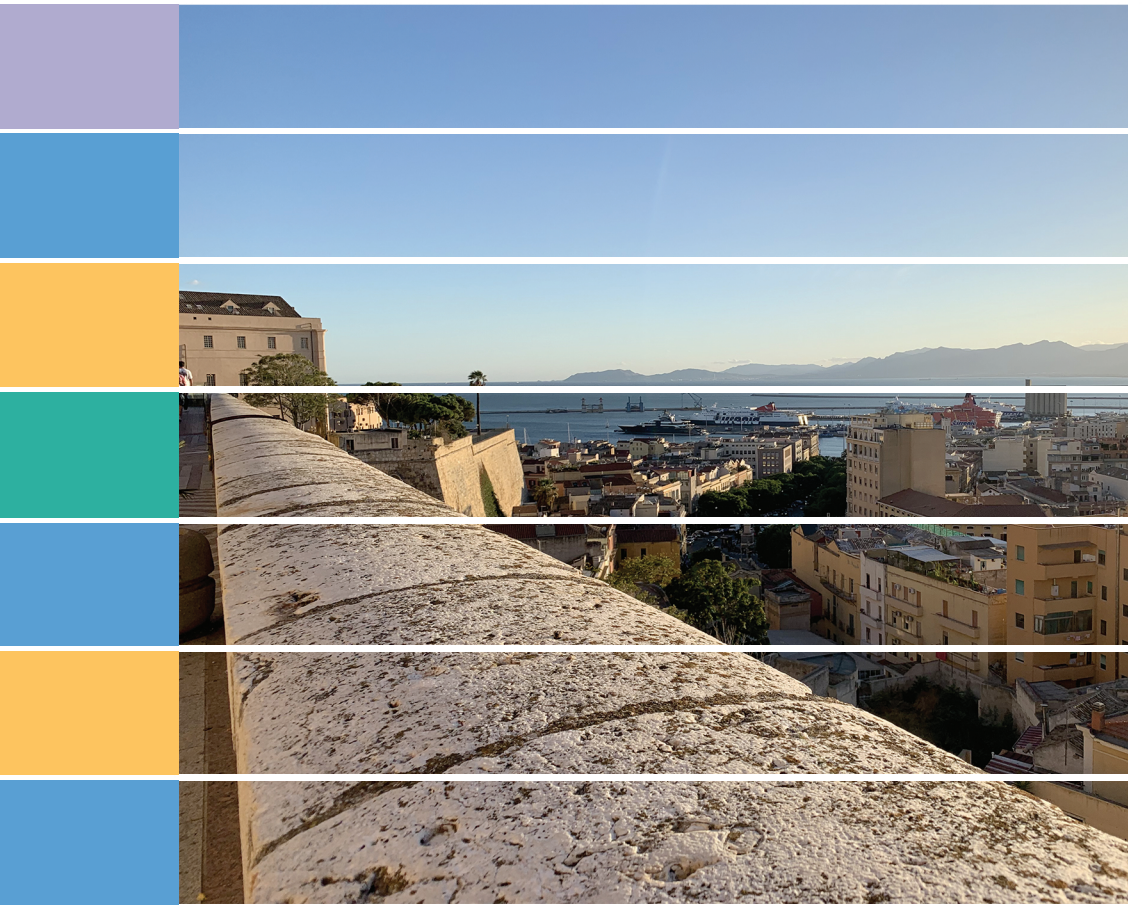
Carmela Gargiulo Corrado Zoppi
Editors

Planning, Nature and Ecosystem Services



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Smart City, Urban Planning for a Sustainable Future

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Carmela Gargiulo Corrado Zoppi

Editors

Planning, Nature and Ecosystem Services

INPUT aCAdemy 2019

Conference proceedings

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This book collects the papers presented at INPUT aCAdemy 2019, a special edition of the INPUT Conference hosted by the Department of Civil and Environmental Engineering, and Architecture (DICAAR) of the University of Cagliari.

INPUT aCAdemy Conference will focus on contemporary planning issues with particular attention to ecosystem services, green and blue infrastructure and governance and management of Natura 2000 sites and coastal marine areas.

INPUT aCAdemy 2019 is organized within the GIREPAM Project (Integrated Management of Ecological Networks through Parks and Marine Areas), co-funded by the European Regional Development Fund (ERDF) in relation to the 2014-2020 Interreg Italy – France (Maritime) Programme.

INPUT aCAdemy 2019 is supported by Società Italiana degli Urbanisti (SIU, the Italian Society of Spatial Planners), Istituto Nazionale di Urbanistica (INU, the Italian National Institute of Urban Planning), UrbIng Ricerca Scientifica (the Association of Spatial Planning Scholars of the Italian Schools of Engineering) and Ordine degli Ingegneri di Cagliari (OIC, Professional Association of Engineers of Cagliari).

This book is the most recent scientific contribution of the "Smart City, Urban Planning for a Sustainable Future" Book Series, dedicated to the collection of research e-books, published by FedOAPress - Federico II Open Access University Press. The volume contains the scientific contributions presented at the INPUT aCAdemy 2019 Conference. In detail, this publication, including 92 papers grouped in 11 sessions, for a total of 1056 pages, has been edited by some members of the Editorial Staff of "TeMA Journal", here listed in alphabetical order:

- Rosaria Battarra;
- Gerardo Carpentieri;
- Federica Gaglione;
- Carmen Guida;
- Rosa Morosini;
- Floriana Zucaro.

The most heartfelt thanks go to these young and more experienced colleagues for the hard work done in these months. A final word of thanks goes to Professor Roberto Delle Donne, Director of the CAB - Center for Libraries "Roberto Pettorino" of the University of Naples Federico II, for his active availability and the constant support also shown in this last publication.

Rocco Papa
Editor of the Smart City, Urban Planning for a Sustainable Future" Book Series
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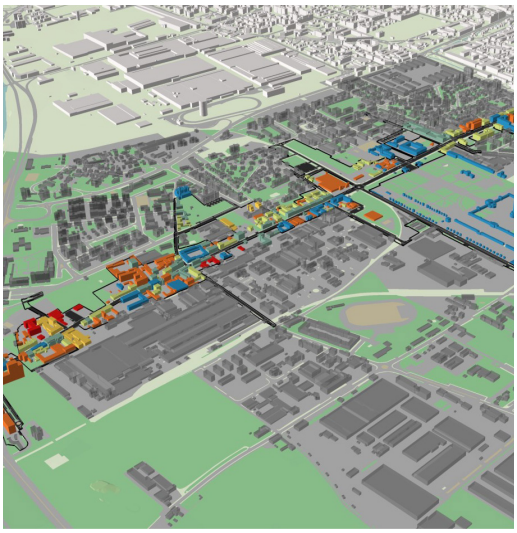

FOSTERING ARCHITECTURE EFFICIENCY THROUGH URBAN QUALITY

A PROJECT FOR VIA MILANO SITE IN BRESCIA

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ABSTRACT

The topic of the enhancement of historical centers is taking importance in contemporary planning due of different reasons. The main ones are the will to empower the efficiency of older houses under the energetic point of view, but also, as it is shown by the recent tragic seismic facts, to increase the capability of ancient buildings to reach higher performances creating a safer place for people. The protection of historical areas of cities involved not only monuments and constrained architectures, it concerns also civil houses and open spaces because there is the will to promote historical sites ensuring the achievement of high standards of life and performances. The goal is to make historical sites resilient, to ensure the architectural heritage to respond to external stresses such as the one linked to climate change, the increase of touristic flows or seismic events. Enhancing historical parts of cities ensure to maintain the features that characterize most urban landscapes. This allows to create better places for citizens and to promote new touristic sectors. The paper considers the case study of the city of Brescia, a middle-sized city, in the north of Italy, which has been interested by an urban regeneration process involving especially a suburban neighborhood. A process that has begun in 2016 in Brescia and it is still in development, with firsts consequences on the physical and social matrix of the area.

KEYWORDS
GIS; Urban Regeneration Process; Historical Fabrics

1 INTRODUCTION

In 2016 Brescia Municipality adopted a new land use plan (PGT), with the aim of reducing free soil consumption and fostering rehabilitation of inner areas (Tiboni, 2015). The goal was to promote sustainable development of the land highlighting the importance of urban regeneration processes. To do this, it was necessary to define which were the aspects that most characterized the city, starting from the elements that could generate tourism or develop new economic sectors (Tiboni & Botticini, 2018).

These operations are also fostered by the United Nation with the Agenda 2030 for the Sustainable Development, which asks cities to become safer, more inclusive, sustainable and resilient (ONU, 2015). To reach these targets it is necessary to develop projects that must enhance open spaces (Yaro, 2009) and generate a public value that can stimulate stakeholders to start new partnership with public bodies for the refurbishment of buildings and the strengthening of existing infrastructures. Particularly, the goal 11.4 of the Agenda highlights the importance of cultural and natural heritage in the urban growth. This is due to the increase in real estate investments in urban areas and the development of infrastructures that, as Bandarin said, have altered the physical landscape of many historical cities and the impact of environmental factors on urban heritage, for example traffic, pollution, industrial wastes and acid rains, has increased significantly in recent decades (Bandarin, 2015).

1.1 GIS & HERITAGE

To foster the sustainable development of land it is mandatory to deeply analyse features of assets involved. So, the PGT started to introduce a classification of the urban fabrics considering the future destinations and the urban original role that the areas had in the past. Another important aspect that it is necessary to take in consideration is that the enhancement of open spaces is at the base of the strategy introduced in Brescia by the new PGT. Indeed, importance is given to the existing relation between monuments and squares and how it can be strengthened. All these analyses were first tested for the case study of the urban core of Brescia, in which the development of the site based on the enhancement of the ancient squares network linked to users' behavior was promoted. The analysis done for the elaboration of the PGT were developed with a GIS software, which allows to create databases in which designers can find information about assets features. This data is useful to define which is the most compatible way to operate on architectural heritage (Tiboni & Botticini, 2018).

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Another important aspect given by GIS software is the capability to upload data in online platforms called webGIS. These platforms are very important to spread data and let people to know which and where are the main aspects of the site. Thanks to the structure of the webGIS they can be used as webmaps for tourists and city users too (Tiboni & Botticini, 2018).

1.2 GIS & HERITAGE

The local urban plan characterizes urban fabrics considering when they were built. In relation to this data, a subsequent classification of buildings was done, considering if they are compatible with the stylistic language of the fabric. This kind of information is important because it allows to define which are the admissible interventions to do on assets.

One of the various historical fabrics of Brescia is the area surrounding Via Milano (Fig. 1). In the last years the Municipality decided to invest on this site, considering it strategical for the development of the city; plenty of projects have been designed to enhance the open spaces with the aim to increase the value of the land and stimulate stakeholders to invest in the urban regeneration.

Fig.1 Milano Street in Brescia: the area of interest and its relationship with the city center

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This strategy of redevelopment of a peripheral area also had the support of the national government, which is financing part of the works in progress, thanks to two different calls for financing, in which it was asked to competitors to produce projects for the regeneration of deteriorated urban areas, considering not only the physical structure but also the social matrix. The projects that won the call aim to produce urban quality and achieve the goals indicated by the United Nations through a design of open spaces deeply linked to the analysis of people that live in the area. This is an important aspect because the process of urban regeneration, called "Beyond the Street", is based on participation and fosters social inclusion and security through the creation of areas that are nice under the architectural aspect (Fig. 2).

Fig.2 A new theatre and other interventions on open spaces (Author: Brescia Municipalità)

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2 THE "VIA MILANO RECOVERY PLAN"

The project "Beyond the Street" gives attention to open spaces and facilities for people, with several targets such as to produce urban quality, creating better conditions of life for people and stimulating private stakeholders to invest on site development. But this project is not the only strategy implemented for this area. A recovery plan has been implemented, and its main goal is to foster the private owners to refurbish their own buildings to adequate them to the new standard achieved by the sit. In this way it is possible to capture and capitalize the public value generated by regeneration interventions on common areas.

Already in 2010 Municipality adopted for the area a previous recovery plan, which however did not produce the expected results. The comparison between the analysis of conservation state of buildings done in 2010 with the contemporary conservation state shows that the situation is worsen (Fig. 3)

Fig.3 The conservation state of buildings in 2010 (up) and in 2018 (down); the red-3D buildings are the ones in a worst state of conservation, the yellow buildings are the partially deteriorated and the green ones represent buildings in a good state of conservation. It is possible to see that the red buildings are increased.
(Authors: Francesco Botticini, Emanuela Vizzardi)

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As already mentioned, in 2016, with the adoption of the new local urban plan, the Municipality decided to start a general variation for Via Milano recovery plan. Particularly, the PGT identifies this site as important for the development of a of sustainable mobility system that will allow to come into the urban core leaving from peripherical areas (Fig. 4-5). This system must be strengthened with a network of green infrastructures too with the aim to create ecosystem services that can increase life quality in the site and the urban quality of the area according to principles introduced by value-led development (Auzinis & Viestrus, 2017).

Fig.4 The new green network introduced by the PGT. (Author: Brescia Municipality)

Fig.5 The new mobility system introduced by the PGT. (Author: Brescia Municipality)

The recovery plan for Via Milano area is subdivided into three phases; the first one is the definition of the objectives of the plan, the second is the definition of the role of the stakeholders and the third one is the elaboration of cartographical support and the development of the project.

The goals are to achieve high quality of life through the partnership between public bodies and stakeholders, fostering social inclusion, creating new economic opportunities and refurbish the assets in an ecological way in order to ensure ecosystem services and high architectural quality of buildings.

The second phase regards how the partnership can be carried out. The plan is focused on private buildings and it can't force owners to operate. So, it is important to understand which their needs are and how stakeholders can be stimulated to invest. The first action is the discount that owners can have if they want to work on their properties. The other strategies are based on fostering participation and negotiate possible solutions directly with involved people.

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The third phase is the elaboration and it is subdivided into two steps: the first one is the creation of the database in which there are all the features that are necessary to understand the assets. Starting from these features it is possible to develop the second phase that is the project. As it is asked by national and regional laws, an urban regeneration process needs to analyse both physical and social structure of the area, so, the system of knowledge links these two different aspects.

2.1 THE CREATION OF THE SYSTEM OF KNOWLEDGE TO DEFINE THE MOST COMPATIBLE STRATEGY OF INTERVENTION

The third phase of the project was developed with GIS software that was useful to create a database that joined features from the site, from buildings and from residents too. The goal was to understand which the peculiarities of the area are to develop a sustainable strategy of intervention.

Namely, it is possible to define different topics that the analysis considers, such as, urban framework, services and infrastructures, urban evolution and buildings value, conservation state and residents' investigation.

The use of GIS software allowed to map data coming from different sources: first, a series of surveys were done. Than an historical investigation started in which ancient cadastral maps were studied, such as Napoleonic, Teresian and the one of the Italian Kingdom (Fig. 6), old pictures of the site were used too (Fig. 7).

Fig.6 Ancient cadastral maps of the site.

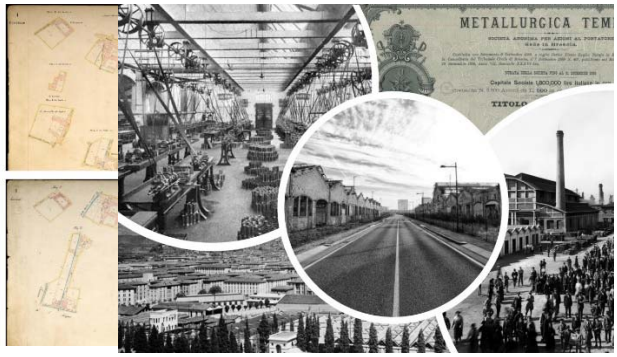

Fig.7 Historical pictures of Via Milano factories.

These steps allowed to define some preliminary features that were mapped to obtain cartographical documents in which the evolution of the site is related to buildings characteristics.

The aim of this phase was to define which are the valuable buildings and the ones that are not compatible with the architectural language of the historical site of Via Milano. Particularly,

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it was possible to define, for every period of urban growth, which architectural typologies were built, and which features they must have. Thanks to the surveys it was possible to define the state of conservation of these components. This is a useful data because it let to define on which buildings it is prior to operate.

Another analysis is the one regarding the constrained buildings that is important to define which are the sensitive blocks along the street and, mostly, if there are buildings that could interfere with the sensitive ones. For this reason, an analysis was done in which, for every block, the incompatible volumes were checked.

With the goal to define the historical feature of the asset the use of the GIS software to relate ages and typologies was important. The same architectural typology builds in different moments can have different features and different typologies build in the same period presents different aspects too thanks to technique evolutions. The GIS software allowed to join these two aspects and obtain a third record that schematizes architectural features that buildings have.

In accordance to surveys, these features were developed in sheets in which every aspect is explained in detail.

After the analysis of valuable buildings and relevant characteristics it was feasible to start defining the guideline for intervention.

The first step in this direction is the creation of a frame of all projects that have been changing the structure of the site in the last years, such as Beyond the Street. The guideline considers the increased value of both, area and buildings, thanks to the operations done by public bodies on open spaces, infrastructures and facilities.

With the creation of new attractive poles along the street, private buildings acquire new importance and, in relation to this aspect, it is possible, to define which the operation that private are can do on their properties (Fig. 8).

This last aspect considers all the previous mapped data. Starting from the architectural value of buildings, the architectural features they have and the importance they acquire it is possible to define compatible and sustainable operations that present different degrees of freedom: the most sensitive buildings are the one on which there is the low level of freedom and the interventions are limited to restauration and conservation. On the other side, on buildings that are not compatible with the historical language of the urban fabric it is given the possibility to private owners to demolish them and replace with other one presenting a high architectural quality.

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Fig.8 3D representation of admissible interventions on private buildings. The purple buildings are the ones with a high architectural value, while the green ones are modern building that are not coherent with the language of the urban fabric. To the purple buildings are linked conservative operations while with the green ones is given the possibility to demolish and replace. (Authors: Francesco Botticini, Emanuela Vizzardi)

2.2 GIS & DIFFERENT SCALES MODELS

As it is asked by the laws, during the elaboration of a recovery plan it is necessary to stress attention on people that live in the site with the aim to highlight its social structure. Namely, in the field of socio-demographic analysis it was possible to join the social matrix of Via Milano to the structural one. The result is a series of maps relating *urbs* and *civitas* (Fig. 9).

Thanks to the GIS software it was feasible to create maps in which the distribution of people along the site is shown in connection to other data, such as the conservation state of houses or the "age" of the fabric in which they live. The other aspect is that GIS software allows to characterize information about population so, it is possible to weight them and obtain distributions related to different aspects such as nationality, gender or people different ages. The process aimed to start from the site general characteristics at urban level up to the architectural ones.

The overlay of this data is important inside the frame of the recovery plan because it let to understand if there are my relationships between different scales variables. Particularly, the data about the evolution is at urban scale, the one about the conservation is at architectural scale and the one about residents is at a lower level.

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Fig.9 Comparison between the distribution of foreign (up) and Italian people (down). The blue spots represent the concentration of people on the analysed area; high intensity of blue means high concentration of people. In this maps people are related to the urban evolution of the area and to the conservation state of buildings.
(Authors: Francesco Botticini, Emanuela Vizzardi)

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3 FIRST CONSIDERATIONS AND FUTURE DEVELOPMENTS

The article analyses the urban regeneration process that has begun in 2016 in Brescia and it is still in development. Now the first interventions have started and so, it is possible to see a little part of the firsts consequences they are having on the physical and social matrix of the examined area.

The goals of urban regeneration process are to achieve high quality of life through the partnership between public bodies and stakeholders, fostering social inclusion, creating new economic opportunities and refurbish the assets in an ecological way in order to ensure ecosystem services and high architectural quality of buildings.

The most important aspect is the relationship between public and private intervention to foster urban quality that can generate value and how this value can be captured to enhance the asset of the site.

This is an interesting point because it is linked to plenty of international researches that aims to define new strategies for the development of processes and plans of urban regeneration, with the partnership of public bodies and private stakeholders.

The other important topic of research in which this work is inserted is the one concerning how to use GIS, webGIS and 3D GIS software to enhance historical assets. This process is an example of how new technologies can be used to foster urban and architectural quality through the elaboration of holistic analysis that try to correlate how the assets are done and how they are used.

Implementation of GIS software in the heritage analysis is taking importance thanks to the possibility of creating databases that are the starting point in the assessment of the admissible strategies. Thanks to these databases it is feasible to develop statistical analysis trying to define possible correlations between the mapped features with the aim to find which are the trigger causes that can damage the heritage and the assets, such as, for example, a possible wrong use of the heritage.

Particularly, the implementation of data with the ones coming from a 3D exam can help in defining the features mapped. The use of 3D GIS allows to do more analysis that are not feasible in the 2D plan, such as the one regarding the presence of incompatible volumes inside blocks.

The last topic that this work talk about is the importance given in the contemporary urban planning to the protection and the enhancement of the historical areas of cities. Urban cores have started to have importance in the last years because it is recognized that they are at the base of the sustainable development of the land. In an optic of resilience, it is necessary to define a strategy for the growth of cities not under a quantitative point of view but under a

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qualitative one, so it is necessary to protect the elements that can generate value and a higher life quality in urban areas.

This vision allows to introduce topics inside the recovery plan such as the ones about the seismic vulnerability and the energetic efficiency that have the aim to protect the heritage and pose the base to its maintenance through the ages. This is because it is necessary to maintain the features that are at the base of the development of the land making it sustainable in accordance to the goals given by the Agenda 2030.

All these topics can be developed in future analysis; starting from the definition of a strategy to capture public value, through the implementation of 3D GIS in the definition of the data, coming to the studies of the vulnerability and of the energetic behavior.

Especially these last topics can be analysed with the goal of setting a process that investigate how to use 3D GIS to develop studies on buildings behavior that can help in defining strengths and weaknesses that plans must focus on.

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AUTHOR'S PROFILE

Michela Tiboni, Since 2005 Associate Professor of Town planning at the University of Brescia (Italy), graduated in Civil Engineering, she obtained a PhD in Town planning at the Polytechnic of Milan (2003). Author of books, papers and other publications, her main fields of research are Land-use dynamics and environmental hazards, Evaluation of plan previews for a safe and sustainable town, Urban policies and techniques towards a safer town. She took part in many projects about Mobility safety as a management objective of urban transformation and Developing Urban Management and Safety, particularly working on the application of Geographic Information System (GIS), with attention to the monitoring of the effects of planning and traffic safety measures. Since 2013 she is Councillor for urban planning in the Municipality of Brescia

Francesco Botticini, Graduated in 2017 in Building Engineering and Architecture at University of Study of Brescia with a thesis about the enhancement and the protection of cultural heritage of Brescia urban core. From 2015 he has collaborated with the Urban Planning Sector of Brescia Municipality. He is PhD student since November 2017 and his researches concern new ways for urban regeneration of cities with strong historical vocation, namely he studies how to use GIS to create functional databases to enhance the heritage and to assess the sustainability of urban regeneration processes.

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