# Thematic mapping for the definition of territorial development strategies in the Province of Biella

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*Abstract*

The current research aims at investigating the potential of the mapping process as a tool to support the definition of territorial development strategies in large scale contexts. Particularly, the research refers to the GIS-based spatial analysis that, on the one hand, enables the management of heterogeneous georeferenced data, available through various sources and on the other hand, enables the drawing of synthetic maps which can support decision-makers. The research focuses on the territory of the Province of Biella in northwest Italy, where new territorial strategies need to be developed in order to enhance the widespread heritage of industrial archaeology, mostly related to the textile industry, which was strongly interlaced with this territory and its natural resources. The methodology has been developed with the main aim to map the areas where industrial archaeology settlements, natural/landscape values and infrastructural accessibility overlap spatially. The spatial analysis has been performed by structuring a multilayers geodatabase with GIS tools which allows to find out the most suitable areas in terms of design opportunities. The main outcomes of the research are described by a sequence of thematic maps, about the Province of Biella, which provides an overall visualization of the territory from a different perspective, between analytic and synthetic representations.

*Keywords*
Mapping, territorial fragilities, GIS, spatial analysis, Biella

*Topic*
Experimenting

Industrial archaeology settlements on the river Cervo in Biella. On the right, the Maurizio Sella wool mill in the surrounding natural landscape



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## Introduction

The current research aims at investigating the potential of mapping process as a tool to support the definition of territorial development strategies in large scale contexts. Mapping, as a creative practice to reveal the hidden potentialities of the territory, [Corner, 1999; Abrams & Hall, 2006], is a fundamental tool to lead up the cognitive process from data to information, and from information to knowledge. Nowadays, the great availability of geospatial data available through the web as open data, enables to build up complex interpretative models of reality, which starts from the analytical layering of the territory, and ends to more synthetic representations [McHarg, 1969]. The process of mapping is preliminary to define a strategic map of such a complex territory, by applying the spatial analysis to different dimensions of the territory. The main research questions are: how can high-spatial quality areas be localized and mapped on large-scale territorial contexts, referring to the environmental and landscape values? How thematic maps can be used as tools to define territorial strategies and to foster strategic interventions? The survey method seeks to integrate a geographic-quantitative approach, through Geographic Information System (GIS) with qualitative interpretation criteria of the characteristics of the territory (thematic maps) and the opportunities for its development, intertwining some ideas relating to geography, landscape, economy, mobility, tourism which can be further investigated. The research has been developed starting from some general geographical considerations, which served as a starting point for the arguments that are proposed. First, is considered the role that a marginal area can play as a hinge between metropolitan areas with which it relates, adequately considering the strong elements given by landscape, history and local cultural and productive tradition and the importance of synergies with neighboring territories. Secondly is the attention to a territorial strategy that is based on spatial planning, which is capable of activating an inclusive and shared process, open to discussion with local actors, according to intervention priority scales. Last, has to be included an approach that considers places and initiatives of a transversal and multi-scale kind the possibilities of using industrial and residential real estate assets that are in conditions of decommissioning or underutilization, in a highly undervalued market, in relation to the valuable elements of the natural, historical, cultural landscape, together with the issues of accessibility through the infrastructural system. During the development of the research, some thematic areas that are important for in-depth analysis were identified, starting from the consideration of specific actions already activated in the area. Together they provided insights into the development of future strategies. In particular, the following issues have been analyzed: the current condition of the existing infrastructure system, with regards to problems, opportunities for improvement and development; functional adaptation of connections to the regional and interregional railway system and relations with local transport networks and with the main interchange nodes; the widespread built heritage as a potential local resource to improve attractiveness for sustainable tourism. In the next section, a real case-study will be introduced in order to test the effectiveness of a GIS-based methodology, as mapping tool to support the definition of territorial strategies.

## The case study of Province of Biella

The research has been applied to the case study of the Province of Biella, northwest of the Piedmont region, in-between the cities of Turin and Milan. The territorial configuration of the Province of Biella is well defined by clear morphological elements of the landscape. On the north, the mountainous landscape of the Alps, from where it is visible a wide part of the Po valley. This portion of the landscape is cut by the Cervo, Oropa and Elvo valleys, which are spotted by several small urban settlements. The western part of the province is well recognizable by the Serra d'Ivrea and Bessa moraines, on the western border of the Aosta Valley. On the eastern part of the Province, a transition area to the plain of the rivers Sesia, consisting of numerous levels of terraces, introduces to the most urbanized area of the Province, which correspond to the towns of Biella and Cossato. The southern part, characterized by a flat agricultural landscape, mainly devoted to intensive rice cultivation, is interrupted by protected natural areas named Baragge [Regione Piemonte, 2017].

One of the main distinctive features of this landscape is the presence of scattered industrial settlements, historically devoted to textile manufacturing, which have been developed in the XIX century along the course of the main rivers (from west to east, Elvo, Cervo, Strona and Sessera) and nowadays are partially dismissed complexes [Chiorino et al. 2017]. This extraordinary built heritage of industrial archaeology, made up of buildings, tall chimneys, power plants, hydraulic infrastructure, workers' villages, villas of entrepreneurs are part of the widespread cultural heritage system of the Province of Biella, which have a strong relationship with the nature. The presence of high environmental and landscape values, distributed across the territory, as well as a system of industrial archaeology settlements, is a great potential for the entire area of the province, so to rethink some territorial development strategies.

## Data collection and methodology

The research exploits the potential of GIS-based spatial analysis, to map physical elements of the landscape, natural and anthropic, localized in the Province of Biella. Three main dimensions have been considered in order to map the spatial quality of the areas: the built heritage one, the natural/landscape one and the fruition one. A multilayer geodatabase has been made up, by collecting and processing geospatial data from different data sources (e.g. Ministry of Agricultural, Food and Forestry Polices, Piedmont Region, Province of Biella, DocBI - Centro Studi Biellesi) [Gualano et. al. 2017] (fig. 01).

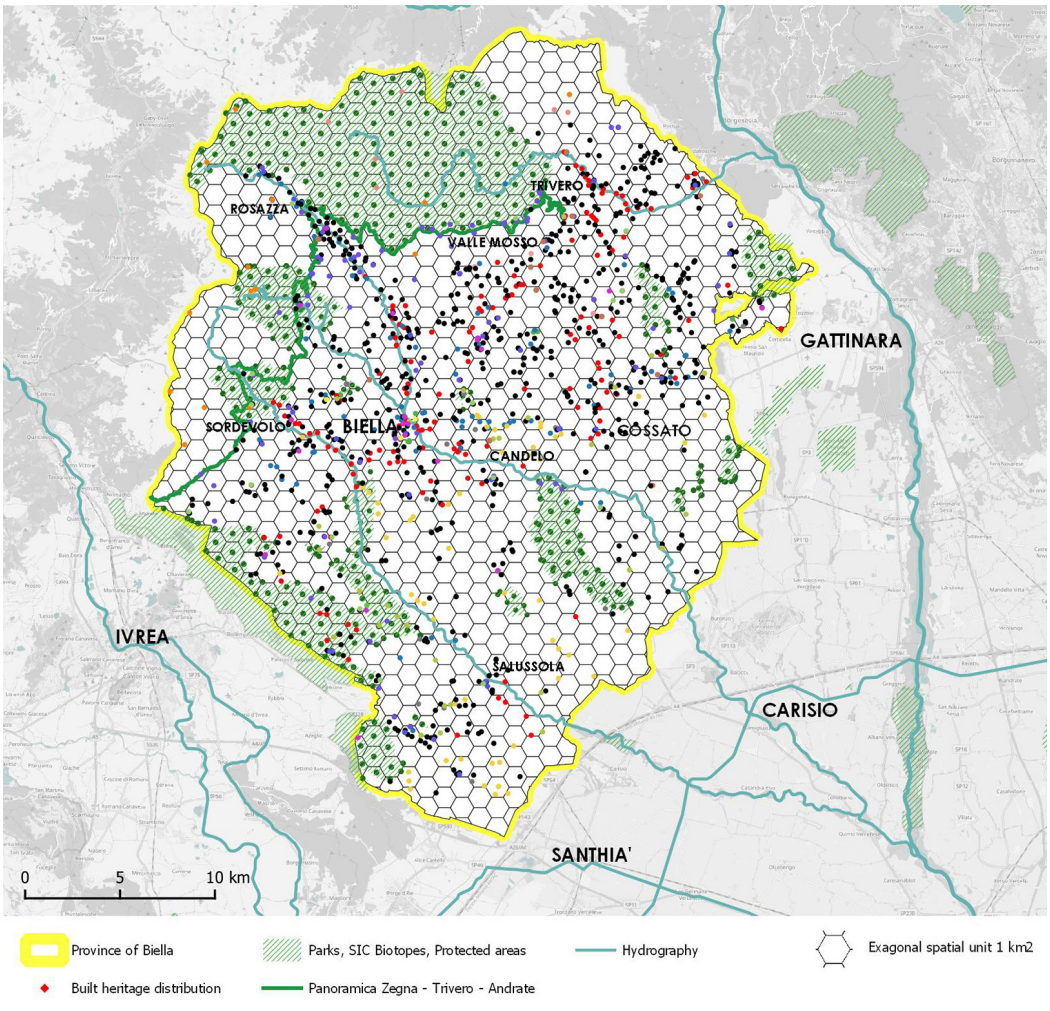


Fig. 01 The map shows the selection of heterogeneous elements of the landscape, which have been mapped by different data sources. The whole dataset is made up of 1.693 punctual entities, selected within the built heritage, natural, landscape and fruition dimensions. (Elaboration by the author)

The first dimension is about the built heritage. In this section, cultural and industrial heritage, have been mapped, by considering the historical urban fabrics, selected by the Plan of the Province of Biella, but also the punctual entities, concerning both major and minor cultural heritage of the territory. In this section many subcategories: civil and religious architectures, rural and industrial archeology settlements, archeological sites have been included in order to analyze the widest possible range of aspects of this territory. Even minor cultural heritage, such as works of art, paintings, frescoes and sculptures, have been included in the mapping process, referring to the work of Centro Studi Biellesi DocBI. The built heritage dataset consists of 1076 punctual entities, distributed across the territory of the province. The second dimension is about nature and landscape. Geospatial data have been collected by analyzing the Piedmont Regional Landscape Plan. In this section protected areas such as parks, natural reserves, Sites of Community Importance (SCI), but also the monumental trees selected by Ministry of Agricultural, Food and Forestry Policies have been included in the dataset. Some of them are available as points datasets (e.g. monumental trees), while the others are in the form of areal entities (e.g. parks, natural reserve and SCI). The heterogeneity of the selected datasets has been solved by applying a discretization process, which is based on the transformation of surfaces into a points dataset. In this specific case a grid, based on hexagonal cells (size of each cell equal to 1 $km^2$), has been set up, in order to measure the density of landscape components across the territory. In the case of areal entities, centroids have been generated by the overlapping of the areal entities to the grid, in order to convert the selected areas into points (472 points). The third dimension that has been taken into consideration is that referring to informal, innovative and unexpected uses. This section includes a list of heterogeneous places that can be considered as a sort of interface between the users and real world (e.g. museums, eco-museums, archives and shelter, panoramic points), that somehow can activate the relationship between users and places (145 points). A comprehensive dataset of 1.693 points represents the heterogeneity of places across the province (fig. 01). The mapping process has been conducted, according to the idea, that the density of a certain mix of places in a restricted area may contribute to its enhancement, by creating the basis for new redevelopment strategies. The GIS-based method has been applied to get the measurement of the spatial quality of the places in a large scale context, by applying mapping tools. The GIS mapping tools, through a quantitative approach, allow performing the spatial analysis of territory, joining the potential of geodatabases and representation tools. One of the main strengths of the GIS tool is the capability to collect and manage geospatial data, but also to make interpretive models of reality by analyzing territorial entities which are in the form of points, lines and surfaces [Nijhuis, 2008]. Therefore, for each cell of the map, a score has been computed, by counting the points within the areas of each cell, through a dedicated algorithm. The three selected dimensions have been represented throughout the territory of the province by the hexagonal cells.

## Outcomes

The main outcomes of the research are spatially represented by thematic maps, which provide in a more synthetic way the results of the analysis. The first outcome is the graded map of the province of Biella, which shows the distribution of spatial quality element of each cell across the Province of Biella. For this kind of map, a specific representation code has been set, which is based on a color ramp. The spatial analysis shows the scores ranging between a minimum of 0 (white hexagonal cells) to a maximum of 19 (dark blue hexagonal cells). A threshold score (9 of 19) has been set up, with the aim to select the most significant areas of the province, in terms of spatial quality. The higher scores, corresponding to the dark blue cells are localized in the proximity of the following locations: Campiglia Cervo (19), Biella (16), Miagliano, Pettinengo and Valle Mosso (11), Rosazza and Trivero (10), Crevacuore, Coggiola and Lessona (9) (fig. 02). In the same map, the industrial archaeology points have been overlapped with the main aim of searching the areas across the province where there is a matching between industrial archaeology settlements and high spatial quality environments (fig. 02).

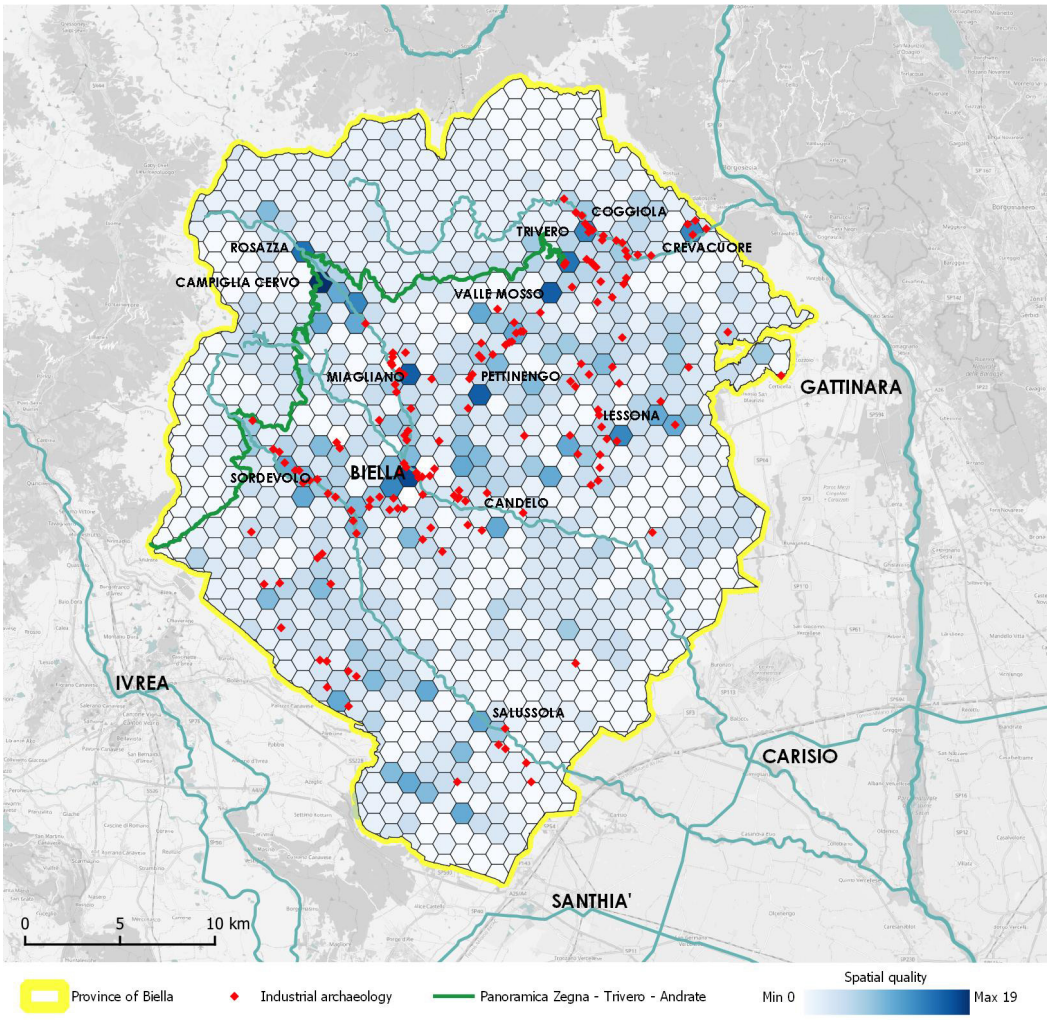


Fig. 02 The map, through the white-blue color ramp, shows the spatial quality distribution across the Province of Biella. (Elaboration by the author)

The proximity of high spatial quality spaces localized in the surroundings of industrial archaeology settlements can inspire new design-oriented strategies for the enhancement of these places (fig. 03). The second outcome of the research concerns with the accessibility issues (fig. 04). The map shows the different transportation modes to access to the territory of Biella. Road and train accessibility has been investigated, starting from the main entrances along the motorways (A4, A5, A5/A26 and A26) to the province of Biella. The province is accessible from the A5 motorway, through the gates of Quincinetto and Ivrea; along the A5/A26 motorway junction, through the gate of Albiano d'Ivrea; along the A4 motorway through Santhià and Carisio gates; along the A26 motorway through Ghemme-Romagnano Sesia gate. The map also shows the train accessibility, through the regional train network from/to Novara and Santhià. The GIS-based method allows to determine the most attractive areas in relation to the industrial archeology settlements, identified as opportunities for the territory, and the spatial quality of the environments (fig. 03). The map shows clearly how the most attractive cells are localized in four main areas, bordered by the thick dark dashed lines; the urban area of Biella; along the north-south direction along Cervo valley in-between Biella and Rosazza; along the north-east direction in-between Biella, Valle Mosso and Trivero; the fourth one, along the landscape of hills of vineyards in-between Biella, Cossato and Gattinara.

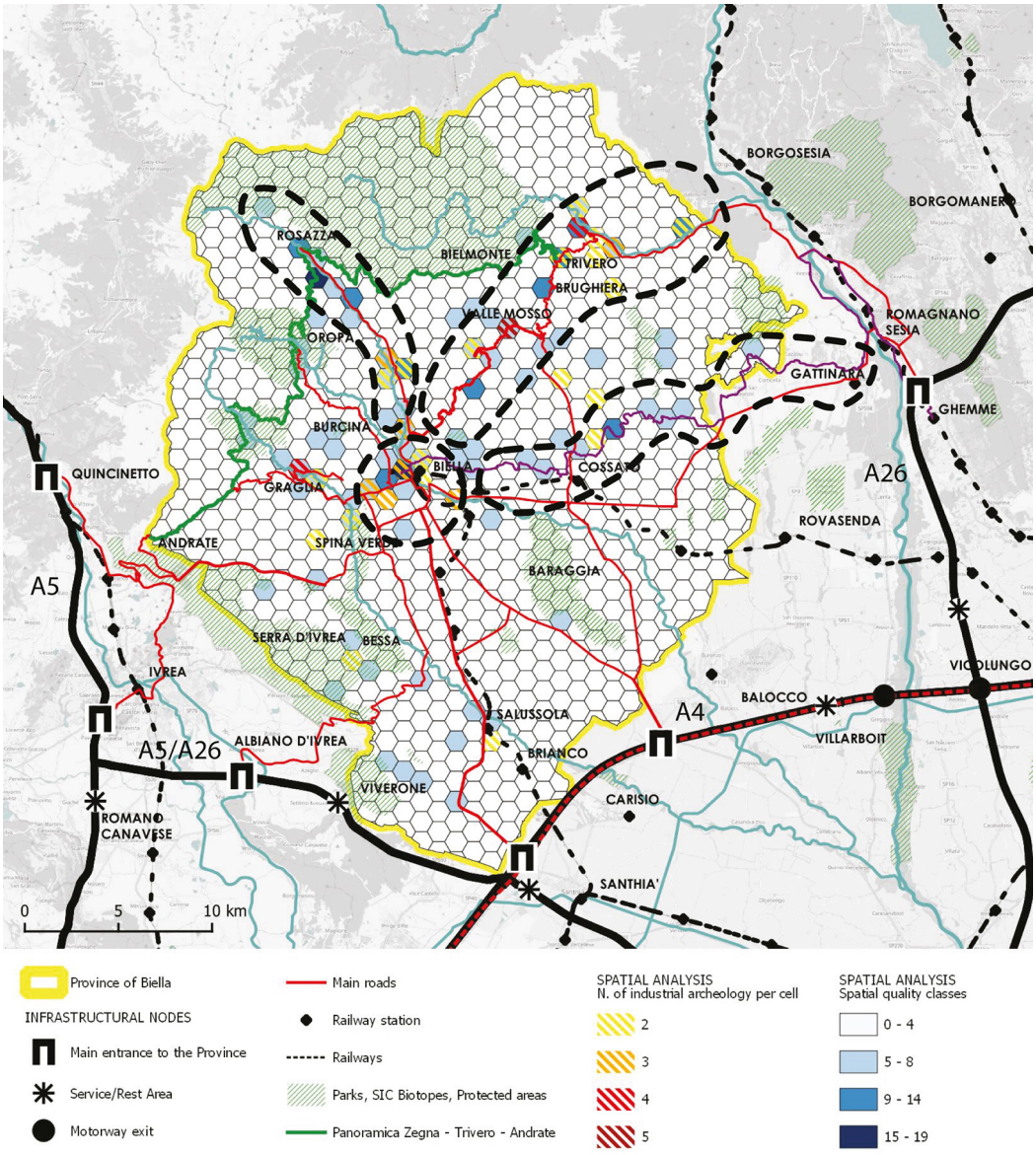


Fig. 03 Selection of places that have been identified with high spatial quality in the GIS analysis, in the area of Trivero and Valle Mosso. a) Picture of Rhododendron Bowl in Oasi Zegna, designed by Pietro Porcinai for Ermenegildo Zegna, with the contemporary art-work "Two Way Mirror/ Hedge Arabesque" by Dan Graham. b) The Zegna mills in Trivero (BI) in the surrounding natural landscape of the Zegna panoramic road. c) Industrial archaeology of Lanificio Picco al bivio in Veglio, close to Valle Mosso (BI), along the Strona river. d) Sanctuary of Madonna della Brughiera, Trivero (BI) inserted in the landscape representative of the local agricultural economy with pastures and chest-nut groves. (Elaboration by the author)

## Conclusion e future developments

The research has shown the potential of the mapping techniques through GIS, as tool to support the definition of territorial strategies in large-scale contexts. Compared to the existing characters of the territory as they result in synthesis from the process of mapping, some strategies emerge as of particular strategic importance, all based on the parts of the territory where a higher density of elements of interest is present. In the territorial areas identified through the thematic maps and along with the main infrastructural system, some territorial strategies for the enhancement of the territory can be outlined: interventions to enhance the architectural quality of the intermodal interchange nodes (railway stations, service areas, motorway gates); improvement of the quality along the three identified axes, between the main nodes of the territory and the existing networks, by taking care of the spatial quality of the main roads; improvements of the slow mobility networks (hiking and devotional routes, cycle tourism, etc.) to better connect, in a comprehensive territorial system, those places of touristic interest where nature, cultural and historical assets, such as industrial archaeology settlements are already present and interrelated.

This contribution, therefore, takes its cue from the many projects, now mature, which are in any case under development. In this context, the study tries to frame its meaning, not only to evaluate those that may have greater effectiveness, but rather to solicit greater integration, involving actors and initiatives that, in many cases, are present on different tables and communicating with each other in a fragmentary way. The resulting strategy is innovative as it encourages tourism in the landscapes generated by productive districts, also exploiting their heritage of industrial archaeology, between innovation in the organization of work and leisure time. This means to develop infrastructure projects to improve physical mobility networks and digital ICTs networks that make it possible to make a truly offer possible, innovative in terms of accessibility, living spaces, work. From the methodological point of view, the future developments of the work can be addressed to include new datasets, maybe promoting the digitalization and georeferentiation of traditional sources of information (e.g. archives), with the contribution of those local experts in niche fields of cultural heritage issues, so to better consider the multifaceted aspects of the territory.


Fig. 04 The map shows the main outcomes of the spatial analysis conducted in the Province of Biella. The most attractive areas have been mapped according to the presence of industrial archaeology settlements and the spatial quality of the environments. (Pictures by the author)

## References

Abrams, J., Hall, P. (a cura di) (2006). *Else/where Mapping. Mapping new cartographies of networks and territories*. Minnesota: University of Minnesota Press.

Chiorino, F., Piva, C., Topuntuoli, S. (2017). *Biella fa territorio. Leggere e agire nella comunità*. Melfi: Libria Editrice.

Corner, J. (1999). The Agency of Mapping: Speculation, Critique and Invention. In Cosgrove D. (a cura di). *Mappings*, pp. 213–252. Londra: Reaktion Books.

Gualano, F., et al. (2017). *MUOVERE, Museo Virtuale delle Opere Restaurate*. Biella: E20 Progetti Editore.

McHarg, I. (1969). *Design with nature*. New York: Nhp.

Nijhuis S. (2008). Application of GPS data in Geographic Information System. In Van Der Hoeven, et al. *Urbanism on track: Application of Tracking Technologies in Urbanism*, Amsterdam: Ios Press.

Regione Piemonte (2017). *Piano Paesaggistico Regionale*. D.C.C.R. 3 ottobre 2017, n.233 – 35836.



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