

THE NAVIGLIO OF MARTESANA: A GIS TO MANAGE A PROTECTED AREA

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KEY WORDS: conservation, GIS, heritage, historic centers, cultural landscape

ABSTRACT

Built in the XII century, a system of once navigable canals connects the city of Milan to the main rivers of the Po valley. The *Martesana* canal, built in the XV century, runs 30km and connects the Lombardy capital with the Adda river. With the development of railway transportation, navigation along the *Martesana* been abandoned and it now functions as part of the region's irrigation network. An architectural heritage of great historical and environmental importance still remains along the canals. The villages, rural buildings, farms, villas, gardens, factories, hydraulic wheels, public washhouses, are some examples of the variety and richness of the area and describe man's historic relationship with this natural landscape. Since the 50s, particularly in the areas closer to Milan, an intensive residential and industrial building development began that joined these diverse historic villages and as a consequence the agricultural land was lost. In response to this development the Regione Lombardia recently defined a protection program that binds the canal corridor as landscape heritage. This includes village centers, villas, gardens, industrial sites and cultural landscapes. This paper examines the Project *Voies d'Eau Vivantes, EU Terra Programme*, and the GIS process with the goal to survey historic sites and features, read cultural and natural values and analyze landscape and urban conservation problems in order to reach a proper approach to preserve, rehabilitate and manage this historical heritage. The focus of this project will explore the use of the existing waterways, however the remaining agricultural areas, green corridors, historical centers and sites will also be important considerations. The project studies the planning tools, considers new building developments and infrastructures while monitoring the impact using preservation and conservation guidelines.

In order to connect Milan with the main rivers of the Po valley, a system of navigable canals, the *Navigli*, started to be built in the XII Century, making Milan a city of water even if it does not stand on the banks of an important river. The Lombardy capital is located at the center of a extensive plain, with a wealth of resurgences, waterways and, in times gone by, marshland. Navigable rivers flow away from Milan, at a distance of about 30 Km: to West the Ticino river, the Po.

The *Navigli* served as both very important trade waterways irrigation networks. At the time of the Industrial Revolution with the development of railway transportation, navigation along the *Navigli* had been abandoned, however, their functions as irrigation canals continued and a new use for the production of electric power began.

Today, the system of the ancient *Navigli* in Milan constitutes an open-air museum of historic sites and urban, rural and natural landscapes. The importance of the architectural and landscape heritage of this canals system has been acknowledged by the *Regione Lombardia* that recently defined a protection program that binds the canal corridor as landscape heritage. The *Naviglio della Martesana*, in particular, connects the Milan to East the Adda river, both are tributaries of the longest Italian river, metropolitan area (a region populated by more than three million inhabitants) with the Adda river valley, one of the most and remarkable natural areas to be found in the Lombardy plain, passing through a territory inside which there is still an architectural heritage of great historical and environmental importance: urban centers, aristocratic villas and their gardens, farms and rural settlements that are still partially active.

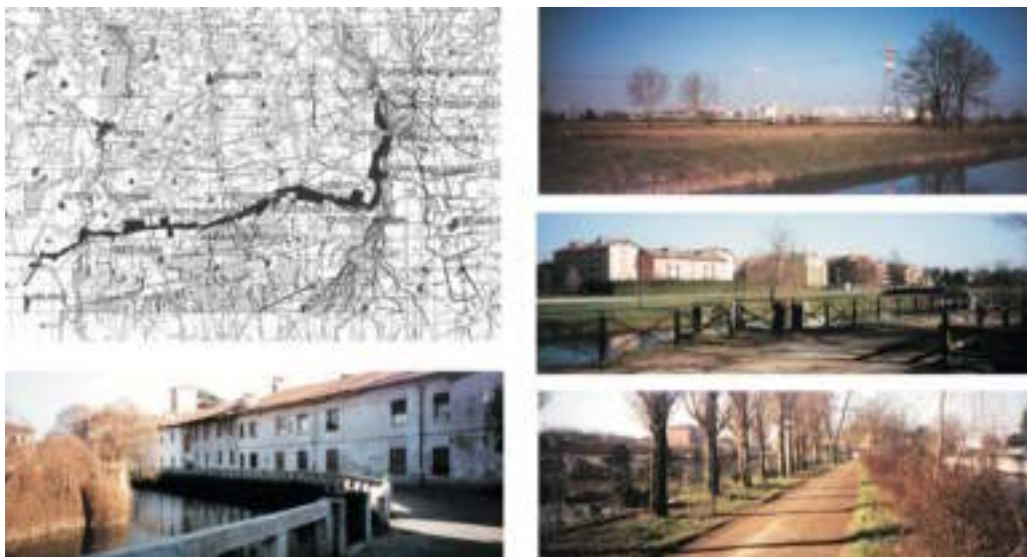


Figure 1. The Naviglio della Martesana from Milan to Trezzo sull'Adda. The grey area is the bound canal corridor, while the other marks represent the protected areas connected with it (regional and local parks). The landscape connected with Naviglio della Martesana: rural areas and buildings, historical sites, urban fronts, contemporary buildings and new infrastructures coexist together.



Figure 2. The analysis of historical land maps and registers (1722, 1850) allows to identify historical sites and landscape features.

The first forms of industry were set up along the canal and interesting historic factories still remain. Since the 50s, particularly in the areas closer to Milan, an intensive and often chaotic residential and industrial development began that joined these diverse historic villages and as a consequence the agricultural land was lost. Today, the *Naviglio della Martesana* planning and preservation problems are complex: on the one hand it is necessary to enhance the canal connected areas, which have been run-down or impoverished by recent urbanization that often did not consider the *Naviglio* historical and landscape values; on the other hand, it is important to conserve and reuse old buildings and the remaining historical, rural landscapes, inside which there are monumental sites, as ancient villas and gardens, industrial archaeology sites, hydraulic wheels, washhouses, etc.

Lastly, there is the need to protect the last remaining natural components of a densely urbanized area. It should be stressed how the canal and the natural, green ecosystem adjacent to it constitutes a potential ecological corridor, able to connect the protected areas already existing (the *Parco Agricolo Sud Milano*, the *Parco Regionale dell'Adda Nord* and some local parks). Furthermore, thanks to the towpaths, it can be gone along the *Naviglio Martesana*, almost in its entirety, using footpaths or bicycle trails, in support of the large number of architectural and landscape resources that characterize it.

An active preservation policy of the rural and urban landscape values requires the definition of procedures to help the local governments: both in the drawing up of the different levels of territorial planning, as well as in the evaluation of the town-planning and infrastructural projects that they are responsible for. In the same way, the Region could use these procedures as its indicators for the monitoring of local government's projects, by exercising their control function.

The *Regione Lombardia*, indeed, in order to respond to these requirements, has set up a preservation plan.

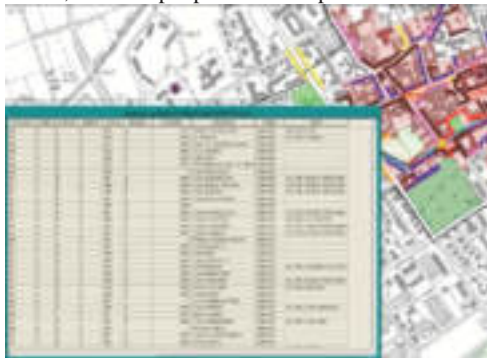


Figure 3. A data base about the identified historical sites is linked with the Naviglio della Martesana GIS.

The project, partially funded by the European Community (the *VEV Project - Voies d'eau vivantes, Canaux Historiques, the TERRA Project - European Structural Funds, 1998/2000*), was entrusted to the Dipartimento di Progettazione dell'Architettura of Politecnico di Milano (see: M.Boriani, A.Cazzani, M.Giambruno, I.Mambretti, with E.Airoldi, F.Bonacci, A.Oppio,

Tutela e conservazione del sistema paesistico storico dei Navigli della Martesana e di Paderno, Politecnico di Milano, Dipartimento di Progettazione dell'Architettura, Regione Lombardia, Direzione Generale Territorio e Urbanistica, Milano, 2001). The goal was that of identifying the architectural, landscape and natural resources that define the quality of *Martesana* corridor, analyzing - from an environmental and historical point of view - decay situations, transformation and alterations problems, cultural values, providing for the consequent, control criteria to monitor new buildings developments and infrastructures impact and management guidelines to conserve or rehabilitate historic features and sites. The work considered the *Naviglio* corridor, approximately twenty square kilometres and whose extension goes right along the length of the still surviving canal (approximately 40 kilometres). It concerned both the historical and contemporary built areas, as well as the rural and natural zones included in the binding area, without excluding, however, external areas, especially when they showed inter-relationships with the *Naviglio* corridor (for example, in terms of long distance views). The project was conducted over two, successive phases: the first (see: M.Boriani, S.Coloru with Z.Faravelli, R.Monici, F.Turrini, V.Villa, *Studio del sistema paesistico-storico dei Navigli della Martesana e di Paderno*, Politecnico di Milano, Dipartimento di Progettazione dell'Architettura, Regione Lombardia, Direzione Generale Territorio e Urbanistica, Milano, 2000) analyzed the historical sites and landscape features, identified by historical land registers and maps (1722, 1850 approximately - and 1897/1902), the *I.G.M.* (Istituto Geografico Militare, the Italian Military Geographic Institute) cartographies and the reference bibliography. This allowed for the drawing up of a specific map in a scale of 1:10.000 with the perimeter of the historic urban centres and the rural landscapes of historical significance and the identification - inside and outside the same - of the most important architectural and/or cultural and environmental resources. Specific surveys conducted - in the second phase of work allowed the identification and evaluation of the complex landscape connected to the *Naviglio della Martesana*, reading the transformation and checking the level of conservation and alteration of the urban and rural landscape. The *Naviglio della Martesana* flows at the upper margins of the so-called Lombardy irrigation plain: here, for centuries, men have worked

and transformed the marshlands created by the resurgences into one of the most fertile and productive territories in Europe. The landscape was designed by a dense network of rogge (small irrigation ditches), partially derived from the springs and local

ivers and partially from the Naviglio itself, irrigate the fields. The irrigation network is regulated by a profuse series of little, hydraulic features (gullies, manhole covers, sharing system, dams, etc.), which have sometimes still silkworm rearing.

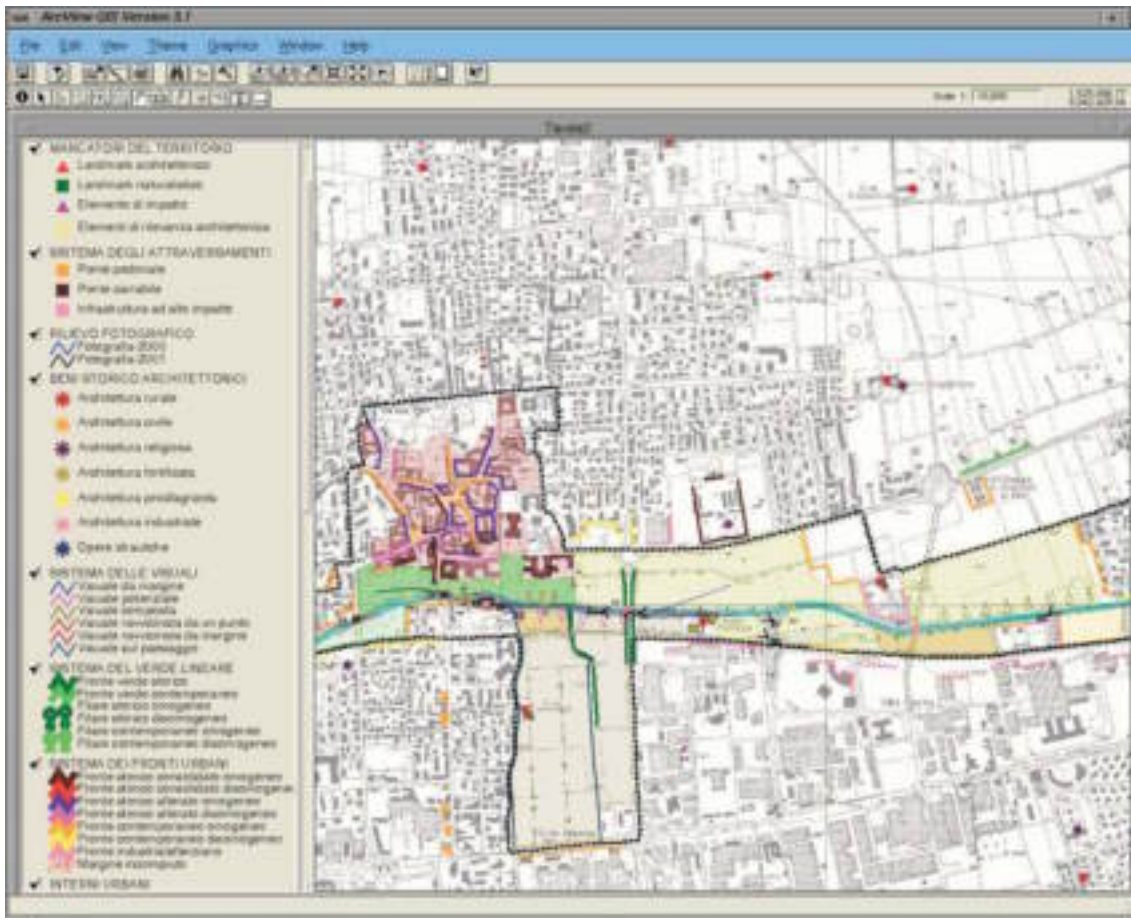


Figure 4. The Naviglio della Martesana GIS that connects the cartographic data (Carta Tecnica Regionale, scale of 1:10.000) with the surveyed present conditions in order to reach a proper approach to preserve, rehabilitate and manage the Naviglio cultural and urban landscape.



Figure 5. Identification and analysis of the structural and perceptive landscape characteristics, two details of the GIS maps. The different symbols identify historic features and sites to be preserved, the decayed areas and the landscape impacts: that detailed survey should constitute a reference for planning tools and new buildings development projects.



Figure 6. Analysis of the landscape conservation problems, a detail of the GIS maps. Decay situations, transformation and alterations problems, buildings expansion plans, natural and cultural values were surveyed to monitor new buildings developments and infrastructures impact and to conserve or rehabilitate historic features and sites.

Isolated, monumental trees, the remains preserved their historical characters. Along the country roads, of tree planting in olden times, sometimes characterize the the boundaries between the properties and the canals, a lush landscape now. form of vegetation has developed, almost always planted by This entire system historical components, in serious danger of man, both in the form of rows and wooded banks: made up of disappearing further to recent rural transformation and building poplar trees, maples, willows and mulberries (in support of development, has been identified and a census has been conducted, marking off, in particular, the areas where their concentration is greatest and the areas, therefore, deserve to be preserved with care. In analyzing the landscape characteristics, the goal was to identify and consider the natural and cultural features, as well as the perceptive ones, having as its objective the preservation and the rehabilitation of urban and periurban

areas, close to Milan. Consequently, two maps were drawn up: the *Identification and analysis of the structural and perceptive landscape characteristics* and the *Analysis of the landscape conservation problems*. These maps are part of a computerized territorial system (GIS process), that connects the cartographic data with the present conditions in order to reach a proper approach to preserve, rehabilitate and manage this historical heritage. The maps drawn up for the *Martesana* corridor have been computerized, using the Carta Tecnica Regionale (scale of 1:10.000), creating a specific Geographical Information System (GIS) in which each identified element is linked with data bases containing historical and descriptive information, photos and notes about landscape characteristics, built features, materials, preservation problems, referring with specific preservation and management guidelines.



Figure 7. Analysis of the landscape conservation problems, two details of the GIS maps. This survey should constitute a reference for planning tools, new buildings development projects, rehabilitation and preservation treatments.



Figure 8. Preservation and management guidelines (linked with the Naviglio della Martesana GIS) about constructed water features still conserved. Hydraulic wheels, dams, irrigation network are important landscape characteristics of cultural and natural significance.

In particular the linear components (like urban fronts, irrigation network, lined trees, trails, roads), the areas (rural areas, different green areas, agricultural groves, parks and gardens, playing fields, villages, historic urban centers), the buildings and structures (historical-architectural properties, landmarks, monumental trees, constructed water features, small-scale features) along the *Martesana* have been highlighted with specific symbols to better understand the canal landscape system and the corridor that it contributes to making. Moreover, the research was also focused on the studies of the functional and visual relations existing between the *Naviglio* and its urban, rural, historical or contemporary context. Consequently it was

important to survey land use, organization, form and shape of the landscape and view and vistas, as landscape features that create or allow a range of vision which can be natural or designed and controlled. The landscape reading, on the basis of the defined methodology, has allowed for identification of areas that require specific preservation and management policies and treatments: sites of particular architectural, landscape and naturalistic significance to conserve and enhance; altered or decayed sites to rehabilitate and reuse. The project studied the present planning tools, to check if they are compatible with the *Naviglio* landscape preservation and rehabilitation goals.



Figure 9. Gorgonzola historic center: Identification and analysis of the architectural characteristics and Analysis of the buildings conservation problems with a preliminary preservation treatment plan. These maps (part of the Naviglio della Martesana GIS) were drawn up to reach a proper approach to preserve, rehabilitate and manage this historical urban heritage



Figure 10. Inzago historic center: Identification and analysis of the architectural characteristics and Analysis of the buildings conservation problems with a preliminary preservation treatment plan. Architectural components, materials, structural characters, decay situations, transformation and alteration problems have been surveyed to underline the historical values of the buildings, in order to define urban conservation plans and guidelines.

The criteria used in the identification of the structural and perceptive landscape features of the *Naviglio della Martesana*, have been explained in appropriate *Definitions* related with *Management Guidelines* defining preservation criteria to support territorial and town planning to control and evaluate the impact of new buildings developments and infrastructures and to conserve and enhance historical, cultural and natural landscape characteristics. The research conducted, therefore, is not a resolving plan and does not solve, through specific projects, individual cases, but set, as its goal, to supply the municipal planning commissions and the regional control boards in the analysis and evaluation of the *Martesana* landscape, determining preservation standards and treatments in order to conserve the landscape historic characters and cultural importance, to protect the rural and ecological value and to manage the future landscape changing and development. The focus of the project was also to consider the historic centers and rural villages connected with the *Naviglio della Martesana*, analyzing and recording not only monumental buildings (like ancient villas, churches, castles, palaces, etc.), but also .popular.

and simpler buildings (like council houses, factories, farms, etc.) as they show traditional cultures and local histories. In particular the architectural components (like porticos, loggias, portals, historic floors, balconies, front decorations), the materials, the structural characters, the decay situations, the transformation and alteration problems have been surveyed to underline the historical values of the buildings, in order to define urban conservation plans and guidelines. Consequently for every historic center or rural village two tables (part of the just mentioned GIS process) were drawn up: the *Identification and analysis of the architectural characteristics* and the *Analysis of the buildings conservation problems with a preliminary preservation treatment plan*.

The conservation level analysis of the historic materials, features and components allows to check and monitor new buildings substitutions or transformations, providing control criteria (*Preservation treatment guidelines*) to preserve the surveyed historical resources with compatible treatments and detailed restoration projects and to manage this urban heritage.

Indice

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- 2. Permanenze morfologiche e materiche dei centri storici e dell'edilizia storica diffusa**
 - 2.1 Caratteri degli edifici
 - 2.2 Elementi morfologici e materici
- 3. Linee guida per l'intervento**
 - 3.1 Casi di intervento
 - 3.2 Indicatori generali
 - 3.3 Disposizioni specifiche

2.3 Disposizioni specifiche

- Portali
- Loggias
- Portici, facce e volte e rivestimenti lapidei
- Elementi decorativi
- Elementi materici
- Integrazioni
- Portici e porte aperte
- Portali ad arco
- Accostamenti
- Loggias-portici
- Portici-balconi
- Coarctati
- Mura di copertura

LINEE GUIDA PER LA CONSERVAZIONE DEI CENTRI STORICI E DELL'EDILIZIA STORICA DIFFUSA

3.3 Disposizioni specifiche

Le indicazioni qui di seguito espresse, di cui si sottolinea il carattere non imperioso, hanno come obiettivo il superamento delle indicazioni puramente vincolistiche e vogliono indicare e sostenere le singole azioni di recupero mediante comportamenti progettuali rigorosi dell'esistente e tecnicamente corrette.

Principi

- Gli interventi da effettuare sui fronti degli edifici dovranno rispettare:
 - Altezze e dimensioni delle aperture esistenti
 - Partiti decorativi di facciata
 - Insieme ed elemento di archi degli edifici commerciali dovranno tenere conto dei caratteri morfologici del edificio. Da più edifici commerciali esistenti sullo stesso progetto gli archi dovranno essere realizzati secondo un progetto complessivo.
- Materiali**
 - L'intervento sulla facciata dovrà privilegiare la conservazione degli intonaci esistenti di stucco e calce, mediante scavo di pulizia, consolidamento e protezione, se necessario. Non è auspicabile l'uso di stucchi cementizi, intonaci gessosi e rivestimenti ceramici di qualità generica.
 - Non è consigliato l'uso a facce a vista di mattoni o elementi che si presentino intonacati e ricoverati.
 - Non è ammesso il tamponamento dei portali con opere murarie o elementi opachi, così come non sono consentite variazioni di forma e dimensione.
- Terrazzi-Balvedere**
 - Non è ammesso l'uso di terrazzi balvedere con strutture fisse o removibili, che alterino il linguaggio architettonico dell'edificio e la percezione visiva dello stesso.

GLI ERRORI

- Eliminazione di porzioni di intonaco al fine di porre in evidenza lesioni murarie ed elementi strutturali ritenuti decorativi
- L'intonaco cementizio non riveste gli archi di fronte, ora tamponati, messi in luce come elementi decorativi
- L'intervento parziale di intonacatura non considera l'unitarietà del fronte che presupponebbe un progetto complessivo.

Figure 11. Historic centres and rural villages preservation treatment guidelines (linked with the Naviglio della Martesana GIS) are control criteria to manage and conserve the urban heritage connected with the Naviglio della Martesana.