Water greenways. A case study in Milano north area: "V'Arco Villoresi" (Villoresi gate - bow).

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Introduction

The northern part of Milan, even if it is formed of many medium and small Municipalities, is considered a big metropolitan area. It's uncontained growth, has caused intense soil consumption and territory capillary fragmentation. Fortunately, natural and agricultural areas survive thanks to some political regulations, on different scales, that have limited damage and protected part of the most significant territory. Most of these are parks, historical agricultural landscape, historical hydraulic system works and architectural emergences. Currently, the principal requisites are, first, to preserve the residual areas, avoiding speculation, and, then, to reconnect a large system that is separated by urbanization and infrastructures.

Different greenway projects are planned in the northern area of Milan. First of all there is the Regional Ecological Network (RER), it is considered the guideline for local and regional planning. With the decision 8/8515, 26th November 2008, the Regional Committee approved the design for the most urbanized part of Lombardy and the criteria for its implementation at regional and local level. At the same time, the Province of Milan, within its' Territorial Plan (PTCP), has armed itself with an instrument dedicated to improve the environmental quality of the territory and lives of citizens: the ecological provincial network, commonly called "Dorsale Verde" (Green Dorsal). In perfect agreement, a good example is what the Consorzio di Bonifica Est Ticino Villoresi ETVilloresi (Reclamation Consortium East Ticino Villoresi) is doing in the northern area of Milan and Monza-Brianza, working in different scales and involving Institutions (Region e Lombardia, Provincia di Milano, Provincia di Monza-Brianza and Local Municipality), Associations, investors (Fondazione Cariplo) and citizens.

Figure 1. Panperduto Dam on Ticino River (C. Pisoni picture)

The ETVilloresi is developing numerous projects on a large part of the territory in the north of Milano and it is increasing its works to draw water from theTicino river. The first is to realize a green corridor employing and improving an existent irrigation canal, the Villoresi Canal, from the Ticino River (west of Milano) to the Adda River (east of Milano): a project under realization that plans 86 kilometers of works with Villoresi Canal and other minor canal systems of about 4.000 kilometers. The project was presented in a meeting in Milano, some months ago, and it is called "V'arco Villoresi" and its intensions are to obtain an ecosystem linear area where water is the protagonist. Along the Villoresi Canal, a large wooden strip and a wetland area series will connect existent parks and ecosystems; a cycle way will join parks and towns; a "Villoresi Museum of Water" in Panperduto Dam (Figure 1) and a visitors centre in Parabiago.

Background/Literature Review

Environmental fragmentation can be defined as a dynamic process, mainly of anthropogenic origin, through which a natural area undergoes a division into progressively smaller fragments, isolated and of poorer quality (Battisti, 2004).

The consequences, direct or indirect, could relate to the loss of habitat, habitat isolation, reduction and edge effect increase. These effects are strictly related to the biodiversity loss and they are well studied at different levels: single and population species; species groups; ecosystem; landscape (Davies, Farina, Forman, Gordon, Santolini, Saunders, Wilson, and so on). Especially in periurban areas, the city growth threatens to subtract more and more spaces from natural or agricultural lands, causing an unproductive use of the territory.

It is not enough to leave ecological spaces for the landscape development, where autonomously, biodiversity can improve without obstacles, but it is necessary to correlate every areas in a system, in an ecological network. Greenways could represent such a resource as to guarantee the opportunity to create or preserve biological diversity; to increase and develop landscapes and to improve quality of life. At the same time, they could be a barrier, an obstacle to urban growth, if protected by planning and political regulations.

Environmental and agricultural common policies are directed in this direction and the Lombardy Region, Milan, Varese, Monza-Brianza Provinces are moving, too. On paper, at least. There is a big gap, in reality, between plan and realization. And if, there is the absolute consciousness of the environmental problems, like the graphic of the territory uses in Milan Province shows (Figure 2), other factors are predominant in common choices (economical and political, mainly).

So it is necessary to preserve what is conventionally called "residual areas as the future of the biodiversity", especially in an urban contest, and to "facilitate the exchange dynamics between the man-made environment and the Third Landscape" (G. Clément, 2005).

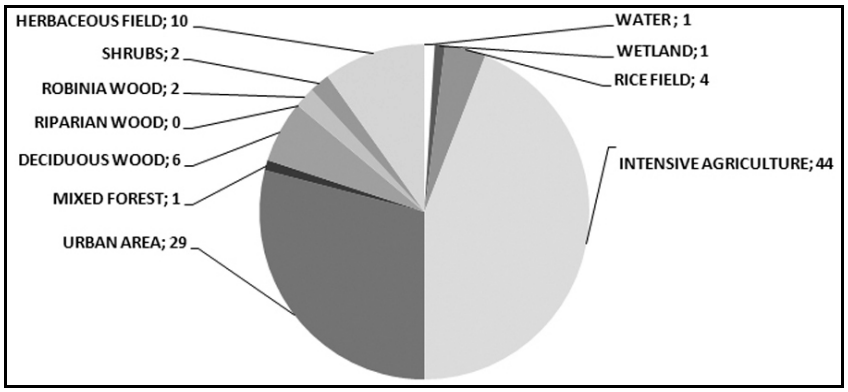

Figure 2. Territory uses graphic in Milano Province (source: Provincia di Milano)

The ecological network represents the best approach to sew up the landscape in all is conjugations, a new landscape not only in its physical connotations, but also in its social and economics meanings. Water, in this sense, has a predominant role, because it represents a life corridor. Moreover, all riparian areas along every water courses are potential areas for biodiversity conservation and increase (Santolini, 2008).

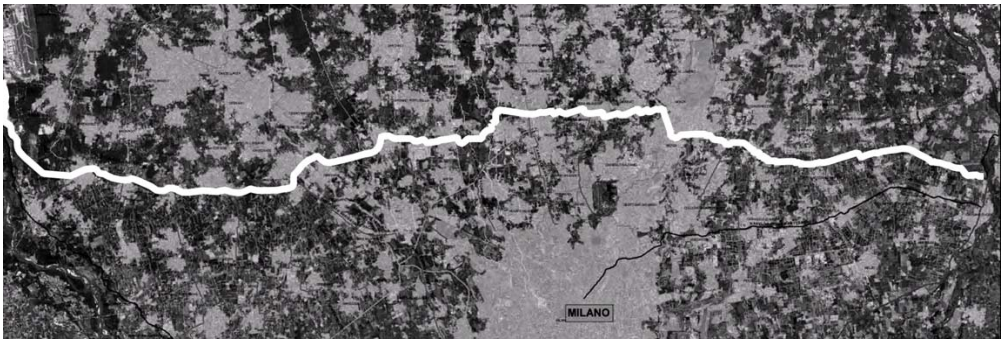

Figure 3. The Villoresi Canal and the urbanization (source: ETVilloresi)

Northern Milano Area

There are two orders of problems in the northern Milan area: the first is related to the water supply for agriculture; the second is an ecological problem, connected to the territory fragmentation. Solving the first means helping the second too.

The critical situations about the increasingly frequent periods of water crisis (e.g. 2003, 2005, 2006), with significant reductions in the flow, caused the necessity to design works along the Villoresi Canal to improve the flexibility and speed of the Canal management; to distribute water throughout the area with small ranges available. The objectives reachable are oriented to have a better regulation of levels and flow rates in 5 sections of the canal; the warranty derivation of all the secondary channels with flow reductions of up to 40% (from 55 to 32 cubic meters/second) and

the possibility to carry out the planned maintenance of the canal lining, maintaining the flow rates in winter periods, with environmental aims.

At the same time, the natural environment, that survived in the territory, follows the major directions north - south and along the river or other superficial water courses. The most important are the Ticino and the Adda and the minor: Olona, Bozzente, Lura, Seveso, Lambro, Molgora, Rio Vallone, Trobbia. Around every river, were established first the regional parks and then the Local Parks (PLIS), Roccolo, Lura, Grugnotorto, Molgora, Rio Vallone. The creation of an ecological corridor that crosses all these areas in east-west direction was easy found along the Villoresi Canal. It allows to patch, not only the existent situations, but also it could be the connection between most of the remaining natural areas present in the range north of Milan, making a green line that directly connects the "Valle del Ticino" Park to "Adda Nord" Park, crossing other different parks: Parco del Roccolo, Mulini, Lura, Groane, Grugnotorto-Villoresi, Molgora and Rio Vallone.

So, inside the project to refurbish the Villoresi Canal, other purposes were promoted.

Eugenio Villoresi and his Canal

Eugenio Villoresi (1810-1879) was an engineer, one of the founders of Agrarian Lombardy Society. His studies were directed towards the agronomy and hydraulics: the need for improving agricultural productivity in the northern area of Milan led him to design a new irrigation system. The design of a Canal linking the Ticino River to the Adda River, distributing water to the north of Milan, was considered "public interest work" and approved by the Ministry of Public Works in 1877. Technical difficulties and financial costs were obviously enormous for its realization and Villoresi gave background to all his personal resources for its implementation and, what's more, not even he saw his work finished. Works completed many years after Villoresi's death. The Canal was called Villoresi and, since 1890, it runs for 86 kilometers, through an area of 85,000 hectares which distributes water through 120 dams, from which branch off secondary channels that run for 130 km. It goes through 27 Municipalities in 3 different Provinces, 5 Regional Parks, 16 Local Parks (PLIS).

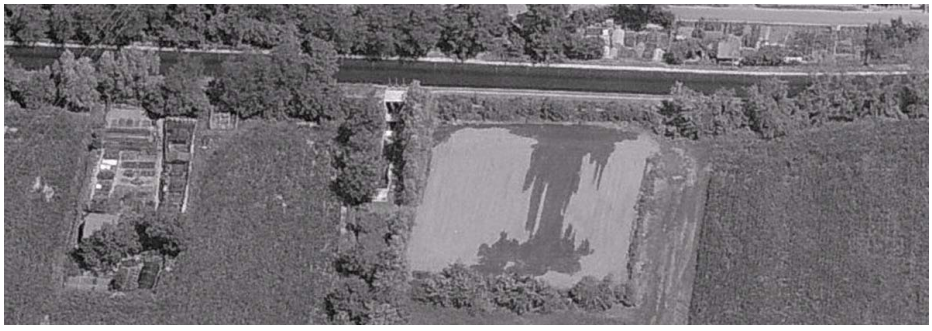

Figure 4. Villoresi Canal and traditional surface irrigation system (source: bing.maps)

“V’Arco Villoresi” Project

The project proposes to coordinate diverse processes of territory to preserve and improve free areas along the Villoresi Canal as the best instrument to protect water resources and as an ecological corridor East - West in the river park system.

To realize this project it is necessary that every Local Institution, Park Organization and every other Association, together Consorzio ETVilloresi, agree common and coordinate actions to concur for the introduction of integrated processes of creation of the ecological network in the metropolitan area, activating the interdisciplinary planning of a “multifunctional linear green system”.

Considering the primary nature of the Canal, agriculture has a predominant role in the project as an active and productive component for local and typical products, for the biodiversity improvement and for the rural landscape conservation. In this sense, the project proposes a system to increase the agriculture also through the development of the green planned and not yet realized, the extension of the green areas and the creation of re-naturalization spaces, finalizing every work to realize a green and blue multifunctional corridor along the Volloresi Canal.

The actions to be envisaged in the project will have two purposes: one, to encourage the environmental rehabilitation and focus on, including the active participation of Municipalities involved, the importance of the preservation of green corridors between farmland, woodland and urbanized areas; the other, to expand, where possible, the friendly use, in particular cycling and pedestrian, in areas where the vehicle mobility on main roads is reaching metropolitan levels.

The landscaping project will bring to fruition the concept of an ecological corridor, working to activate an authentic blue and green corridor, not just the network an integral system of Parks and PLIS and ecological network in the Region of Lombardy, but an integrated pathway in nature, at the citizens disposal, too.

Among the aims is the setting of the project as the application of various technologies related to environmental design: the collection, transportation and use of water (irrigation, river rolling and retention ponds for biodiversity, release of groundwater, phytopurification); the environmental engineering (including consolidation, construction and reconstruction of the area, building biotope, banks redefinition, creation of wetlands); encouragement of biodiversity (habitats, ecotones, tree lines and hedgerows, wildflower meadows and / or bushes); not least the possibility of including in the present context of land-art experiments.

The usability improvement of the bordering areas will give back to the irrigation system the centrality in the development policies, including expanding opportunities for use, in particular, cycling and pedestrian friendly paths.

Closely connected to the Green Multifunctional System is the possible creation of a network of small wetlands along the Villoresi Canal, useful to small animals (especially amphibians) who currently suffer the heavy lack of a satisfactory network suitable for breeding, resulting in genetic isolation and impoverishment.

The project intends to pursue the following objectives in terms of natural:

1. redevelopment of existing "source areas" with maintenance and management of breeding sites and the elimination of critical factors such as non-native fish species, anthropogenic disturbance, pollution. The Biodiversity Centers' presence in the Lura PLIS will implement the populations of amphibians by a computer program of restocking;

2. creation of other "source areas" ,with appropriate size to complete the PLIS and Regional Parks system, fed through the canal water Villoresi;

3. activate other possible funding (e.g. LIFEplus or INTERREG) for larger interventions implementation.

Among the target species there are: **anphibios**: Triturus cristatus, Triturus vulgaris, Rana latastei, Hyla arborea, Bufo viridis; **birds**: Alcedo atthis, Ixobrychus minutus; **invertebrates**: Lycaena dispar, Zerinthia polixena, Ophiogompus cecilia, Odonata sp.

Between the possible wetlands to redevelop, are reported the golf Lainate ponds, lakes in Serenella area (Garbagnate), the wetland area known as "dell'Isolino" in Senago, North Lake Park in Paderno Dugnano, and so on. During the monitoring of the project, a specific naturalistic inquiry aims to monitor existing populations of amphibians, invertebrates and birds.

The "Green Multifunctional System Villoresi Canal" will be integrated with a Fauna Plan that provides appropriate interventions for wildlife: restocking projects for populations of smaller animals under Regional Law (10/2008), provision of suitable crossings for animals, growing trees, shrubs, herbaceous species and aquatic plants especially for the target species.

Goals and objectives

The aim, as M. Galli ETVilloresi Director General says, is to give not only water, but also high quality water for a living system. A. Folli, ETVilloresi President, writes "to conjugate the need to serve out water to the country to have a modern and productive agriculture, with quality products, water for the environment, the landscape and usable for the community" (Folli, 2008). In fact, in the complexity of the project, there was also introduced some other solutions to take water to the southern part of Milan, especially Pavia's province, where the particular agriculture typologies (rice) have a high demand for water.

There is in program works to secure hydraulic structures and to build small hydroelectric plants to produce sustainable energy. In course of evaluation is the

possibility to re-establish locks and Leonardo hydraulic works for a touristic river navigable system, from Pamperduto to Parabiago. Here, another project involves the enhancement of a channel, "Canoa way", where there will be the possibility to compete in international competitions.

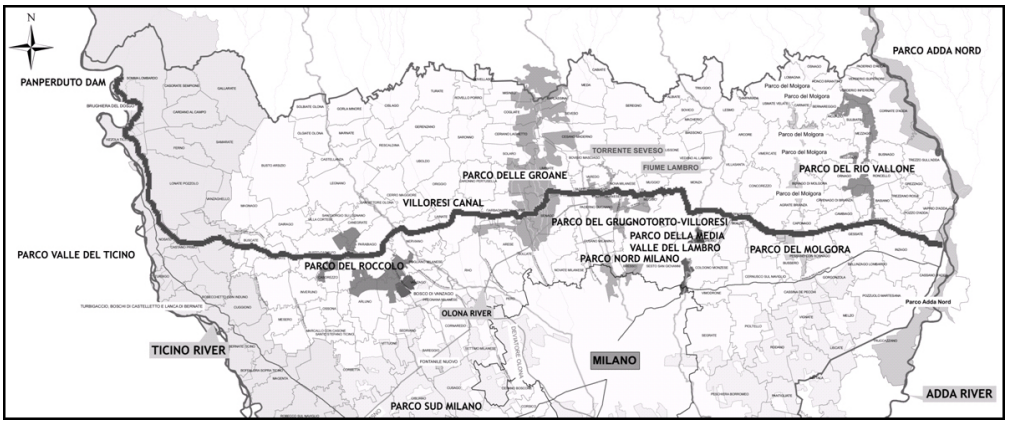

Figure 5. Villoresi Canal and the Parks system (source: ETVilloresi)

Expected Results

The proposed initiative moves within the Guidelines of the implementation program for the creation of 10,000 hectares of new forests and green multifunctional areas promoted by the Lombardy Region. The aim of the project is to work on some pieces of land by creating new integrated forest areas along the shaft of the Villoresi Canal in a system whose features are instantly recognizable by common criteria and requirements of design and construction, as well as through specific intervention criteria for aspects of forestry, wildlife and fruition.

The **methodology** used for the project follows innovative criteria for an integrated and multidisciplinary design, through appropriate simulations and continues monitoring. The main objective is to increase biodiversity and improvement of existing ecological network, through environmental design and landscape derived from an innovative form of governance based on the best current practices of active listening, social realities and key stakeholders.

These results will then be the basis for the development of some pilot interventions along the lines of what has been achieved in similar situations in Milan areas (Lambro, Seveso, Olona basins), where there was serious situations of partial degradation similar to those that characterize some Villoresi Canal areas.

The Project needs about 24 months for the implementation of the following actions: monitoring and preliminary analysis; monitoring natural and implementation of a fauna plan; project scientific-technical and administrative coordination; feasibility study of the interdisciplinary "Villoresi Canal Green Multifunctional System";

design of a pilot intervention to be identified in the feasibility study; implementation of the intervention pilot.

Discussion and conclusion

Currently, Villoresi Canal, with its physical characteristics (concrete bed and banks, depth, width, water flow, long periods of dry and so on) could represent more an obstacle than a corridor for many species, especially in some of its cross sections. All other works, whereas, realized in the contest could be considered a greenway in large part of the canal. To this end, it is really fitting the Padoa-Schioppa's paradigm about Conservation International (2001) biodiversity corridor definition: "an ecological or biodiversity corridor is a mosaic of land uses connecting fragments of natural forest across a landscape". He writes that this is a paradigm particularly useful in those territories greatly affected by human activities" (Padoa-Schioppa, 2002).

There is more than one problem to solve, especially in urban areas, but "V'Arco Villoresi" has significant potential that could be solved with good coordination between the different local authorities and the citizen participation. It will be so useful to conjugate social, economical and ecological aims, without forgetting the quality of the water, the only fundamental resource for life.

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