

# The City's New Road. The Fundamental Role of Nature in Urban Transformation Processes



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**Abstract** As with numerous contemporary situations regarding industrial suburbs, nature and artifice, alternating over time, have provided Bovisa—a strategic area in Milan—with a legacy full of contradictory signs such as the negative effects left by the productive apparatus, the vigorous return of nature and the marked evocative value of the remaining buildings, living deposits of a not-too-distant past. The development of the project, presented in the context of a Call for Ideas (Moro in Bovisa, un parco per la ricerca e il lavoro. Maggioli, Milan, 2017), involves three main parts that correspond, in order, to the phases indicated for the transformation:

- the first regards buildings outside the Goccia area, intended for residence and commerce;
- the second is the link between the stations and the construction in the area of the gasometers of the Library and the Congress Centre;
- the third, along with setting up the park, entails, on its sides, the construction of the New Politecnico/Science Park and the residential system of the Strada Nuova, two diverse settlements, albeit conceived according to similar formal and constructive logic.

The ideas expressed here, according to a single project aimed at enhancing the area's features, propose a transformation process that will enable the construction of a formally defined and complete urban part, characterized by high accessibility and

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The proposal is the result of a Call for Ideas launched by Politecnico di Milano for a vision on the future of Bovisa. Through this experience many professors and students of the ABC Dept. PhD Course have positively tested their polytechnic approach, here featured by the author of the contribution, who coordinated the team. Professors Roberto Camagni, Roberta Capello, Alberto Franchi, Paola Ronca, Pietro Crespi, Massimo Ferrari, Maria Cristina Loi, Cristina Pallini, Sara Protasoni, adjunct professors Daniele Bignami Samuele Camolese, Mario Maistrello, Stefano Perego, Claudia Tinazzi, Alessandro Zichi and PhD students Daniele Beacco, Annalucia D'Erchia, Derya Erdim, Manar El Gammal, Marta Ferretti, Alessio Passera, Manuela Scamardo, Marco Zucca all participated together in the development of the project.

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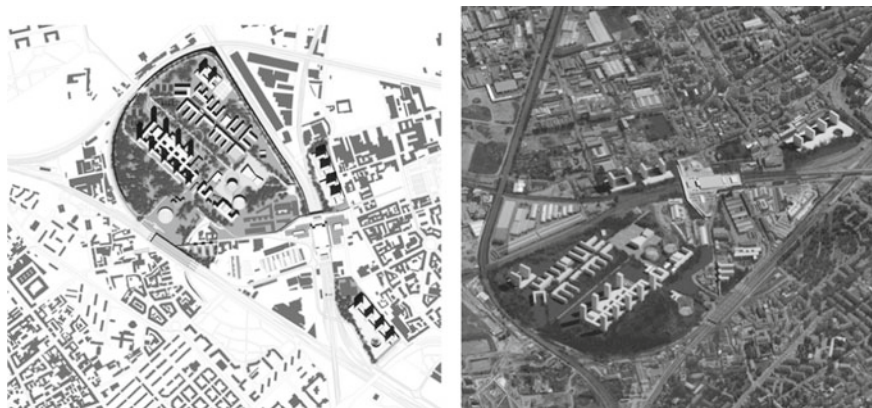
reduced vehicle traffic, built in a green environment according to principles of sustainability and equipped with activities, residences and services of a metropolitan nature. As a result, the general idea of the project tends to express, in organized and orderly terms, the traces of the phases which over time have created the Goccia di Bovisa area: the original phase of nature, the industrial urban service phase, the phase where nature returns to occupy the abandoned work-related spaces and the phase being proposed here in which the elements present are valued in relation to the characters and the size of the set of activities envisaged. At the basis of all this is the search for a balanced relationship between artifice and nature, where the latter, an original and fundamental element, makes up the primary place in which to structure the proposals of the new city.

**Keywords** Urban project · Bovisa · Technology park · New Politecnico · Residentials

## 1 Bovisa Area. The Relationship with the City and Its Parts

It is an ancient geometry, that which initially marks the ground disposition of the urban layout imagined as a new research settlement, an underlying plot that places in order the individual parts of the project, the recognition and compensation of an orientation that, despite the contemporary confusion, for centuries has been drawing directions to the north-west of Milan where the reasons, which are not only political and social but even more so geographical and orographic, behind the rooting in the territory that coincides with the Lombard culture, are still evident (Figs. 1–2).

Inside and outside the fence of the train tracks, a nineteenth-century limit imposed by the culture of mechanical work, the suspension of the city's consistently slow transformations still highlights the isolation of the area balanced between memory



**Figs. 1–2** Project plan and general view

of its own forced identity and the possible homologation to the city built around it; a theme that has been the main feature of the project. Moreover, the same ideal axis along which the project area is located, confirms, starting from the Garibaldi-Repubblica area, passing through the former Farini railway station up to, past the Gasometres area, the most recent area occupied by Expo 2015, a contamination between green passages and public and research places.

The proposed solution, developed between isolation and connection, chooses the enhancement of green areas found within the area, as a value to be preserved, to be integrated, to be implemented starting from the relationship with the pre-existing structures which initially traced, in their orthogonal layout, the more natural and original story of settlement in the area.

The imagined greenery is therefore connected to an ideal system which, from the centre of Milan, has the possibility of enjoying public routes in nature; a tamed and equipped nature in which the same research sites offer contact points between the not-too-distant neighbourhood life and the daily technical-scientific training and cultural learning.

A continuous change in horizon, scale, which gives the neighbourhood the most intimate and somehow introverted dimension, yet at the same time creates and searches for ideal, distant relationships, new points of view that are compared to the territorial scale with a rich environment of memories and values capable of recalling the ideal effort for the construction of a single cohesive landscape, whose identity was already imagined in the words of Cattaneo (1844).

## 2 Accessibility to the Area and Internal Mobility

The demand for mobility generated by the new university Campus and complementary functions is the cornerstone for defining the infrastructure layout serving the new functions. The site is expected to host a daily population of around 13,500 people, including teaching staff/employees and students. The current 13,300 users who gravitate around the existing campus must be added to the above figure. The demand for mobility, generated by the new settlement, is estimated at roughly 22,000 journeys (commuting) (Fig. 3).

The largest share of journeys will be managed by public transport (tram + rail); in this regard, the extension of the tram line becomes the strategic connection with the local mobility system of the north-west quadrant of the city, while the train service, with stops at Bovisa and Villapizzone, allows a connection at both a suburban level (S lines) and regional level. In order to guarantee a direct relationship with the city centre, the Garibaldi station and the transformation of the Farini airport will be connected to the Goccia's interior via a new overpass to the existing tracks. Once the planned work has been implemented, there will be three primary networks with public roads, north, south and west, and these will be connected to each other by a partially underground or trench road that develops between the park and the new university buildings. A second underground network crosses transversely the gasometers area.

**Fig. 3** Public transport (dashed) and project mobility. The new system of covered parking spaces of the Bovisa Station

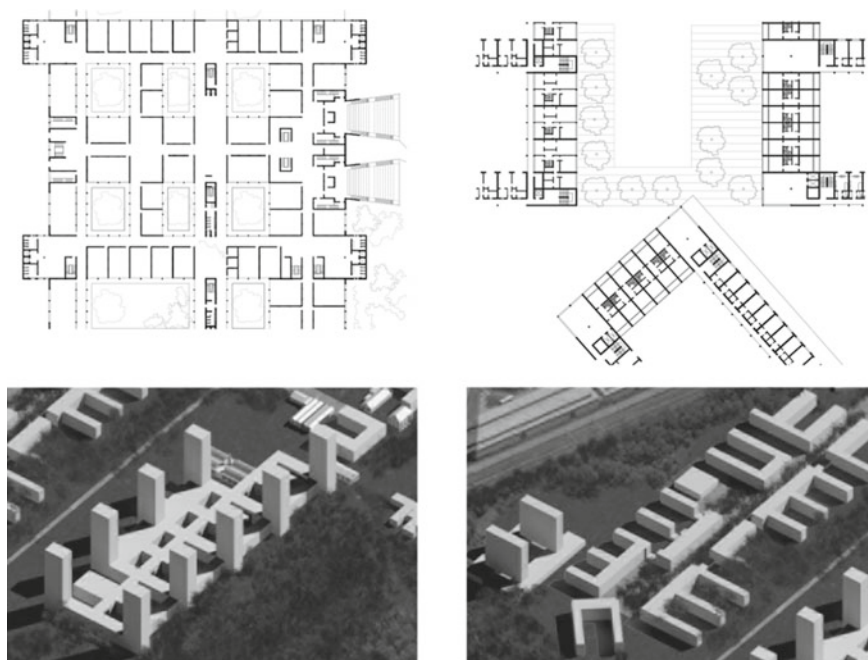


The decision to lower the street level will ensure continuity of pedestrian spaces, providing for a continuous path without obstacles/dangers between the new Campus, the gasometres area and the Bovisa and Villapizzone stations. A secondary perimeter road in the works area will enable to serve the residences, thus guaranteeing access to the appurtenant parking areas and relevant public areas.

### 3 The Project: Identification of the Parts

#### 3.1 *The New Politecnico Campus and the Technology Park*

As the main aspect of the overall project, the university settlement directs and indicates all the further alignments within the urban design, while emphasizing the original pre-existing footprint. In terms of size and position, the research centre qualifies and identifies the new destination of the enclosed space, aligning itself to the existing urban areas, maintained and reused, yet increasingly confirming the natural division into quadrants within the protected enclosure. Separation and connection are the two souls that coexist within the interpretation of the proposed theme which alternates pauses and proximity in its views that relate to the general composition, choosing to allocate the perpendicular sides to the east/west axis in direct comparison with the natural park while emphasizing, furthermore, to the south, the possibility of a continuity capable of interpreting the necessary connection with the Politecnico settlement, already present in the area. Separation and connection are, simultaneously, the keys to interpreting a settlement principle that also places in order and



**Fig. 4** Plan and axonometry of the New Politecnico Campus and of the residences inside the Goccia Area

chooses, through hierarchy, the distances and the adhesions needed for studying and for university research (Fig. 4).

At the northern border of the entire project area, the spaces structure for higher education and specialization has been thought of as a complex machine, an elongated distribution designed to be built in consecutive phases capable of accommodating the study and research facilities of the various Departments inside the Milan Politecnico. Transferring the School of Design from the nearby Campus Durando, placing its Department next to the Departments of Electronics, Information and Bioengineering, Physics and Computer Science currently located in the Leonardo Campus, will give life to a coherent macro-laboratory regarding the skills related to the industrial sector in an enthusiastic structure inhabited by researchers. A superimposed composition made up of courts, cross vaults and towers that allocate the ground floors to studying and teaching of the various disciplines with a considerable degree of interrelation between the parts, placing, in height, the slender towers of singular and specialized research. Through a realistic hypothesis, this follows numerous European and global experiences, the expansion of the research centre within a purely university context, envisages the possibility of accommodating specific business realities which, with regard to the close relationship to the technical-scientific disciplines found on the Campus, give life to a Technological Park.

### ***3.2 Residential Settlements and the Internal and External Trade System Within the Goccia Area***

There are two types of residence within the project; two different housing models whose qualities stem from their expected role and from the provision established with respect to the context in its future prefiguration. These collective dwellings are comparable to a mid-density neighbourhood, within the large urban park, and the thin tall buildings that are placed at the edges of the area, in relation to the city, mark the boundary towards the train tracks. The first residential model, distributed in the greenery that is already present in the area, mainly assembles student housing and subsidized housing in the succession of a diversified series of buildings with an open courtyard which, starting from a central spine with an urban character, looks outwards towards the houses. Court houses, a student residence and two residential towers fulfil the requirement for a total area of 100,000 m<sup>2</sup> of residence.

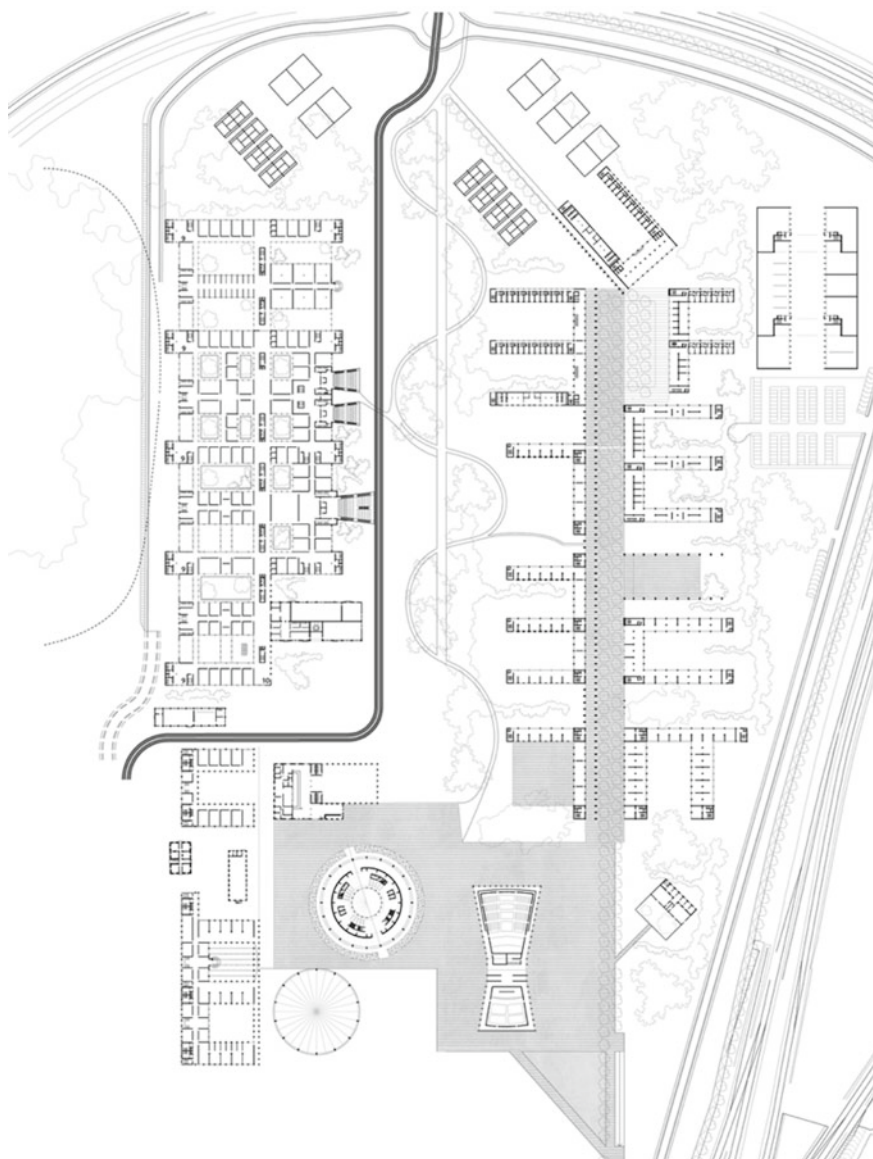
Outside the area, fenced off by the railway, a single settlement system places the tall buildings on the opposite side, following a broader scale logic of reference: slender slabs leaning on capacious bases capable of containing the services needed by the neighbourhoods in question as well as proposing new ones for the imagined settlement (30,000 m<sup>2</sup>). Sporting, leisure, entertainment, and cultural activities define a road within the protected, yet open, block in which to find the closest neighbourhood dimension. The bodies in line, overlapped and supported by these massive bastions that raise the horizon line above the disordered proximity of the train tracks and by casual urban choices, oriented north-south, create a discontinuous system that punctually confronts the built city through its most evident positions, while drawing, with their principle, a recognizable broken line which is a memory, once again, of the design of the infrastructures engraved in the ground (Fig. 5).

### ***3.3 The Park: The Green System***

In its current layout, the “goccia” landscape appears as a still unstable result of a profound change that has affected spaces, natural elements and structures. The dismantling of the production plants and the total segregation of the area have established the return of a colonizing nature with an unexpected and evocative result (the formation of actual biodiversity protection) of an original condition lost in almost all the other areas throughout the city. The green project and the design of open spaces were intended to work around this specific identity of the location through two different types of action.

1. An overall re-naturalization plan which, starting from the existing vegetation covering, directs the spontaneous processes towards the formation of a complex system of landscape units starting from the heritage of tree and shrub species which, after the disposal of the installations, have created woods composed of





**Fig. 5** General plan of the intervention

*Platanus orientalis*, *Tilia cordata*, *Celtis Australis*, *Paulonia tomentosa* and *Populus Nigra*. Three forms of aggregation are envisaged in this plan: belt types, brushes and neat rows.<sup>1</sup>

<sup>1</sup>Reference is made to the specific Action COST dell'Unione Europea (COST 837 Plant biotechnology for the removal of organic pollutants and toxic metals from wastewaters and contaminated

2. The design of a system of green open spaces closely integrated with the structure of the city, each with a different layout and character, in relation to the various parts of the project:
  - The New Road as a pedestrian axis with a double row of Judas Trees (*Cercis siliquastrum*) planted according to a quincunx arrangement.
  - The Central Park, a large meadow (*formed by Dichondra repens*) dotted with large size trees so as to form shaded areas for summer comfort, with relative undergrowth of herbaceous and shrubby species.
  - The gardens of the residence created by a sequence of tree-lined courtyards in continuity with the wooded area of the Central Park
  - The Politecnico gardens with a more distinct character, are delimited and shaded by rows of *Tilia platyphyllos* and isolated specimens of *Magnolia grandiflora*.

### ***3.4 The Gasometers Area: Existing Buildings and New Collective Buildings***

The urban landscape of this part of the city reveals, despite the progressive state of abandonment, some features of a history which, unfolding over the centuries, has been characterized through some fundamental passages: from a rural area, whose structure is witnessed by historical cartography beginning at the end of the sixteenth century, to an important industrial-worker district.

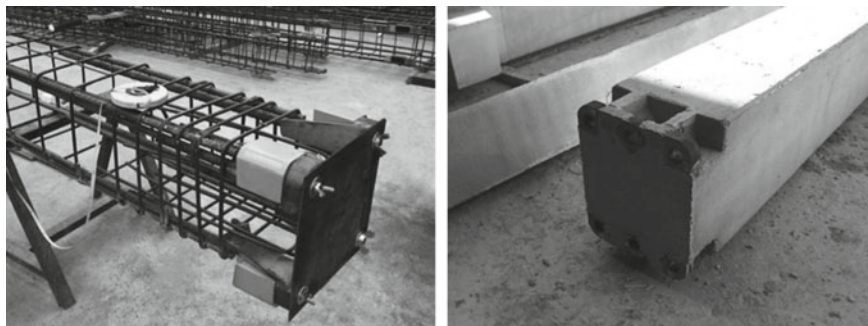
This transformation, which occurred at the end of the nineteenth century and which was favoured by the birth of the railway, is followed by a process of decay and abandonment starting from the 1970s. Revitalized via the establishment of the Politecnico two decades later, the area is now once again ready to welcome major intervention towards its rebirth.

In the general plan, the Gasometers Park takes on the role of a fulcrum towards which its different functions come together to support not only the district's more collective activities but also the entire city of Milan. The planned permanence of the two Gasometers and historic buildings, along with their reuse, opens the possibility of imagining a new composition in which the two large structures dialogue with the new buildings, in particular a large Auditorium juxtaposed in dialogue with the new redesigned Campus library inside one of the two cylindrical volumes.

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sites) who was in charge of the state of experiences and research, at a pan-European level, in this sector.





**Figs. 6–7** Dry-connection system of the prefabricated elements: reinforcement of the pre-fabricated element, connected to the node made with steel plate and bolts and pre-fabricated element ready for installation

### ***3.5 Standardization and Economy of the Construction System***

In accordance with the idea behind the architectural project, a single flexible structural system was designed and consequently easily adaptable to all the different functions found within the project itself. This system involves the use of frame structures, consisting of prefabricated elements made of high-strength reinforced concrete.

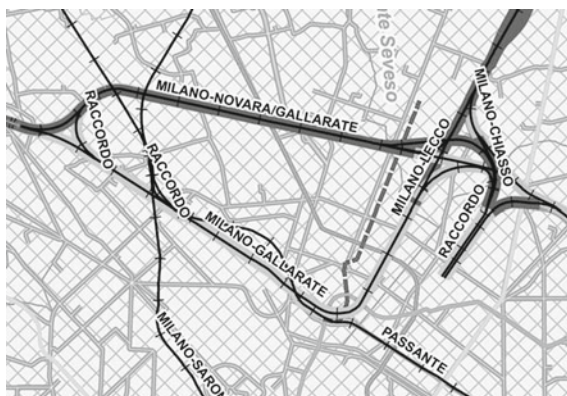
Starting from the module at the base of the geometric-design development (7.2 m), two standard types of recurrent structural meshes have been identified which, given the repetitiveness of the elements, have allowed to opt for a prefabrication technique, minimizing the costs and time necessary for carrying out the work. Furthermore, the high-strength concrete allows for the use of structural elements with reduced sections compared to those made with ordinary concrete, thus obtaining a considerable saving in terms of raw material used. With regard to the exposed concrete elements, a self-cleaning “photocatalytic” white cement can be used that “purifies the air”, spontaneously eliminating organic and inorganic contaminants. The coverings, given the reduced weight loads, will be made of laminated wood type “X-lam” (Figs. 6–7).

## **4 The Project: Evaluations**

### ***4.1 Risk Assessments***

Within the growing importance of Disaster Risk Reduction—DRR strategies, Urban Risk Assessment action is characterized by specificity. If the DRR is defined as “the concept and practice of reducing disaster risks through systematic efforts to analyze and cause causal disasters, including reduced exposure to hazards, less vulnerability of people and property, wise management of land and the environment [...], in parallel the concept of Corrective Disaster Risk Management is considered as “management

**Fig. 8** Dangerous transport of dangerous substances on the railway network



activities that address and correct or reduce disaster risks which are already present". It is the task of urban planning and architecture to seize DRR opportunities, in a corrective way, particularly in the case of territorial transformations where risks are known.

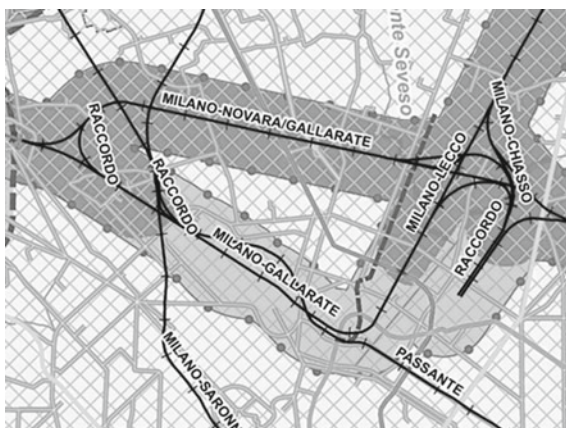
With regard to Bovisa, it is worth highlighting that the area could be involved in railway accidents, since it is considered as being a "high" hazard and a "high" risk location due to the trains passing by on the Milan-Novara-Gallarate line. What emerges therefore is the indication of a project that offers spatial arrangements that pursue invariance in the risk levels. It is suggested, as far as the project is concerned, to increase the quota starting from the 30 m zone, in order to contribute to or limit any possible release of harmful substances or to absorb possible pressure waves or energy flows. This solution camouflages the presence of the railway, providing landscape benefits, while also protecting it from noise, dust, vibrations, etc. and offers a synergy with the needs of cycle-pedestrian transport and with the creation of the greenery needed to guarantee sustainability and quality of life in the new district (Figs. 8 and 9).

## 4.2 Evaluation of Energy Sustainability

The strategies chosen for energy and environmental sustainability were imagined so as to intervene in a coordinated manner, both at the neighbourhood and building scale. In order to compare the quality level of the building work to be carried out, it was decided to evaluate the project with the aid of two rating systems: "GBC Quartieri" and "LEED Italia Nuove Costruzioni e Ristrutturazioni". Thus, by displaying the qualitative plaque, the quality of the technological centre, the residences and the shopping centre will become easily visible to users coming from all around the world. At the same time, the innovative task becomes a potentially replicable experiment.

The quality level expected in the preliminary project would be:

**Fig. 9** Risk for the population of the transport of dangerous substances on the railway network



- Gold, achieving 69 points with the 'GBC Quartieri' system;
- Gold, achieving 72 points with the 'LEED Italia Nuove Costruzioni e Ristrutturazioni' system, for the building.

From the neighbourhood point of view, a balance has been established regarding the urban planning aspects, density of services and creation of infrastructures that enable the production of thermal and electric energy from renewable sources, the recovery of water sources and action on the microclimate. With regard to water management, it will be possible to reduce the use of water, both for irrigation and within buildings, for over 40% of typical consumption thanks to the infrastructures.

On a building scale, the typological mix, the use of easily renewable and low-emissivity materials, the content of recycled material, and the reduction of water consumption, will allow for the creation of buildings with low environmental impact without increasing costs and, above all, they will have reduced management costs.

### **Integrated Energy Management**

Action was taken both on an urban scale and on a building-services scale, with the aim of providing users with the highest environmental quality within the buildings during the various seasons of the year, while simultaneously creating an innovative pole relevant to the management of energy resources.

The plant will be built as follows:

A rotating furnace and air flow control gasifier that generates SYNGAS, mainly consisting of hydrogen and carbon monoxide, used by an alternative internal combustion engine connected to an electric generator for combined production of both electricity and heat. During the summer the heat is sent to an absorption machine, which will enable to produce chilled water for the settlement's needs. The wood material will be transported via rail to Villapizzone and storage will take place out in the open in the former quarry area. At the building-services level, in addition to optimizing the zenithal orientation, the winds and insulation, work was carried out on the installation of a water-to-water heat pump system; the plant-building is made to

work at low enthalpy. The heat exchange is entrusted to foundations that function as an accumulator of thermal energy produced by the tri-generation plant. The biomass tri-generation plant located between the area occupied by the old gasometer adjacent to the railway station and the old quarry, allows for the use of wood-type virgin plant biomass to generate the overall requirements of the settlement.

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