

4.7 ECOCITY Umbertide

4.7.1 General information

The city of Umbertide is situated in the middle of the Alta Valle del Tevere, north of the Umbria Valley, and has a population of about 15,000. It lies on the River Tevere, 30km from Perugia to the south and 25km from Città di Castello to the north. The evolution of Umbertide started with the foundation of the ancient settlement of Pitulum above the river fort in the 3rd century BC. Through the 18th and 19th centuries, a hillside development evolved together with a planned settlement in the valley below. The railway of 1930 ensured further growth in the valley, followed by the first industrial structure with a 'workers' village' near the river.

Italy's transport policy of recent decades has focused on highway mobility and a fast national rail network to connect its major cities, thus weakening and marginalising local train communication. The railway services in and around Umbertide have subsequently declined and must be restored and extended to support sustainable means of transport for both passengers and goods. With the construction of the E45 highway (Perugia-Cesena), local industry recently relocated to be closer to more suitable infrastructure – thus making available a suitable location for a sustainable, residential development.

The sustainable structure of any urban or rural development needs a specific local economy to characterise and support it. The traditional cultivation of olive trees, wine, cereals and most importantly tobacco has formed the core of the local economy and its prosperity. Industry in Umbertide chiefly comprises small and medium-sized enterprises. These were established with the profits from agriculture and are oriented towards the production of specialised components, often linked to the cultivation, processing, distribution and storage of food. According to the 'Renewable Energies Campaign' promoted since the 1990s by the Umbertide municipality, the agricultural and industrial sectors have good potential for biomass and bio-energy production.

4.7.2 Project description

The general objectives and principles that have been applied in Umbertide are intended to prevent urban sprawl through a compact settlement that grows in an evolutionary urban process. The existing urban texture and building typologies are inspiring new urban planning which is climatically responsive. Furthermore the existing conventional transport structure is to be converted for alternative mobility within the 'urban comfort design' and integrated into a new sustainable regional and city light rail infrastructure.

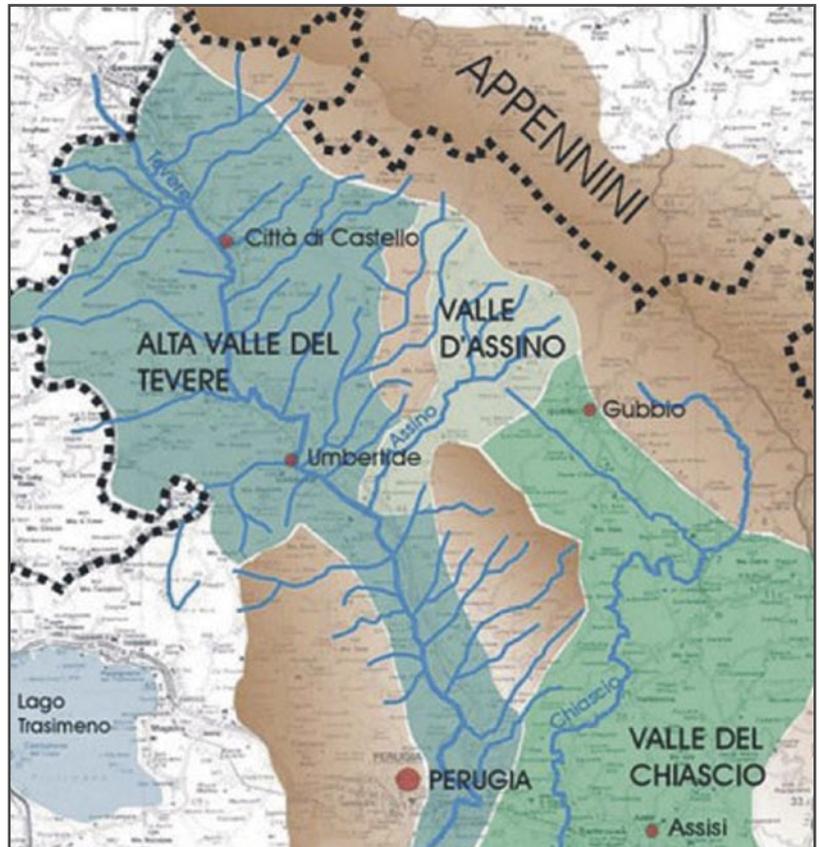
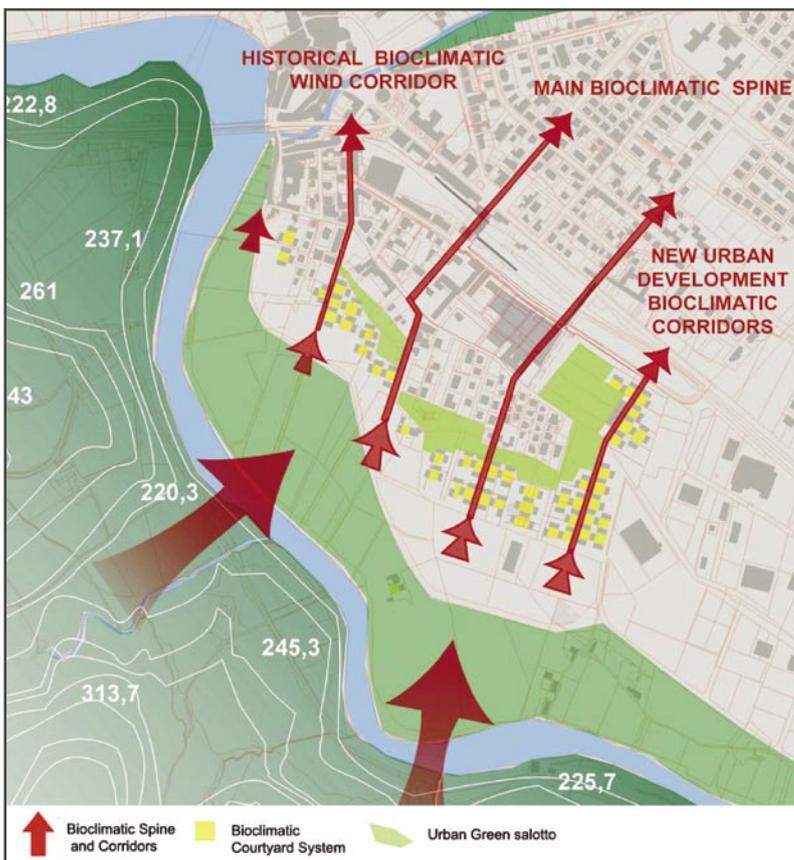


Figure 4.7.1
Umbrian
orographic
system

The Italian ECOCITY partners, together with architects, planners and regional railway representatives, the Municipality of Umbertide and its community committee, organised several participatory workshops in order to select the main sustainability indicators. Through a community planning process (which included the citizens), the most important guidelines for the Umbertide ECOCITY project were also selected. The 35 workshop participants expressed their general consensus to the ‘city as power station of renewable energies’ followed by a progressive ‘city for pedestrians, cyclists and public transport’, a ‘city of bioclimatic comfort’ and a ‘city of cultural identity and social diversity’. Their subsequent strategic choices were bioclimatic urban and building measures, biomass district heating, mixed land use and light rail implementation for passengers and goods.



Urban structure

The landscape and the hydrological network is integrated into the urban project according to the same rules as both the historic and more recent rural elements, with water storage and irrigation in a closed cycle, natural green structures, canals and small lakes. Green areas, water and wind fill the city spaces, forming a continuous private and public network for the residents, from a natural green *salotto* (an outdoor living room) to more architecturally built-up squares and streets.

The site does not provide the most suitable microclimatic conditions so the ECOCITY project worked hard to gain maximum possible levels of comfort in the existing microclimate. The objective of well-being for the citizens results in the need to transform the area through a series of urban measures in order to achieve bioclimatic benefits, the mitigation of emissions and the control of air circulation and noise.

These aspects together make up ‘urban comfort’ and are defined as the principal motivation for urban design and for the new sustainable transport structure.

Figure 4.7.2
Microclimate and urban settlement

The first objective was to create the backbone of the urban structure in the form of the ventilation-oriented main axis, coming from the hillside across the river. This is in accordance with the existing city’s structural orientation. Consequently, the principal bioclimatic spine tunnels the wind from the river park, from the south to the railway station and into the 9th-century city centre. The historical bioclimatic spine tunnels the wind from new urban area A to the ancient Borgo Minore. The other two remaining wind corridors run from area B through the existing roads of the ‘workers’ village’ (the Molino), the former tobacco factory site and the modern city (see Figure 4.7.3).

The design of the urban texture comprises a system of buildings around a common external *corte* (courtyard) derived from the ancient Roman *domus* (typical Roman townhouse). There are three different building typologies: apartments, detached houses and terraced houses. Differences in the systems of construction, such as technological components, heights, density etc., depend on the specific microclimatic requirements of the location.

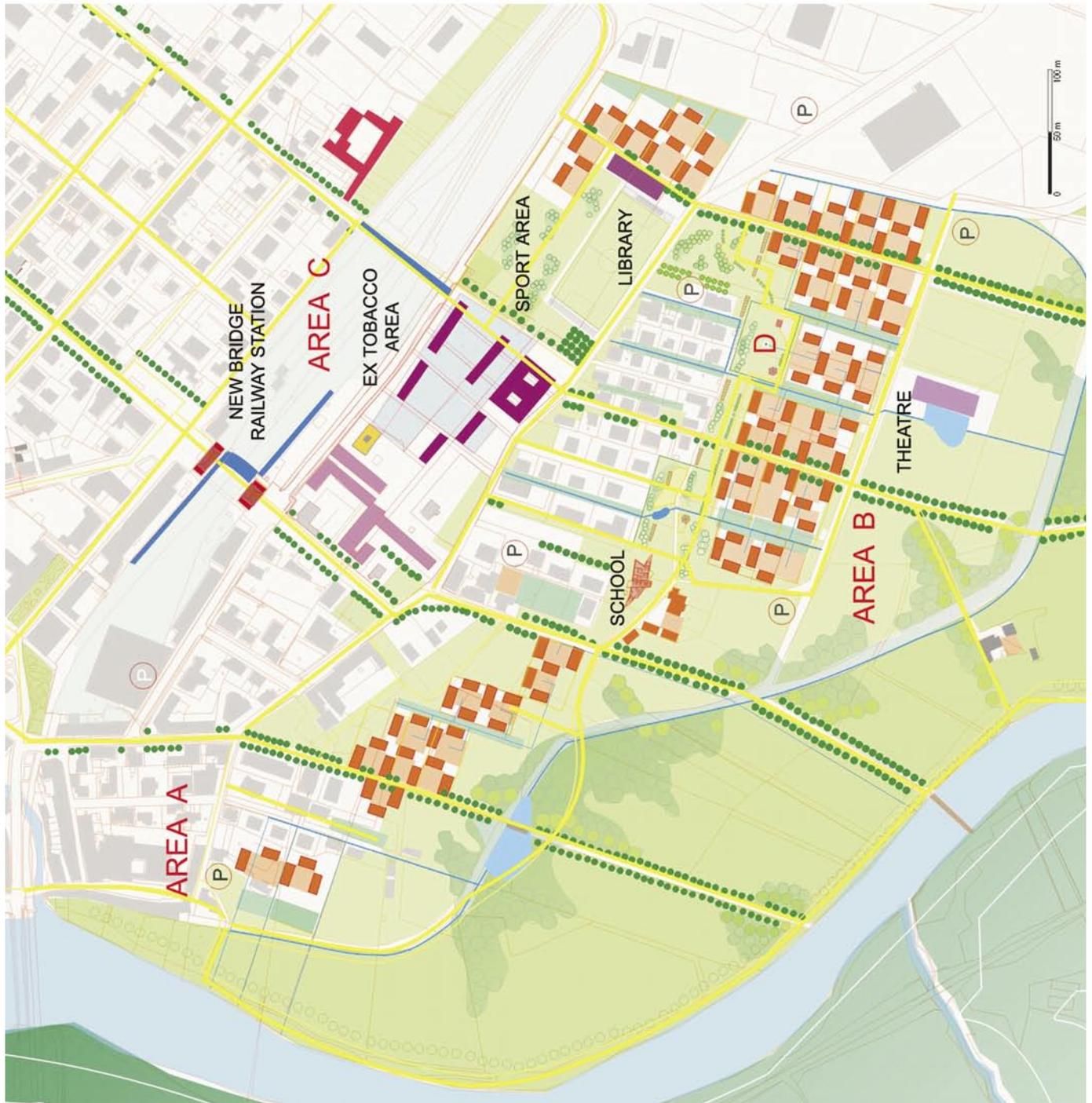


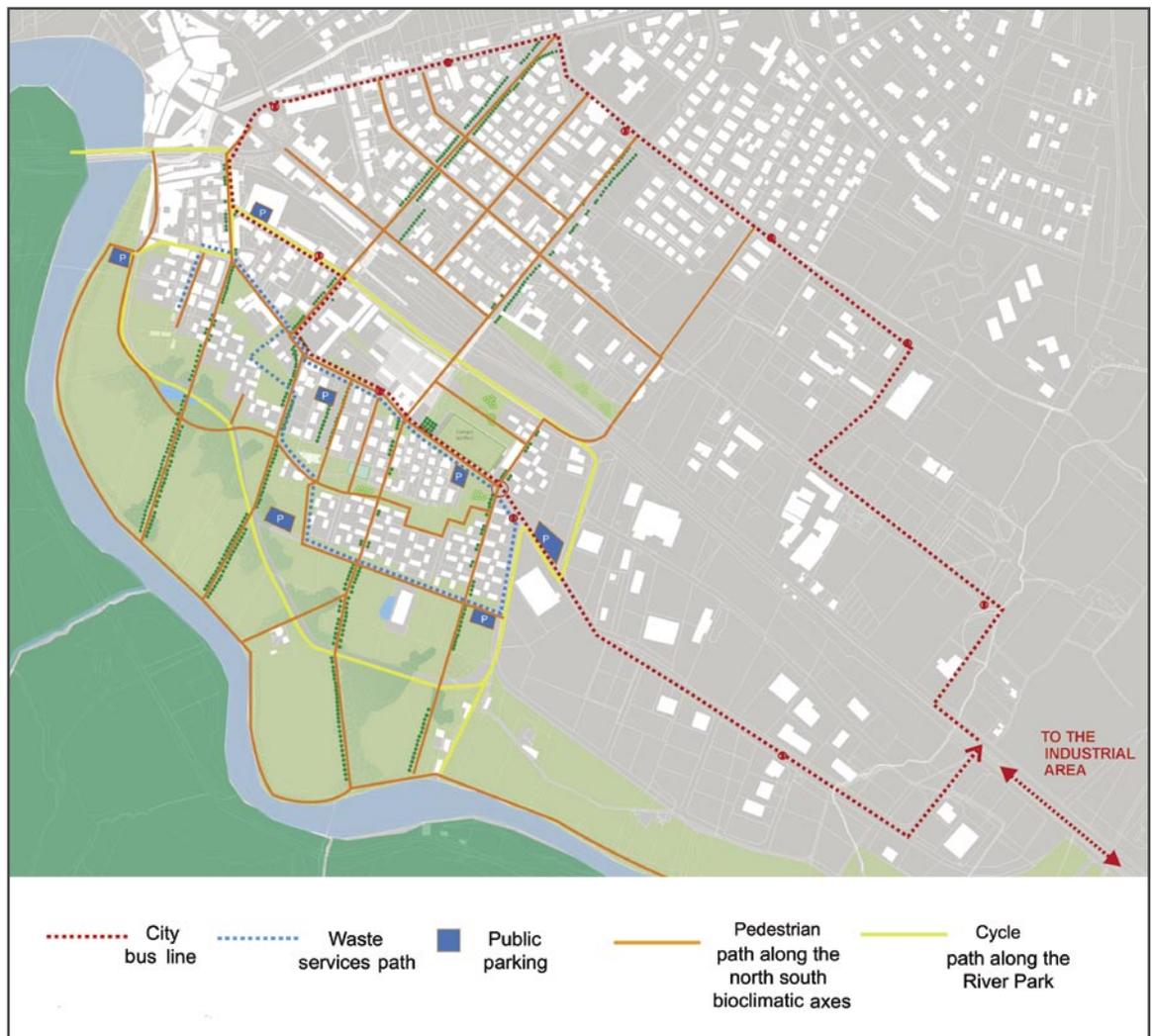
Figure 4.7.3:
 Masterplan Umbertide

The new urban residential plan, integrated into the river park, respects the characteristics of the existing city with regard to density levels. Existing heights of buildings, numbers of flats, building typologies and district compactness are used as reference points for the continuing city evolution process. Furthermore, the interrelationships and boundaries between buildings, together with the geometrical shape and size of open spaces, has been optimised by using FLUENT software ('fluid-dynamic calculation simulation'). This allows levels of urban comfort and relative density to be regulated.

Business and public services will be mixed with residential functions. The first two are situated primarily on the ground floors of the buildings. They are centred around the principal points of the main bioclimatic axis, along the urban green *salotto*, the *atrium* buildings (see explanation below) or in the multifunctional open and covered areas of the renovated former tobacco factory.

The shape of the city and the landscape was originally formed by the geometry of the ancient Roman *centuriatio* (regular-meshed network of drainage and irrigation canals). The modern urban structure is also planned in accordance with the water system, relating to the collection, distribution and drainage of water. The River Tevere curves and meets the River Reggia, forming a critical flood point. Therefore the River Basin Authority prescribed urban extension limits.

Figure 4.7.4
Umbertide: new
mobility structure



From the urban grain the analysis continues to building typology, concentrating on the Italian *casa corte* (house with a central courtyard) as a local interpretation of the Roman *domus*. This type of structure articulates its buildings around two fundamental systems. The first is the *atrium*, a more architectural and defined space serving as a basin for rainwater storage. The second is the *peristilium*, a larger and more open space used as a vegetable garden. These systems not only represent the most appropriate response to more compact urban development in the high-density city, but also represent a more efficient bioclimatic mechanism. Even though the initial typology has been transformed during the past century into the ‘middle class villa’ and finally the ‘upper class villa’, the original concept and its fundamental characteristics are still intact.

Transport

The primary objective and principle for transport is the almost complete absence of cars. Unlike conventional urban planning, structured along roads for cars, the Umbertide ECOCITY project is organised according to bioclimatic wind tunnel axes, which are also used as footpaths and cycle paths and harmonised with the architecture of public, semi-public and private open spaces.

In collaboration with the railway company and the people of Umbertide, a plan was produced for the redesign of the existing, inefficient rail network to provide a new, efficient light railway, interconnected with the national rail network. In addition, a new railway station will be built in Umbertide.

In order to change the current modal split (80% of Umbertide citizens travel in private cars), a three-stage project was proposed, allowing a gradual transition to a ‘long-term scenario’. By the final stage, private car use would be reduced to about 10% and journeys would instead be made by train (50%), other public transport (20%) and by bicycle or on foot (20%).

Together with bioclimatic comfort, alternative mobility has become a prominent feature of the project. Different types of mobility can be identified, such as fast and slow modes, and there are other important divisions such as ‘single-minded spaces’ (spaces, such as large roads, that people pass through with a common purpose) or ‘open-minded spaces’ (spaces that are used for different purposes and that are not dominated by speed). The articulation of the fast, ‘single-minded spaces’ is organised along an external ring road, where bioclimatic efficiency is less important. The ‘open-minded spaces’ are made up of the alternation of the private and semi-public courtyards, the public square and the mixed-use locations as well as the ‘urban green salotto’ where comfort and aesthetic quality have been optimised. Here, far more attention was paid to details of construction, materials and bioclimatic efficiency (glare, orientation, sun protection, wind benefits etc.). They are organised along the north-south bioclimatic spine and the wind corridors between the buildings.

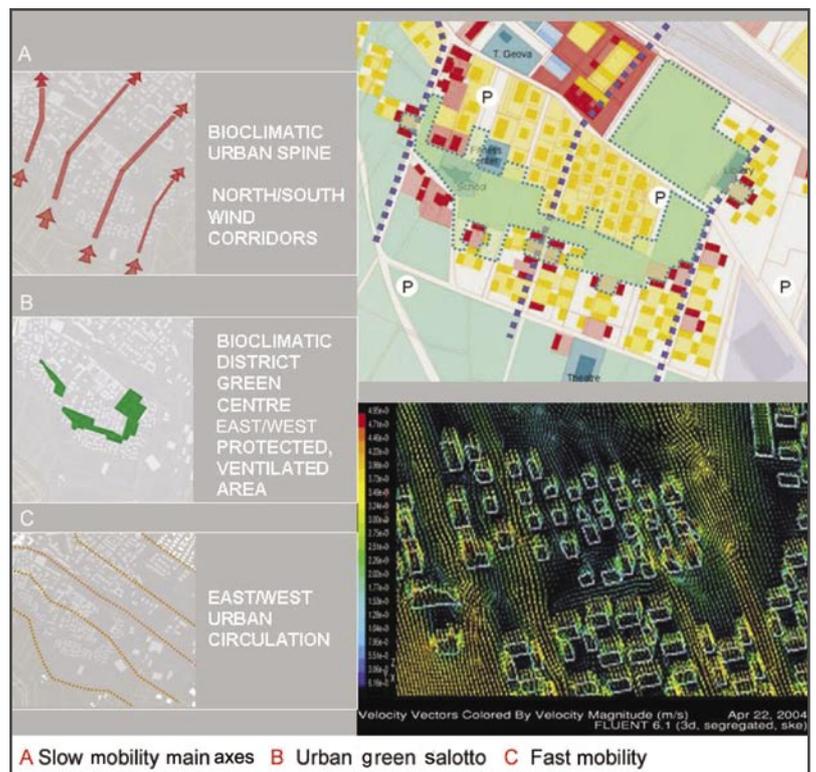


Figure 4.7.5
Mobility structure
coherent with wind
flows (ventilation)

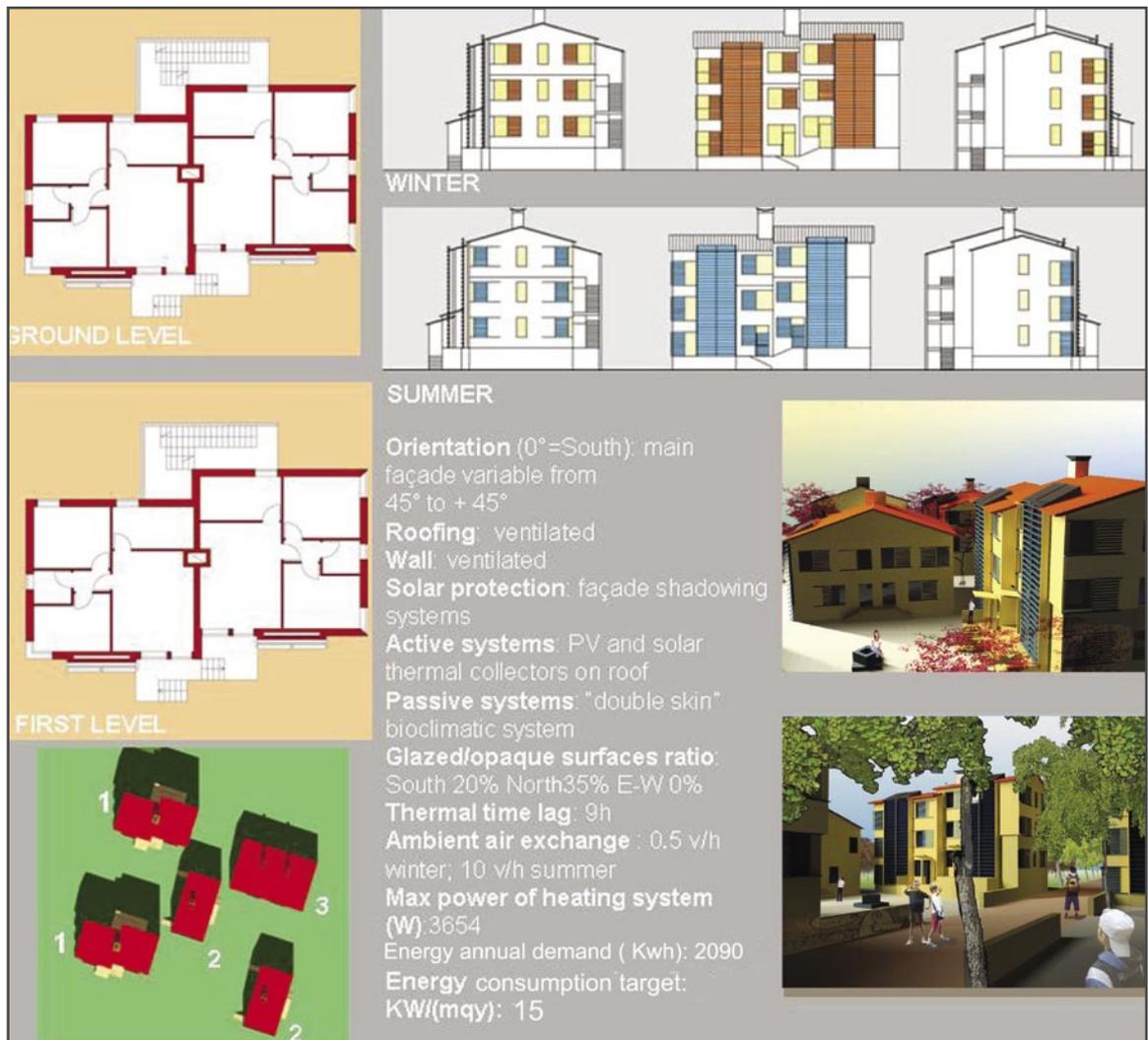
Energy and material flows

Umbertide has a Mediterranean temperate climate with rainy winters and hot summers. During the summer months, light breezes from the south, east and west enter the city from the surrounding hills, providing the buildings with natural air conditioning. During the remaining seasonal periods the prevalent wind direction veers between north and west.

The strategic choices made by the people of Umbertide in relation to energy direct the ECOCITY masterplan towards passive solar housing, high energy efficiency and the use of renewable energies. The most important priorities are: first, urban district heating and secondly, cooling features (including natural ones) for urban spaces and buildings.

The sustainable solar housing energy target was set in accordance with the Italian 'Casa Clima' certification concept. The proposed building typologies use a three-chimney scheme (two for air entry, and a convective loop system and one for air expulsion) which improves indoor comfort through natural ventilation, passive solar heating and cooling systems, optimising energy and bioclimatic efficiency. The remaining energy demand will be covered by a district heating network using the existing agricultural biomass produced and converted into wood pellets by local enterprises. The energy saving achieved is 75% and the CO₂ emission reduction is 73% compared to existing Italian building standards.

Figure 4.7.6
New building
typologies



The demolition rubble, excavation material from the roads and gravel from the rivers will be used for landscaping, to construct playgrounds and as recycled materials for new buildings.

The water system follows the ancient urban grain: the small ponds, the canals and the rivers in the park represent the remnants of this natural water network. In the new residential settlement, the water cycle starts from rainwater collection in each central well and then flows into the private 'edible garden', along the pedestrian and cycle paths and enters the houses. It finally concludes with grey water and wastewater treatment and management in a closed cycle.

Socio-economy

Umbertide was originally a city of small and medium-sized industry surrounded by specialised agriculture. However, the relocation of some of this industry and the potential revitalisation and implementation of the railway produced a demand for housing and commercial space in the project area. The acquisition of the remaining building structures and property has awoken interest in creating an artisan commercial and mixed-used urban node along the railway and the main footpaths connecting the new district and the existing old city.

The railway station will become the central node of commercial and mobility interchange and will lead to new land use and enhanced building value. The ECOCITY project could increase the number of people available for employment in the planning area.

The conversion of the existing railway network into an efficient light rail line will create a new city centre. The new multifunctional 'bridge station' – with a carpark, two glass elevators, shops, an information centre and footpaths and cycle paths running from one part to the other – will function as a social and economic infrastructure between the entire city and the new quarter.

The 271,890 m² of the river park with the revitalised, rural organic farms, the existing 'workers' theatre' on the lake, a cultural centre and library and the playing field provide an attractive social and leisure infrastructure.

In accordance with the land-use and commercial, mixed-used structures of the northern part of the city, the new urban district locates its mixed-use commercial, services and communal facilities in the 'atrium courtyards' of the residential building blocks along the main bioclimatic spines. Furthermore, the primary school, the gym, the children's playground, the cafés, tea rooms, pizzerias and community centres will be situated along the controlled urban comfort area of the urban green 'salotto' as a connecting centre between the existing 'workers' village' and the new urban development.

4.7.3 Project outcomes – key elements

Key element 1	Key element 2	Key element 3
Holistic city organism	History, microclimate, urban and building typologies	Car-free area
<p>The ECOCITY project represents a good opportunity for an ‘ecological dialogue’ between experts, local administrators and citizens. Attention to bioclimatic and transport issues increased collective awareness and some strategic choices could be made in a more innovative way.</p> <p>The innovative objective is an integrated approach to climatic and urban transport for a comprehensive, holistic city.</p> <p>The focus on urban comfort as a new planning culture concept will mean major changes to the urban planning discipline.</p>	<p>The site analysis originates from the ‘studies for the city’. These studies recognise the city and surrounding area as a long-lived, holistic organism which is in a constant process of evolution, in relation to use, technology and form.</p> <p>The logical continuation of this philosophy, known as ‘bio architecture’ and ‘urban ecology’, forms the basis for the project.</p> <p>Hence, history, microclimate and urban grain and building typology are the main matrices for the ECOCITY-design.</p> <p>An innovation of the project is the FLUENT (fluid-dynamic calculation simulation) system applied for the first time to urban and building open spaces.</p>	<p>Unlike conventional urban planning (structured along roads for cars) the ECOCITY project is organised according to bioclimatic wind tunnel axes, which are also used as footpaths and cycle paths.</p> <p>Alternative mobility is the real core of the project; in fact it provides the main axis of the urban structure design for both pedestrian and cycling circulation and the architecture of public, semi-public and private open spaces.</p> <p>Alternative mobility becomes the fundamental framework, divided into fast and slow modes and including interrelationship aspects.</p>