

‘Green Urban Catalyst’: An Ex Post Evaluation of Sustainability Practices

Maria Cerreta, Ilaria Salzano

(Maria Cerreta, Researcher, Dept. of Conservation of Architectural and Environmental Assets, University of Naples, Italy, cerreta@unina.it)

(Ilaria Salzano, Contract researcher, Dept. of Conservation of Architectural and Environmental Assets, University of Naples, Italy, isalzano@unina.it)

1 ABSTRACT

This paper presents a methodological approach aiming to analyse and evaluate some selected experiences of sustainability. The main purpose is to understand the key-factors that influence the realization of a ‘green urban catalyst’. A ‘green urban catalyst’ reflects the principles of sustainability, and is able to stimulate new dynamics that guide urban transformations: ecological, economic, social, institutional, etc. At the same time, it is the engine of change too, able to stimulate a new culture of urban planning, based on an integrated approach that combines reduction of consumes and use of renewable energies, innovation and local participation, creativity and good governance.

How to realize a ‘green urban catalyst’ and how to analyse the impacts and effects can be useful to explore the interaction between the ‘real world’ of models and the ‘unreal world’ of everyday life, between expert knowledge and lay knowledge. Through a multidimensional ex post evaluation it is possible to identify objectives and criteria but, above all, strategies, actors and tools in order to understand how to improve future design and to transfer the lesson learnt.

2 EUROPEAN DISTRICTS: STRATEGIES OF SUSTAINABILITY

The European Union, through legislation, directives, economic incentives, and subsidies, is trying to redirect its policy towards a less damaging relationship with the environment, built and natural. A new model of nature as source of new generative strategies and/or forms, but also of new ways of constructing and running buildings can have relevant effects on the form of a building and/or a district and its/their environmental performance, as orientation and materials.

The need to understand the patterns of interactions between the forces of nature and buildings, and their context has produced a demand for new strategies and projects. It also expresses the need to promote the ‘industrial ecology’, able to transform production and consumption from a linear entropic process to a circular energy-efficient one.

The intellectual, practical, technical, economic and pedagogical reasons (Hagan, 2003) can be the main components that influence a process of elaboration and implementation of a ‘green urban catalyst’, able to combine green design and green economy.

A ‘urban green catalyst’ reflects the principles of sustainability, and is able to stimulate new dynamics that guide urban transformations: ecological, economic, social, institutional, etc. But it is the engine of change too, able to stimulate a new culture of urban planning, based on an integrated approach that combines reduction of consumes and use of renewable energies, innovation and local participation, creativity and good governance. How to realize a ‘urban green catalyst’ and how to analyse the effects and impacts can be useful to explore the interaction between the ‘real world’ of models and the ‘unreal world’ of everyday life, between expert knowledge and lay knowledge.

The paper, through a multidimensional ex post evaluation of the districts practices in Europe, aims to identify objectives and criteria but, above all, strategies, actors and instruments in order to understand how to improve future design and to transfer the ‘lesson learnt’.

In Europe, in the last years, many projects of urban development have been realized, according to the principles of sustainability, in the field of urban planning and environmental architecture design.

In particular, it has been seen that sustainable strategies can have significant results if they are carried on at neighbourhood level. This size can help to realize and monitor the control and the management of processes (such as water and power consumption, noise pollution, differentiated waste collection, use of green areas in outside spaces, involvement of stakeholders, etc.). Moreover, at this level, it is possible to see the effects of urban transformations at a ‘micro scale’ showing cultural, social and economic dynamics. Thus, some well-known urban practices have been selected that, in different areas of north-middle Europe, put the principles

of sustainability into practices. Here are these experiences, considering the context, the strategies and the results.

2.1 The Greenwich Millennium Village (Gmv), London, United Kingdom

The GMV occupies a dismissed industrial area, available after the reclamation of the Greenwich peninsula by English Partnerships Agency. The Greenwich Millennium Village Ltd (Gmvl), a joint venture between Countryside Properties and Taylor Woodrow Development, together with English Partnerships, the Moat Housing Group and the Ujima Housing Association, cared about the development and the realization of the project within the Millennium Communities Programme and activated since 1997, aiming to encourage the construction industry to reach high standards in innovation and energy efficiency.

In 1999 architect Ralph Erskine Tovatt was charged to design the GMV in innovative terms and to reflect the principles of sustainability and eco-compatibility, according to the prescription of Building Research Establishment (Bre).

The Gmv extends on 13 hectares and includes 2.934 houses, both isolated dwelling units, than office buildings. In the step 1 and 2 (from 1999 to 2003) 1.377 dwelling units have been built (with 172 for rent, 54 shared property); while, in the steps 3 and 4 (from 2003 to 2005) 1.557 must be built; 25% of land and 20% of realized houses are for social dwelling; and, in addition, 4.500 m² of shopping hall and 1.770 m² of public buildings have been built, together with health facilities and schools, a yacht club, 14 cinemas, a hotel, a supermarket and 2 mega-stores.

The total cost of the Gmv was about € 360.000.000, but the rehabilitation of the whole Greenwich Peninsula was able to attract about € 580.000.000 of private investment and to create more than 1.000 new jobs. At the end the project is supposed to grant more than 25.000 jobs and houses for 28.000 people (Cabe, 2002).

Gmv is the first British settlement to reach the excellence in the category 'ecological houses' of Bre certification. The design process, in integrated terms, was very careful to solar energy, natural light, and wind systems. Thanks to the improvement of insulation systems, the emission of CO₂ was reduced of 65%. In addition, a district heating system was installed based on a high-efficiency combined heat unit (Combined heat power unit – Chp) supplied with natural gas, able to produce also the power for the whole settlement.

The consumption of primary energy was reduced of 85%, the one of water of 30%. At the same time, the incorporated energy was reduced of 50% and the wastes produced during the building process passed from 50 m³ per dwelling unit to 25 m³ (Hobbs and Anderson, 2003).

As far as landscape is concerned, was created an urban park with artificial lakes, islands and water meadow that keep and clear, along the kilometre, rain water. In addition, more than 20 hectares were used for a park and open spaces, planting more than 12.000 trees and hundreds of shrubs. Green corridors encourage the use of walking paths and cycle tracks, while the spaces among the buildings let the microclimate to be controlled. The urban design let the sunlight penetrate the settlement during the year and use deciduous-trees, which protect façades during the summer and let the sun heat the rooms during the winter (Cabe, 2002).

The neighbourhood is strongly connected to surrounding areas thanks to walking paths, cycle tracks, a bridge over the river and a good network of public transport (buses, subway, trains). Parking areas are below the street level and the ones above are for diverse ability people. The rate of parking area per dwelling is 1,25. Public transport system was highly improved and a strategy of waste reduction started.

A holistic approach to sustainable development granted the care also for social aspects, involving local organizations such as Village Trust, created with developers funds. For its qualities and the results achieved, we can say that Gmv was able to put together architecture, innovation and technology at their best.

2.2 The Beddington Zero Energy Development (BedZed), London, United Kingdom

The Beddington Zero Energy Development (BedZed) is a successful experiment, sensitive to environmental issues and able to promote energy efficient development of mixed use of land. The project is the first example of 'carbon neutral' community, since the aim is not to put CO₂ in atmosphere.

On the other hand, BedZed proved that technical potentiality and economic feasibility can both to improve the building process without damaging the environment. It was realized thanks to the cooperation among

Bioregional Development Group, Bill Dunster Architects office, Arup Partners office, Ellis and Moore office, Gardiner e Theobald office and the Peabody Trust, as developer, aiming to promote an innovative project that could explore the potentiality of a high density sustainable urban development (Aa.Vv., 2003).

The project by Bill Dunster and Arup Partners was completed in 2001 on an area owned by London Borough of Sutton. The project idea was strictly influenced by the characteristics of the area, very well connected to local public transport network. The project extends on 1,4 hectares, with about 50 dwellings per hectare and has 82 units of four different kinds, shopping areas (1.695 m²) and 18 units for everyday life and work. In addition, there is a series of facilities such as a medical centre, a nursery school, two churches, five café-restaurants, five shops, an internet bar-café, a sport field (4.336 m²) with its facilities (538 m²).

Anticipating the latest planning issues, the strategy includes some aspects as reduction of wastes, a low impact transport system using solar supplied electric cars and low consume air-conditioning.

Sustainable approach determined a significant range of design and technological choices. For example, the high level of heat insulation of external walls and the high density of the materials used were fundamental to grant more efficient heat performances than the once requested by law (for example 300 mm insulation, much thicker than the 50 mm requested by law). In addition the materials come from a maximum of 50 km, so that the energy and the pollution deriving from transportation are very low, and local economy can benefit. All buildings are realized with low-allergenic materials. Main façades face south, to get the maximum benefit of the sun, while the streets are in the shadow. The neighbourhood is zero-emission thanks to a combination of strategies including green-houses to south and photovoltaic panels used both as sunshade and to produce electricity. On the roof there are the wind cowls, fireplaces designed by Arup study, that create inner ventilation also with weak wind, able to reuse about 70% of hot air. On the other hand, the houses are designed to use passive solar energy at the maximum through photovoltaic panels that, together with super insulation systems, oriented ventilation, Chp plants and water saving, let the demand of energy to be reduced of 25% compared to a traditional house of the same size. The combined use of photovoltaic, Chp and low energy consumption system for heating, cooling and ventilation can completely fulfil the power needs of the dwelling units.

The total cost was about € 430.000. The Chp (88 €/m³) costed another € 920.000; the high cost of photovoltaic panels was partly covered by European funds and partly by funds of British Government and local power providers. The building cost of the 82 dwelling units is € 9.965.000, with 34 units to be sold together, 23 as shared property, 10 for rent and 15 as social houses (Burroni and Lorenzini, 2003).

The neighbourhood is made of five line buildings facing north-south, 2-3 store red bricks buildings whose structure, frames and cladding made of wood. About 90% of land surface is permeable, to recycle rain water and clear and reuse domestic water. There is also an ecological system to treat black waters. Most of first floors have a terrace surrounded by a garden to protect privacy and use open spaces.

As far as photovoltaic panels are concerned, the most innovative aspect is the use of power, that supplies 40 electric cars. A 'green' transport plan means to promote the use of walking paths and cycling ways and public transport, reducing the movements house-workplace and offering real alternatives to private cars. The need of parking areas was thus reduced of 50%, with a year tax for inhabitants and economic and business activities, giving diverse ability people, electric and GPL cars priority to park.

One of the main design strategies is the simultaneous presence of many functions: dwelling, shopping, administrative centre and public facilities. The mix of dwelling and business activities, together with the particular architecture language, made the neighbourhood a 'reference' of social and environmental sustainability, proving that these strategies can have positive economic fallout.. The realization of BedZed proves that a 'green' lifestyle can be a real utopia, attractive and realizable, able to integrate the logics of energy efficiency and renewable energy according to an eco-compatible approach reflecting also in planning, formal, typological and functional choices.

2.3 The GWL-Terrein, Amsterdam, Holland

The GWL-Terrein is the result of rehabilitation of a dismissed industrial area and is part of the urban development program of Amsterdam, that adopted some significant measures of sustainable intervention on the territory. The neighbourhood covers six hectares, close to the middle age areas, and includes 600 dwelling units. The general plan is by architect Kees Christiaanse, the design of public space and landscape

is by West8 office, the environmental interventions are by Boom society. The project was realized from 1994 to 1997.

Its philosophy is to build a neighbourhood able to create a shared sense of belonging and responsibility, improving life conditions and safety (Aa.Vv., 2000).

It was developed with different ecological and social aspects. The strategy focused on three relevant issues: the use of resources, the community and the mobility. As far as the first one is concerned, the action was the revitalization of the area; the respect of building standard of low energy consumption buildings; passive solar design; solar and photovoltaic heating and combined heat system using biogas that supplies power and heat; a main network collecting rain water for domestic use connected to a secondary one; the treatment of land to ensure its permeability; the differentiated waste collection (paper and glass) all along the perimeter of the neighbourhood and their treatment; roof gardens; promotion of mixed use of land with the presence of difference facilities (Aa.Vv., 2000).

There is also a special care for community; inhabitants are involved in planning and some stakeholders participate to decision-making process (Christ e Loose, 2001).

As for the mobility, there was an integration among public transport systems, walking networks and cycle tracks; the exclusion of motor traffic; the reduction of parking areas (less than 0,5/dwelling units); integration of workplaces and basic facilities. One of the main aims was to realize a car-free neighbourhood, meeting the needs of the tenants and using existing connecting systems, mainly the old tramway.

The results is that 57% of tenant doesn't own a car, the bike is widely used (four bikes every three tenants), 73% of movements within the area does not use engine means within an area of 2-6 km, while 39% of tenants has a public transport year ticket and 10% joined a car-sharing program. There is a multi-store garage for visitors for 400 cars, close to the neighbourhood. According to the strategy, the dwelling units are partly owned and partly rented (50%), with a density of 100 units per hectare. The typology is 5 storeys buildings with terraces, two 5-10 storeys buildings along the perimeter of the area and that include about 60% of dwelling units.

The design of public spaces and green areas was very cared, with 260 private gardens for single family houses connected to public gardens. Innovation, creativity and competence are the guidelines of the design choices of GWL-Terrein, where some simple principles became specific characteristics of the neighbourhood.

2.4 The Viikki, Helsinki, Finland

Sustainable development in Helsinki has been realized through a series of environmental priorities, so that city has been considered a 'whole organism'. According to these principles and with Local Agenda 21, some interesting neighbourhoods have been realized, such as Vikki. The project started in 1994, when the city of Helsinki together with the Group for Sustainable Cities Development announced the competition for the design of an ecological dwelling neighbourhood. The winning project was selected in 1995 and the work started.

In 2000 the first part of the project ended with the realization of the dwelling units for 2.000 people and the creation of 2.000 new jobs. The works should be completed by 2010, when 10.000 tenants will have their homes and 6.000 new jobs will be created (Sokka, 2004).

The Viikki extends on more than 1.000 hectares and 63.000 m² are for dwelling; it is 7-8 km far from the centre of Helsinki, along one of the main streets, and at 20 minutes from the airport by car. The surrounding area is not particularly urbanized and is surrounded by a natural park. Viikki is seen as a university neighbourhood, with the university, a scientific park and biotechnological centres.

The city of Helsinki had a key role in managing the realization, whose aim was, on one side, to definite the urban characteristics and, on the other, to realize cheap experimental dwellings.

The design solution, by architect Petri Laaksone, was the result of a competition whose announcement reflected the requests of Pimwag environmental evaluation system (Faninger-Lund, 2002).

The 4-5 storeys buildings have open courtyards, private gardens and public spaces, closed by their same disposition and oriented to maximize the benefits of the sun and not to shade each other.

Sustainable technological solutions have been used, such as radiating panels and sewage treatment. Thus, the demand for heating was reduced of 50% (Sokka, 2004). The Viikki channel was the opportunity to change the course of water and define a new urban landscape, designed by a team of experts (landscape designers, hydrologists, geotechnical engineers, botanics). According to design choices, two urban centres have been realized, with a careful organizing integration including dwellings, facilities and equipments (school, universities, shops). The walking paths are separated from the car ways, but there is also an efficient public transport system connected to local bus and train network.

In the southern part of the neighbourhood a model settlement has been made, promoted by the Finnish Ministry of Environment, the National Association of Architects (Safa) and the National Agency for Technology (Tekes) (Engström, 2002). Realized according to ecological principles, it extends on 64.000 m² and there are from 1.700 to 2.000 tenants. There are 9 buildings with an integrated system of solar energy able to satisfy about half of the demand for hot water and heating, with a performance of about 400 kWh/m². The basic needs of heating are satisfied by the neighbourhood network system. The project is part of the European project Thermie A and the total cost is about € 800.000. The 'ecocriteria' followed to realize Ecoviikki refer to some significant issues such as pollution, natural resources, health and biodiversity, according to the principles of Pimwag approach. The different technological solutions have been carefully integrated considering the role of materials, tools and technologies to save energy. On the other hand, the different approaches to keep energy in the buildings all aimed to reduce energy demand, which makes the use of photovoltaic very significant. The realization of Viikki was the chance to experiment a method able to include ecological criteria in urban development projects, and to make sustainability principles real.

2.5 The Bo01, Malmö, Sweden

The Bo01 is part of urban transformations included in the program of investment for the ecological development of Malmö, started in 1995, to make 'Malmö sustainable'. It extends on the big ex industrial area of Västra Hamnen, close to the harbour. Its closeness to the sea and to the beach of Ribersborg, and to the central station made it a strategic place. The new neighbourhood aims to create a model of sustainability within a densely built area. The first part of the realization ended during the European fair Bo01 Ecological City of Tomorrow, in 2001. Only 400 dwellings out of 3.000 were realized (Beer, 2001).

Many important European architects were involved such as Santiago Calatrava, Gert Wingård, Kai Wartiainen, Ralph Erskine and Bertil Öhrström, together with some young Swedish and Danish architects. One of the basic strategies was totally fulfil the demand of energy using renewable local sources. The aim was to be 'energy independent' and to benefit from a multidisciplinary approach.

The energy solution is part of this bigger program, sustained by three main issues (Andersson e Lövehed, 2001): the production of energy from local renewable resources; the balance between energy production and consumption; energy efficiency. The power supply is most completely eolic. There is a 2 MW turbine at 3 km from the harbour, west of Malmö, one of the most powerful ones in Swedish. Its year performance is about 6,3 million of kWh that is more than enough for the electronic card, and it is possible to manage the operations of control and monitoring. At the same time, there are solar panels on the roofs; 120 m² of these panels should be able to supply 12.000 kWh and to fulfil the needs of 5 dwellings.

Heating is obtained with solar energy (15%) and with water (85%), able to supply the neighbourhood urban network. The reversible use of the pump can grant cooling in summer (3.000 MWh for 2,4 MW of energy). If there isn't enough water, the energy can be obtained by the sea. There are about 14.000 m² of solar collectors in 8 dwelling units that supply extra heating also for hot water. The year production is 525 MWh, with an average of 375 kWh/m²/y. It is possible to use the biogas obtained from the wastes to heat houses and supply energy for vehicles (Beer, 2001).

Aiming to get the balance between energy production and consumption, one of the purposes was to use 100% of local renewable resources. To avoid any problem caused by the time gap between production and consumption, without using expensive system of storage, all the plants that produce energy are connected to existing networks of heating and power. On the other hand, it is possible to get the balance between production and consumption only if there is energy efficiency. Thus, all buildings have highly efficient heating and power plants to minimize energy demand. The ecological cycle is granted by a plant that extracts the nutritious from the mud created by the collection of rain water. The neighbourhood is designed to be less

dependent from cars as possible, walking paths and cycle ways are the alternatives for short movements, and public transport system is the obvious choice. There is a program to promote electric/gas supplied cars and public vehicles. The materials used to build the dwellings are not included in the list of dangerous elements of Swedish chemical inspectorships, and can all be recycled after the demolition of buildings.

An adequate program of environmental education must help tenants adopting a more ecological lifestyle: every family can control and compare its consumption of water, power and heating; there is a campaign to inform on how to recycle wastes; it is possible to book a car pooling and there is an information system about the use of public transport. The aim is to change everyday behaviour stimulating competition among tenants. The mixed use of land integrates dwelling units, shopping halls and social facilities thanks to new technologies and innovative solutions able to make the neighbourhood more attractive. The buildings have different height (from one to six storeys), whose disposition protects inner spaces from the sea strong wind.

The project aims to create a well-built urban structure able to promote a lifestyle that encourages the meeting among different people and cultures. To transform polluted ex industrial area into a sustainable neighbourhood is a real challenge; a holistic approach, on participating basis, is letting Malmö reach this goal. Sharing the experiences of the cities in a partnership was a key-factor to the success of this initiative. Everybody were directly involved in the construction of cooperating and sustainable each other.

2.6 The Vauban District, Freiburg, Germany

The city of Freiburg is today among the few cities in Germany that are witnessing a continuing population growth and sustainable development, that has become one of the basic principles underlying political action. To illustrate, let us consider the areas of land use planning and inner city transportation, and specifically the development of districts of Vauban, Rieselfeld and Solar Siedlung. Indeed, these districts are the symbols of 'Solar City'.

The Vauban area (about 41 hectares) was a 'nazi' armed forces until 1945 and then a French one. In accordance to the local development plan, in '90s the city of Freiburg has acquired this site with the idea to start a planned urban development: through site acquisition the City was able to have direct control over the parcelling and sale of plots. There was a competition for the district design and were chosen those capable of adaptation in the course of development process to suit changing framework condition.

The Vauban allee forms the central axis of the development and have the exclusive purpose of opening up the new build area and, then, to create the tram network. The plan excludes the possibility of assigning specific parking spaces on the housing plots, only a common garage on the edge of the district. However, most district inhabitants don't have a car, they use the car sharing city service, and so the streets are pleasant places to meet and live, particularly for children. Moreover the plan provides a urban railway line. The majority of the building zone is predominantly parcelled up into small lots (maximum 160 m²), and the marketing will favour sales to individual property owners and building cooperatives ('baugruppen'), which will lead to a variety in the built environment and architecture.

Residential units must comply with low-energy housing standards and exceed the official requirements for heat insulation in accordance with the stricter Freiburg scales (65 kWh/m²/y). This obligation will be formalised in the sales contracts for the plots. This standard will also be adopted as a voluntary commitment by the local authority when constructing the primary school and the kindergartens (Stadt Freiburg i. B., 2003).

The heating supply will be provided by a heating plant fired by wood chips for constant load supply and a district heating plant located in the northern plan's section. It is hoped that buildings will be erected which voluntarily exceed these prescriptions in a bid to improve quality. Passive houses (15 kWh/m²/y) are as much a part of the scheme as 'surplus' energy houses, which are built to a 'passive standard', with supplementary energy generation plant, that produce more energy in the course of a year than they consume and put surplus into public grid. The district capacity is 5.000 inhabitants (with a high under eighteen years old percentage) and notable, for its planning, development and living is the local association (Forum Vauban but also S.U.S.I.). They saved some 'old barracks' and promoted the participatory 'green districts' development (Forum Vauban, 1999).

2.7 The Rieselfeld District, Freiburg, Germany

The new district of Rieselfeld occupies a 70 hectares area, providing 4.200 residential units for about 10.000/12.000 inhabitants. The project is not being carried out by external developers, but by a project group which is part of the city administration that operates outside of regular administrative hierarchy.

The building code for the district has an orientation towards ecological objectives by means of low-energy construction (65 kWh/m²/y), district heating networks fed by a combined heat and power plant, integration of solar energy, a concept for rain water use, and the primacy of the streetcar line (Stadt Freiburg i. B., 2003).

The main political guidelines aim to have flexible urban design principles which allow for current developments and provide the possibility to adapt planning. Moreover a particular care for women, families, as well as diverse ability people, elderly people through the construction of social buildings construction, unfortunately stopped at the half of '80, when public subsidies finished. In the district there is a mixed use of shops and houses, and little shops are preferred to big store.

Future oriented traffic systems of district give priority to public transport and walking and bicycle traffic: Rieselfeld allee divides the district in two main parts and the tram network is on this street. Though the traffic is oriented towards public transport, the houses can have a private car parking, but there is a general speed limit of 30 km/h. Moreover Rieselfeld has a nature reserve of 250 hectares connected with private green space and social district infrastructures. These include 'Kepler' secondary school, the gymnasium, three kindergartens, a sports area and a local meeting centre with multimedia library and rooms for meeting and special events. In the district is active 'Kiosk', a local association for the development and organization of Rieselfeld.

2.8 The Solar Siedlung District, Freiburg, Germany

The district Solar Siedlung is a prototype project wanted by architect Rolf Disch to build 'energy-plus' homes that produce more energy than they consume. The site area is about 12.000 m² and include a residential space with 50 plus-energy houses and a mixed building, 'Sonnenshiff', with commercial use and 8 penthouses, built on the commercial site roof, as superstructures. Energy plus housing is both functional and stylish, and offers an entirely new type of solar home (Solarsiedlung GmbH, 2003).

A key-feature of this typology is that all the houses face south. This enables both passive and active use of solar energy. The homes are fully glazed with special windows on the south-facing side. In winter, low-lying sun can shine deep into the buildings' interiors and thus contribute to heating. Such passive use of solar energy is sufficient to maintain a comfortable room temperature on many days throughout the winter. In summer, when the sun is high, shade is provided by balconies and an overhanging solar roof. This keeps interior temperatures comfortably cool on even the hottest days of summer. Home owners can choose between 32 different sizes and layouts: they have special technologies to save energy, so, for the remaining heat needs they are connected to the nearby wood chippings-fired district heating plant owned by Badenova (Vauban heating system) and all sanitary appliances are equipped with water-saving taps (Badenova, 2003); rain water is used to flush toilets. Energy plus roofs consist entirely of photovoltaic panels and the exceeded electricity produced is put into public grid. Energy consumption in these houses is 10-15 kWh/m²/y and they produce more electricity than they consume, so, through the national renewable energy law, they have a certain income for twenty years.

3 AN EX POST EVALUATION PROCESS

The elaboration of strategies aiming to the integrated conservation of environmental and built heritage, and the creation of territory sustainable transformations, can not ignore the need of a new 'balance' between the need of change and the demand for new measures to control and guide the processes. The search for such balance is part of planning processes that tries to find tools and evaluate results of action concerning community. The dialogue between 'conservation' and 'development' allows to think about the importance of change and how it is possible to adapt present to future in a mutual support and real interaction process. In this sense, the care to change and the search for balance let use recognize evaluation as a useful tool to identify the necessary conditions to get the balance, considering how the conditions and experiences can vary. Evaluation, indeed, has different aspects according to the moment in which is made: before starting any activity (*ex ante*), through the realization (*in itinere*), when programmes goals are compared to reality (*ex*

post) (Lichfield, 1989). Ex ante evaluation, preceding the implementing of a strategy, a plan, a program or a project, is the presupposition on which to create the choice among possible actions. At the same time, in itinere, conclusive and ex post evaluations allow to monitoring the different steps of implementation and also to check the results (Lichfield et al., 1998; Lichfield, 2001).

Through ex post evaluation it is possible to compare the empirical and modelling worlds, promoting the meeting of theoretical presuppositions and the results of real experience. Starting from experience it is possible to use evaluation processes able to combine ex post evaluation and the approach to case studies (Yin, 2003), and using abductive principle as guideline. The abductive approach helps to investigate the relationship between 'reality' and 'conception of reality' (Ribeiro et al., 1995), valid to create new concepts and new theoretical models, rather than to confirm existing theories. *What we learn* from reality and *how* are the two key-questions as respect to which we must create a dialogue between theory and experience. In this sense the analysis of sustainability experiences is a significant tool to develop a theoretical approach starting from reality, in which the comprehension in abductive terms of characteristics and consequences of a specific case needs an integrated vision and a systematic combination of theoretical models, empirical reality, approach typology and reference experience (Dubois and Gadde, 2002). The interaction between empirical observation and theoretical models allows to broaden the comprehension of phenomena in a continuous feed-back process, stimulating the encounter of theory and reality and re-modulation of a non-linear approach, depending on the run followed. The approach that starts from experience helps understanding specific situations, recognizing the opportunity value of what was seen as a problem and deeply understanding the relationship between phenomenon and its contest (Weick, 1979). Whidely applied to different areas (psychology, sociology, political sciences, anthropology, history, economy, urban planning, public policies, management, etc.), it was often used to understand the complexity of problems and to find holistic and significant aspects of real events (Yin, 2003).

In this perspective, a meta-evaluation, that means an 'evaluation of the evaluation', aims to define relevant questions and significant classes of data to be considered when examining reality (Smith, 1990; Stake, 1994). It implies to combine the approach to case studies and ex post evaluations, structuring a meta-analysis whose characteristics are a systematic construction of information, a set of operating criteria that can be easily identifiable, and the possibility to use both qualitative and quantitative methods.

A meta-approach can give order to the comparing process, allowing to synthesize the results of similar studies and experiences, trying to reduce or make the singular parts clearer and to formulate the lesson learnt from the previous experiences or analyzed case-studies (Wolf, 1986).

Starting from the evaluation of environmental policies and the relative strategies of intervention, many meta-analytic approaches became very common, and the word 'meta' means that the evaluation can be made in a general perspective able to compare in a very strict way the experiences, referring to real results (van den Bergh et al., 1997).

Glass (1976) and Hunter et al. (1982) use meta-analysis to define an approach aiming to analyze and know through well-known methods, useful to examine a specific set of data. Meta-analysis was successfully applied also when it was necessary to express a judgment on results and use the experience for other contexts, especially when it was difficult to have a complete control or there was a high level of uncertainty (Nijkamp and Pepping, 1997; Matarazzo and Nijkamp, 1997; van den Bergh et al., 1997; Nijkamp and Vindigni, 2000). It is a multi-dimensional and a multi-discipline approach that needs both a good level of methodological conceptualization and an empirical level of operative application. In this sense, the 'analysis of the analysis' (Glass, 1976) becomes a synthesis process, that can be made explicit through different methods depending on the topics, such as conventional statistic methods, meta-regression analysis, multi-criteria meta-analysis; soft models (such as fuzzy set or rough set analysis). Therefore, starting from the combined application to case studies and meta-analysis, it is possible to develop a methodological way that recognizes the validity of ex post evaluation of practices made to identify principles and rules to be applied in ex ante evaluations, oriented to new projects.

In this case, through an ex post evaluation it was possible to analyze critically the characteristics of architectural and urban plans of some sustainable neighbourhoods, expressions of a culture that sees the future starting from an 'ecological alternative'. Through a case studies approach, it was possible to

reconstruct steps of realizations of each experience and to better understand the knowledge of some most relevant questions, finding an adequate grid for a correct comparison.

The analyzed sustainability practices let us reflect on what to consider in urban planning of life environment with a human dimension. It is clear that the most significant successes can be examined starting from a sustainability vision, able to consider six relevant dimensions (Nijkamp et al., 1993; Fusco Girard et al., 2003a; 2003b; Cerreta, 2004): ecoware, hardware, finware, orgware, software and civicware.

Each dimension is clearly interrelated with the others and it is important to consider their connections in order to find integrated strategies of intervention. They let us make explicit the essential parts that can have a relevant effect on the construction of sustainable choices. The reflection of the six dimensions helps us to find the interdependence and the integration among their domains through a logical structure of reference. Starting from the analysis of the experiences it was possible to find for each dimension the common criteria for the eight case studies.

In particular, the ecoware dimension refers to natural capital, including among the criteria the environment and natural resources, the landscape, the energy, the waste, with specific attention to ecological issues and the effects on ecology, namely the quality of the natural environment by means of urban ecological management, reducing energy consumption, materials, etc., but also in terms of residential and cultural amenities.

The hardware dimension refers to man-made capital, technological issues and the constructed environment. It considers among the criteria the built environment, the buildings, the transport, the land use, the technologies and building systems, and tangible/physical components.

The finware dimension refers to financial-economic aspects, related to the availability of financial and economic resources, private and public capital, but also the organisation of financial support systems, integrating already existing ones and combining economies of scale with purpose-oriented economies (productivity, quality, and diversity). It includes some criteria as financing, incentives, subsidies, costs, and economic vitality.

The orgware dimension refers to institutional capital, organisational issues, and in particular the organisational structure which is shifting from production to promotional and policy strategies. It involves the presence of supporting services and government policies that encourage entrepreneurship. It can be expressed by laws and regulations, local governance and partnership.

The software dimension refers to the human capital, to availability of a skilled and dedicated labour force, people who are receptive to technical progress, the culture of innovation, professional know-how and investment in knowledge. However, it also refers to a cultural mindset and can consider some criteria as education and sensitising, training and knowledge, innovation and creativity.

The civicware dimension expresses social capital, i.e. civic issues and civil/social infrastructure, the capacity of civic society to live together, to be inclusive, to participate and share public decisions, to take care of public safety. It considers as criteria participation, equity and social inclusion, and life quality.

The six dimensions define a theoretical framework suitable for structuring and considering the different aspects and factors that can characterise a sustainable project, that let us guide the approach to the case study.

3.1 The Methodological Approach

The analyses followed to evaluate 'sustainable neighbourhoods' let us identify the characteristics of each example and let us find a common 'reading code', starting from the action promoted in each practice, aiming to obtain an adequate 'information matrix' to ex post evaluation.

In particular, the case study oriented approach, was useful to select, starting from the real experience, the significant criteria to describe and evaluate the results choosing the typologies and the categories of intervention that gave a real contribution to a sustainable transformation of the territory. For each dimension of the hexagonal model (ecoware, hardware, finware, orgware, software and civicware) (cfr. § 3) have been made explicit the relative criteria and the correspondent results indicators, that can be recognize through their own identifying code, able to state the kind and the level of result of the examined sustainability practices.

Basing on the information got for each practice, the data have been systematized making them explicit through the indicators able to express the performances of the interventions and the strategies.

For each experience was created its 'sustainability profile', verifying the results for each evaluation dimension. The values of the results indicators have been expressed through a score, able to explicit the performance level (0 = none; 1 = very low; 2 = below the average; 3 = average; 4 = above the average; 5 = excellent). Thus, it was possible to create the evaluation matrix and compare the profiles of the eight neighbourhoods according to an ex post evaluation approach.

The profiles of the eight neighbourhoods have been analyzed to understand their level of performance as respect to the six dimensions. The methodological approach used the multicriteria methods to define the significance of the practices as respect to sustainability. In particular, starting from the systematization of the information got and expressed through result indicators, was used the Regime method to make explicit the satisfaction level of each criterion. So it was possible to verify the performance of each neighbourhood as respect to the examined criterion, obtaining a synthetic index representing the selected indicators (fig. 1).

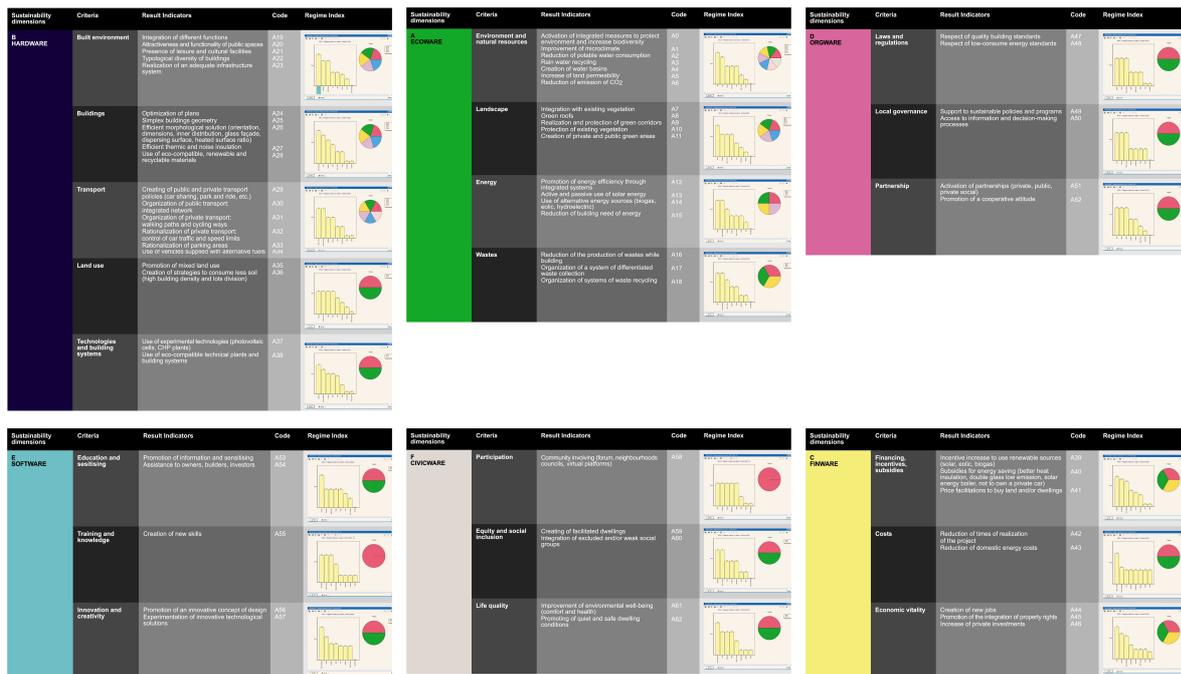


Fig. 1: The satisfaction level of selected criteria

The Regime method was introduced by Hinloopen et al. (1983), assessed by Hinloopen (1985) and refined by Hinloopen and Nijkamp (1990). In general terms, an evaluation table is given and composed by scores of a number 'n' of alternative options with respect to 'm' criteria. In the case of ordinal information, the weight can be represented by means of rank orders in a weight vector: the higher the value of the weight, the better the correspondent criterion. The method is implemented by a software application, included in Definite software. The following main features characterise the multiple choice Regime method (Herwijnen and Janssen 1988; Herwijnen et al., 1992):

- this method allows to use of cardinal, as well as ordinal, data in the evaluation table: this is accomplished by treating cardinal information as ordinal, with reference to the ranking position of each alternative;
- the basis of the method is the regime vector: it is composed of '+' or '-' signs, or eventually zeros, and reflects a certain degree of (pairwise) dominance of a choice option with respect to another for the un-weighted effects for all judgement criteria.

The alternative options will be compared pairwise for all criteria and for two alternative choice options, the difference of the criterion scores is assessed.

On the basis of this pairwise comparison, a synthetic index will be calculated which defines a ranking among alternative options: higher is the index, the most preferable is the option. In this case, the synthetic index expresses the level of performance of the different selected indicators as respect to the criterion referring to each analyzed experiences, and made them explicit in the 'information matrix'.

The data of the information matrix let us create the 'evaluation matrix', whose columns have the neighbourhoods and whose lines have the dimensions (ecoware, hardware, finware, orgware, software, civicware) and the relative criteria. This evaluation matrix (fig. 2) let us compare the eight examined neighbourhoods, analyzing the significance of the criteria as respect to the six dimensions of sustainability. The evaluation was made with the approach of Decision Lab 2000 method (Bana e Costa, 1990; Brans and Mareschal, 1994):

Sustainability dimensions	Criteria	Districts							
		Gmv	BedZed	Rieselfeld	Vauban	GWL-Terrein	Viikki	Bo01	Solar Siedlung
A - Ecoware	Environment and natural resources	1	0,57	0,57	0,14	0,29	0,86	0,57	0
	Landscape	0,43	0,14	0,29	0,71	0,71	0,71	1	0
	Energy	0,21	0,43	0	0,64	0,43	0,43	0,93	0,93
	Wastes	0,93	0,21	0	0,5	0,71	0,5	0,21	0,93
B - Hardware	Built environment	0,43	0,36	0,79	0,21	0,79	0,43	1	0
	Buildings	0,86	0,71	0,07	0,07	0,36	0,36	0,57	1
	Transport	0,36	0,64	0,36	0,64	0,93	0,07	0,07	0,93
	Land use	0,50	0,21	0,36	0,71	0,71	0,71	0,71	0,07
	Technologies and building systems	0,57	0,93	0,07	0,64	0,07	0,29	0,64	0,79
C - Finware	Financing, incentives, subsidies	0,07	0,50	0,93	0,93	0,36	0,07	0,43	0,79
	Costs	0,43	0,43	0,43	0,43	0,93	0,43	0,43	0,50
	Economic vitality	1	0,29	0,43	0,79	0,29	0,21	0,29	0,71
D - Orgware	Laws and regulations	0,07	0,86	0,07	0,46	0,46	0,46	0,86	0,86
	Local governance	0,86	0,36	0,36	0,86	0,86	0,36	0,36	0
	Partnership	0,86	0,50	0,14	0,50	0,29	0,86	0,86	0
E - Software	Education and sensitising	0,43	0	0,57	1	0,57	0,57	0,57	0,29
	Training and knowledge	0,21	0,21	0,86	0,21	0,86	0,21	0,86	0,57
	Innovation and creativity	0,43	0,50	0	0,43	0,43	0,71	0,50	1
G - Civicware	Participation	0,71	0,07	0,71	0,71	0,71	0,29	0,71	0,07
	Equity and social inclusion	0,57	0,57	0,57	0,93	0,93	0,21	0,21	0
	Life quality	0,71	0,71	0,14	0,14	0,43	0,71	0,14	1

Fig. 2: The evaluation matrix

Decision Lab 2000 is a multicriteria analysis and a decision-making software. Its advanced features will provide evidence of strengths and weaknesses, of conflicts and consensus. Based on the concrete results of academic research that got worldwide recognition, Promethee (Preference Ranking Organization METHod for Enrichment Evaluations) and Gaia (Geometrical Analysis for Interactive Assistance) methods, Decision Lab 2000 was designed to be applied to various multicriteria decision problems. Indeed, it is adoperated to decide in a multicriteria environment in which, at the same time, it is difficult and important for practice: most decision problems that arise in our daily life involve different and often conflicting objectives that we try to satisfy simultaneously by considering the best compromise. The Promethee approach is normative, while the Gaia procedure consists of a visual interactive modelling technique. In general terms, by Decision Lab 2000 it is possible to (Brans and Mareschal, 2002):

- administer the data of your decision-making problem inside a multicriteria table and through property sheets describing the main elements of analysis;
- define several scenarios, corresponding to the various points of view of several decision-makers or to the various hypothesis in the study, for a common set of actions and criteria;
- define categories of actions or criteria to underline the principal decision elements and to facilitate the analyses of sensibility;
- apply numerous forms of sorting better to appreciate the results of the analysis;
- calculate classifications Promethee I and II for actions, considering the perceptions and priorities of decision-makers, without sacrificing the rationality and the reliability of the analysis;
- generate graphic representation Gaia of results;
- realize extensive analyses of sensibility by using walking weights, intervals of stability, axis of decision Gaia, profiles of actions and comparative multi-scenarios.

The unique descriptive tool Gaia is a graphic representation of the decision problem, that offers a global sight of conflicts criteria and characteristics of actions.

In Decision Lab, Gaia method is used collectively with the representation 3D to help the decision-maker to identify the best compromise solutions.

Decision Lab's method is based on a principle of comparison by pair and makes use of a matrix in which 'A' is a set of 'n' possible decisions or alternatives which are evaluated through 'k' criteria f_1, \dots, f_k . After the matrix construction, the Promethee methodology (Brans et al. 1984, 1985, 1985, 1992, 1994; Mareschal et al., 1988) requests additional information: for each criterion, a specific preference function must be defined. This function is used to compute the degree of preference associated to the best action in case of pairwise comparisons. Six possible shapes of preference functions are available in the software: linear, V-shape, U-shape, Gaussian and usual have been respectively associated to different criteria. To take in account all the criteria, a valued outranking relation is built and then Promethee I provides a partial ranking of 'A', including possible incomparability, and Promethee II provides a complete ranking of 'A'. In this case, the Decision Lab 2000, through the Promethee and the Gaia plan, let us read the behaviour of the dimensions, considering the relative criteria. The application of Decision Lab 2000 let us have a preferable rank of the neighbourhoods evaluated as respect to criteria and dimensions (ecoware, hardware, finware, orgware, software, civicware). Nevertheless, the aim of the evaluation is not only to define the preferable project, but to understand the most relevant criteria in defining a strategy of sustainability.

3.2 The Evaluation Results

To make explicit the meaning and the role of a cyclic evaluation process, recognizing the validity of an approach moving from ex post evaluation of practices to deduce principles and rules to apply in ex ante evaluation of new projects, was one of the main goals of the study. In particular, ex post evaluation of realized experiences can be seen as a strategic process, able to find the essential steps of a project and to value its impacts and consequences, becoming the necessary beginning of a better ex ante approach.

In this case, through ex post evaluation it was possible to analyze in a critical way the factors characterizing the processes of sustainable urban transformation, specifically referring to the experience of eight districts.

Through the application of Decision Lab 2000 it was possible to elaborate some significant considerations. The method allows to elaborate a complete ranking of the eight analyzed practices, that enhances how Bo01 is the experience best satisfy the selected criteria. Indeed, the complete ranking expresses the balance between the positive and negative outranking flows. The higher the net flow, the better the practice. The ranking obtained by Promethee II is based on a numerical rating of the actions that allows to better appreciate the distance that separates one district from the others.

In the ranking (fig. 3), the Bo01 is followed by GWL-Terrein, Vauban, Gmv, Solar Siedlung, Viikki, BedZed and, at the end, Riesefeld.

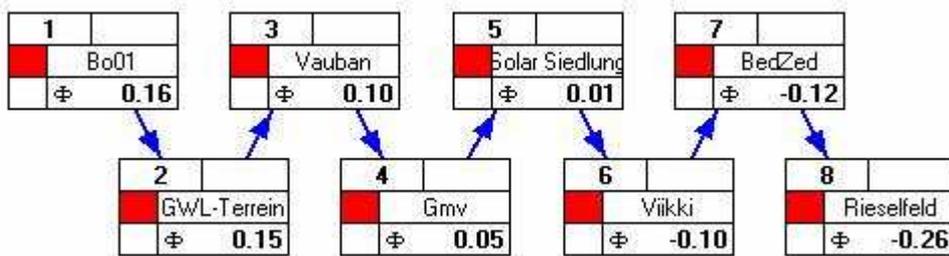


Fig. 3: Complete ranking (Promethee II)

By Decision Lab 2000 it is possible to obtain a clear view of the conflicting characters of the criteria. A special feature of the software, called 'the walking weights' (fig. 4), allows to modify the weights and to observe the resulting modifications of the Promethee II ranking. In the examined case, the six dimensions have the same weight, and the result allows us to verify which experience is able to perform a balanced strategy of intervention able to satisfy the principle of sustainability.

At the same time it is possible to make explicit the behaviour of each experience as respect to the six dimensions aiming to find the most considered issues and the capability to give real and significant answers defining the relative sustainability profile.

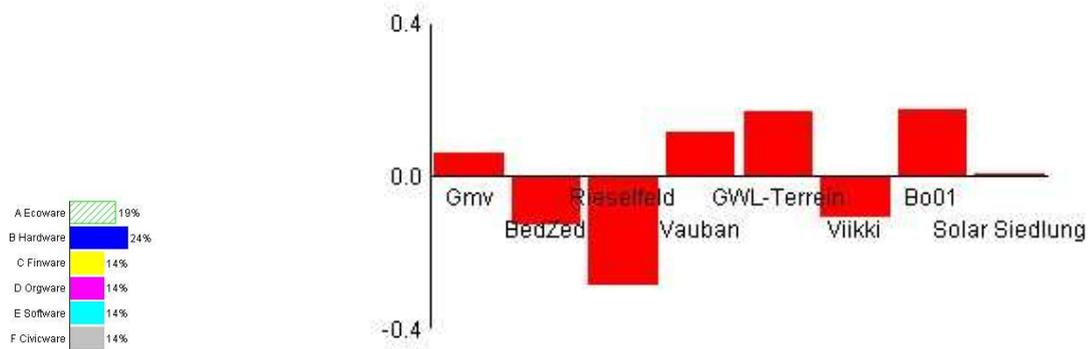


Fig. 4: The walking weights

The information relative to an evaluation issue including six dimensions can be represented in a six-dimensional space using the Gaia plan. It is obtained by projection of this information on a plan, where the practices are represented by a solid triangle and the six dimensions by axes. By this way the character of the dimensions appears clearly (fig. 5): dimensions expressing similar preferences on the data are oriented in the same direction, conflicting dimensions are pointing in opposite direction.

In this case, we observe that ecoware, hardware and orgware are in the same quadrant; in particular, orgware and hardware are oriented approximately in the same direction. Finware, civicware, and software are independent dimensions and are represented by nearly orthogonal axes; civicware and software are in conflict, having opposite directions. The axes length is another component useful to underline the relevance of each dimension. Indeed, the length of the axis is a measure of how much is the difference among the practices. In addition, the projection of the weights vector in the Gaia plan corresponds to another axis ($\pi - \pi$), that is the Promethee decision axis, able to show the direction of the compromise resulting from the weights allocated to the dimensions.

It is possible to consider the practices located in that direction and, for equal weights, it is confirmed that the Bo01 district is the best compromise, able to satisfy the different dimensions at the same time.

Observing the Gaia plan, clusters of similar alternatives can easily detect: one defined by Bo01 and Viikki; another two by GWL-Terrain and BedZed, and Riesefeld and Solar Siedlung, whereas Vauban and Gmv have an independent position. This result reflects the sustainability profiles, and it is clear that the most relevant dimensions are orgware, finware, software and civicware, followed by ecoware and hardware.

The conclusion makes evident how the intervention strategies need not only to find adequate interventions on the built and natural environment, but also to make explicit an integrated approach considering the role and the significance of the other dimensions, despite the possible conflicts.

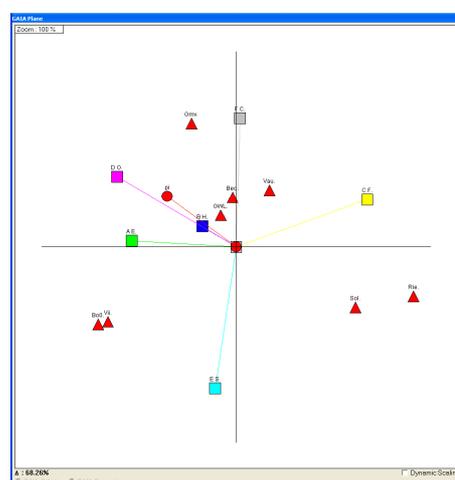


Fig. 5: The Gaia planes

4 CONCLUSION

The evaluation of the selected cases aimed to reconstruct the processes, finding the actors involved, the goals, the results, and trying to make the experience transferable to other contexts. The analysis of the examples wanted to create a feed-back based on the continuous monitoring of economic, socio-cultural and environmental impacts of the choices and the results, so that it was possible to re-modulate the actions.

Through an evaluation process that makes a reconstruction of the steps of the project it is possible to identify the significant aspects and the reasons of success and/or failure.

If one wants to learn from experience it is possible to use ex post evaluation approaches able to make the significant element of the project explicit, to analyze the critical factors and to identify the relevance of change.

'Learning from comparing' is the aim and, at the same time, the result of ex post evaluation that allows to make new experiences transferable to other context (Fusco Girard and Cerreta, 2001; Fusco Girard, 2002; Cerreta, 2004; Cerreta and Salzano, 2004). An ex post evaluation can be seen as a 'learning process', able to guide the creation of decisions and to conciliate the world of reality and the world of models.

These different approaches helped diffusing the principles of sustainability in planning and designing, spreading a series of significant experiences that can be defined 'green urban catalyst', as they catalyze a 'green' urban development, able to reflect the synergies between project and context through integrated strategies.

To realize a green urban catalyst implies to apply the principles of sustainability at different scales, from territory development to urban planning and architectural designing, finding the relationships among the main significant parts according to a multidimensional approach, including environmental, technical, economic, financial, institutional, cultural and civic aspects (Fusco Girard et al., 2003a).

The care for all these dimensions can have different priorities as regards to the context and can be modified and redefined on the basis of the needs, determining time after time different solutions. In this view, the neighbourhood urban scale, was useful to understand the dynamics that can be developed and the issues to consider if one wants to project and realize a catalyst of positive urban values.

5 REFERENCES

- Aa.Vv.: BedZed & Eco-Village Development, www.bioregional.com, 2004.
- Aa.Vv.: Gwl-Terrein, Amsterdam: Carfree Public Housing, Urban Ecology, Innovations in Housing Policy and the Futures of Cities, Amsterdam, 2000.
- Aa.Vv.: The New District of Rieselfeld, Freiburg, 2003.
- Andersson J., Lövehed L.: 100 Communities – RES Partnership, Energie-Cités, European Commission DG Energy and Transport Altener Programme, 2001.
- Baaijens S., Nijkamp P.: Meta-Analytic Methods for Comparative and Exploratory Policy Research: An Application to the Assessment of Regional Tourist Multipliers, *Journal of Policy Modeling*, 22(7), 821-858, 2000.
- Badenova: Verbunden Geschäftsbericht, Dinner Druck, Schwanau, 2003.
- Bana Costa C.: Readings in Multiple Criteria Decision Aid, Springer-Verlag, Berlin, 1990.
- Beer A.: Bo01 – City of Tomorrow, Malmö, Sweden, www.map21ltd.com, 2001.
- Brans J.P., Mareschal B., Vincke Ph.: How to select and how to rank projects: the Promethee method, *European Journal Operative Research*, 44, 1-10, 1986.
- Brans J.P., Mareschal B., Vincke Ph.: Promethee: a new family of outranking methods in MCDM, *IFORS '84*, Amsterdam, 447-490, 1984.
- Brans J.P., Mareschal B.: PROMETHEE-GAIA. Une Méthodologie d'Aide à la Décision en Présence de Critères Multiples, Ellipses, Paris, 2002.
- Brans J.P., Mareschal B.: The Promcalc & Gaia Decision Support System for Multicriteria Decision Aid, *Decision Support Systems*, Elsevier Science, Oxford, 12, 297-310, 1994.
- Brans J.P., Vincke Ph.: A preference ranking organization method: the Promethee method for MCDM, *Management Science*, 31(6), 647-656, 1985.
- Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit: Amending Renewable Energy Sources Act (EEG), 2004.
- Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit: Renewable Energy Sources Act (EEG), 2000.
- Cabe (Commission for Architecture and the Built Environment): Greenwich Millennium Village, London, www.cabe.org.uk, 2002.
- Cerreta M., Salzano I.: Dalle valutazioni ex post alle valutazioni ex ante: un approccio metodologico per la conservazione integrata del patrimonio culturale, in Aa.Vv., Conoscenza, innovazione e sviluppo territoriale, XXV Conferenza Italiana di Scienze Regionali (AISRE), Novara, 6-7-8 ottobre 2004, Cd-rom, 2004.

- Cerreta M.: Strategie integrate di sostenibilità: le valutazioni ex post per la costruzione dell'“alternativa ecologica”, in: Fusco Girard L., Nijkamp P. (Eds.), *Energia, bellezza partecipazione: la sfida della sostenibilità. Valutazioni integrate tra conservazione e sviluppo*, Angeli, Milano, pp.420-459, 2004.
- Christ W., Loose W.: *Town-planning and Ecological Qualities of Car-Free and Car-Reduced Urban Areas*, Öko-Insitute, Bauhaus-Universität, Weimar, 2001.
- Dubois A., Gadde L.-E. *Systematic Combining: An Abductive Approach to Research Case*, *Journal of Business Research*, 55, 553-560, 2002.
- Engström D.: *PvNord – Paving the Way for BIPV in Northern Europe*, PvNord Report, Göteborg, 2002.
- Faninger-Lund H.: *Bioclimatism*. Helsinki (Finland), *Energie-Cités*, 2-4, 2002.
- Forum Vauban: *A Journey through the Model District Vauban*, Freiburg im Breisgau, Freiburg, 2000.
- Fusco Girard L., Cerreta M.: *Il patrimonio culturale: strategie di conservazione integrata e valutazioni*, *Economia della cultura*, 2, 175-185, 2001.
- Fusco Girard L., Forte B., Cerreta M., De Toro P., Forte F. (Eds.): *The Human Sustainable City. Challenges and Perspectives from the Habitat Agenda*, Ashgate, Aldershot, 2003a.
- Fusco Girard L., Forte B., Cerreta M., De Toro P., Forte F. (Eds.): *L'uomo e la città. Verso uno sviluppo umano e sostenibile*, Angeli, Milan, 2003b.
- Fusco Girard L., Nijkamp P. (Eds.): *Energia, bellezza e partecipazione: la sfida della sostenibilità. Valutazioni integrate tra conservazione e sviluppo*, Angeli, Milan, 2004.
- Fusco Girard L.: *Una riflessione sull'attuazione dell'Agenda Habitat: alcune 'best practices'*, in Aa.Vv., *HabitatAgenda/AgendaHabitat. Verso la sostenibilità urbana e territoriale*, Angeli, Milano, pp.187-245, 2002.
- Glass G.V.: *Primary Secondary and Meta-Analysis of Research*, *Educational Research*, 5, 3-8., 1976.
- Greco S., Matarazzo B., Slowinski R.: *Rough Set Approach to Multiattribute Choice and Ranking Problems*, ICS Research Report 38/95, Warsaw University of Technology, Varsavia, 1995.
- Hagan S.: *Five Reasons to Adopt Environmental Design*, *Harvard Design Magazine*, Spring/Summer, 5-11, 2003.
- Herwijnen M. Van, Janssen R.: *Definite*, in: A.G. Lockett, G. Islei (Eds.), *Improving Decision Making in Organizations*, Springer, Berlin, 1988.
- Hinloopen E., Nijkamp P.: *Quantitative Multiple Criteria Choice Analysis, Quality and Quantity*, 24, 37-56, 1990.
- Hobbs G., Anderson M.: *Reduction, Re-use and Recycling of Construction Waste: A Project Management Guide*, Bre, London, 2003.
- Hunter J.E., Schmidt F.I., Jackson G.: *Advanced Meta-Analysis: Quantitative Methods for Cumulating Research Findings across Studies*, Sage, Beverly Hills, 1982.
- Lichfield N., Barbanente A., Borri D., Khakee A., Prat A.: *Evaluation in Planning: Facing the Challenge of Complexity*, Kluwer, Dordrecht, 1998.
- Lichfield N.: *Community Impact Assessment and Planning. The Role of Objectives in Evaluation Design*, in H. Voogd (Ed.), *Recent Developments in Evaluation in Spatial, Infrastructure and Environmental Planning*, Geo Press, Groningen, 75-83, 2001.
- Lichfield N.: *Economics in Urban Conservation*, Cambridge University Press, Cambridge, 1989.
- Mareschal B., Brans J.P.: *Geometrical representations for MCDA*, *European Journal Operative Research*, 34, 69-77, 1988.
- Matarazzo B., Nijkamp P.: *Methodological Complexity in the Use of Meta-Analysis for Empirical Environmental Case Studies*, *International Journal of Social Economics*, 34(719), 799-811, 1997.
- Nijkamp P., Oirschot G., Oosterman A.: *Regional Development and Engineering Creativity: An Instrumental Comparison of Science Parks in a Knowledge Society*, *Research Memoranda*, Free University, Amsterdam, 1993.
- Nijkamp P., Pepping G.: *A Meta-Approach to Investigate the Variance in Transport Cost Elasticities: A Cross-National European Comparison*, *Research Memoranda*, Free University, Amsterdam, 1997.
- Nijkamp P., Vindigni G.: *A Multidimensional Comparative Assessment Methodology for Policy Analysis: a Multi-Country Study of the Agricultural Sector*, *Journal of Environmental Systems*, 28(1), 71-90, 2000.
- Pawlak Z.: *Rough Sets. Theoretical Aspects of Reasoning About Data*, Kluwer, Dordrecht, 1991.
- Ribeiro R.A., Powell P.L., Baldwin J.F.: *Uncertainty in Decision-making: An Abductive perspective*, *Decision Support Systems*, 13, 183-193, 1995.
- Smith N.L.: *Cautions on the Use of Investigative Case Studies in Meta-evaluation*, *Evaluation and Program Planning*, 13(4), 373-378, 1990.
- Sokka P.: *Ekoviikki in Finland – Ecological Residential Area in Helsinki*, www.skanska.com, 2004.
- Solarsiedlung GmbH: *The solar community in Freiburg im Breisgau*, Freiburg im Breisgau, 2003.
- Stadt Freiburg im Breisgau, Landkreis Breisgau-Hochschwarzwald, Landkreis Emmendingen: *Solarführer Region Freiburg*, Vollmer & End, Freiburg im Breisgau, 2004.
- Stadt Freiburg im Breisgau: *Quartier Vauban*, Freiburg im Breisgau, 2003.
- Stadt Freiburg im Breisgau: *Solar Region Freiburg*, City of Freiburg Environmental Protection Agency, Freiburg im Breisgau, 2004.
- Stadt Freiburg im Breisgau: *The new district of Freiburg – Rieselfeld: a case study of successful, sustainable urban development*, Freiburg im Breisgau, 2003.
- van den Bergh J., Button K., Nijkamp P., Pepping G.C.: *Meta-Analysis in Environmental Economics*, Kluwer, Dordrecht, 1997.
- Weick K.E.: *The Social Psychology of Organizing*, Random House, New York, 1979.
- Wolf F.: *Meta-Analysis: Quantitative Methods for Research Synthesis*, Sage, Beverly Hills, 1986.
- Yin R.K.: *Case Study Research. Design and Methods*, Sage, Thousand Oaks, CA, 2003.