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Par

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Brownfield regeneration: sustainable approach for buildings and infrastructure

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I dedicate this thesis to my parents.

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General introduction

The term "brownfield" is used to describe abandoned, idled, or underused industrial and commercial property where expansion or redevelopment is complicated by real perceived environmental contamination (US. Environmental Protection Agency (EPA)). Across Europe there is no common definition regarding brownfield land, each European country refers to its own legislation and national perspective to define it. However, it's commonly recognised (e.g. OECD, 1998) that the presence of derelict land has adverse effects not only on the environment but also on the economic and social health of the city. Furthermore, brownfield sites are often avoided by developers, investors, planners and lenders due to the environmental contaminations regarding soil and existing buildings and infrastructures and the potential cleanup costs. As a result, the loss of greenfield land increases for building purposes.

Hence, it must be recognised that a sustainable built environment can not be achieved without reintegrating brownfield land into property markets and shifting development back to central urban locations (Detlef Grimski and Uwe Ferber, 2001).

Thus, various regulatory initiatives and approaches have been introduced at national or European level to reverse this trend in order to reuse brownfield sites and to bring them back into productive and sustainable use. However, it's still a challenge for national and regional policy makers to achieve this goal in sustainable way due to the complexity of the process of regeneration of brownfield. One of the complex issues in the redevelopment of brownfield is the management of existing buildings and infrastructures. Often approaches follow the tradition of destroying old structures prior to the construction of new installations according to the planned land reuse option. This way, some issues caused by the features of the existing buildings can really be avoided. The construction and fabric of old buildings often are not up to sustainable standards for example energy or water saving. In addition, the demolition of old buildings and infrastructure normally causes masses of old materials which need to be managed. This planning approach leads in certain cases to the failure of the whole project in terms of sustainability.

That's why the management of existing buildings and infrastructures should be approached as a sustainable process. In order to deal with this particular issue of brownfield generation a sustainable approach has been developed within European project called "Regeneration of European Sites in Cities and Urban Environments (RESCUE)". This approach takes into account the different dimensions of the sustainable development

(environmental, social and economic dimension). For this purpose, some objectives and indicators of sustainability are elaborated to serve as tool and a guide. These tools will be useful for stakeholders, owners, developers, architects etc. in order to help them to make a decision whether or not to retain these existing buildings and infrastructures. The second objective of our work is to avoid the common practices which give priority to the new construction in line with the chosen land reuse option. Inevitably, this planning approach leads to an underestimation, or even the loss of the historic, economic, semiotic values that the existing built environment represents. Our researches are focused on the sustainable regeneration of brownfield with more concentration on the sustainability rehabilitation of existing buildings and infrastructures in the eight pilot sites in Europe with further investigation and analysis of French practices. The result emerged from our work was integrated in web-based tool called the Virtual Training Centre (VTC) which aims to allow newcomers to, and practitioners in brownfield regeneration to acquire an awareness and understanding of the built environment issue.

This thesis is structured in four chapters.

- In the first chapter, concerns the definition of brownfield sites and present the different problems and obstacles that make the process of rehabilitation complex and difficult considered from the sustainable development angle, especially for the management of existing buildings and infrastructures. Furthermore, a sustainable definition of regeneration of brownfield sites is developed and detailed within the framework of sustainability.
- The second chapter introduces the different indicator frameworks and presents the methodologies used by different organizations at national and international levels for developing and elaboration of sustainable objectives and indicators. An application in the context of brownfield redevelopment based on the definition of sustainable brownfield regeneration and participatory indictor frameworks was presented and explained in order to develop a set of sustainable objectives and indicators related to the rehabilitation of existing buildings and infrastructures in brownfield. Finally, a description and information about these objectives and indicators were introduced.
- The third chapter, at first, a description of pilot sites will be presented with further focus on the two French pilot sites, secondly, an application of this sustainable approach will be carried out on the internal eight case studies and external ones via strengthens, weaknesses and gaps analysis in order to check practicability of

sustainable objectives and indicators, to identify the best practice in term of sustainability concerning each sustainable objective and to explain the deficit of the current French approach for the application of sustainable development objectives. Finally, recommendations will be proposed for sustainable management of existing buildings and infrastructures in France

- The last chapter introduces the virtual training centre as a tool to help to understanding lessons to emerge from our work across the sustainable management of existing buildings and infrastructures in brownfields. This tool will be designed so as to be used by trainers in an attractive form of training sessions. The result of this work is integrated as a module in a web site containing all the different issues of the redevelopment of brownfields. The VTC is broken down in three levels (awareness, understanding and able to use levels).

Chapter 1:

1. Brownfield redevelopment

Abstract

Across Europe, the brownfield sites represent a challenge to national, regional policy makers and planners to return these sites to productive use taking into account the sustainable development. Generally, these sites are characterised by the presence of buildings and infrastructures and often, stakeholders decide to demolish them instead of rehabilitate and reuse this industrial heritage. The objectives of this chapter are to find out a common definition of sustainable regeneration of brownfield sites and to examine the current French approach. Legal and finical incentives for this study were collected to identify the benefits that can encourage stakeholders to carry out a sustainable process to deal with the industrial heritage.

1.1 Introduction.

Brownfield sites are often avoided by developers, investors, planners due to the cost of remediation and the potential environmental liability (Elizabeth, 2001). However, Alberini et al (2005) pointed out that brownfield cleanup and reuse are attractive to communities and policymakers for three reasons. First, they reduce the adverse effects of the site's soil and water pollution on human health and ecological systems. Second, they contribute to stop conversion of agriculture land and rural sites to urban uses and other development patterns that generate environmental problems, congestion, and sprawl. Third, they promote economic growth in inner cities and are, therefore, potentially important components of sustainable growth. In this chapter, firstly, we have introduced the different definitions of the term "brownfield" as it is difficult to obtain an acceptable and agreed definition (Tedd et al, 2001). Secondly, focuses on the comprehension of the concept of sustainable development in order to develop a definition of sustainable regeneration of brownfield. Finally, we have examined the European and the French concepts and requirements regarding the regeneration of brownfield with stress on the available French legal and economic incentives for sustainable management of the industrial heritage.

1.2. What are brownfields sites?

Several definitions have been given to brownfield sites by the international organisations such as:

a) The Contaminated Land Rehabilitation Network for Environmental Technologies in Europe (CLARINET).

Working Group „Brownfield Redevelopment“ has agreed on the following definition, which is intended to describe the full context of the environmental, economic and land use issues that are involved:

Brownfields are sites that:

- have been affected by the former uses of the site and surrounding land,
- are derelict or underused,
- have real or perceived contamination problems,
- are mainly in developed urban areas that require intervention to bring them back to beneficial use.

b) Organisation for Economic Cooperation and Development (OECD), (2000).

“Brownfield land is that land which is, or is likely to be contaminated result of former industrial, commercial or governmental operations”.

c) US. Environmental protection Agency (EPA), (2002).

The term `brownfield site' means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

d) French definition of brownfield

France considers that brownfields are different from contaminated sites, the definition of brownfield site is: “space previously been developed (agricultural, port, industrial, service, processing, military defence, storage or transport); that are temporarily or definitively abandoned following the cessation of activity; and they need to be reclaimed for a future use. They can be partially occupied, derelict, or contaminated".

“Friche industrielle” or “Friche urbaine” (industrial or urban derelicted land) which means “land built or not, which has been used for various activities (industrial, commercial, mining, military…) and which has been so damaged that any reuse needs a treatment.

Or, “Declining non-rehabilitating land which has been used in the past for industrial, economic, mixed housing and military facility (etc) purposes with no immediate reuse”.

e) UK Definition of brownfields

"Land capable of redevelopment, whether with or without treatment, whether contaminated or not, and where redevelopment would be in accordance with planning policy". PPG 3 (Housing) defines previously developed land (PDL) as "land which is or was occupied by a permanent structure (excluding agricultural or forestry buildings), and associated fixed surface infrastructure. The

definition covers the curtilage of the development. Previously developed land may occur in both built-up and rural settings. The definition includes defence buildings and land used for mineral extraction and waste disposal where provision for restoration has not been made through development control procedures".

These definitions agreed on certain common characteristics of brownfield sites:

- Contaminated land
- Under used due to potential contamination

For the purpose of our work, concerning the management of existing buildings and infrastructures in brownfields in urban area, and as we work in European context the definition of Clarinet is regarded the more suitable for our purpose.

1.3. Brownfields in Europe

Since the mid-1980, policy makers and planners in Europe, have been paying a significantly more attention to measures designed to foster sustainable development improve the quality of life in urban areas, one issue that has received widespread political support has been the cleanup and redevelopment of under-utilized brownfield sites in urban areas (De Sousa, 2002) in order to reduce the consumption of agriculture land for housing and infrastructures. These sites present particular challenges to national and regional policymakers, regarding the remediation of hazards to human health, groundwater, ecosystems and socio-economic issues. Therefore, many disciplines are involved in the process of brownfield regeneration.

In term of quantity, it's difficult to estimate exactly the size of brownfield sites in Europe (Figure 1.1) due to the lack of a common definition across Europe of the concept of 'brownfield', and also the fact that the concept is not legally defined in any of the European countries (Detlef Grimski and Uwe Ferber, 2001).

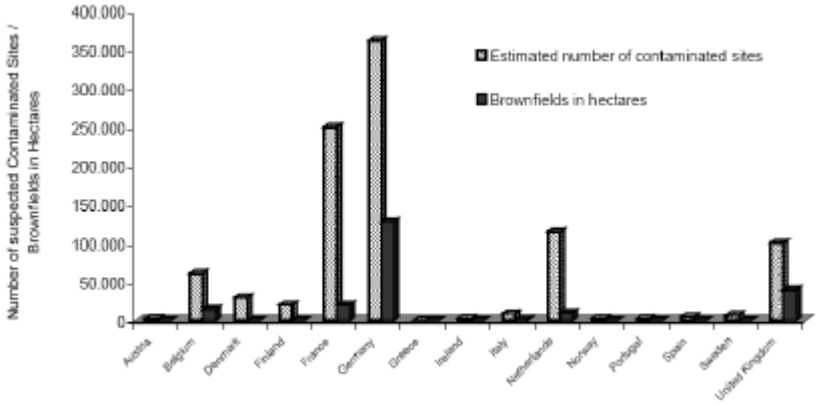


Figure 1.1 Brownfield in Europe (CLARINET, 2002)

In general, the legal framework used in Europe to deal with the regeneration of brownfield is the 'contaminated land' although; it's not the case because of the complexities of brownfield redevelopment, so all European countries need a new approach and methodology dealing with this issues.

1.4. Sustainable brownfield regeneration

Sustainable approach for the regeneration of brownfield requires better comprehension of the concept of sustainable development from the existing references and recognized international organisations. So many definitions were chosen and reviewed to define a reference framework for sustainable regeneration of brownfield and in particular the sustainable management of existing buildings and infrastructures in brownfield sites.

In 1987 the World Commission on Environment and Development (WCED) (Brundtland report) defined the sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition was generally agreed on world-wide. Clearly the Brundtland statement concentrates on the satisfaction of human needs, rather than for example the environmental aspect which is very important in the context of brownfield sites, therefore the conclusions of Bruntland's report brought a new dimension into the environmental debate.

The International Council for Local Environmental Initiatives ICLEI (1994) provides more practical and local interpretation of sustainable development, which is helpful to apply the concept sustainable regeneration of brownfield in urban area "Sustainable development is development that delivers basic environmental, social and economic services to all residents of a community without threatening the viability of the natural, built, and social systems upon which the delivery of these systems depends."

As a result of the Rio de Janerio conference in 1992 an action plan for sustainable development called Agenda 21 was carried out. 170 countries committed to start support a sustainable development in theirs countries. In chapter 28 cities and municipalities are asked to find a consensus within theirs communities on a Local Agenda 21 until the end of 1996.

In 1994 the European commission and the city of Aolborg, Denmark, realised the first European Conference for Sustainable Cities and Municipalities to promote the realisation of the chapter 28 in Agenda 21 and the development of local sustainability objectives. The notion and the principals of a sustainable development are defined in the Aalborg Charta as follows:

„We, cities & towns, understand that the idea of sustainable development helps us to base our standard of living on the carrying capacity of nature. We seek to achieve social justice, sustainable economies, and environmental sustainability. Social justice will necessarily have to be based on economic sustainability and equity, which require environmental sustainability which means maintaining the natural capital. It demands from us that the rate at which we consume renewable material, water and energy resources does not exceed the rate at which the natural systems can replenish them, and that the rate at which we consume non-renewable resources does not exceed the rate at which renewable resources are replaced. Environmental sustainability also means that the rate of emitted pollutants does not exceed the capacity of the air, water, and soil to absorb and process them.

Within the definitions of sustainable development presented above and other, some aspects are used repeatedly;

- ✓ environmental aspects
- ✓ social aspects
- ✓ economic aspects
- ✓ institutional aspects
- ✓ gender aspects
- ✓ needs of present and future generations
- ✓ global and local level
- ✓ north-south perspective

It ‘s then necessary to integrate the economic impacts with the environmental, economic and social impacts of the different regeneration objectives to determine the most sustainable scenario of rehabilitation of brownfield sites.

Sustainability has become a leading target of scientific research and policy agenda (Lopez-Riaura et al, 2002). Thus sustainable development is a much broader concept than environmental concept (Ravetz, 2000). Therefore, in our work we need to develop an approach that make the concept of sustainability operable in the context of brownfield regeneration. Furthermore, sustainable development should be investigated from its four dimensions environmental dimension (Turner, 1993), social dimension (Brown and Jacobson, 1987), economic dimension (Lopez-Ridaura, 2002; Ravetz, 2000), institutional dimension and geo-political dimension (Bouma, 2002) (Figure 1.2).

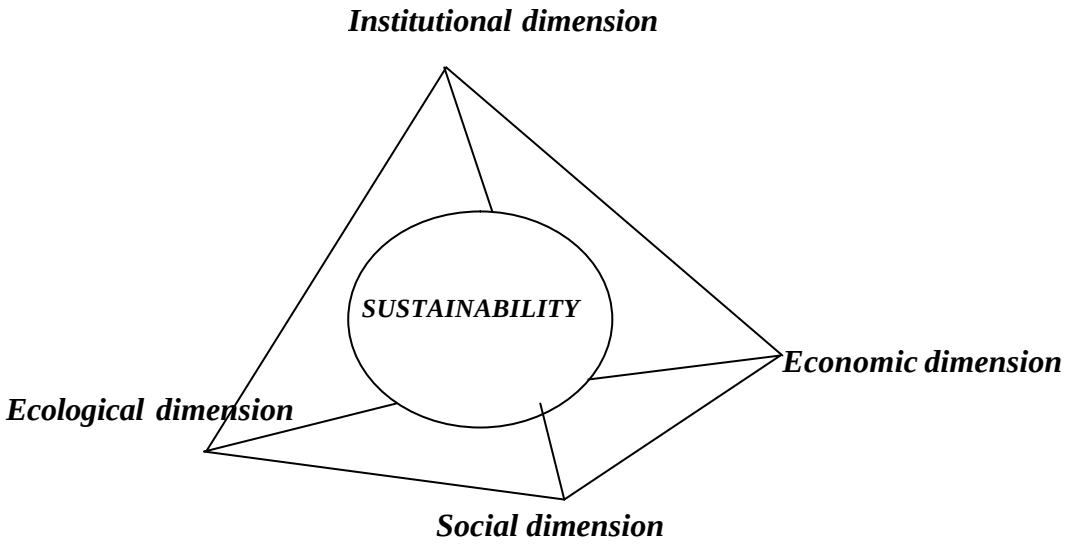


Figure1.2 Dimensions of Sustainability

The common understanding the meaning of these four dimensions is the following:

- **Environmental dimension:** it means;
  - ✓ The resource use is not exceeding regeneration rate;
  - ✓ A decrease of consumption of non-renewable resources;
  - ✓ non negative ecological impacts
- **Economic dimension:** it means;
  - ✓ Direct and attractive benefits for all stakeholders;
  - ✓ fully internalised costs and benefits;
  - ✓ improvement of living standard of community
- **Social dimension:** it means**;**
  - ✓ Meet actual needs of community;
  - ✓ Gender sensitive (at least in participation)
  - ✓ Equal access to benefits
  - ✓ Reduce social disparities (empowerment and responsibility)
- **Institutional dimension:** it means;
  - ✓ Compatible with local culture, moral issues and ethics;
  - ✓ Shared responsibilities (participation);
  - ✓ Visible impacts on involved organisations and institutions;
  - ✓ Involvement into decision-making;
  - ✓ Legislative and fiscal framework.

Sustainable development is characterized by economic growth based on social justness and sustainability use of natural resources. These three requirements should be obtained harmoniously, i.e., their interrelation should occur in balance way (Seiffert and Loch, 2005). So to achieve sustainability, coordination across social, cultural, economic and environmental areas are required (Lele, 1991; Sheng, 1995). That cooperation, coordination and recognition, are note necessarily present, nor perhaps possible, in governmental thinking, policy or practice. That may be identified as one of the barriers to achieve sustainability (MAF, 1993). Therefore, the ideal solution probably lies in an intermediate point at which none of the objectives, taken individually, can reach their optimum (Seiffert and Loch, 2005).

Other aspects of sustainability should be taken into account are the notion of time scale, spatial perspective. Sustainability is neither static in time nor does it imply a fixed spatial perspective (RESCUE, 2002)

The concept of sustainability shows many facets. Ecologist, Environmentalists, Agronomists, Sociologists, Economists and Politicians use it with different connotations. In addition, the sustainability regarding the regeneration of brownfield sites varies in space according to soil, existing structures, technology, social conditions and safety and human health. Because of its complexity in this specific context, RESCUE developed an appropriate definition of sustainable brownfield regeneration "is the management, rehabilitation and return to beneficial use of brownfields in such a manner as to ensure the attainment and continued satisfaction of humans needs for the present and future generations in environmentally sensitive economically viable, institutionally robust and socially acceptable ways within the particular regional context". In term of sustainable management of existing buildings and infrastructure we can retain from this definition some key objectives of sustainability "require intervention to bring them back to beneficial use", "satisfaction of human needs", "for the present and future generations", "environmentally sensitive", "economically viable" and "within the particular regional context" (RESCUE, 2002).

Furthermore, sustainable indicators are needed to assess the sustainability of the management of existing buildings and infrastructures on brownfields sites. A good indicator is free of bias, sensitive to temporal changes and spatial variability, predictive, referenced to threshold values (Zinck and Farshad, 1995).

1.5. Sustainable rehabilitation of buildings and infrastructures

Referring to the OCED project, sustainable buildings can be defined as those buildings that have minimum adverse impacts on the built and natural environment, in terms of buildings themselves,

their immediate surroundings and the broader regional and global settings. And it identifies five objectives for sustainable buildings;

1. Resources efficiency;
2. Energy efficiency (including greenhouse gas emissions reduction);
3. Pollutions prevention (including indoor air quality and noise abatement);
4. Harmonisation with the environment;
5. Integrated and systemic approaches.

So, buildings have to be designed to take into account ecological principals, such as the reduction of pollution, sustainable growth, recycling of waste and energy, energy effectiveness and conservation of resources (Enshassi, 2000).

Furthermore, to secure a sustainable built environment, Maver and Petric (2003) propose four necessary and sufficient conditions:

i. **Fitness-for-Purpose**: over the life span of building, the needs of the original and subsequent clients/users may change significantly. It is important if a building is to sustain its usefulness over its span that it is potentially adaptable, i.e., " loos fit"
ii. **Cost beneficial**: the benefit which the original and subsequent clients / users get from their use of the buildings must justify the critical capital investment (and reinvestment in refurbishment), together, with the substantial range recurring costs (for maintenance, energy consumption, etc) over its life span.
iii. **Environmentally friendly**: Less atmospheric and stratospheric pollution.
iv. **Culturally significant**: more than any other designed artefact, buildings embody the values of their time, their location and inventiveness and confidence of those who commission and design them.

Moreover, It is sated in strategic document "Towards a thematic strategy on the Urban Environment", Communication from the Commission to the Council, The European Parliament, The European Economic and Social Committee and the Committee of the Regions (Commission of the European Communities,2004) "Sustainability should be incorporated into national building codes, standards and regulations, using where possible a performance-based approach rather then prescribing particular solutions to be applied."

Furthermore, the European Environmental Legislation and Strategy has a priority attention to certain issues which have negative impacts on the environment such as construction and demolition (C&D) waste. According to the sixth Environment Action Program entitled 'Environment 2010: our future, our choice', recommendation actions need to be taken with the respect to the stream of C&D waste, (EC, 2001).

Also, the assessment of buildings performances in term of energy consumption has to be considered, since buildings are responsible for half nation's energy and hence carbon dioxide emissions, the design, construction and operation of buildings are vitally important for people now and in the future. This of course applies to the entire buildings stock of old and new buildings (Godfaurd et al., 2005).

In practice, the reuse of existing buildings and infrastructures can be a possible scenario for the rehabilitation of brownfield sites. Referring to Garrod et al., (1996), the preservation and continued use of historic buildings may produce additional benefits for the community over and above those which more modern buildings provide. These additional benefits arise from:

- Their historical and architectural importance;
- Their role in the development of a sense of identity for the local community;
- Their role in encouraging tourism and investment.

A number of economic benefits can be realised from the renovation and restoration of historic buildings. Some of these benefits will be derived from the increased commercial value of the property but others can be non-priced benefits. Non-priced benefits arise when people get enjoyment and satisfaction from restored buildings, and do not have to pay for access (Garrod et al., 1996).

So, to cope with the management of buildings and infrastructures in sustainable way we have to take into consideration issues regarding energy, natural resources, recycling and reuse construction waste, health and security of occupants, socio-cultural and economic dimension. To embrace the whole dimensions of sustainability in the buildings sectors, several exiting concepts and programs at national or international level have been developed such as:

- ✓ At national level;
    - High Environmental Quality concept in France.
    - Guideline for Sustainable Building, Federal Office for Building and Regional Planning , January 2001 (Germany);
    - Sustainable Building Technical Manual, Green Building, Construction, and Operations, 1996 in USA;
    - The State of Minnesota Sustainable Building Guidelines, 2003 (USA).
    - E-Audyt: Metody oceny oddzialywania na srodowisko objektów budowlanych (Method of evaluation of Environmental Impact Assessment of Buildings), Biblioteka Monitoringu Srodowiska, Inspekcja Ochrony Srodowiska, 2002 in Poland;
    - Eco-profile for Commercial Buildings. Simplistic Environmental Assessment Method, 2000 in Norway;

- ✓ International level:
  - International Initiative for Sustainable Built Environment;
  - Agenda 21 for Sustainable Construction in Developing Countries, The International Council for Research and Innovation in Building and Construction CIB, United National Environmental Programme, International Environmental Technology Centre UNEP-IETC.

It's, however, in application level that major constraints arises and specially, in a complex context of brownfields sites.

1.6. Redevelopment of brownfield in France

1.6.1 Current situation

Brownfield sites are of considerable interest in some former industrial French regions since the 1970s (in particular, Lorraine and Nord–Pas-de-Calais), and more recently in other regions because of extensive urban development (Paris and Île de France, Rhône–Alpes). Most of the available information on brownfields management (regional procedure, location of brownfields, regional database, examples of sites reclamation, etc.) is provided by the regional authorities.

Two inventories are at present were complied:

- The inventory on past industrial activities will be archived in 2005. It will contain about 400 000 sites in this historical inventory at the end.
- The inventory on contaminated sites or potentially contaminated sites which need an administrative action for remediation or to prevent risk.

Different questions have been addressed, related to inventories of brownfield sites, suitability of sites for future use (when sites are not considered as contaminated) or site reclamation according to the regions' situation. In the first approximation, brownfields include about 200.000 former industrial and service sites, and about 200 former mines. The stock of industrial brownfields is estimated at about 20,000 ha (Figure1.1). This is concentrated as expected in the traditional industrial areas of the northern and eastern part of the country, especially in the region of Nord-Pas-de Calais (9.400 ha) (CLARINET, 2002). Most of these are large sites (more than 10 ha) in suburban locations. The stock of brownfields has not decreased in the last decade despite of considerable reclamation activities.

1.6.2. France policy

In France long-term policies and programmes exist in the traditional industrial regions piloted by Lorraine. Since the 1980s, and in the context of the national "Contrat de plan" – funded by the state,

region and the EU, specific brownfield reclamation programmes have been developed. It was important to create a new economic foundation and modernise urban and infrastructure structures, which had been exclusively geared to the former industrial use. As consequence, 3.350 ha of derelict industrial land had been rehabilitated between 1987 and 1998. Due to the difficult regional context, a joint intervention of national, regional, and local actors was necessary. As it was clear from the beginning that it would not be possible to immediately find new uses, the strategy developed in 1986 concentrated on the rapid improvement of the ecological situation through large-scale landscape treatment. Preparation of the land for new uses, which involves much higher costs, will be a medium and long-term task. Therefore, all efforts were focussed on overcoming the negative image caused by derelict land. The programme priorities were based on:

a. The first, and simple priority of rapid identification of derelict land;
b. The establishment of a regional development agency called "Etablisement Public Foncier (EPF)".
c. a clear and comprehensive methodology - „requalification sommaire";
d. adequate and regular funding;
e. a partnership of all parties involved;
f. Support for the preparation and development of derelict land for the implementation of leading projects with regard to the development of the agglomeration.

Ordinary "Re-qualification" ("Requalification sommaire") is clearly preferred if any future use project could be defined. The derelict land strategy known as "Remise en état" contains:

- Demolition of the old existing buildings as well as clearing work in the area;
- Turning brownfields into green space.
- Creation of leisure facilities in this brownfield sites;
- Where necessary, cleaning of soil to prevent human risk and using of all legal instruments to make the polluter pays.

Subsequently, the properties are to be managed on a regional level and in individual cases left to the free property market.

The executive body of this part of the programmes is the regional development agency, the "Etablissement Public Foncier" prices. At the same time, partial sales of attractive and unencumbered properties directly by the owner were prevented.

The strategy chosen was exemplary as it succeeded in linking the interests of the private property owners, the community and other actors in the framework for a coordinated regional master strategy.

1.6.3. Administrative tools for sustainable management of existing buildings and infrastructure on brownfield in France

No special legal regulations for the management of existing buildings and infrastructures on brownfield exist in France. Legal aspects are covered by the following codes as any other buildings:

1.6.3.1. Code of construction and Housing

The code construction and housing defines regulations concerning:

- The energy equipment in order to minimize the consumption of energy and use of renewable energy in heating;
- Safety of existing buildings and infrastructures (solidity and stability);
- Healthy reuse of existing buildings and infrastructures.

The main relevant regulations are the following;

i. Energy regulations for equipment (Law n°74-908 of October 29, 1974).

ii. Decree relating to the thermal characteristics of constructions, modifying the code of construction and housing and taken for the application of the law n° 96-1236 of December 30, 1996 on the air and the rational use of energy**;**

iii. New Thermals regulation 2000**;** application of the law n°96 - 1236 on the air and the rational use of energy;

iv. Law on the unhealthy buildings (laws n°521-1 to 521-4);

v. Law on the building in state of ruin (laws n°511-1 to 511-4).

1.6.3.2. Mining code

The mining code sets standards to be fulfilled by the end of mining activity. These standards concern:

- The instability of buildings (subsidence of soil)
- The reuse of equipments.
- Existence of dangers substances which harm people health.
- Elaboration of plan to remediate the site.

Some of the relevant laws for the brownfield redevelopment are the following:

i. **Art 91**. After the suspension of mining activities the mining company must elaborate a plan to remediate the site:

ii. **Art 92**. After the suspension of mining activities the explorer or the owner of the mine is held to give to the interested communities or the publicly-owned establishments of inter-commune co-operation the hydraulic installations that these public people estimated necessary or useful for sewage system, the distribution of water or the control of rain water, streaming and underground water.

iii. **Art 93 to 96**: **Prevention and monitoring of the mining risks**

When significant risks of land subsidence or dangerous gas, which endanger the safety of the goods or people, were identified at the time of cessation of mine activities the owner must install the equipment necessary to their monitoring and their prevention.

1.6.3.3. Environment code

The environment code sets the standards concerning the management of demolition and construction waste. These standards have the following objectives:

- Struggle against the non - authorized or non - regulated dumping sites
- Set up a treatment network associated with a funding instrument, and adopt a balanced approach between reuse, recycling and landfilling.
- Reduce waste production at their source.
- Limit landfilling and improve recycling and waste reuse.
- Improve the reuse of recycled materials in operations or working sites by creating sustainable markets and by saving materials of natural origin.
- Better involve the contracting authorities in the disposal of wastes generated by their project.

In addition, the environmental code encourages the implementation of sustainable management of water resources.

Some of laws that illustrate the above objectives are:

- **Law of July 15, 1975.**

In agreement with the "polluter- payer" principle, the task devoted to the waste producers includes waste destruction, storage and treatment.

- **Law of July 13, 1992.**

Fix at 2002, the deadline limiting the access to landfills to waste that cannot be recycled or reused.

- **"Circulaire " of February 15, 2000.**

Recommends the implementation of Local construction and demolition waste Management Plans (at the department scale),

- **ICPE law (1976-07-19):** The future use of a place determines the cleaning threshold. This is a characteristic of the French way of treating waste and polluted soils (ICPE = Installations Classées pour la Protection de l'Environnement*)*.
- **Barnier's law (1995-02-02):** It reinforces environmental protection, introduces sustainable principles, makes previous laws more consistent, develops agricultural impact assessments, and defines tools for managing water resources:
- **SDAGE** (Schéma Directeur d'Aménagement et de Gestion de l'Eau): planning tool defined on the scale of a major drainage basin;
- **SAGE** (Schéma d'Aménagement et de Gestion de l'Eau): planning and operational tool on the scale of a minor drainage basin; a local committee is formed by municipal councillors and technicians. The plan is developed on a voluntary basis.

1.6.3.4. Planning code (Code d'Urbanisme)

The relevant laws are the following:

i. **Law of December 31, 1913** on the historic buildings.

The law of 1913 makes it possible to classify or register under historic buildings the buildings or the objects "of which conservation present from the point of view of the history or art a public interest". The classification and the inscription protect the monuments, for any modification, an authorization must be requested from of Building architect of France. When a building is classified, the accesses are protected in the same way, in a perimeter of 500 m and also the visibility of a classified building.

ii. **Law of May 2, 1930**

The law is relating to the protection of the natural monuments and the sites of nature artistic, historical, scientific, legendary or picturesque, by a classification or an inscription of spaces with great diversity: natural monuments, vast landscape sets, picturesque sites, and in certain case a complement access of certain monuments. The management of these spaces concerns the Ministry for ecology and the sustainable development (Direction of nature and the landscapes) represented, locally, by the regional Directorates of the environment (DIREN) and by the departmental Departments of architecture and inheritance (SDAP).

iii. **Zones of protection of architectural, urban and landscape heritage** (**ZPPAUP)**

Created in 1983 (**law on decentralization**), supplemented in 1993 by landscape law, this planning document tends to give to the communes an active role in management and the development of their heritage. It enables them to carry out in dialogue with the State (Building Architect of France), a step of protection and harmonious evolution of built and not built spaces of their territory. Based on an analysis of diagnosis entrusted to one or more specialists (architects, landscape designers, planners), this step is concretized through a contractual document which includes/understands regulations appended to the documents of town planning.

This decision-making aid and reference document is particularly relevant for the various actions of transformation engaged at the communal or deprived level: rough-casting, treatment campaigns of public spaces, programmed operation of the improvement of the habitat, movable restoration, etc… Building Architect of France checks the conformity of each project with the provisions of the ZPPAUP.

iv. '**Plans de Sauvegarde et de Mise en valeur ' (PSMV)**

In France, PSMV has the status of a town planning document. They are considered as plans of safeguard and development. Their objectives are to preserve, restore and develop urban complexes with an historical and/or aesthetic value. They make up a set of particular rules applicable in a given perimeter representing a "safeguarded area". The steps taken for this purpose combine various means of deep analysis of the existing buildings and infrastructure to release its potentialities and to support its development. Within this framework, the urban composition and design are regarded as essential in the appreciation of what must "be transmitted to the future generations". A synergy is required for the means necessary in this respect; for the implementation of these objectives, for the control of the rehabilitation and for the Re-dynamization in term of land use of the old districts, i.e.:

- ☒ For the old district: PSMV look for a development of these areas by revitalizing the activities and the housing and by reconverting it to new uses which are adapted to their built framework.
- ☒ For the more recent districts destined for housing or industrial activities, PSMV reveal and make known their particular value and search for means to improve them for the future, while protecting them from possible destructions.

1.6.4. Financial incentives and public funding in France

Appropriate incentives represent the most powerful means by which policymakers can promote their visions at the national, regional, sub-regional, local project level. In the following section the main financial incentives in France were introduced:

1.6.4.1 Subsidies for the improving of the habitat (ANAH)

These subsidies are reserved for the followings works:

a. The work intended for the improvement of the habitat as far as safety, healthiness or equipment of the buildings are concerned.
b. The work of accessibility or adaptation to people suffering from old age, reduced mobility or disabilities/ physically challenged,
c. The work supporting sustainable development.

1.6.4.2. Premiums and subsidies for the ecological and economical technologies

The Agency of the Environment and Energy Control (ADEME) set up since 1992 a supplementary program in order to sustain projects supporting the development of ecological and economical technologies such as the use of:

a. The individual solar-water heater:
b. The collective solar-water heater
c. The combined solar system:
d. The Production of electricity in an isolated site
e. Production of electricity connected to the network:

Moreover, the ADEME subsidizes sustainable projects till 15% of all taxes included amount, Furthermore, certain regional Councils in France Subsidize these project between 15 to 30% of all taxes included amount**.** Finally, at the European level, the European Commission can fund up to 35% of tax-free amount.

1.6.4.3. The subsidy intended for historic buildings

The restoration works of a classified or listed buildings as historic monuments, are funded by the government between 20 to 80% of work costs.

1.6.4.3.1. VAT (Value-Added Tax) reductions:

Since 1999 the VAT has known a significant fall while dropping from 20.6% to 5.5% for the restoration and maintenance work checked by professionals and carried out in residences completed for more than 2 years. This measure is provisional and ended on December 31, 2003; nevertheless it is not excluded that it may be prolonged if we consider its impact on employment and its growth in the building sector.

1.6.4.3.2. Tax credits for equipments expenditures:

- Tax credit for equipments expenditures intended for energy production by using a renewable energy source (Caution: this measurement ended on December 31, 2002.)
- Tax credit for the expenditure of heating regulating devices (Caution: this measurement ended on December 31, 2002.)
- Tax credits for the development of ecological and economical technologies

1.7. Concluding remarks

Although, brownfield issue has affected all the Europe, each European country has developed specific strategy to deal with brownfield. In order to promote the redevelopment of brownfield some European countries rely on voluntary cleanup initiatives that resemble voluntary cleanup programs and brownfield initiatives in the US and other countries have crafted their own superfund-like legislation (Alberini et al, 2005). While, a common action at European level for the task of sustainable brownfield regeneration is still obvious.

Across Europe, there is no unique definition of brownfield. It‘s often comparable to contaminated land, though, the brownfield issue is more complex due to the involvement many disciplines as land-use planning, environmental disciplinary, economic policy, soil contamination, industrial heritage, citizen participation, etc. The sustainable redevelopment of brownfield is a difficult task, since a commun definition of sustainable brownfield regeneration is not yet defined.

Recently, RESCUE has developed a definition of sustainable regeneration. This definition will be presented in chapter two.

Concerning built environment and industrial heritage preservation, France introduced various legal and finical incentives to encourage a sustainable rehabilitation of old buildings and infrastructures. However, there is no specific legislation and financial incentives related to brownfield sites in France. The effectiveness of existing measurements in simulating sustainable rehabilitation of the existing buildings in brownfield will be carried out in chapter three via real practices.

Chapter 2: Sustainability approach for brownfield

Abstract

This chapter describes the development of a sustainability approach for the rehabilitation of existing buildings and infrastructures in brownfield sites. It takes as a starting point the definition of sustainable regeneration of brownfield and it adapts participatory indicator frameworks in a sustainability context. An expert group was assembled to identify the sustainable process and to propose objectives and indicators that would be useful for stakeholders who have the responsibilities of sustainable redevelopment of brownfields. Five objectives and thirteen sustainable indicators were developed in the context of socio-economic (industrial heritage preservation, building reuse etc,) environmental (renewable energy, solid waste, water, etc) and institutional issues. The sustainable objectives and indicators are used to assess the old industrial building for possible reuse or / and dismantling in order to secure a sustainable built environment.

2.1 Introduction

Indicators are supposed to be simple figures or other signs, which help to understand a complicated phenomenon like environmental pressure. This is how the information is easier to explain for those who are not experts or who need the information quickly (CRISP, 2001)

Adriaanse (1993) defines an indicator as a quantitative model and a form of information that makes a certain phenomenon perceptible that is not immediately detectable. Indicators therefore provide a simpler and more readily understand form of information than complex statistics or complex phenomena. The three main functions of indicators are:

- Quantification
- Simplification
- Communication.

Therefore, sustainability indicators aim at monitoring key aspects of society–nature interaction in order to generate information needed to document the current state and the history leading up to it. Moreover, they are useful to communicate complex sustainability problems within the scientific community, to policy-makers and the broad public (Haberal et al., 20004)

In the Agenda 21, chapter 40 states that “Indicators of sustainable development need to be developed to provide solid bases for decision making at all levels, and to contribute to a self-regulating sustainability of integrated environmental and development systems.

In relation to policy-making, environmental indicators are used for three major purposes (EEA):

- to supply information on environmental problems, in order to enable policymakers to value their seriousness;
- to support policy development and priority setting, by identifying key factors that cause pressure on the environment;
- to monitor the effects of policy responses.

Indicators are not only needed to supply information about the state and condition and causalities, but also to assess the effectiveness of alternative responses.

Moreover, Stewart (1993) discussed current thinking on indicators of sustainable development. He proposed that indicators are tools for tracking progress towards sustainable development, measuring its success and identifying the selection of alternative choices to facilitate a more substantial form of development.

Strategies have been proposed to reach sustainable development. Many of these strategies deal with one type of problem - preventing environmental deterioration but they ignore the importance of economic or social goals (Ravetz, 2000).

In building sector indicators are needed (CRISP, 2001):

- to take into account the requirements of economically, societal-culturally and ecologically sustainable development,
- to overcome the complexity of building projects and to assess the sustainability impact,
- because the nature of building projects and buildings also emphasises the need of simple indicators - especially in the sense of data collection.
- if the activity that is looked at, has important indirect effects on sustainable development. For example, planning, design, management and administration normally have minor ecological impact in terms of hazardous emissions and consumption of resources

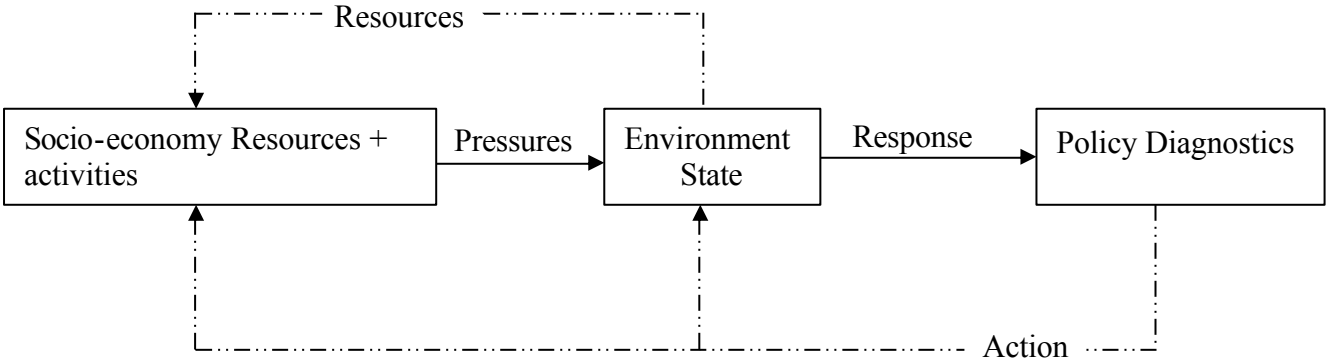
2.2 Different indicators framework

There are two concepts for developing sustainable indicators: the first one concerns the institutional indicator frameworks while the second deals with the participatory indicator frameworks.

2.2.1. The institutional indicator frameworks

The most well known indicators frameworks of this category are:

i. ***The ¨Pressure-State- Response"*** (PSR) of the OECD (1994), this model considers that activities of human system exert ' pressures' on the environment and affect the quality and quantity of natural resources "State", society responds to these changes through environmental, land use, awareness and sartorial policies "Response ".Consequently, the PSR-framework (Figure2.1) is based on a concept of causality. This approach has some limitations when applied to sustainable development. It fails to incorporate the links between economic activity and environmental change and with a concentration on state variables, is weak in its treatment of system fluxes, which are important for monitoring purposes (Crabtree and Bayfield, 1998). Furthermore, this model is unsuitable and unhelpful regarding the brownfield redevelopment for several reasons: first, the OCED indicator set has limited focus on environmental problems, their triggers and human reaction on simple cause-effect relations excluding further social and economic impacts. Second, the concentration on the national and the international research in the elaboration of these indicators. Third, the indicators are not enough detailed, e.g., the aspect of decontamination is expressed by 'proportion of decontaminated land compared to the amount of all identified contaminated land' and by 'the concentration of harmful substances in the environmental media (air, water, soil)'. More specific information on 'how' (e.g., the state of the site, decontamination methods), 'why' (e.g., type of previous use) or on the consequences (e.g., reuse of brownfield), is not mentioned in this indicator set.



Source: Crabtree and Bayfield, 1998

Figure 2.1, Pressure-State-Response framework

ii. ***The Driving Force-State-Response framework***- The limitations of PSR model led the United Nations Commission on Sustainable Development (UNCSD) to develop a Driving Force-State-Response (DSR) model (Figure 2.2) with primary modification. It extended the category of pressures to more general deriving forces. Hence, the socio-economic dimensions were added to the framework.

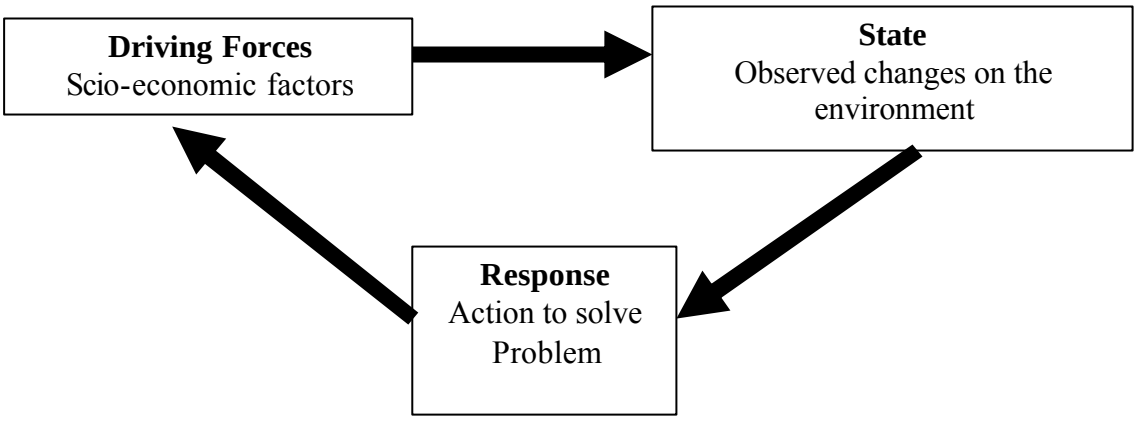


Figure 2.2 Driving Force-state-Response framework

The UNCSD carried out a set of 134 indicators to harmonise international activities aiming at sustainable development. This indicator set doesn't supply sufficient information for the analysis of sub-national level. Therefore, it's not suitable for describe and analyse decontamination or land recycling of specific brownfields.

The two models PSR and DSR tend to miss the complex interaction and interrelations between the different indicators and topics. Besides, it's very difficult to identify cause-effect chains in socio-ecological and economic system. The inadequacies of those two frameworks which are based on functional casualties lead to oversimplification and to wrong policy recommendation (Birkmann and Martinez, 2001).

Driving force-Pressure-State-Impact-Response (DPSIR) framework

The European Environmental Agency (EEA) has developed the DEPSIR model (Figure 2.3).

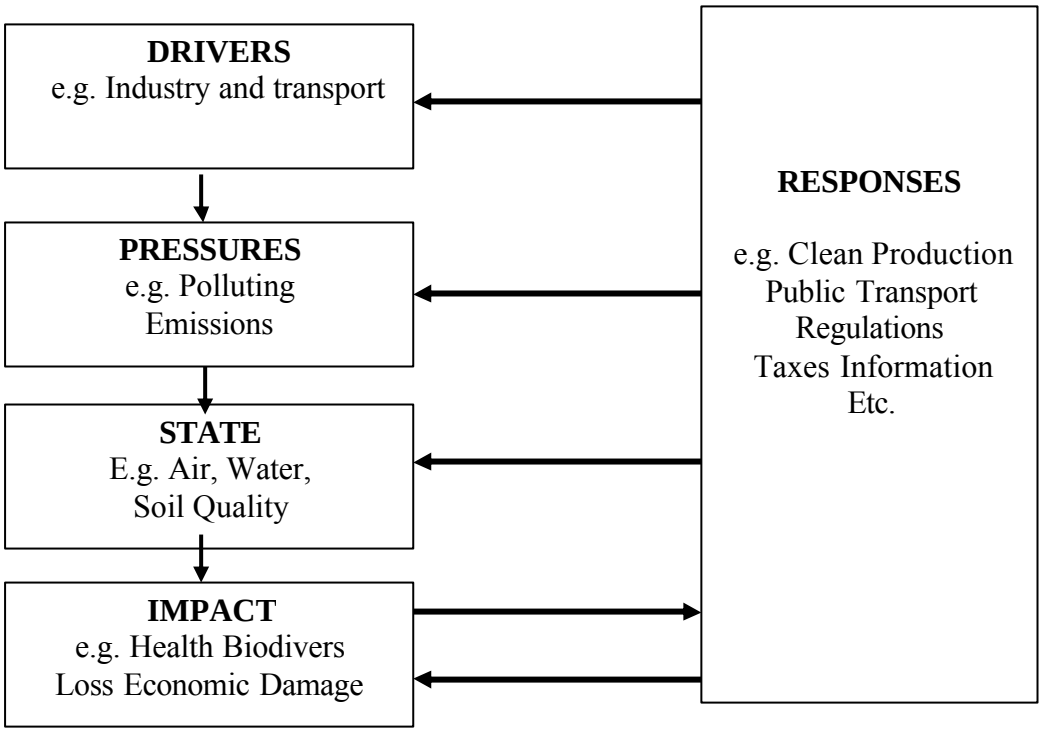


Figure 2.3 The DEPSIR Framework for reporting on environmental issues

DPSIR builds on the existing OECD model and offers a basis for analysing the inter-related factors that impact on the environment.

The aim of such an approach is:

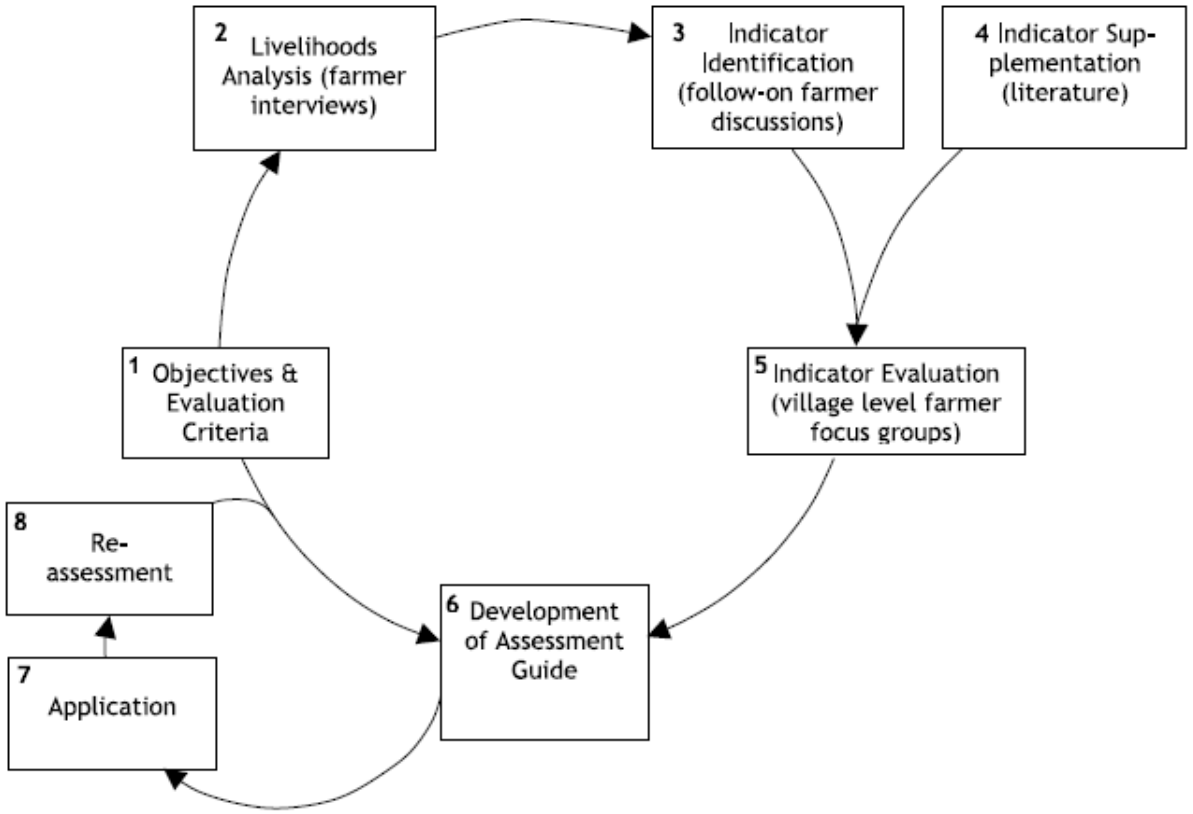
- to be able to provide information on all of the different elements in the DPSIR chain
- to demonstrate their interconnectedness,
- to estimate the effectiveness of Responses.

The DEPSIR model allows describing single dimensional relations, a fact that makes it unsuitable for a complex and interrelated matter like decontamination and reuse of land, these topics are covered only by DEPSIR indicators. Furthermore, the indicators are applied on the European level. The set can not provide detailed information for the sub-ordinate levels. In our case, we need an oriented indicator framework that is applicable for the process of brownfield regeneration. Therefore it seems questionable, if a DSR, PSR or DPSIR frameworks are suitable for the purpose of a sustainable management of existing buildings and infrastructure on brownfields.

2.2.2 The participatory indicator frameworks:

Breckenridge et al. (1995) developed a framework in which indicators were identified by interdisciplinary teams of researchers, who evaluated them with reference to a list of predefined

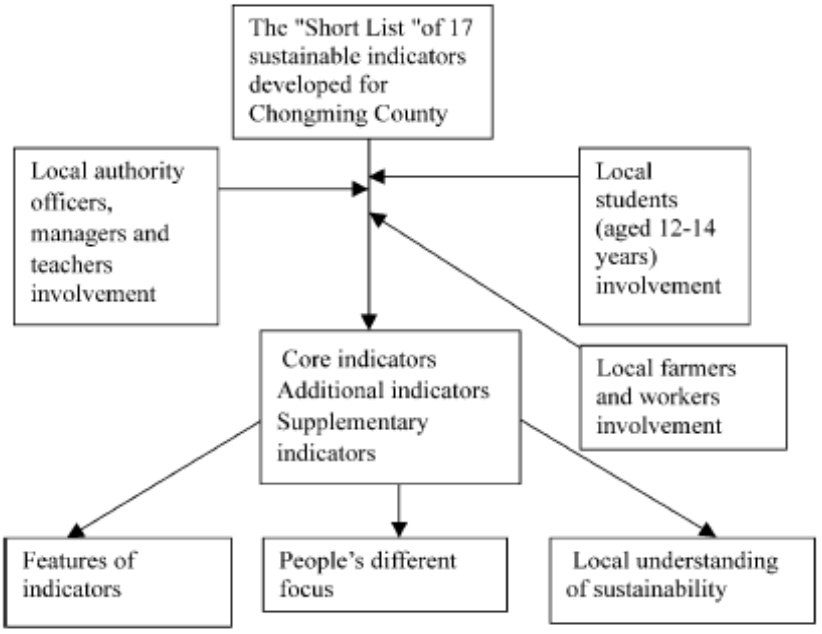
evaluation criteria and tested them with empirical research and re-evaluated them. Rennie and Singh (1996) developed a similar framework in which indicators were identified by researchers. Moreover, Reed and Dougill (2002) propose a participatory framework (Figure 2.4) for the identification, evaluation and selection of rangeland condition indicators. Within this framework the participation of stakeholders for the evaluation criteria is therefore essential to select appropriate indicators.



Source: (Reed and Dougill, 2002)

Figure 2.4. Conceptual framework for farmer-led indicator.

Yuana et al (2003), carried out a process (Figure 2.5) involving public participation in the implementation of sustainable indicators as an opportunity to introduce a "bottom-up" approach.



(Source: Yuana et al, 2003)

Figure 2.5: Refining process to develop Chongming community sustainable indicators.

In addition, there are a substantial number of participatory indicators frameworks which mainly developed within local Agenda 21 process aiming at define local sustainable development as an example, we introduce the framework developed by Bochum city (Germany). During the process stakeholders (work group, city representatives, administration, NGOs, associations etc) participated in order to achieve consensual approaches and activities for the context Bochum. After, the formulation of sustainability objective, stakeholders assigned indicators to these objectives.

2.3 Criteria for choosing sustainability indicators.

The OECD (1998) has argued that a successful indicator should:

- Reduce the number of measures required for actual presentation of a situation;
- Simplify the process communication to managers, stakeholders and communities.

The United Nations Commission on sustainable Development (CSD) has listed the following criteria for the selection of indicators:

- Primarily national in scale or scope;
- Relevant to the main objective of assessing progress towards sustainability;
- Understandable: clear, simple and unambiguous;
- Achievable within the available resources including time, money, technical capacity, logistics and given the existing constraints;

- Conceptually well founded;
- Limited in number, remaining open ended and adaptable to future developments;
- Representative of an international consensus, to the extent possible; and
- Dependent on the data, that are readily available or available at reasonable cost to benefit ratio, are adequately documented, of known quality and updated at regular intervals (UNDPCSD, 1995).

Barrera-Roldan and Saldivar-Vales (2002) introduced the following criteria for the selection of the core, main and relevant indicators:

- Availability and reliability of the source of information data;
- The most current statistical data;
- Representatives in the analysis of the three systems: natural, social and economic;
- A holistic approach that included qualitative and quantitative terms.

Spangenberg et al. (2002) developed a number of criteria to determine the quality of selected indicators:

- Independent, each indicator must be meaningful in itself;
- Indicative, it must be truly representative of the phenomenon it is intended to characterize;
- General, not dependent on specific situation;
- Robust, directionally safe with no significant changes in the methodology or improvements in the data base;
- Sensitive, to changes in what they are monitoring.

Gilbert and Feenstra (1995) list four desirable characteristics of indicators including:

- The indicator must be representative for the chosen system and have a scientific basis;
- The indicator must be quantifiable;
- The indicator should clearly represent part of the cause effect chain;
- Indicators should offer implications of policy.

According to Manoliad (2002), there is no universal set of indicators that is equally applicable in all cases. However, the following criteria are appropriate to most indicator selections. The indicator selection (World Bank, 1999) must be:

- closely linked to project objectives and the environmental
- problems being addressed;
- part of a small set aiming to an effective approach;
- defined clearly in order to avoid confusion in their development or interpretation;

- practical and realistic, and their cost of collection and development therefore needs to be considered;
- of high quality and reliability;
- in appropriate spatial and temporal scale.

2.4 Validation of indicators

In any case, the methodology, underlying the elaboration and development of indicators should fit scientific standards, which implies a procedure of validation (Bockstaller and Girardin. 2003). Some authors mention the necessity for indicators to be scientifically valid (Mitchel et al., 1995; Crabetree and Brouwer, 1999; Smith et al., 2000; Vos et al., 2000) but they do not propose a procedure for validation. An indicator will be validated if it is well founde scientifically designed, the information it supplies is relevant, if it is useful and used by the end users (Bockstaller and Girardin, 2003). The validation of indicator design is very important (Reus et al., 1999). Experts' judgments and consensus for the choice of indicators among a panel of experts plays a major role in this kind of validation (Mayer and Butler, 1993; Van der Werf and Zimmer, 1998; Hess et al., 1999; Smith et al., 2000). To validate the quality of indicator, a usefulness test should be undertaken to get the end users opinions about the effectiveness of the indicator as diagnosis or decision support tool (Bockstaller and Girardin. 2003).

2.5 Sustainable building and infrastructure indicators

2.5.1 The High Environmental Quality concept (HQE)

A working group of HQE Association was launched in April 2000, in order to create a French environmental framework for decision-makers and designers. This group has developed a set of indicators related to the environmental management of buildings. This framework is composed of two topics, the first one deals with the “Eco-construction" and "Eco-management" issues and it focuses on the reduction of outdoor environmental impacts. The second topic treats the “Comfort" and "Health" issues in order to improve the indoor environment.

2.5.2 Environmental indicators at OECD.

OECD countries and OECD have agreed to use the pressure-state-response (PSR) model as a common harmonised framework for environmental indicators. Sets of indicators have been identified based on their policy relevance, analytical soundness and measurability. In addition, these indicators

have been measured on a country by country basis. The purpose of the environmental indicators is stated as follows:

- to keep track of environmental progress,
- to ensure integration of environmental concerns into sectoral policies (e.g. transport, energy and agriculture),
- to ensure integration of environmental concerns into economic policies,
- to use indicators to measure environmental performance and to help determine whether countries are on track towards sustainable development.

2.5.3 The European Common Indicators (ECI)

ECI can be regarded as an institutional indicator framework with participatory elements. The concept aim to develop and test indicators reflecting local actions towards sustainability in order to measure progress on the way to sustainable development, The Indicators have been developed according to a bottom up approach since the very beginning of the project, involving local authorities as main actors in the process and improving synergies with existing indicators sets. In the context of sustainable management of existing structure on brownfield site, there are three indicators in relation with this issue 'sustainable land use', 'quality of local air' and 'Noise pollution'. However, the ECI doesn't deal with other important topics which are essential towards a sustainable management of existing buildings such as the use of renewable energy, recycling of materials, and preservation of industrial heritage etc. Therefore, the ECI are not suitable for the context of brownfield regeneration.

2.5.4. Sustainability Indicators at EEA

The European Environment Agency EEA uses the DPSIR framework (Driving forces, Pressure, State, Impact, and Response) in its reporting activities. The EEA Typology of indicators has been prepared by TNO centre for strategy. The latter produced a report called "Environmental indicators: Typology and overview". The purpose of this document is to help policy-makers to understand the meaning of the information in indicator and to define common standards for future indicator reports from the EEA and its member states.

EEA classifies the urban indicators according to 3 categories (Berrini, 1997):

i. Urban patterns indicators: population and population density; urban land cover (total area and total built-up area); derelict areas; urban renewal areas, urban mobility (modal split, commuting patterns, and traffic volumes).
ii. Urban flows indicators: water consumption and wastewater; energy consumption and production plans; materials and products; waste production, recycling and waste treatment and disposal.
iii. Urban environmental quality indicators: quality of air and water; acoustic quality, traffic safety, housing quality, accessibility of green space and quality of urban wildlife.

2.5.5. Green Building Challenge – environmental performance indicators for buildings

Green Building Challenge (GBC) is an on-going international process focusing on the development and testing of a new system of assessing the environmental performance of buildings (http://www.greenbuilding.ca). GBC is an international partnership of 14 countries the purposes of green building challenge process are:

- To advance the state-of-the-art in building environmental performance assessment methodologies.
- To maintain a watching brief on sustainability issues to ascertain their relevance to "green" building in general, and to the content and structuring of building environmental assessment methods in particular.
- Sponsor conferences that promote exchange between the building environmental research community and building practitioners and showcase the performance assessments of environmentally progressive building.

The indicators used in this process dealt with several aspects such as: transportation, resource consumption (net consumption of potable water, land, materials and delivered energy), direct environmental loading (solid waste, emission of greenhouse gases, etc), and indoor environmental quality, life cycle cost of buildings, functionality, pre-operation management, architectural quality and urban context.

2.6 Concluding remarks

Projects dealing with the elaboration of sustainable indicators for buildings and infrastructure are quite numerous. Moreover, Sustainability indicators have been formulated in different frameworks and by different organisations, so several selection criteria and validation of indicators have been carried out, However, most of sets indicators are focused on environmental issues, and few consider also social and economical issues. Moreover, few indicators describe issues related to brownfield regeneration. Therefore, it's important to establish suitable framework for indicators for the context of management of existing buildings and infrastructures in brownfield sites and based on integrated approach. The proposed indicator framework includes:

- Sustainable objectives and indicators related to sustainable management of existing buildings and infrastructure and reflecting and translating the sustainability definition for the context of brownfield regeneration with emphasis on the four dimensions of sustainability social, economic, environmental and institutional.

- Indicators which focus on regional characteristics. The regional level indicators should describe specific regional development and have to be elaborated for every region on its own.
- Indicators elaborated on the base of participatory approach in other word by participation of multi-disciplinary team (owners, planners, architects, investors, scientists, local authorities, experts, citizens, etc) in order to validate the design and the usefulness of the indicators.
- Indicators selected following the criteria below:
    a) Indicators must be measurable in qualitative or quantitative terms; indicators can be surveyed in a suitable frequency (with respect to fast availability, limited number, fungible costs for present and future enquiry);
    b) indicators are horizontally comparable (between regions or nations) and vertically compatible (nation– region – municipality) over a certain period;
    c) indicators cover the four sustainability dimensions (more or less balanced);
    d) indicators are relevant for planning and political decisions, i.e. they can be influenced by political decision makers or planners; they are suitable to serve as basis for political decisions;
    e) indicators describe trends and changes, they assess trends with regard to sustainability (time-series-data);
    f) indicators are generally comprehensible, logical, scientifically meaningful, specific, reliable, communicable, simple, valid, optimally inaccurate;
    g) indicators aggregate data to volumes that can be processed, neither too abstract nor too detailed;
    h) development, deduction, selection and weighting of indicators are transparent (as it is a normative process);
    i) indicators are precautionary, and not reactive (early warning function);
    j) indicators are relevant for brownfield regeneration.

2.7. Set of sustainability indicators in the context of brownfield regeneration

Our approach for developing sustainable objectives and indicators is based on the participatory framework (figure 2.6).14 partner institutions from France, Germany, Poland and UK were involved in the process of elaboration of these objectives and indicators. These partners represent a wide range of stakeholders' interests (owners, developers, investors, local authorities, researchers, Architects, etc) and competences (natural sciences, socials sciences, economy and laws) in brownfield regeneration.

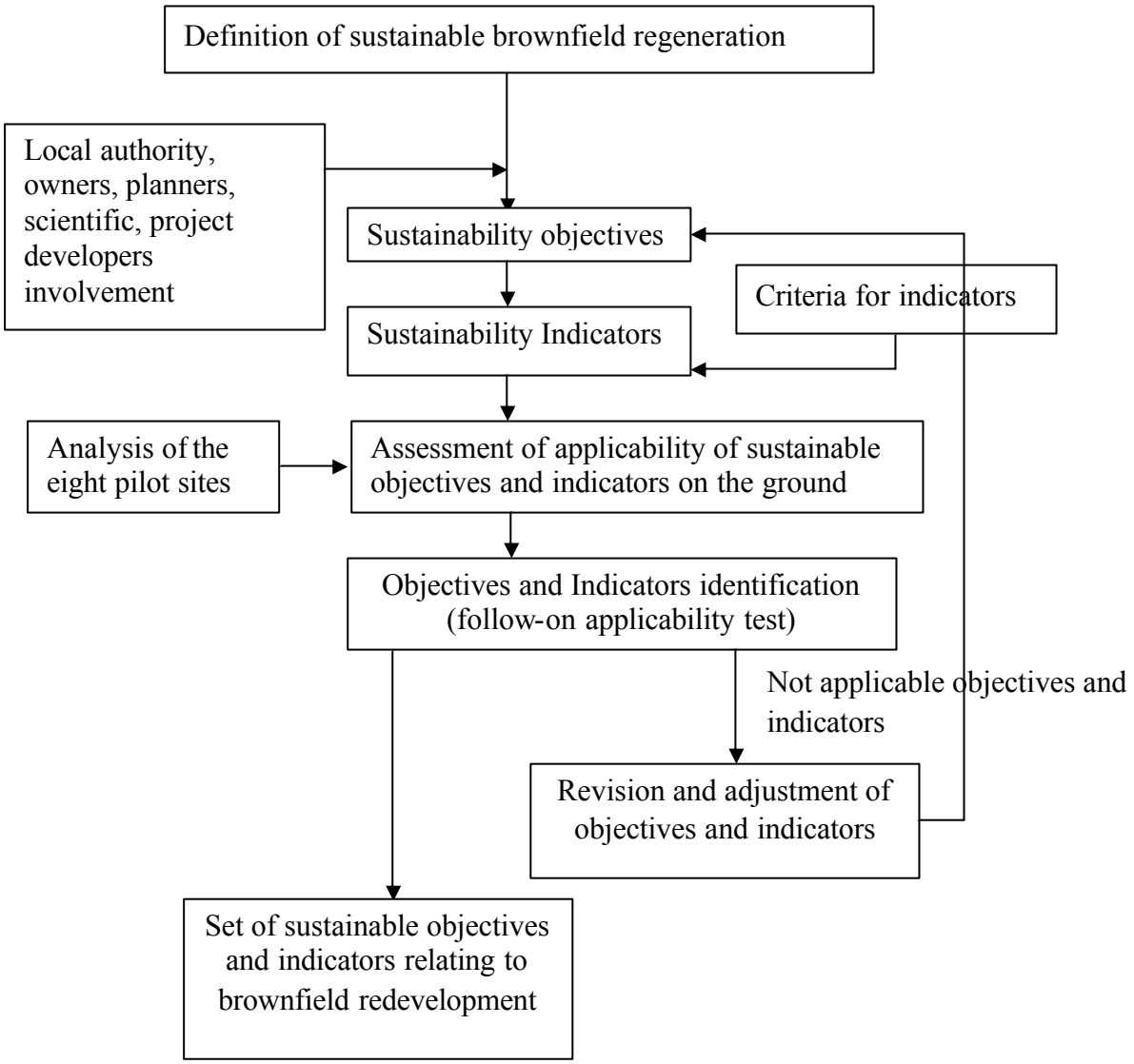


Figure 2.6 Conceptual framework for setting sustainable objectives and indicators.

This process reflects the well communication between representatives of theory and practice, and is the result of intensive discussion, so the suitability and the applicability of objectives and indicators are checked in the run of the eight case studies, and if it was deemed necessary, the indicators and objectives can be modified, but it's checked anyway on the fulfilling the list criteria. The result of our work on the sustainable objectives is introduced in Tables 2.1, 2&3.

The sustainable indicators for the management of existing buildings and infrastructures are presented in Table 2.4.

N°	Sustainability objectives	Topic
1	To reduce negative environmental impacts on the site and on the neighbourhood including human health risks	Management of Contamination and Reuse of Soil and Debris
2	To minimise waste and maximise recycling and reuse of soil and debris	
3	To ensure cost-effectiveness and technical feasibility of the management of risk from contamination and the reuse of soil and debris.	
4	To improve social acceptance through identification and engagement of all stakeholders	
5	To retain buildings and infrastructures on brownfield sites	Management of Existing Buildings and Infrastructures
6	To reuse existing buildings and infrastructures, or components thereof, on brownfield sites.	
7	To recycle materials of existing buildings and infrastructures on brownfield sites	
8	To minimise energy demand and produce renewable energy on the site	
9	To minimise water demand and reduce waste water production	

Table 2.1 sustainable objectives for brownfield redevelopment (RESCUE, 2002)

N°	Sustainability objectives	Topic
1	To promote land use functions that match socio-economic demands and needs.	Sustainable Land Use and Urban Design on Brownfield Sites
2	To integrate the reuse of brownfield sites into regional land management	
3	To integrate the reuse of brownfield sites into urban development	
4	To achieve benefits for and prevent adverse impacts on the local neighbourhood	
5	To generate and safeguard employment and economic development.	
6	To promote land use functions that suit the natural and man-made environment of the site and its neighbourhood.	
7	To save resources	
8	To increase the possibility of the public traversing former brownfield sites.	
9	To provide adequate access.	
10	To achieve high urban design quality.	
11	To create and maintain flexibility and flexible urban design.	

Table 2.2 Sustainable objectives for brownfield redevelopment (RESCUE, 2002)

N°	Sustainability objectives	Topic
1	To obtain better quality information.	Sustainable Planning Processes and Methods for Citizen Participation
2	To improve information flow and use within the decision-making process	
3	To deliver a fair discussion and conflict resolution process.	
4	To increase the legitimacy of the decision-making process	
5	To improve the efficiency of the process in terms of duration and cost.	
6	To empower citizens, especially those representing non-organised interests.	
7	To delegate responsibility to lower decision levels and to stimulate a sense of ownership	
8	To adopt an interdisciplinary project team approach	Management of Brownfield Projects
9	To facilitate efficient project delivery	
10	To promote and manage stakeholder participation	
11	To provide a framework for transparency in decisions, flow of information and improved communication structures.	
12	To protect human health and safety and the environment during site operations.	
13	To adopt an approach that integrates social, economic and environmental aspects.	

Table 2.3 Sustainable objectives for brownfield redevelopment (RESCUE, 2002)

Sustainable objectives	*Sustainable indicators*		*Kind of indicator*
1. Retain buildings and infrastructures on brownfield sites	1	Conservation of industrial monuments	Quantitative
2. Reuse existing buildings and infrastructures, or components thereof, on brownfield sites.	2	Innovative Solutions to comply with health and safety regulations	Quantitative
	3	Guideline use	Quantitative
	4	Studies realised	Quantitative
	5	Financing and taxation approaches	Quantitative
3. Recycle materials of existing buildings and infrastructures on brownfield sites	6	Building material recycling and reuse	Qualitative
	7	Building material recycling and reuse on site	Quantitative
4. Minimise energy demand and produce renewable energy on the site	8	To minimise energy demand and to produce renewable energy on the site	Quantitative
	9	energy efficiency optimisation possibilities	Quantitative
	10	Renewable Energy production	Qualitative
5. Minimise water demand and reduce waste water production	11	Potable water reduction facilities	Qualitative
	12	Non-purified waste water runoff	Qualitative
	13	Rainwater separation	Qualitative

Table 2.4 Sustainable objectives and indicators for the rehabilitation of existing buildings and infrastructures

General observation regarding the sustainable objective developed above can be mentioned:

- All the issues relative to the brownfield redevelopment have been formulated between 5 and 11 sustainability objectives, with a total of 33 objectives. E.g. the rehabilitation of the existing buildings and infrastructures includes five objectives.
- The objectives of each brownfield redevelopment issue cover the four dimensions of sustainable development. We have 17 environmental objectives, 22 economic objectives and 28 social objectives and 16 institutional objectives.
- All the different issues have been formulated by multi-dimensional objectives or/and uni-dimensional objectives. E.g. The rehabilitation of the existing buildings and infrastructures has been represented by multi-dimensional objectives. The objective 5 "minimise water demand and reduce waste water production' includes environmental, economical and social dimensions.
- The distribution of objectives can be regarded as very satisfying result, because there are no dominances but a varied and balanced pattern.

Details on the sustainable objectives and indicators regarding the sustainable rehabilitation of existing buildings and infrastructure on the brownfield sites are developed in the following sections.

2. 8. Sustainable rehabilitation of existing buildings and infrastructures: objectives and indicators

Following the process above for the developing of objectives and indicators, we introduce the final objectives and indicators set relating to the sustainable rehabilitation of existing structures on brownfield sites:

2.8.1. Objective 1: Retain buildings and infrastructures on brownfield sites

One of the least known forms of patrimony in our country is probably our industrial heritage, because its value is not based on its artistic importance, but rather on its value as a witness of an industrial process which has changed society (Arwel Edwards, 1996).

The need for promoting preservation, conservation of the industrial heritage has been illustrated by the action of Council of Europe (the Committee of Ministers) which recommends member States on the protection and conservation of the industrial, technical and civil engineering heritage in Europe. The legal base for that recommendation is formed by following conventions:

1) The European Cultural Convention signed in Paris on 19 December 1954 and, in particular, to Articles 1 and 5;
2) The ICOMOS 'Venice Charter for the Conservation and Restoration of Monuments and Sites', 1964; (ICOMOS is an international non-governmental organization of professionals, dedicated to the conservation of the world's historic monuments and sites.)
3) the Convention for the Protection of the Architectural Heritage of Europe, opened for signature at Granada on 3 October 1985; and, in particular, the resolution No. 2 on the promotion of the architectural heritage in socio-cultural life and as a factor in the quality of life;
4) European Convention on the Protection of the Archaeological Heritage (Revised), Valetta, 16.I.1992

The Recommendation No. r (90) 20 of The Committee of Ministers oblige Member State to systematically identify industrial heritage by:

a) establishing or continuing detailed surveys which take into account the multidisciplinary character of this heritage and can be used for protection and enhancement policies;

b) Identifying significant sites and places, particularly those whose geographical situation makes access difficult (small hydraulic works, small dams, disused mines ...) and which are harder to protect;

c) Promoting programmes of study and research on the technical, industrial and civil engineering heritage by:

- public bodies responsible for the management of the heritage,
- university and scientific research institutions, as well as in professional circles,
- the industrial and commercial companies concerned, whilst fostering sponsorship by firms to that end,
- associations, organisations and private associations engaged in the defence and promotion of this heritage;

d) a better use of human resources by, in particular, calling on early retired or retired professionals in the context of the enterprise or outside, not only with a view to analysing and protecting archives but also to techniques, know-how and the operation of tools, machines and installations.

Recommendation stressed out, that the technical, industrial and civil engineering heritage constitutes an integral part of the historic heritage of Europe.

This issue becomes also important - The International Committee for the Conservation of the Industrial Heritage (TICCIH - adviser to ICOMOS on industrial heritage) has been created as platform for cooperation of historians, conservators, museum curators, researchers, students, teachers, heritage professionals and anyone with an interest in the development of industry and industrial society. On of

the Congress of TICCIH hold in Moscow, Russia in July, 2003 the document The Moscow Charter for the Industrial Heritage has been formulated. The Moscow Charter gives good foundation for politicians and law makers for implementation industrial heritage world widely. The Charter works will be presented to ICOMOS for ratification and for eventual approval by UNESCO.

The Moscow Charter formulated basic definition concerning semiotic and cultural identity related to industrial heritage:

Industrial heritage consists of the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for social activities related to industry such as housing, religious worship or education.

The Moscow Charter goes further then only preservation of historical value of industrial building, which is common view of Monument Protection Legislation in European Country (usually they set year as time caesura for enlisting building as monument) and gives mandate for preserving the building with particular merit dated later while society recognize it.

So, in the sustainable process of brownfield regeneration the preservation of industrial heritage has to be considered. Indeed, The preservation and the continual use of the existing buildings and infrastructure considered as industrial heritage may produce additional benefits for the Community over and above those which more modern buildings provide. Furthermore, Garrod et al, (1996) pointed out that, the preservation and the continued use of historic buildings may produce additional benefits for the community over and above those which more modern buildings provide. These additional benefits arise from

- Their historical and architectural importance
- Their role in the development and preservation of a sense of identity for local community and in the improvement of the site image.
- Their role in encouraging tourism and investment.

2.8.1.1. Sustainable indicator

1	**Indicator number**	**1**
2	**Name of the Indicator**	**Conservation of industrial monuments**
3	**Objective**	**regard buildings and infrastructures as a resource**
4	**Definition**	1. Percentage of historically valuable buildings preserved and accessible for the public compared to all historically valuable buildings. 2. Percentage of historically valuable buildings reused and accessible for the public compared to all historically valuable buildings. 3. Percentage of historically valuable buildings classified as protected monuments and accessible for the public compared to all historically valuable buildings. 4. Percentage of buildings classified as protected monument and reused and accessible for the public compared to all historically valuable buildings.
5	**Justification**	The "technical / industrial culture" is a part of historical heritage. Specific architectural forms of industrial buildings define the local/ regional identity and form the typical landscape. Existing industrial buildings allow to allocate new economic activities and functions Within a "historical framework".
6	**Unit**	Set of 4 Numbers

2.8.2. Objective 2: Reuse existing buildings and infrastructures, or components on brownfield sites.

The presence of existing buildings and infrastructure at most brownfield sites constitutes an important advantage regarding greenfield sites. Most of these sites have useful buildings and infrastructures: existing roads, lines for water sewers, and electric power. The presence of such structures can save development costs and create continuity between the industrial past of the site and the present; so it preserves the local identity of the community.

According to the European Council of Town Planners (ECTP), urban regeneration should have regard to the rehabilitation of existing structures, redevelopment of existing buildings and sites, or the re-use of urban land; it often concerns derelict or contaminated land. The ECTP has established several objectives concerning the reuse of existing structures in urban area: mainly:

- The Renovation and re-use of existing buildings and urban structures
- The Integration of existing elements into urban fabric,

- To take care of existing historical elements when planning new functions and try to maintain old buildings.
- Create a relation between new expansion and existing urban structures, thus fostering continuity.
- Maintain or re-use existing pavements (stones, cobbles, slabs, etc.) especially for squares and pedestrian streets.

Tim Heath (2001) mentioned that this adaptive re-use of obsolete buildings is helping to revitalise cities and to make them more sustainable containers for life in the twenty-first century.

2.8.2.1 Sustainable indicators

1	**Indicator number**	**2**
2	**Name of the Indicator**	**Innovative Solutions to comply with health and safety regulations**
3	**Objective**	**Reuse of existing building and infrastructure**
4	**Definition**	"Innovatively Index": Number of (known = remarkable) innovative solutions which help to comply with regulations
5	**Justification**	Regulations, especially those concerning health and safety, may be an important obstacle for the re-use of existing buildings and infrastructure. To find new solutions to deal with these regulations is an important advantage for sustainable redevelopment.
6	**Unit**	Number of known solutions

1	**Indicator number**	**3**
2	**Name of the Indicator**	**Guideline use**
3	**Objective**	**Reuse of existing building and infrastructure**
4	**Definition**	Number of guidelines considered or developed concerning saving resources (energy, water, materials etc) or treatment of existing buildings.
5	**Justification**	The use of guidelines often help to find better and more sustainable solutions
6	**Unit**	Yes/ No, according to the following checklist: Number of guidelines used in treating: ▪ Energy efficiency ▪ Water consumption ▪ Reuse of building and infrastructure debris, ▪ Reuse of existing buildings ▪ Waste water management,

		▪ Economically viability, ▪ Innovative solutions of buildings renovation / reuse

1	Indicator number	**4**
2	Name of the Indicator	Studies realised
3	Objective	Reuse of existing building and infrastructure
4	Definition	Studies (e.g. feasibility studies) realised in order to optimise sustainable reuse of existing buildings and infrastructures
5	Justification	The use of guidelines often help to find better and more sustainable solutions
6	Unit	Yes/ No, according to the following checklist:
7	Checklist	Number of guidelines used in treating: ▪ Energy efficiency ▪ Water consumption ▪ Reuse of building and infrastructure debris, ▪ Reuse of existing buildings ▪ Waste water management, ▪ Economically viability, ▪ Innovative solutions of buildings renovation / reuse

1	Indicator number	**5**
2	Name of the Indicator	Financing and taxation approaches
3	Objective	Reuse of existing building and infrastructure
4	Definition	Use of sophisticated financing or taxation approaches(e.g. contracting) in order to improve resources saving or building reuse
5	Justification	The use sophisticated financing or taxation approaches can considerably help to foster measures for sustainable redevelopment; in addition, it makes economically viable the reuse or dismantling of buildings and infrastructure respecting regional public demands.
6	Unit	checklist
7	Checklist	▪ Unknown ▪ Mentioned, ▪ Possibilities assessed, ▪ Developed, ▪ Made public ▪ applied

2.8.3. Objective 3: recycle of materials of existing buildings and infrastructures on brownfield sites

Achieving ecological or environmental sustainability is closely linked to the manner in which we deal with the waste products of the society (Anders Klang et al, 2002). A study, of the World Resource Institute of materials flows in a number of industrialised countries, showed that one half to three quarters of the annual material input to these societies was returned to the environment as waste within a year (Hutter,2000). As respond to this issue, waste minimisation and effective and sustainable waste management are basic principles of the European Environmental Legislation and Strategy. Construction and demolition waste (C&D) waste according to the EU waste strategy is considered as one of the 'propriety' waste streams (Fatta et al, 2003). According to the Sixth Environment Action Program entitled 'Environment 2010: Our future, our choice', recommendation actions need to be taken with respect to the stream of the C&D waste, (EC, 2001).

Minimising waste generation is required by sustainable principles and justified by the economy. Increasing land prices and the reduced availability of suitable disposal options on the site make waste generated from buildings costly and difficult to eliminate. Minimisation of waste by using recycling techniques should reduce the costs in the redevelopment process.

Sustainable waste management on the site should include reduction of waste production, use waste as a resource and thus avoid the hazards to the environment and human health.

Moreover, Fatta et al (2003) suggest that the management of C&D waste must take into account and be in line with the following principals:

- Sustainability and viability,
- Waste prevention and minimization,
- Polluter pays principles,
- Producer's responsibility,
- Energy and raw materials conservation,
- Protection of natural resources,
- Minimization of the hazardous characteristics of waste,
- Minimisation of the waste quantities stored temporarily,
- Increase of the quantities being reused, recycled and recovered,
- Promotion of environmental investments,
- Safe final disposal,
- Launch of awareness campaigns and educational programs.

C&D waste could be used as covering materials in landfills after removal of the dangerous substances. In addition, it could be used in road construction, in parking, lot construction, as embankments, etc (EC, 2000).

2.8.3.1. Sustainable Indicators

1	**Indicator number**	**6**
2	**Name of the Indicator**	Building material recycling and reuse
3	**Objective**	Recycle as much as possible
4	**Definition**	Volume of materials from existing buildings and infrastructure which were or can be recycled compared to the debris volume of all existing buildings and infrastructure which was or will be demolished during the regeneration process.
5	**Justification**	The recycling or reuse of materials from existing buildings and infrastructure can considerably improve the sustainability of a regeneration project.
6	**Unit**	Volume ratio (%)

1	**Indicator number**	**7**
2	**Name of the Indicator**	Building material recycling and reuse on site
3	**Objective**	Recycle as much as possible
4	**Definition**	Volume of materials from existing buildings and infrastructure which were or can be recycled on site compared to the debris volume of all existing buildings and infrastructure which was or will be demolished during the regeneration process.
5	**Justification**	The recycling or reuse of materials from existing buildings and infrastructure can considerably improve the sustainability of a regeneration project. By treating these materials on site costs and environmental effects can be reduced considerably.
6	**Unit**	Volume ratio (%)

2.8.4. Objective 4: minimise energy demand and produce renewable energy on the site

The rational use of energy becomes a keyword for the world sustainable development both in developed and developing countries (Marechal et al,2005).Nowadays, there is an open discussion concerning how to improve energy performance in restored old dismissed buildings of industrial archaeology and which could be the best choices for their sustainable re-use (Ballestinia et al, 2005).

Building practices in the past have not properly addressed the current concerns about the optimum use of energy in buildings or the minimization of the environmental effects. Moreover, Existing buildings are often energy costly to operate (Constantinos et al, 2005).

In most of the building codes in each European country, there are legislations on requirement concerning energy aspects of building. Recently the European Commission issued Directive 2002/91/EC of the European Parliament and of the council of 16 December 2002 on the energy performance of buildings which gives common background on energy usage within building sector. Member States are obliged to transpose this directive into national legislation at the latest on 4 January 2006.

The main provisions of the directive are as follows:

- To establish general framework for methodology of calculation of integrated performance of buildings.
- To set of minimum requirements for energy performance of new building
- To set of minimum requirements on the energy performance of large existing building that are subject to mayor renovation.
- To introduce energy certification of buildings
- To introduce regular inspection of boilers and of air-conditioning systems in buildings, and in addition assessment the heating while boilers are older the 15 years.

Directive allows Member States not to apply set requirements while buildings are officially protected as monument or because their special architectural or historic merit or complying with the requirements would unacceptably alter their character or appearance.

2.8.4.1. Sustainable indicators

1	**Indicator number**	**8**
2	Name of the Indicator	Energy Consumption Standard
3	Objective	To minimise energy demand and to produce renewable energy on the site
4	Definition	Do the re-usable existing buildings fulfil national / regional energy Standards which would be applied to new buildings?
5	Justification	The energy demand by the re-used existing buildings is one of the most important indicators to determine the influence on air and climate. This parameter indicates the usage of natural resources as well as the indirect impact on environment.
6	Unit	checklist
7	Checklist	o windows o roof o cellar, ceilings o windows and doors o outside walls o heating / cooling system o total specific thermal energy consumption

1	**Indicator number**	**9**
2	**Name of the Indicator**	energy efficiency optimisation possibilities
3	**Objective**	**To minimise energy demand and to produce renewable energy on the site**
4	**Definition**	How far can the energy efficiency of re-usable existing buildings be improved in order to reach national standards for new buildings?
5	**Justification**	The energy demand by the re-used existing buildings is one of the most important indicators to determine the influence on air and climate. This parameter indicates the usage of natural resources as well as the indirect impact on environment.
6	**Unit**	Yes / No, according to the checklist
7	**Checklist**	▪ windows and outline direction suitable to take advantage of solar energy ▪ roof insulation ▪ insulation of windows and doors ▪ insulation of outside walls ▪ suitable to use or install with little effort a low temperature heating ▪ suitable to use or install with little effort artificial ventilation ▪ Suitable to use or install electricity saving applications (lighting, cooling etc.) ▪ suitable to use gas for heating and cooking ▪ suitable to use or install with little effort systems in order to produce renewable energy

1	**Indicator number**	**10**
2	**Name of the Indicator**	Renewable Energy production
3	**Objective**	To minimise energy demand and to produce renewable energy on the site
4	**Definition**	Percentage of Renewable Energy produced at re-used buildings and infrastructure: Ratio *KWh ren/ KWh total* per year (in %)
5	**Justification**	Reducing demand for non-renewable sources of energy improves sustainability of the reuse of building. This indicator monitors if energy demand is minimised and if non-renewable energy sources are replaced by renewable ones.
6	**Unit**	Ratio: Energy produced at re-used facilities / total energy use on site (%)
7	**Ideal indicator**	Ideal indicator only - although data availability no problem.

2.8.5. Objective 5: Minimise water demand and reduce waste water production

The concept of water being a never-ending resource with a limitless renewable capacity belongs to the past (Beekman, 1998).Thus, for a sustainable urban future, society must move towards the goal of efficient and appropriate water use. Reuse of domestic grey water and rainwater has a significant role to play in this task (Dixon et al, 1999). That's why a minimizing water demand and reducing of waste water production are considered as a one of the major issues in brownfield regeneration, Hence, the necessity of Water Demand Management (WDM). The latter refers to any socially beneficial action that reduces average or peak water withdrawals or consumption form either surface or ground water, consistent with the protection or enhancement of water quality (Tate, 2000).

According to Rothert and Macy (2000), water demand management is the adaptation and implementation of a strategy by a water institution to influence the water demand and usage in order to meet any of the following objectives: economic efficiency, social development, social equity, and environmental protection, sustainability of water supply and services and political acceptability. Furthermore, Mwendera et al. (2003), pointed out that, water demand management should integrate an effective equitable water charges; an effective credit control; reducing water leakage losses; reducing other causes of unaccounted-for water; preventing unacceptable water degradation; preventing, the excessive exploitation of any water resource to the detriment of any aquatic ecosystems; and promoting equitable distribution, and that at a more advanced level. They also mentioned that sustainability also includes all the water demand management factors that ensure that a water scheme continues to deliver indefinitely all the appropriate benefits for which it was built, and even additional ones. The advantages of water demand management are (Mwendera et al. 2003):

- it strengthens water services institution's financially,
- it reduces the cost of supplying water,
- it reduces total water demand by curtailing wastage and non-efficient use, and
- Through each of the above actions, it helps to achieve the sustainable and optimal use of water resources.

In Europe, a common strategy was implemented to protect and improve the quality of all water resources such as rivers, lakes, groundwater, transitional and coastal water within the European Union. This strategy is defined in The Water Framework Directive (WFD) (December, 2000). Member States must incorporate the WFD into national law by the end of 2003. Some of the elements of the new and innovative approach to managing Europe's water resources in the WFD are:

- ambitious objectives and clear deadlines,
- the introduction of River Basin Management on a Europe-wide scale,
- the requirement for cross border co-operation in water management between countries and all involved parties,
- pollution prevention and control on the basis of the so called "combined approach"
- greater public participation in water management, and
- Economic analysis of water use.

2.8.5.1. Sustainable indicators.

1	**Indicator number**	**11**
2	**Name of the Indicator**	Potable water reduction facilities
3	**Objective**	To minimise water demand and reduce waste water production
4	**Definition**	Existence of facilities in re-used existing buildings and infrastructure To reduce potable water consumption, e. g. by using rainwater or water saving installations.
5	**Justification**	To save drinking water is very important in many regions of Europe. This parameter indicates desirable waste water management practice.
6	**Unit**	Checklist
7	**Ideal indicator**	Quantity (m3) of water that can be saved, can e. g. be estimated From rainwater collection area. Reason: Present water reduction 0 m³ in all facilities, but possible reduction difficult to assess
8	**Checklist**	o not possible o possible with big effort o possible with little effort o planned o realised

1	**Indicator number**	**12**
2	**Name of the Indicator**	Non-purified waste water runoff
3	**Objective**	To minimise water demand and reduce waste water production
4	**Definition**	Existence of a runoff of non-purified waste water from the site (neither treated on site nor off site), for example due to leakages.
5	**Justification**	The runoff of sewage and liquid waste from re-used existing buildings and infrastructure is an important indicator for the influence on water contamination. It may determine the reusability of existing facilities.
6	**Unit**	Checklist
8	**Checklist**	Runoff from existing water facilities is proven to be o no problem o probably no problem o probably a problem o contamination by existing water facilities is a known problem

1	**Indicator number**	**13**
2	**Name of the Indicator**	Rainwater separation
3	**Objective**	To minimise water demand and reduce waste water production
4	**Definition**	Existence of a separated management of rainwater and waste water
5	**Justification**	A separated management of rainwater which percolates slowly into the groundwater helps to reduce the amount of water to be treated in Purification plants, to reduce efforts for the sewage water system and to reduce flooding problems due to rainwater peaks.
6	**Unit**	Checklist
8	**Checklist**	▪ not possible ▪ possible with big effort ▪ possible with little effort ▪ planned ▪ realised

2.9. Demolish and / or rehabilitate the existing buildings and infrastructure in brownfield sites

The question that should be answered regarding the existing buildings and infrastructures in brownfield sites is: what's the best scenario for the rehabilitation of these exiting structures?

Several answers can be proposed to this issue:

- Demolish all the existing structures,

- Retain all the existing buildings and structures,
- Demolish and retain: but what should be demolished? And what should be retained?

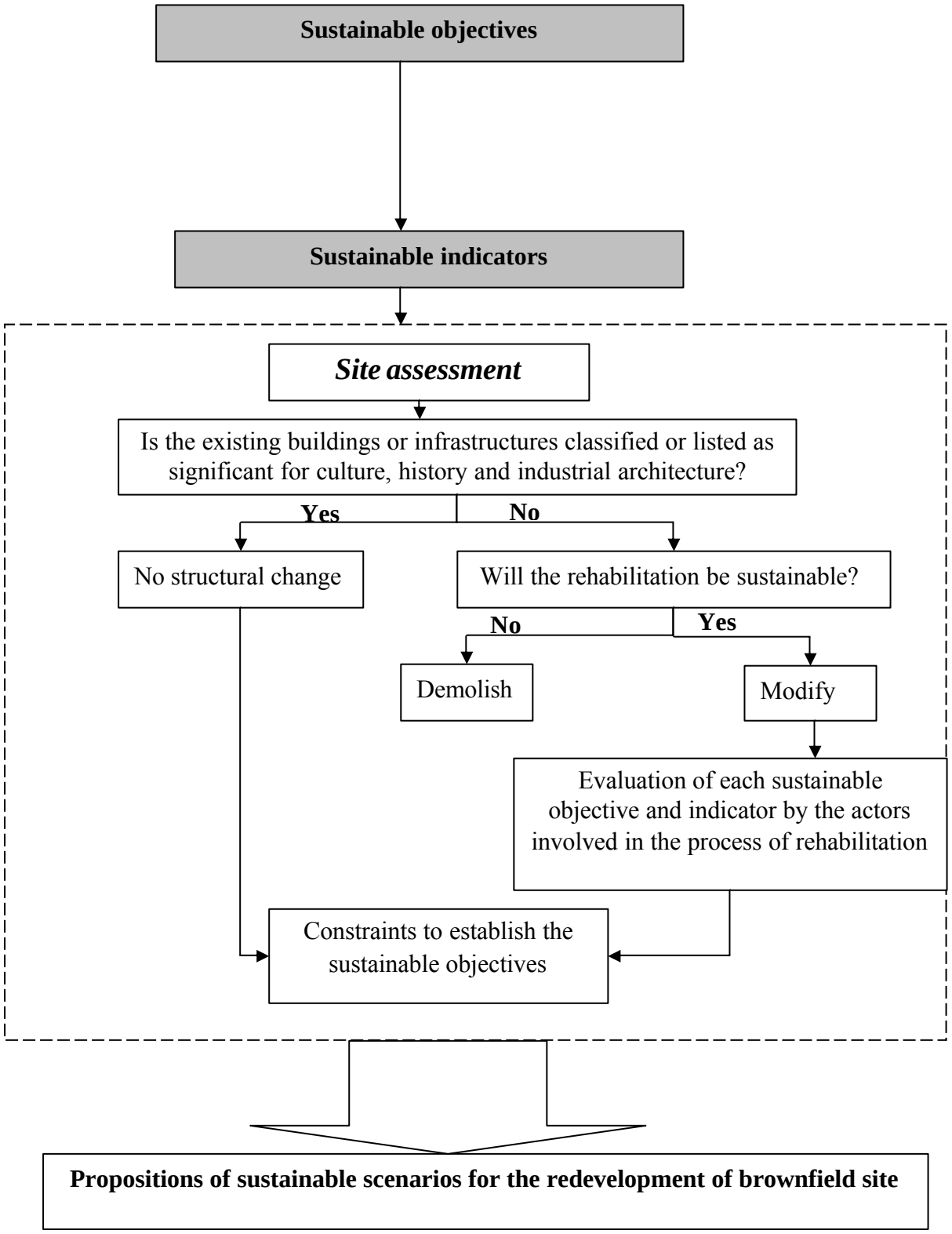


Figure2.7: Demolish or/and rehabilitate the existing buildings.

Referring to our work, the sustainable way to regenerate these existing structures can be showed in the Figure 2.7.

We notice that this process deals with the four dimensions of sustainability; the environmental, social, economic and the intuitional ones. Decision to keep or/and to demolish should be based on:

- The balance between the four dimensions of sustainability,
- The degree of actors' interest: the relative important of sustainability objectives varies from site to site, time to time and also between the actor's views. Therefore and in order to cope with the relative importance of the objectives has to be defined for each individual brownfield projects- the relevant actors have to set priorities on aspects of sustainability.
- Constraints: on the base of the priorities set by actors, we look for constraints that prevent the achievement of these sustainable objectives. These constraints can be: technical(health and safety issues, etc), financial (funding application), and institutional (classified or listed buildings, urban constraint, etc…),

The general aim of this process is to optimise the project impacts on the combined four dimensions. Finally, the chosen proposition for the rehabilitation of the brownfield site has to respond to the question 'How to minimise negative impacts and to optimise positive impacts?' This will be occurred via negotiation among the actors in the brownfield regeneration project.

2.10. Conclusion

Due to the fact that existing frameworks are not applicable to brownfield regeneration projects or rather hardly concern issues in the field of brownfield redevelopment, the participatory approach involving relevant actors (owners, developers, researchers, local authorities, etc) has been applied to elaborate the sustainable objectives and indicators to deal with the redevelopment of brownfield site. These objectives and indicators cover without dominance the four dimensions of the sustainable development. A 61 indicators have been elaborated, including qualitative as well quantitative indicators, some of them with a checklist, other simply with yes/or no questions.

Regarding, the rehabilitation of existing buildings and infrastructures, 13 indicators have been developed. These indicators serve to help decision makers to decide to keep or demolish old structures. Therefore, propose the best scenario in term of sustainability for the rehabilitation of brownfield site. In the following chapter, the proposed list of indicators will be checked and evaluated to see its significance for measuring sustainable development in brownfield regeneration using the SWG-analysis (Strengths-Weakness-Gaps. This means that objectives and indicators may still be subject to changes.

Chapter 3: Application of sustainable approach on European brownfield

Abstract

Existing buildings and infrastructures in brownfield sites are rehabilitated and managed differently. Many industrial heritage buildings are in danger of disappearance if relevant measures and approaches are not elaborated to ensure continuity of their traditional characters and preservation of their culture heritage. This chapter proposes a method - based on the SWG analysis- for checking the applicability of the sustainable objectives and indicators and assessing the sustainable approach developed in chapter two. In order to illustrate the implications of the proposed methodology, to check its validity and to see how it works, this chapter uses several case studies in Europe.

3.1 Introduction

This chapter presents the application of the sustainable approach of brownfield regeneration presented in chapter two on pilot sites in order to assess and evaluate the sustainable objectives and indicators and to check their practicability. The practice of brownfield regeneration has been analysed on eight pilot sites in six core industrial regions within France, Germany, Poland and United Kingdom. Our analysis is based on SWG-analysis (Strengths-Weakness-Gaps) which introduces and uses as a framework for analyzing the sites to identify the best practice in term of sustainability. External examples have been added and assessed in this study to overcome the missing sustainable aspects in the eight cases analysed.

The two French sites are analysed deeply concerning the rehabilitation of existing buildings and infrastructures. A number of recommendations are proposed for sustainable management of existing buildings and infrastructures in brownfield.

3.2 The Strengths-Weaknesses-Gaps Analysis (SWG-analysis)

The SWG-analysis is the derivative of Strengths-Weaknesses-opportunities-threats analysis (SWOT analysis). The only difference between them is the conversion of opportunities and threats into gaps. SWOT (the acronym standing for Strengths, Weaknesses, Opportunities and Threats analysis is a commonly used tool for analyzing internal and external environments in order to attain a systematic approach and support for a decision situation (Kurttila et al.,2000). The SWOT analysis has its origins in 1960s (Learned et al., 1969). It aims to identify the strengths and weaknesses of organisation and the opportunities and the threats in the environment. Having identified these factors strategies are developed which may build on the strengths, eliminate the weaknesses, exploit the opportunities or counter the threats (Dyson, 2004). Moreover, the SWOT approach seeks to address the question of

strategy formation from two-fold perspective: from an external appraisal (of threats and opportunities in an environment) and from an internal appraisal (of strengths and weaknesses in an organisation) The distinction between internal and external conditions is more difficult to apply when assessing the potential part of the physical world such as the city district, or a historic urban quarter (Doratli et al, 2004). It is essential to note that the internal factors are within the control of organisation, such as operations, finance, marketing, and in other areas. On the contrary, the external factors are out of organisation's control, such as political and economic factors, technology, competition, and in other areas (Lee and Lo., 2003).

Doratli et al, (2004) pointed out that the SWOT analysis method should be applied to the area for conservation purposes. This purpose represents an objective in the rehabilitation of existing building and infrastructures in brownfield sites. If used correctly, SWOT can provide a good basis for successful strategy formulation (Kurttila et al., 2000). When used in matrix form SWOT analysis is a powerful tool for identifying the proprieties and potential of an urban area (Cuesta et al., 1999). If the examination of the data is structured as shown in table 3.1, the strengths and weaknesses of a number of the main aspects of life in a study area can be addressed and analysed (Doratli et al., 2004).

Strengths	Opportunities
Weaknesses	Threats

Table 3.1.SWOT matrix (Doratli et al., 2004).

The use of a matrix aids the analysis. The result of that analysis will be a statement summarizing the site's potential to achieve sustainable revitalization, identification those interventions or actions necessary to arrive at such an outcome (Doratli et al., 2004).

3.3 Methodology

The sustainability objectives presented in chapter two serve as the assessment framework for this investigation (figure 3.1). They operate and specify the definition of sustainable regeneration of brownfield and are therefore the standard whereof the data have to be checked. Moreover, this method guarantees a structured and purposeful approach, assessing all case studies against the yardstick which has been elaborated in this work.

There are two categories per objective, containing the case studies with the identified KEY strengths and KEY weaknesses, i.e. the best and the worst practices and a short explanation in relation to the practicability of the objective. The strengths identified in the case studies should then be analysed in more detail in terms of completeness and transferability to other European countries.

If necessary, there is additionally a third category, including the 'gaps'. If no good or best practices for some topics (objectives) can be identified within the case studies, these 'gaps' must be clearly denoted and filled up by the know-how of an additional literature review. Additionally, 'gaps' might also refer to instruments regarded as necessary to implement the objective but which are currently missing.

The indicators, operating the objectives, served as a first easy clue to assess the case studies. But generally it is intended to regard the objectives as the assessment standard. Therefore we mentioned strengths, weaknesses and gaps, which relate to the concrete information asked by the indicators as well to the more general objectives.

It is important to say, that this classification into key strengths and weaknesses do not pursue the target of a ranking of our case studies. This assessment was made on the basis of the limited knowledge of the eight case studies.

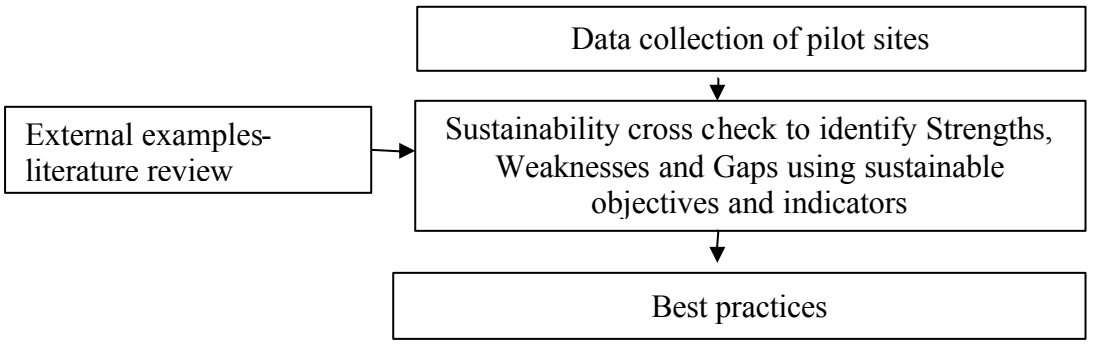


Figure 3.1 Assessment process of sustainable objectives

3.4 Selection criteria for Pilot Sites

The selection criteria for pilot sites are (RESCUE, 2002):

a) From each participating country two sites have to be selected.

b) The chosen sites have to represent the interests of many aspects and especially building and infrastructures in the site.

c) The projects are providing lessons in terms of approaches focusing on sustainability and participation for the current practice in brownfield development and may be shown to have generated sustainable outcomes.

d) The selected sites have to be comparable (e.g. in terms of the previous land use (heavy industries); size (large industrial sites); etc.).

e) Data has to be available, at reasonable costs and time.

f) The selected sites should have had a significant social influence in their previous use.

g) The existence of sustainable approaches, and exemplary features for the recognition of sustainability concepts in brownfield redevelopment.

h) Soil and debris: The needs of exemplary features for the re-use of waste construction in brownfield redevelopment.

i) The needs of the existence of buildings and infrastructure on the site and exemplary features for the maintenance of existing buildings in brownfield redevelopment.

j) The site needs to be integrated in an urban context with different uses (industry, housing, recreation), and needs to provide perspectives for sustainable land use.

k) Starting year / year of intended finalization: The purpose of this criterion is that state-of-the-art projects are proposed for selection. The project period covers the duration of the whole regeneration project. It does not refer to a single phase or part within a brownfield redevelopment project like decontamination, planning, construction or marketing.

m) Previous land use: To fulfil the objective of comparability of the sites, a minimum of conformability in terms of the previous land use has to be given. This conformability is heavy industry as the previous land use on every pilot site.

n) Follow-up land utilization: The process of redevelopment should be in a phase as much advanced as possible.

Several sites have been proposed by each country; France proposed seven sites, Germany proposed five sites, Poland listed four sites and finally the United Kingdom proposed two sites. Following the criteria above:

- For France two sites have been retained they fulfil more than 75 % of the criteria (Loisinord site and les Tertiales sites),
- For Germany: East-German site Espenhain was retained it fulfils 100 % of the criteria and Radbod Hamm was retained as pilot site because it fulfils more than 75 %
- For Poland, "Sosnowiec" coal mine and the dolomites- sport valley were chosen these sites fulfil more than 75 % of the criteria,
- For United Kingdom Gateshead quays (North-East of England) and Markham Willows (East Midlands regions of England) were chosen as pilot sites they fulfil more than 75 % of the criteria.

In the ANNEX 1.1 and 1 2 a matrix on the proposed pilot sites and all the selection criteria is proposed. At the time of the selection of sites, there were no valid analyses of the different supposed sites. Thus the rating was based on the existing knowledge at that time.

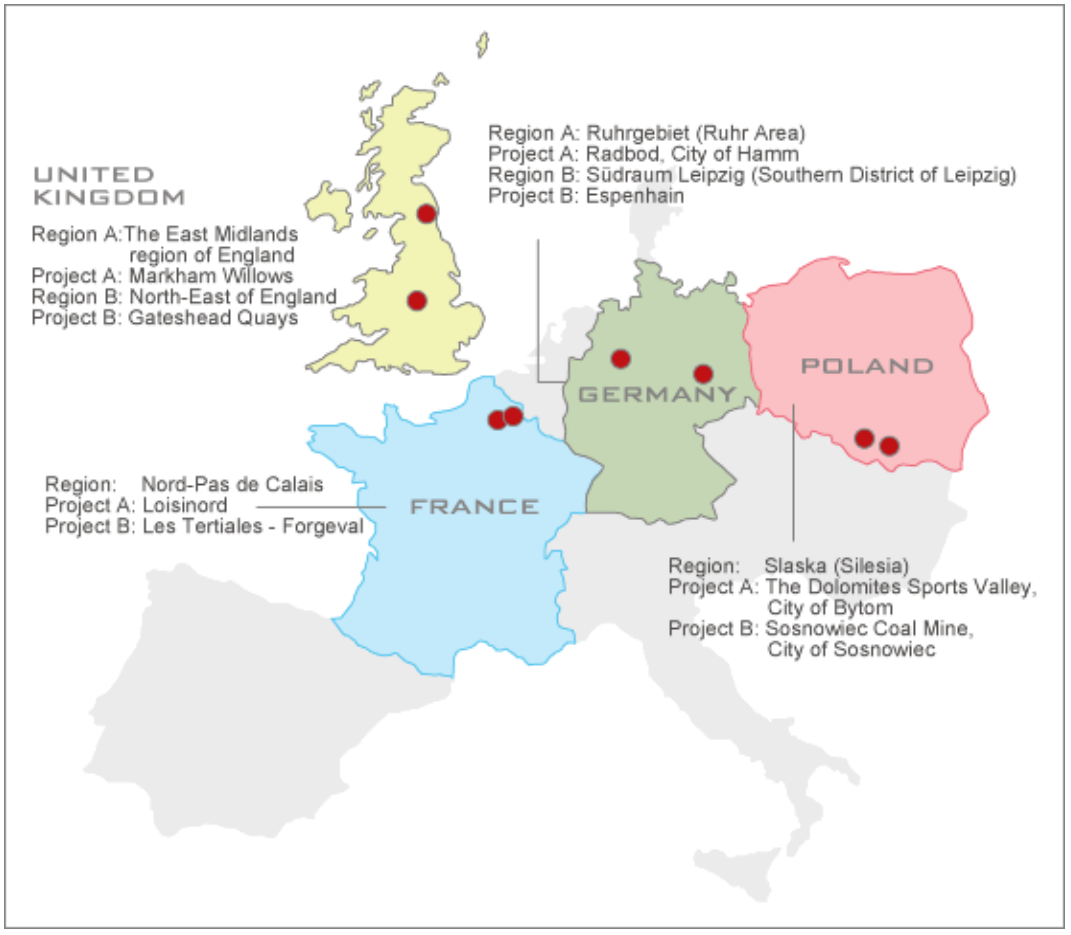


Figure 3.2 eight pilot sites in Resue project (RESCUE, 2002)

3.5 Description of pilot sites

3.5.1 French sites

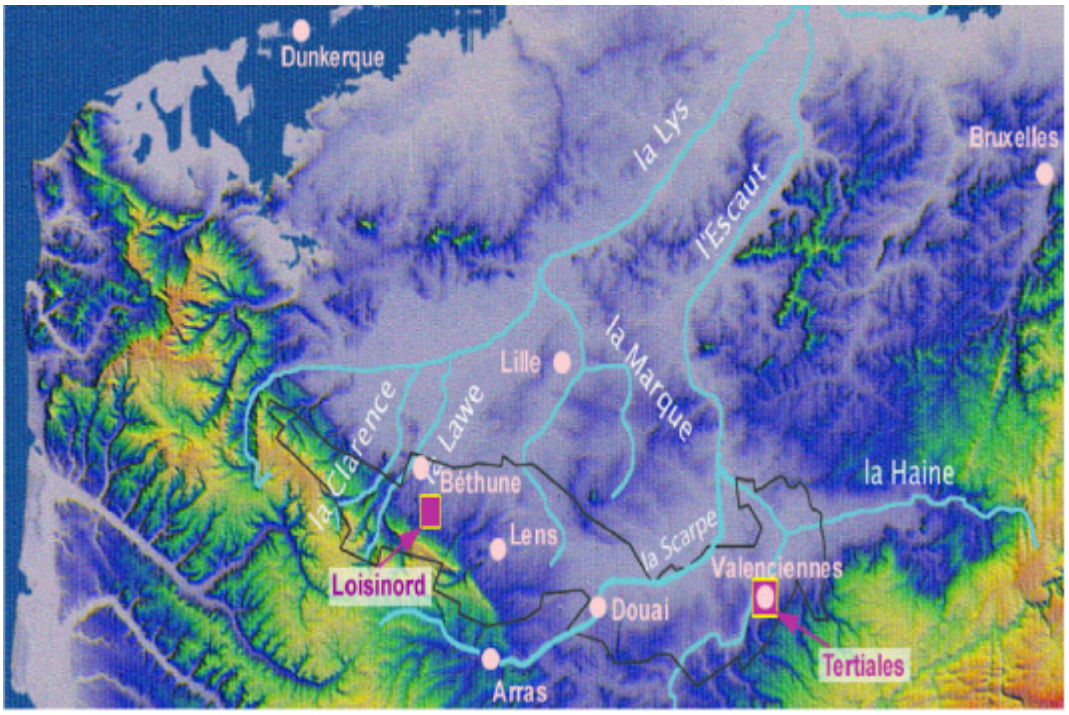


Figure 3.3 Location of Loisinord and les Tertiales sites

3.5.1.1 Site 1: Loisinord (Noeux–les-Mines)

a) Location and history

The Loisinord site is located within the western part of the Coal Basin precisely in Noeux-les-Mines town (Figure 3.4); the site was:

i. The first coal mine (shaft n°1) (1851-1852)
ii. Coking plant (1862)
iii. Brick plant (1882)
iv. Coal tar distilling (1910)
v. Closed (closure of coking and washing plant) in1965.

The site consists of the coal mine and coking unit (90 ha) and farm lands (110 ha) resulting in a total of 200 ha.

b) Site owners

i. 1862 : Company "des mines de vicoigne"
ii. 1897 : Company ' des mines de Noeux'
iii. 1946 : HBNPC (national Coal mine company)
iv. 1980-1993: Town hall of Noeux-Les-Mines

c) Regeneration plan

In the early 80's Noeux-les-Mines municipality decided to regenerate the post-industrial sites, because they were spatially overlapped with the urban area. An urban regeneration plan has been carried out by the mayor of the town:

i. In 1990; a leisure park has been built in the site;
ii. In 1994, the nautical base was opened (22 hectares).
iii. In 1996 the skiing slope was opened by remodelling the tip 42 (16.000 m² in area) (figure 3.5). It can be used all the year and is the lowest skiing slope in France.

Regarding the existing buildings and infrastructures, the coke plant and the infrastructures (roads, water, electric, sewerage networks etc) were completely destroyed. Only one tip (N°42) was kept and remodelled to suit the future use which is a skiing slope.

All the construction and demolition waste weren't recycled and reused during works, they were evacuated to landfill.

The redevelopment project of Loisinord was composed of five steps:

a) Step 1:
   - Demolition of old buildings.
   - Connection of Loisinord to the purification station in Beuvry.
   - Elaboration of the principal roadway systems: centre water level- ski course and the connection of Loisinord to Moussy Street.

b) Step 2:
   - Adjustment of the water zone which includes the sealing of the basin and the treatment of the banks.

c) Step 3:
   - Modelling of the ski course.
   - Adjustment of the accesses to the lake.

d) Step 4:
   - Installation of the ski course.

- Modelling of the esplanade, the Modelling of the spoil heap with contribution material, the creation of car parks and work accesses to the reception building
- Construction of a reception building.

e) Step 5:

- Work relating to the nautical base.
- Work relating to the harbour office.
- work relating to Nautical Tele-ski

The existing mining houses which are close to the Loisinord site have been restored in Coron n°3 district in order to keep to the maximum of habitants on the site and to improve its image and especially the part which is in front of the lake of Loisinord. During the restoration work in Coron n° 3 (1992-1993) the entire existing infrastructure were demolished due to several reasons:

- The roads were in drove state the architect was obliged to move certain roadway systems for safety reasons.
- Water networks and sewerage networks were removed due to the existence of leakages.
- The telecommunication networks and electricity networks were apparent but following the chosen plan of rehabilitation of the district, the networks became buried.

As no industrial monuments were on the Coron n°3 district, the decision of restoring or dismantling of the existing houses was based on two criteria:

i. The location of the exiting building as regards to Leisure Park.
ii. The state of building in term of safety and security

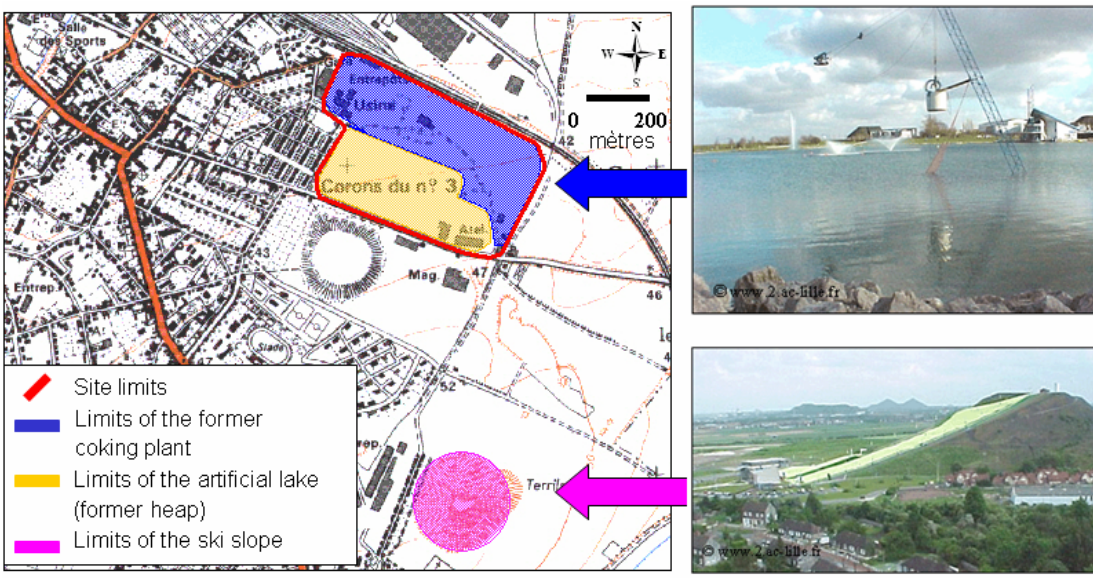


Figure 3.4 Loisinord (Noeux-Les-Mines)

Figure 3.5 Loisinord site: the tip 42 has been remodelled as skiing slope

3.5.1.2 Site 2: Les Tertiales - Canonniers (Valenciennes)

a) Location and history

The site is very close to the city centre. It is located within the major bed of the Escaut River which flows across Valenciennes (Figure 3.6). The site is partly located above coal mines. Early coal mines (early 18th century) induced several boreholes, the site is located downstream relative to the city centre of Valenciennes, but upstream relative to several other localities. Les Tertiales site is 11 ha in area (figure 3.7), it was:

- Factory of metallic pipes (société des tubes de Valenciennes) (1899)
- Closed (The end of the industrial activities of the factory) (1980)

b) Owners and operators

- 'Société des tubes de Valenciennes' (1899)
- Vallourec company (1863)
- 'Syndicat mixte ' Les Tertiales' (1987)

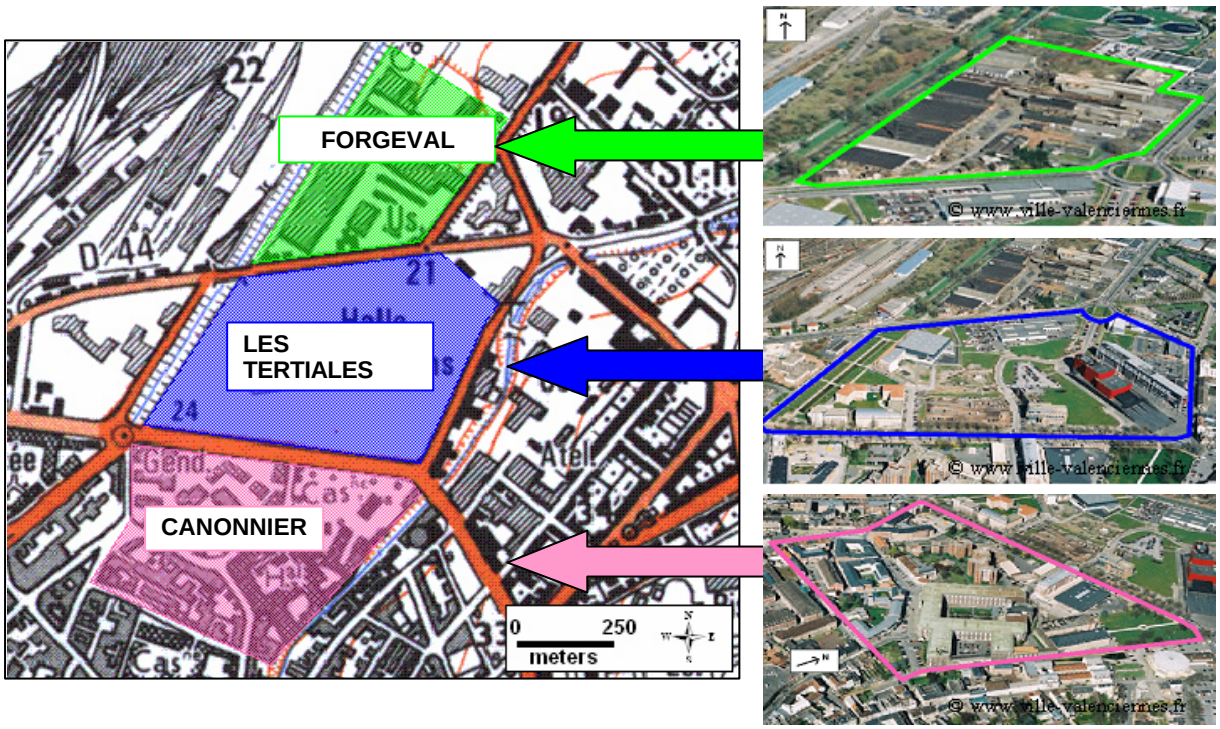


Figure 3.6 Les Tertiales and Canonniers site

Figure 3.7 Arial photo of the site les Tertiales

b) Regeneration plan

A Partnership was created between the municipality of Valenciennes and the "*Chambre de Commerce et d'Industrie*" (the chamber of trade and industry) for buying the site. It was decided to redevelop the site by creating complex of services on it. First all the existing buildings and infrastructures were demolished by the 'Syndicat Mixte' (1980) and all the demolition waste was removed to landfill without recycling. Secondly, Valenciennes municipality has built a modern theatre called Le Phénix and a university. And, the remaining land was sold to private owners.

The redevelopment process applied in "Les Tertiales site", was considered unsatisfied regarding the management of existing buildings and infrastructures, so we decided to extend our study area to include the Canonniers district which close to"les Tertiales site". The choice of this site was based on the existence of old building and infrastructures which were restored and reused by the municipality of Valenciennes.

The Canonniers district was very degraded and devalued by:

- The existence of industrial waste and public equipment in abundance (barracks, old people's home)
- The existence on site of small vacant buildings,
- Unhealthy habitat
- The presence of warehouse and places of storage for the trade neighbourhood
- The rate of vacancy was up to 18%, there was practically no social housing on the site.

The local authorities launched a study on the old city of Valenciennes and mainly to the district of Canonniers. The purpose of this study is to present projects of rehabilitation and redevelopment, taking into account various aspects of life in a district by integrating historical dimension in the evolution of the district. The study was carried out by the Architect of French building "Architecte des Bâtiments de France (ABF)" and it called "Zones de Protection du Patrimoine Architectural, Urbain et Paysager (ZPPAUP)" (Architectural, Urban and Heritage Landscape Protection Zones). The latter aimed to define rules for the development of areas containing historic monument. This is the case of Canonniers district with the general hospital building which was classified as monument by June 18, 1945 decree. The ZPPAUP examines all works affecting the outside appearance of buildings or grounds, and makes observations on the basis of regulation governing the zone.

As a result, several buildings and facades were kept, restored and reused in the site. The decision of keeping or dismantling old buildings was based on:

- The architectural quality of existing buildings.
- The state of the building (safety and healthy dimension).
- The availability of funding for the project.

The demolition works was composed of two steps:

- Step 1: Diagnosis: An association called AGEVAL, in partnership with Hainaut-Archaeology, and the Safeguard Committee of Valenciennes intervene to recover materials and furniture concerned with the inheritance and being able to be reused within the rehabilitation framework (restoration of facades, public monuments …) in site or offsite. The materials recovered after the phase of diagnosis are treated, cleaned and stored according to their dimensions, their colours and their natures (Doors, windows, tiles, bricks, pave.....).
- Step 2: Demolition phase by using the mechanical machines and evacuation of construction and demolition waste to landfill.

3.5.2 The German sites

3.5.2.1 Site 1: Radbod1/2/5, Hamm-Bockum-Hovel

a) General description of the site and its development

The site is located in the Northwest of the City of Hamm (Figure 3.8), in the quarter Bockum-Hövel. Hamm, a city of approx. 182.000 inhabitants, is located in the Northeast of the Ruhr, near the more rural regions Münsterland and Sauerland. In comparison to the most of the Ruhr cities Hamm is marked by a high percentage of agriculturally used areas (58 %), but the percentage of areas covered by buildings and traffic reaches also 32 % (for comparison: German average: 12,3 %). The city centre of Hamm is situated 3.5 km from the site, the centre of the quarter Bockum-Hövel, at a distance of 500 m, provides all offers of the daily consumer needs and services. Bockum-Hövel is one of the most populous quarters of Hamm. The closedown of the coal mine Radbod in 1991 has substantially impacted the development of the economy and the labour market of this quarter. In the North and Northwest neighbourhood of the site coal miners' housing areas are adjoining, in the South and West agriculturally used areas, greenfields, forest areas and the floodplains of the river 'Lippe' are bordering. An industrial area, a small sports park and slack heaps are located in the East and Southeast of the site.

Figure 3.8 Radbod-Locations in Hamm (RESCUE, 2002)

The history of Radbod started in 1904 when the preparations for coalmining on the site Radbod 1/2/5 (Figure 3.9) began with the extraction itself, actually starting in 1906. Six years later, in 1912 the cookery Radbod was put into service and its demand for coal contributed to the mine's growth to a staff of 3.500 employees and an extraction volume of more than 700.000 t coal in 1914. During the two world wars the mine still increased the extraction until it was seriously damaged by air strikes in 1945.

In the following years the damage was repaired and extraction could be further improved so that in the peak time from 1955 to 1960 more than 4.200 employees mined 1.2 million tons a year. In the following three decades the staff was reduced continuously until the mine was closed in 1990. The site has a surface area of 21 ha.

From 1992 to 1995 the sanitation process of Radbod started with an exploration and investigation phase including an historical inquiry. 1997 and 1998 were used for the elaboration of the sanitation and preparation concept. Part of the concept was the implementation of an active soil management during the recovery of the site. At first there was the necessity to partly fill up the area

ecause of mining subsidence. Soil with light concentrations of hydrocarbon and other contaminants was safely accumulated in the southern part of the project area. It was also part of the sanitation scheme to remove constructional barriers, also in the underground and to dispose heavy contaminated materials. The marketing of the plots of land started in 2000 after the preparation and coverage of the project area was finished (figure 3.10). Today, six remaining buildings on Radbod remind of its industrial history. The two shaft towers 1 and 2 and the steam engine house are listed buildings and are preserved from demolition. Besides, the old porter-house and the vehicle hall will be re-used and shaft "Winkhaus" is still in operation for airing purposes.

Figure 3.9 Aerial photo of Radbod 1/2/5 site (RESCUE, 2002)

Figure 3.10 computer simulation: the future use of Radbod1/2/5 (RESCUE, 2002)

3.5.2.2 Site 2: Espenhain

a) General description of the site and its development

The site is in the central part of the Südraum Leipzig and as such surrounded by a post-Industrial landscape, that was formed by open lignite mines and is now developing into an "attractive region of water, parks and technology." The site is surrounded in the North (Figure3.11) by the housing-estate of Espenhain and Mölbis, in the East by the heep of Trages, in the South by the former power-plant of Thierbach and in the West by the rest-hole of the former open lignite-mine Witznitz, that is actually flooded and will be developed into a water-landscape with surrounding leisure, residential and business uses. The Campus Espenhain (Margarethenhain) and the Espenhain-site are separated by the federal highway B 95 (Leipzig- Chemnitz). An A*utobahn* (A 72), that will tangent the site is in the early stages of the planning process *(Linienbestimmungsverfahren).*

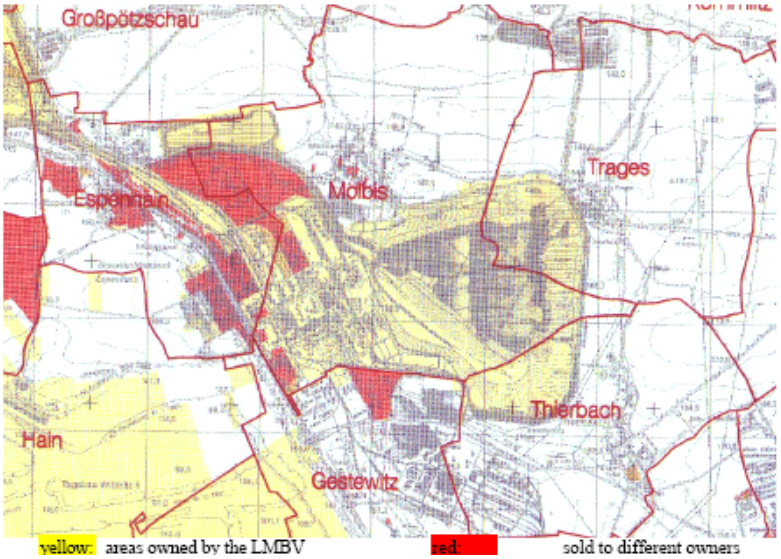


Figure 3.11. Espenhain: boundaries (Gemarkungen) (RESCUE, 2002)

In August 1990, the chemical plant of Espenhain was closed down, 8,500 employees lost their jobs. The power stations of Espenhain were closed down in 1995 and 1996, the Espenhain open mine was also closed in 1996 (figure 3.12), the Witznitz mine had been closed in 1993.

The deconstruction works are going on since 1990, the process of reusing began according to the deconstruction process: a soil decontamination facility and a scrap recycling firm settled on the site. A competition of ideas for the area of Campus Espenhain in 1994 and for the Espenhain site and its spatial context in 1995 started the planning process for the reuse of the site (figure 3.13). The winning draft became the basis for the development of the site.

The Campus Espenhain as science and Business Park was opened in 1998. The development of Mölbis industrial-park in the northern part of the Espenhain site has been completed; some industrial and service uses have been developed in the central part of the site. The deconstruction and decontamination works are ongoing; a first zoning plan for the central part of the site has been started and will prospectively be realized by the end of 2004.

The surface area of the site:

- Espenhain (differentiated to planned and former use): appr. 300 ha
- planned industrial and business area in the centre of the site: 115 ha (first step of realization: 64 ha)
- existing purification plant and rail track-system: appr. 30 ha
- terrain of existing soil-decontamination-plant: appr. 20 ha
- existing new industrial area Mölbis: appr. 20 ha
- planned green, landscape, autobahn etc.: appr. 115 ha
- Campus Espenhain science and technology park (Margarethenhain): appr. 15 ha planned

Figure 3.12. Espenhain 1996 (RESCUE, 2002)

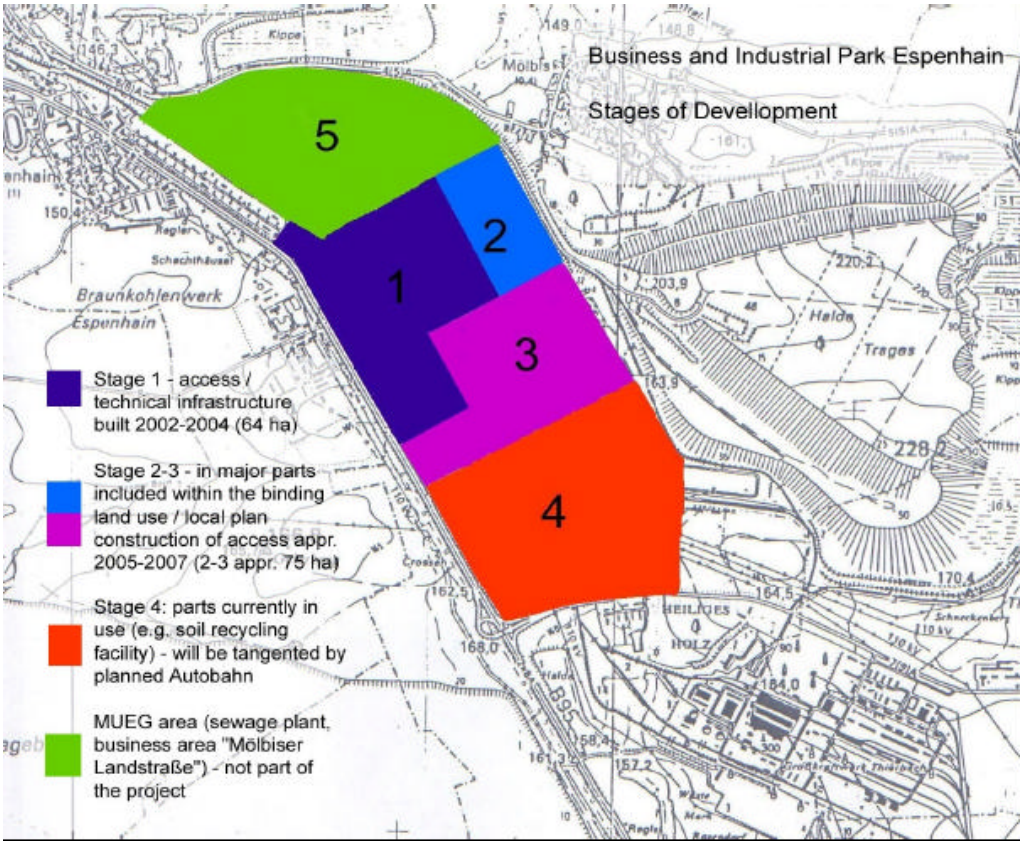


Figure 3.13. Stages of development (RESCUE, 2002)

3.5.3 Poland sites

3.5.3.1 Site 1: The Dolomites – Sport Valley, Bytom

a) General Description of the site and its development

The site has a surface area of 37,64 ha and is located in the centre of the agglomeration with 3 million of inhabitants, precisely it is situated in the Bytom (Figure 3.14a et b) – Sucha Gora Quarter, in the north part of the city, near Blachówka St., close to the boundary between Bytom and Tarnowskie Gory. On the west the site borders with Segiet Reserve, on the north with another post-exploitation open cast, on the east with agriculture areas and greenfields and on the south with single family housing.

Figure 3.14a Municipality of Bytom (RESCUE, 2002)

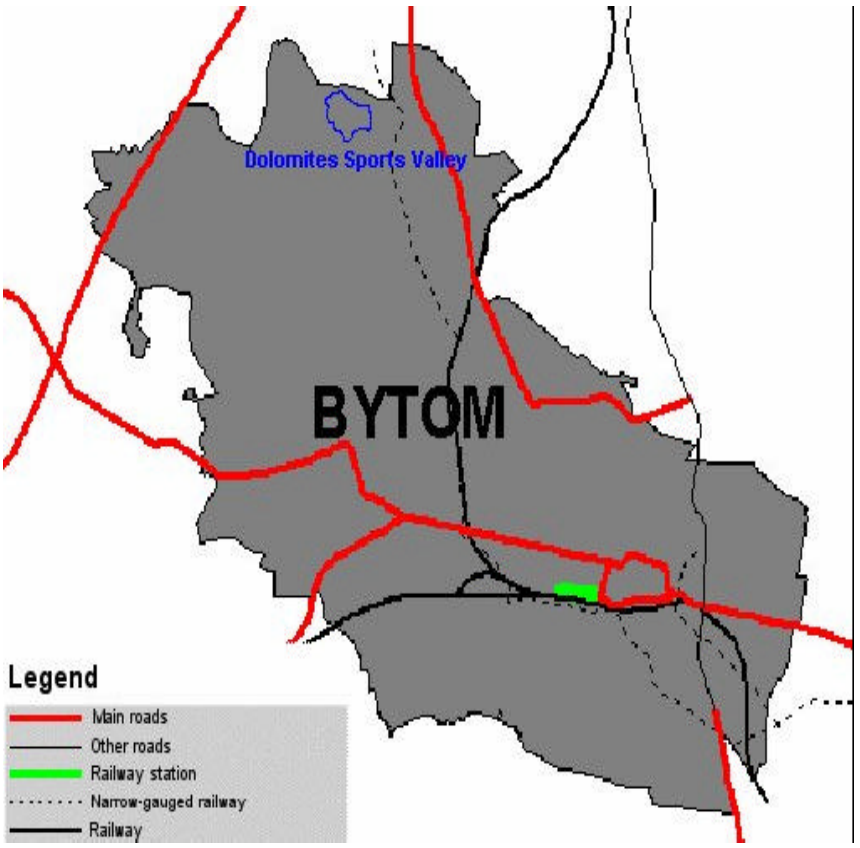


Figure 3.14b.Location of Dolomites sports valley site (RESCUE, 2002)

The *"Blachówka"* Mine is the oldest Polish dolomite mine. It was established in 1856. Originally it was planned as an iron ore mine. The Blachówka Mine was closed at the beginning of the 1990's, mainly due to worse production figures than in the remaining mines, chemical properties of excavated dolomite, increase of quality standards and liquidation of traditional end users.

As a result, of the post- industrial activity on the environment, we mention:

- The degradation of neighbouring agriculture grounds and forests,
- The arising of mining-dumps,
- The presence of seismic tremors,
- The spreading of rock fragments caused by shooting works,
- Gas emission due to the waste production
- Emission of dust and gas pollution into the atmosphere,
- Sewage disposal to Stola River (through local sewage-treatment plant)
- The Presence of building materials,

The existing buildings and infrastructure on the site were dismantled during the process of mine activity liquidation. Soil contamination is low, but the topography has been disturbed massively.

The Blachówka Mine area, where currently the project of Dolomites Sports Valley (Figure 3.15) is executed, was excluded from production activity at the beginning of the 1980's. From that time until the end of the 1990's the area was treated as a waste land. Only basic land reclamation was carried out. More intensive revitalization works were undertaken at the end of the 1990's and still is continue

Figure 3.15 the dolomites-Sport Valley, Development of the site, May 2003 (RESCUE, 2002)

3.5.3.2 Site 2: "Sosnowiec" coal mine

a) General description of the site and its development

The area of former "Sosnowiec" Coal Mine at Kombajnistów Street is located in the central part of the city between Gabriel Narutowicza and Kombajnistów Streets. Such a location, directly adjacent to the intersection of Gabriel Narutowicz and 3-go Maja Streets (the latter one is a main communication artery of the city) is a great advantage because it is very easy accessible and well connected with the downtown and railway station serving Warsaw-Katowice railroad (Figure3.15a et b).

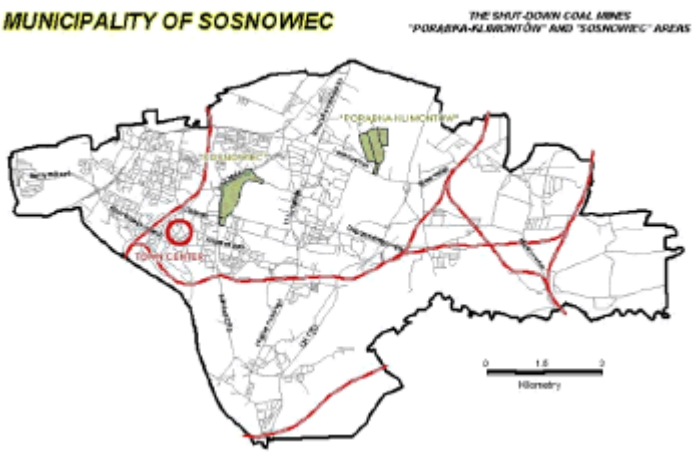


Figure 3.15a. Shut down coal mines „Prorabka-Klimontow“and „Sosnowiec“areas

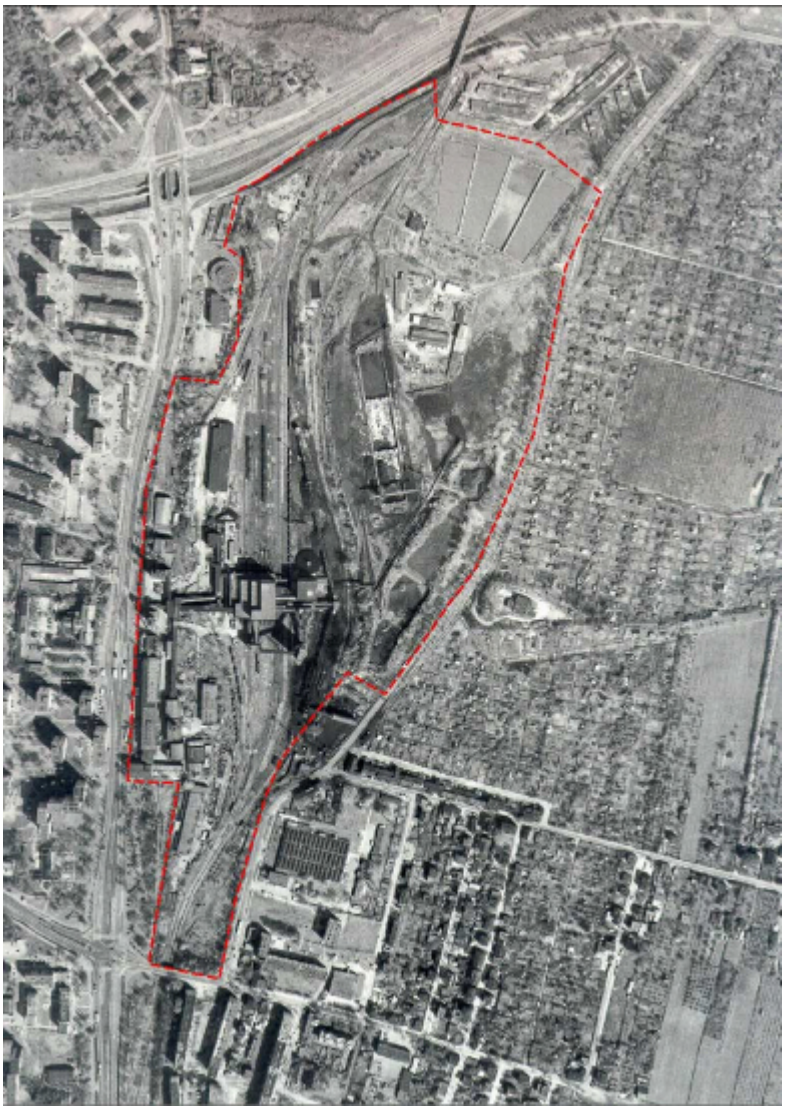


Figure 3.15b Old aerial photo of the site

Almost all industrial facilities (Figure 3.16)located in the mine area have been wholly demolished with exception of one 3-floor-administration & social building and two workshop & storage facilities, which have remained. In the South-Eastern part of the area a new manufacturing plant is under completion. A pit shaft hoist tower still exists on the site and it should be kept as an example of mining excavation history (see figure below). Moreover, a monumental building, originating from the early years of the last century, located at Narutowicza Street, in which electrical equipment of the coal mine has been installed, should be included in the national monument preservation policy. On the area of the former coal mine the Central Mine Dewatering Plant exists (since 2000). It is a very important plant for further operation of Kazimierz Juliusz Coal Mine (the unique coal mine still running in Sosnowiec, which is linked with shut down mines by underground galleries) and for proper water conditions within the Czarna Przemsza river catchment. The Area in question is located in the range of the Main Underground Water Reservoir No. 329 Bytom, and for this reason full surface and underground water protection is compulsory.

At the South-eastern part of the site, is a seat of the Heraeus Company on an area of 2 ha (electro-technical branch). On the Eastern side of the mine area, along Kombajnistów Street, a spoil bank has been being reclaimed in order to reinstate the environmental conditions as they had used to be before mining excavation started. The top of this spoil bank elevated 8,0 m over the adjacent area has not yet been demolished. Therefore, the scheduled development of this shall be possible upon uncovering of the subsoil and the confirmation, that it has not been contaminated.

Figure 3.16 Mine view in the 1980s (RESCUE, 2002)

At the Northern side of 3-go Maja Street, which is a boundary of the coal mine area, a new multifunction commercial & service centre was opened last year. The Eastern side of the former mine area is limited by Kombajnistów Street; at this street there is also an area with little gardens and a single family housing quarter. Garment factories- ZPO "Bytom", still in operation, and ZPD "Wanda", already shut-down are located in the South-Eastern corner of the area concerned. The Western boundary is formed by apartment houses completed in 1970-ties and stretching from Gabriel Narutowicz Street to the park area along Czarna Przemsza river banks. At the North-Eastern corner of the former mine area the Srodula Park is located, where the artificial ski slope erection has just started (according to the project, this slope shall be artificially snow-covered). This facility shall form a part of 'All The Year Sport & Recreation Centre'. North of 3-go Maja / Norwid Streets there is a second multiple apartment housing area, completed in the early 1980s of last century. The Area to the East of Kombajnistów Street, located a bit further, has been destined to expend the already existing single family housing quarter (Kukulek Residential Area).

3.5.4 The British sites

3.5.4.1 Site 1: Markham Employment Growth Zone, District of Bolsover

a) General description of the site and its development

The site lies between the urban centres of Chesterfield, Bolsover and Worksop (Figure 3.17). It is within 15 km of Sheffield and Rotherham. It is bisected by, but inaccessible from, the M1 motorway and a railway. The site is surrounded by farmland on three sides and a small residential area (Duckmanton) to the West. A large coking plant exists to the East and a very large landfill to the North West

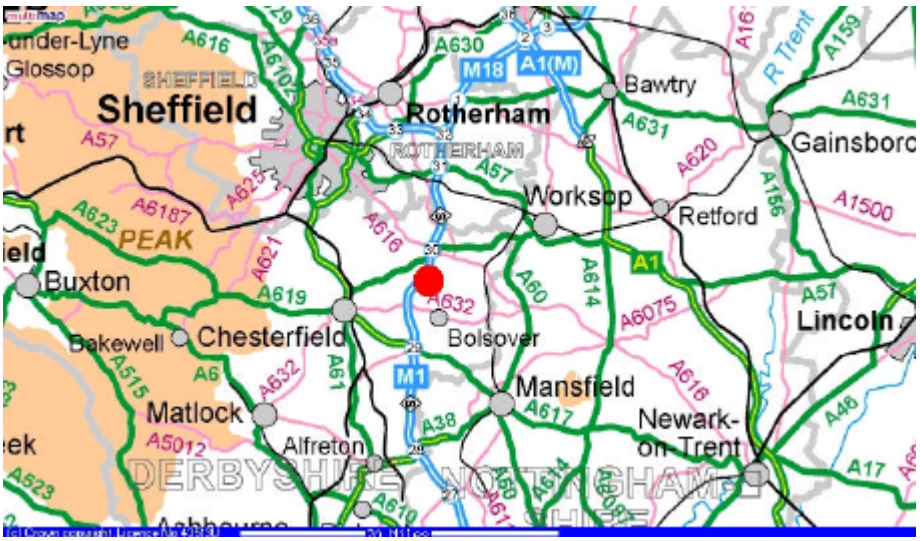


Figure 3.17 Markham Employment Growth Zone in the East Midlands region (RESCUE, 2002)

The land was used for a coal mine. The visual stigmata are: contamination, instability, and inaccessibility. The waste consists of mine waste and contaminated soil. The land will be used for industry, housing, leisure and amenity purposes. The size of the surface area is 320 ha.

Some of the original buildings have survived on the site. They are used by local businesses but are not regarded as historically or architecturally significant. Within the redevelopment plan, which includes a new motorway junction, to give access to the site from the M1 (Figure 3.18), the existing buildings will be cleared make way for new infrastructure and buildings.

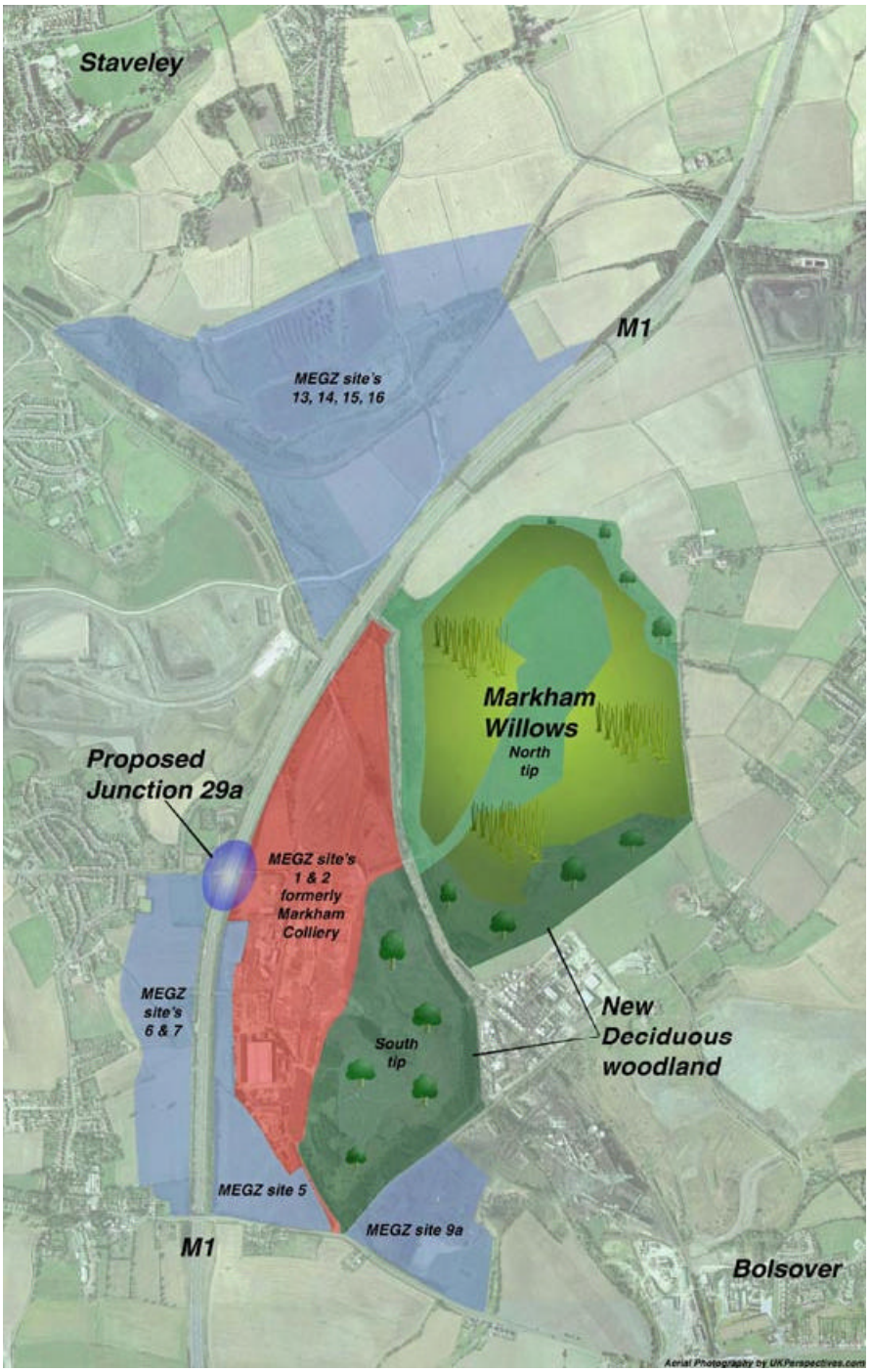


Figure 3.18 Markham Employment Growth Zone (RESCUE, 2002)

3.5.4.2 Site 2: Gateshead Quays, Gateshead

a) General description of the sites and its development

Gateshead Quays is an inner-city, waterside area of immense historical significance. It is one of the birthplaces of the Industrial Revolution, and is now pursuing a post-industrial renaissance. This area has been an industrial, commercial and residential area in prolonged decline (Figure 3.19). The site was used for mixed industry. The visual stigmata are contamination, high crime and bad image. The waste consists of contaminated land. Today however, Gateshead Quays is being converted into a truly unique arts and cultural space, unparalleled to anything else in Europe.

Gateshead Council and partners are dedicated to delivering a cutting edge, world-class arts, leisure and residential destination for residents and tourists alike. More than £250 million has been injected into the re-generation and 100's of new jobs have been created.

Developments on the Gateshead Quays include BALTIC Centre for Contemporary Art, The Sage Gateshead and the world's first and only tilting bridge - The Gateshead Millennium Bridge, plus a luxury Taylor Woodrow residential development.

The aspiration of the instigators of the project, Gateshead Council, is that the project will act as a catalyst to promote a recovery from high crime and social and economic deprivation. The surface area of the site is 200 ha.

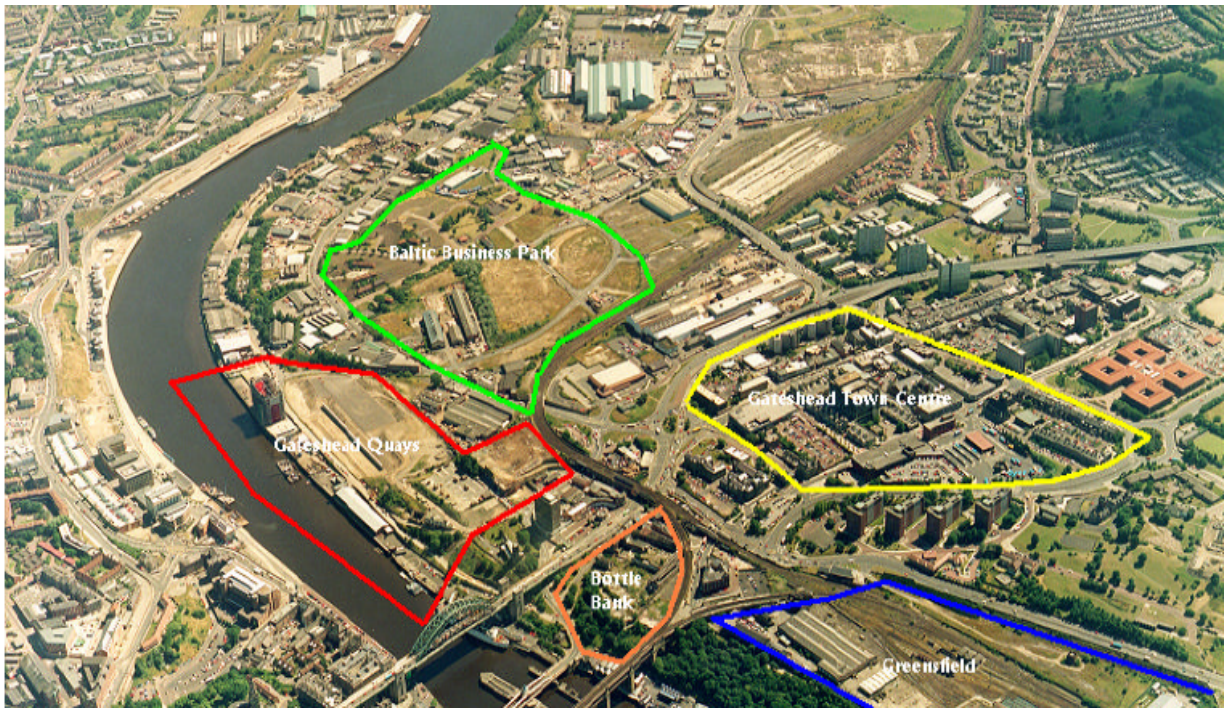


Figure 3.19. Gateshead Quays location plan (RESCUE, 2002)

3.6 Data collection

Stakeholder post	*Organization*	**Purpose issues**
Director of Mission Bassin Minier	Mission Basin Minier	Loisinord (Coron n°3)
CERDD agent Sustainable Development consultant	CERDD "Centre ressource du développement durable en Nord-Pas de Calais"	11/19 sites
Architect	Town Council of Hénin-Beaumont	Hénin Beaumont (9/9 bis site - Oignies)
Director of Syndicat mixte in Hénin-Beaumont	Syndicat mixte (Le Shéma de Cohérence Territoriale de Hénin-Beaumont SCOT)	Hénin Beaumont (9/9 bis site - Oignies)
Responsible of regeneration of loisnord site (local authorities)	Town council of Loisinord	Loisinord site
Responsible of regeneration of les Tertiales site (local authorities)	"Communauté d'agglomération Valeciennes Métropole "	Les Tertiales site – Valenciennes
Town planners in Valenciennes city	Technical departments of Valenciennes Town Hall, les Tertiales, Canonniers	Les Tertiales and Les Canonniers sites
Director of Ageval Associtaion	Ageval Associtaion	Les Tertiales and Les Canonniers sites
Responsible in « Etablissement Public Foncier Nord Pas de Calais »	Regional Land Spatial Planning and Land Development Agency	Les Tertiales and Les Canonniers sites

Table 3.1 French Stakeholders

The first step of our study was the collection of data via a questionnaire relative to each aspect of the redevelopment process of brownfield. This questionnaire is filled in by the stakeholders, local

authorities, investors, architects, planner, developer involved in the regeneration process of the pilot sites and external sites (Table3.1).

The questionnaire contains information and data related to the following issues (see. ANNEX 2.1,2 and 3):

- general situation of the site,
- site information and spatial structure (existence of classified or listed building on the site),
- natural space management,
- existing Infrastructure on the site (retained or dismantled),
- water supply,
- sewerage networks,
- heat networks,
- electricity networks,
- tele-communication networks,
- existing building (retained or dismantled),
- buildings or construction characteristics,
- buildings and constructions value assessment,
- financial questions,
- assessment of organisation of dismantling or renovation works,
- contamination management,
- dismantling process,
- rebuilding process,
- quality management,

Unfortunately, some data were not available in some pilot sites due to:

1. Confidentially of some aspect in the planning process (cost of the project).
2. Absence of (possibility of use of renewable energy, recuperation of rain water)
3. Some aspects were not quantified (quantity of reused and recycled materials).
4. Systemic dismantling of the existing buildings and infrastructure, particularly, if there is no classified or listed buildings on site or in the surrounding.

Analysis of the information on the available data was carried out using sustainable development approach. This analysis allows for identifying of the best practice and the applicability of indicators and objectives.

3.7 SWG analysis on brownfield regeneration

The application of the SWG analysis to the eight pilot sites has been carried out following the five sustainable objectives developed in the chapter 2; the result of our analysis is presented in Table 3.2.

Objectives	**S**	**W**	**G**
A. retain buildings and infrastructures on brownfield sites	Les Canonniers Dolomite Val. (Bytom) Radbod	Loisinord Sosnowiec Espenhain Gateshead	Markham Tertiales
B. Reuse existing buildings and infrastructures, or components thereof, on brownfield sites.	Les Canonniers Dolomite Val. (Bytom)	Loisinord Sosnowiec Espenhain Radbod Gateshead	Markham Tertiales
C. recycle materials of existing buildings and infrastructures on brownfield sites	Markham	Loisinord Les Canonniers Gateshead Dolomite Val. (Bytom) Sosnowiec Radbod	Espenhain Tertiales
D. minimise energy demand and produce renewable energy on the site	Dolomite Val. (Bytom)	Les Canonniers Markham Gateshead	Loisinord Sosnowiec Espenhain Radbod Tertiales
E. minimise water demand and reduce waste water production		Loisinord Les Canonniers Markham Dolomite Val. (Bytom)	Gateshead Sosnowiec Espenhain Radbod

(S): Strengthens ;(W): Weaknesses ;(G): Gaps

Table 3.2 SWG matrix of pilot sites (RESCUE, 2002)

3.7.1 French sites

The result of SWG-analysis which has been summarized Table 3.2 will now be discussed in the following section:

3.7.1.1 Objective 1: Retain buildings and infrastructures on brownfield sites:

In the redevelopment plan of Loisinord site, the coal plant and other existing buildings and infrastructures were demolished. Moreover the area was dug up and, due to the high groundwater level, it was used for water sports facilities.

In the case of Les Tertiales the preservation of existing buildings was partially achieved. All the buildings were in fact demolished except the General Hospital, in Canonniers District, that was preserved due to its monumental value. In this case, the conservation of the building is mainly due to ZPPAUP regulations (Architectural, Urban and Heritage Landscape Protection Zones).The historical value of this buildings provides a legal obligation for reconstruction processes.

The application of ZPPAUP regulations was essential in this specific case. But in terms of general management of existing buildings in brownfield sites, it has clear limitations as it exclusively applies to areas and buildings which are listed or classified as historic monument.

Figure 3.20 Nestlé French Headquarters

To show other French practice where the existing buildings are restored and reused by private investors we have proposed Menier chocolate plant Nestlé French Headquarters (Figure 3.20) as an external best practice in term of retaining and reusing of existing buildings.

The site is located in Noisiel town. The built environment has been successfully achieved in the redevelopment of Menier family chocolate plant into Nestle Headquarters. All the buildings on the site have been conserved and their interiors modified to meet the new users' needs and comply with new building and Health and safety regulations. The historical chocolate mill has been listed as a monument and restored without any significant modification. The regeneration process has been carried out mainly with managerial staff provided by Nestle Company, and without any public intervention in terms of financing or taxation support. The feasibility, financing and operating studies allowed optimising the sustainable and effective reuse of the buildings. The above mentioned cases clearly show how the lack in France of specific legislation or incentive makes the private initiative or the monument legal obligations the only effective drivers for the retention or for the total / partial reuse of buildings and infrastructure on brownfield sites.Indeed, there is no specific legislation or incentive dealing with existing buildings and infrastructures on brownfield or with reusing construction components on brownfield. As a consequence, existing buildings and infrastructure are considered as any other mundane buildings and infrastructure.

3.7.1.2 Objective 2: Reuse of existing buildings and infrastructures.

In both French case studies the reuse of building and construction components was just partially addressed. In Loisinord only the heap was reused whilst other building components were demolished and dumped.

In Les Tertiales a small volume of material was reused in the general rehabilitation works in Canonniers District, therefore both on and off site. Some facades of existing buildings were maintained and the rest dismantled, according to the "house in house" method. Again, the application of ZPPAUP regulations was determinant as it managed the selection of methods and materials to be used for the rehabilitation of existing listed buildings.

Moreover, in France doesn't propose, public incentives for the reuse of construction components of buildings are not available. Furthermore, the costs of dismantling e.g. windows carefully and storing those safely in order to reuse them exceed the costs of purchasing new windows; this will mostly not be done by the owner. However, those components which will not be reused by the owner but for which there is a commercial demand, will be sold. It has also to be considered that components of existing buildings often cannot be reused as they do not comply with modern building regulations, e.g. for thermal insulation.

In the cases of listed buildings, components have to be reused as this is legally obligatory. For listed buildings, exemptions from the building regulations are therefore granted.

3.7.1.3 Objective 3: Recycle materials of existing buildings and infrastructures on brownfield sites.

No specific construction or demolition waste management and recycling strategy has been applied in French case studies.

In Les Tertiales, a small and un-quantified volume of materials, coming from the demolition of existing buildings and infrastructures, has been recycled in the general regeneration of the Canonniers District. This partial recycling process has been possible due to the legal obligation by ZPPAUP and the intervention of the Ageval Association, which reclaimed reusable demolition materials for on site or off site rehabilitation.

The sustainable opportunities coming from the recycling of construction or demolition materials appears undoubtedly underestimated in the mentioned French cases. This perhaps reflects the national lack in specific incentives or taxation procedures, which could make recycling more economically convenient than landfilling, and in regulations in order to clarify the definition of demolition waste and the related private/institutional responsibility.

The available incentives are insufficient for the recycling of materials of buildings and infrastructure on brownfield sites because:

i. The definition of demolition waste remains unclear: it is not clearly identified by the usual classification which distinguishes domestic waste, industrial waste and special waste;

ii. This category of waste “is often forgotten” by the legal texts regarding waste management: one can speak about a gap in the law on this subject;

iii. On the institutional level, the responsibility of local authorities concerning collection and elimination of domestic waste does not extend to demolition waste, while often they are compared to household waste;

iv. The cost of recycling techniques increase by approximately 7 % per year because recycling techniques are more expensive than putting construction and demolition waste in landfill. In addition, the start-up of units of valorisation requires heavy investment.

3.7.1.4 Objective 4: Minimise energy demand and produce renewable energy on the site.

The French case studies no specific measures for energy saving or renewable energy productions have been adopted. In Loisinord all the existing buildings were demolished, while in Les

Tertiales the preserved buildings were not specifically improved in order to meet national energy standards which apply to new buildings although, there are several financial and legal incentives trying to encourage people into buying Renewable Energy Sources equipment. A subsidy scheme is also being introduced to get experience with systems less common in France, such as the solar thermal systems for domestic hot water and space heating. The aim of this subsidy scheme is to introduce combined solar systems into use and to increase the number of combined solar systems to 1500 in 2006. The same kind of subsidy scheme exists for collective solar thermal systems. Separately, there is a subsidy scheme, issued by ADEME (the French Agency for Environment and Energy Management), for investment in photovoltaic (PV) systems. This subsidy can contribute to up to 50 to 60% of investment costs including installation and VAT. However, the available incentives are insufficient for saving resources and reducing their consumption in buildings and infrastructure due to the French tariff for electricity, which is considered as a handicap for the encouragement of renewable energy since the electricity price is the same everywhere and it doesn't take into account the distribution costs in remote areas. In addition, the French nuclear program has three negative effects on Renewable energy resources development:

i. It consumes public funding which otherwise can be used to renewable energy resources policy;
ii. It leads to overcapacity of electricity production and reduces the interest of saving electricity;
iii. People think that the country has a clean and abundant energy source and they are less motivated with renewable energy resources.

3.7.1.5 Objective 5: Minimise water demand and reduce waste water production

No measures for the minimisation of water demand and waste water production have been applied neither in Loisinord or Les Tertiales that's why we have proposed a best sustainable practice in term of reuse of rain water. The external example is located in the Loos-en- Gohelle town and it's called 11/19 site which has an innovative system that allows recycling rain water in sixty public houses.

Due to reuse of rain water for WC and garden taps, a reduction up to 30% in drinkable water demand has been achieved. The cost savings related to reduction in drinkable water consumption allow repayments of investments and make the system cost effective. Therefore the site is a successful example of sustainable water resources management, moreover if compared with the national background that presents a lack of legislation dealing with the use of rainwater retention/reuse and water seepage techniques.

In France, the national health legislation states that all water entering a building from a central water supply is presumed to be potable. Any other water is presumed to be non-potable and not fit for human contact or consumption. There is no leeway for use of non-potable water, with two exceptions: the legislation does not apply to individual homes that are not served from a central system (rural residences); and other buildings, such as schools, can be approved for exemption.

Other legislation in France permits the use of rainwater for certain uses and under certain conditions. Untreated, the water can be used only for external water uses, such as irrigation and automobile washing, or where there is suitable plumbing construction preventing cross contamination or cross-connections, it can be used inside homes for toilet flushing. In addition, there is no legislation that institutes the use of certain techniques of rainwater retention and of water seepage, and the developers suffer from an absence of precision as regards times and standards as for the instruction of the files. The constraints generated by these inaccuracies tend to support the use of the traditional techniques than innovative techniques of saving water resources however indirectly encouraged by the law on water.

3.7.2 The Germany sites

3.7.2.1 Objective 1: Retain buildings and infrastructures on brownfield sites:

While in Espenhain no historic buildings were preserved, in Radbod 8 out of the 34 buildings existing at mine closure have been preserved. The demolition option has been taken after an evaluation of the buildings technical properties and potential reusability. Four of the preserved buildings have been listed as monuments, they have not yet been reused and a monumental foundation merely support the maintenance works without any attention to economically viable possible reuses**.**

3.7.2.2 Objective 2: Reuse of existing buildings and infrastructures, or components thereof, on brownfield sites

In both the German case studies very little building and construction components were reused.

3.7.2.3 Objective 3: Recycle materials of existing buildings and infrastructures on brownfield sites

The recycling of construction and demolition waste has been partially achieved in both the German case studies. In Espenhain a small volume of debris was reused off site for landfill engineering, while in Radbod brick and materials from demolished buildings on site were ground and incorporated in the site's road substratum.

An external good practice in term of reused of materials the German partners have proposed DUISBURG site Germany. During its redevelopment, the outside walls of the former storehouses were

dismantled carefully and then relocated after the interior of the building was converted into a modern high-tech building.

3.7.2.4 Objective 4: minimise energy demand and produce renewable energy on the site.

In both the German case studies this objective has not been met. Only passive energy saving measures, like heat insulation, has been adopted. However, two external examples were proposed, they dealt with the issue of minimisation of energy demand and production of renewable energy. The first one was about the production of renewable solar energy on site addressed in the redevelopment of Cookery Zollverein in Essen, the site was closed down in 1993 was declared UNESCO World Cultural Heritage Monument in 2001 and is currently used for cultural events. The big photovoltaic panel built on the roof makes the building an excellent example of renewable solar energy production on site and it can supply forty single occupancy houses. Its usefulness is not only practical but also promotional. The second one was in the city of FREIBURG where an innovative "block type thermal power station" has been installed in old barracks buildings and runs with rape oil thus producing energy to be distributed in the local electricity network. This technique contributes to reduce the consumption of non renewable resources and the CO2 emissions. Moreover it supplies four buildings with not only electricity but also heating coming from the generator water-cooling system.

3.7.2.5 Objective 5: minimise water demand and reduce waste water production

Both German case studies did not apply any facility to reduce water consumption. Rainwater separation systems are applied due to specific national regulations. In Radbod, because of remaining soil contamination the environmental department recommended the prevention of rainwater infiltration.

3.7.3 The Polish sites

3.7.3.1 Objective 1: to retain buildings and infrastructures on brownfield sites:

In Bytom Kwartal the objective was achieved, as two apartment buildings have been preserved, converted into a hotel and integrated in the creation of a new inner-city space focused on commercial and offices. The preservation of their historical value has been therefore successfully combined with an economically viable reuse.

In Sosnowiec the existing buildings from the old mining activities have been only partially retained. 10 out of 100 existing buildings have been preserved, but their reuse has not been designed yet. Moreover the former power station building, in spite of its historical and architectural value, has not been listed as a monument.

3.7.3.2 Objective 2: Reuse of existing buildings and infrastructures, or components thereof, on brownfield sites

The reuse of some building and construction components was successfully achieved in Bytom Kwartal by means of a selective demolition process, which also allowed the preservation of components of listed buildings and complying with related legal obligations.

In Sosnowiec the objective was partially met as an existing underground channel has been reused by Hereaus Foctory as a conduit for district heating. National regulation, such as the Building Code 1994 and Waste Act 2001 were successfully applied in this case.

3.7.3.3 Objective 3: Recycle materials of existing buildings and infrastructures on brownfield sites

The recycling of construction and demolition waste has been partially achieved in both the Polish case studies. In Bytom Kwartal, according to legal obligations from the Building Code 1994 and Waste Act 2001, debris from dismantled structures was recycled. They were partly re-processed and used in off-site road constructions, and generally reused as inert material for landfill capping engineering.

In Sosnowiec all steel beams and scrap metal collected on site have been sold to a steel mill as feedstock therefore making the recycle cost effective. Moreover, the need for construction materials to shape the artificial ski slope drove the recycling of on site demolition rubble.

Selective demolition was successfully applied in the Polish external example of Gdansk Power Station Olowianka, where it allowed the collection of demolition rubble to be used to restore the waterfront on site.

National building and waste regulations seem to be positively adopted by both private and public stakeholders involved in regeneration projects, giving an essential input to sustainable construction/demolition waste management on brownfield sites.

3.7.3.4 Objective 4: minimise energy demand and produce renewable energy on the site.

Renewable energy production and energy efficiency are partially addressed in the considered Polish cases. The project in Sosnowiec is still at the conceptual stage and therefore not relevant for this objective. In Bytom Kwartal both energy efficiency, through a building specific energy audit study and the realisation of a new roof, and renewable energy production, through a landfill gas fuelled heating system, have been addressed. National energy regulations appeared in this case as successfully applicable and well targeted.

As good external example in Poland, we mentioned the project Warsaw University of Technology which includes improvements in the heat distribution and monitoring systems, and intends to improve building energy efficiency, reducing heat losses and introducing an innovative system of steering and monitoring of heat supply.

3.7.3.5 Objective 5: minimise water demand and reduce waste water production

The reduction of water demand is not addressed as a relevant issue in either of the Polish case studies, and it seems to be common practice in Poland as none of the external examples show a different more sustainable approach to water management in brownfield redevelopment.

In Bytom Kwartal, water saving systems have been planned at the design stage, but due to the project ceasing they have not been installed.

3.7.4 The British sites

3.7.4.1 Objective 1: to retain buildings and infrastructures on brownfield sites:

In Markham Willows the objective was not achieved. None of the existing mine structures were listed as monuments and, as normal practice in the 90's, the complete demolition was considered the most economically viable option.

The regeneration of Gateshead Quays site included the retention of one 'landmark' building because the icon on the skyline was a design requirement to obtain funding support.

Listed building obligations seem to be the only effective driver for preservation of existing buildings and infrastructures in brownfield sites in UK. In fact there are several lottery related funding schemes available for projects of national, regional and local significance that address cultural, social, environmental and heritage aspects, but they do not focus specifically on brownfield sites and are highly competitive. Also the Dereliction Aid Scheme, which is fully focused on brownfields and funds up to 100% of remediation costs including those related to existing derelict and disrepair buildings, is more focused on supporting demolition costs for buildings, structures or works that are derelict or otherwise unsuitable for any new use. Therefore, it is not surprising to see how the demolition more than the retention and restoration of existing derelict buildings and infrastructures can be considered as the most cost effective solution by developers.

3.7.4.2 Objective 2: Reuse of existing buildings and infrastructures, or components thereof, on brownfield sites

In both the British case studies the reuse of building and construction components was not met. In Gateshead Quays site only some external walls of the Baltic Arts Centre were kept whilst all internals were removed and some crushed for re-use on an adjacent construction. The lack of public

funding in the UK to support the recycling of building and construction materials means that the market is clearly the only driver. In spite of the establishment in 2001 of the Waste & Resources Action Programme (WRAP), which promotes sustainable waste management and the creation of stable and efficient markets for recycled materials and products, still the recycling of construction components and material is often seen by private and public stakeholders as not economically viable.

3.7.4.3 Objective 3: Recycle materials of existing buildings and infrastructures on brownfield sites

In Markham Willows the objective was successfully achieved. In fact, all concrete slabs, foundations, structural concrete and bricks were retained on site and then recycled for reconstruction works. Only materials unsuitable for recycling (e.g. asbestos) were disposed of.

In the Gateshead Quays site only some debris coming from the demolition of the building internals were crushed and re-use on the adjacent construction.

In this context, the advent of the new Landfill Tax and the Aggregates Levy, which are expected to increase the costs of construction waste landfilling and new aggregates acquisition, seems to be the only likely factor impacting construction waste recycling and improvement in cost effectiveness.

3.7.4.4 Objective 4: minimise energy demand and produce renewable energy on the site.

Renewable energy production and energy efficiency are partially addressed in the considered British cases. The reason is that perhaps energy saving measures and renewable energy production technologies are still perceived in UK as not economically inconvenient, and the available national incentives are focused on domestic users and not on brownfield sites large redevelopment projects.

In Markham Willows the tip will be used to produce biomass (willow trees) to provide heat and energy for the new uses on the colliery site. In Gateshead Quays site the production of renewable energy on site has not been considered, while the new buildings design met energy efficiency modern requirements.

3.7.4.5 Objective 5: minimise water demand and reduce waste water production

The reduction of water demand is not addressed as relevant issue in both of the British case studies.

In Markham Willows the reduction of waste water production has been addressed. In particular some concepts from the Sustainable Urban Drainage System have been applied in order to separate rainwater runoff and allow its reuse.

3.8 Concluding remarks

The SWG-analysis framework is often presented as method of rapidly moving towards an agreed strategy and new approach. It can be an aid to check the applicability of sustainable objectives and indicators, to identify the best practices in term of sustainability for the brownfield regeneration. The examination of the eight case studies of the redevelopment of brownfield sites proves that the only issue that interest stakeholders in the process of rehabilitation of existing structures is the historic and the architectural value of the exiting buildings and infrastructures. Thus, the buildings or certain structures (facades) were preserved and maintained. However, the others aspects related to the renewable energy, water consumption, recycling are often ignored or partially integrated in the regeneration process. As result, certain sustainable objectives and indicators are considered non applicable due to the higher grade of complexity of brownfield regeneration process in the technical (e.g. contamination, existing structures), legal (e.g. monument protection) and financial dimensions. To check the validity and the practicability of aspects that had been ignored in the regeneration process of the eight pilot sites. Further external case studies were analysed to identify best practices during the step of applicability check. Thus, all the objectives and indicators were preserved and the sustainable approach was validated in term of applicability.

The deficit analysis of the French approach added to the SWG-analysis represents good tools to understand and assess the current practices and the national approaches regarding brownfield regeneration. Obstacles and barrier towards sustainable development were identified as a result; recommendations were formulated to integrate sustainable approach in the complex process of derelict land recycling to help planners, owners, architects, engineers, public authorities to achieve sustainability goals.

Chapter 4: Virtual Training Centre Tool

Abstract:

In order to assist stakeholders involved in the brownfield regeneration and anyone interested by this issue, we have developed a new web- based tool called Virtual Training Centre (VTC). The latter allows VTC-users to acquire an awareness and understanding of the main topics related to brownfield regeneration such as land use, citizen participation, contaminated land, industrial heritage, etc. The VTC material is composed, essentially of lessons, reports, and studies emerged from RESCUE project and it was designed to be accessible and understandable without any need of trainer. This chapter presents web-training conception that has been used in the VTC for sustainable management of existing structures in brownfield sites (www.rescue-europe.com).

4.1 Introduction

Design Technology and practices industry experts see the need for defining sustainability, for streamlining the design process, for developing knowledge-base systems, and for bringing understanding and awareness of sustainable design and construction opportunities (American Society of Civil Engineers, 2004). Planners and urban designers have employed a wide variety of techniques in order to plan, model and simulate the outcome of a given process or development (Ranziger& Gleixner, 1997).In support of this analytical and planning function, the WWW is used as a support tool (Doyle, 1998). The Virtual Training Centre (VTC) is a web based tool which helps users (experts, planners, developers, students, owners etc) to understand the process of sustainable brownfield regeneration. It is based on the conclusions, reports, good practices, and lessons emerged from our research across the entire field of urban regeneration. The proposed web based training is expected to contribute to:

- the comprehension of the different issues of brownfield redevelopment,
- understand the sustainable regeneration framework of brownfield,
- understand the nature of sustainable indicators to track progress,
- integrate a sustainable approach in brownfield regeneration,
- identify the best practice in brownfield regeneration in term of sustainability,
- use a proposed tools in brownfield rehabilitation aiming at achieving sustainable redevelopment.

The structure and the design of this web-based site are presented via illustration of one aspect of brownfield regeneration which is the rehabilitation of existing building and infrastructures regarding others aspects, they can be found in the web site www.rescue-europe.com.

4.2. VTC Participants

Each specific aspect of brownfield regeneration has been assigned to a team (Table 1.1), who had carried out the integration and the conversion of all the results emerging from our research into training and educational format.

Topic	***VTC developers***
Development of an analytical sustainability framework,	University of Bochum (Germany)
Management of contamination and reuse of soil and debris,	University of Nottingham(United kingdom)
Management of existing buildings and infrastructures,	University of Lille1 (France)
Sustainable land use and urban design on brownfield sites,	University of Cardiff (United kingdom)
Sustainable planning processes and methods for citizen participation	University of Bochum (Germany)
Tools for the management of brownfield projects,	GIG Central Mining Institute (Poland)

Table 4.1 VTC Developers

4.3 Description the Virtual Training centre

The Virtual Training Centre (VTC) is a self-contained learning resource for sustainable brownfield regeneration, derived excursively from the results of RESCUE research, more specifically the outputs of all the aspects of brownfield redevelopment such as;

- Development of an analytical sustainability framework,
- Management of contamination and reuse of soil and debris,

- Management of existing buildings and infrastructures,
- Sustainable land use and urban design on brownfield sites,
- Sustainable planning processes and methods for citizen participation,
- Tools for the management of brownfield projects,

The VTC is based within a simple frame-based web page. The pages use HTML and a limited amount of Java and Flash. The web pages are within a predefined framework, which uses a series of standardised templates. Features include:

- Text
- Graphics
- Animations
- Interactive features
- Quizzes.

The VTC is subdivided into a number of modules, one module per topic. The modules are further subdivided into a number of courses. Each course is based on a predefined learning outcome, such as «Understanding of practical processes and problems appearing at site development concerning the saving of natural resources and waste management.". The course will be expected to fulfil the learning outcome.

4.4 The structure of the VTC

The VTC consists of a number of web pages within a predefined framework, all using standardised templates.

The VTC is based on all the outputs of our research within the project RESCUE. It contains Learning Outcomes, Case Studies, External Links, a Glossary and Modules. The VTC is subdivided into six Modules (Figure 4.1).

The Modules are the actual learning material. Each Module is based on an entire work of RESCUE project. Each Module is divided again into Sections.

Each Section is based on one of the main themes of each topic related to brownfield regeneration process. The Sections are then further subdivided into a set of Courses, each one exploring some section of the subject area covered by the applicable topic.

Each Course is based on one Level within a Learning Outcome. Each one should stand alone from other courses, though it might reference other courses for additional information. A Course is the smallest chunk of stand alone Learning Material within the VTC, but consists of a number of Web Pages. Each Web Page is part of a Course and will not be usable without the other pages in the Course.

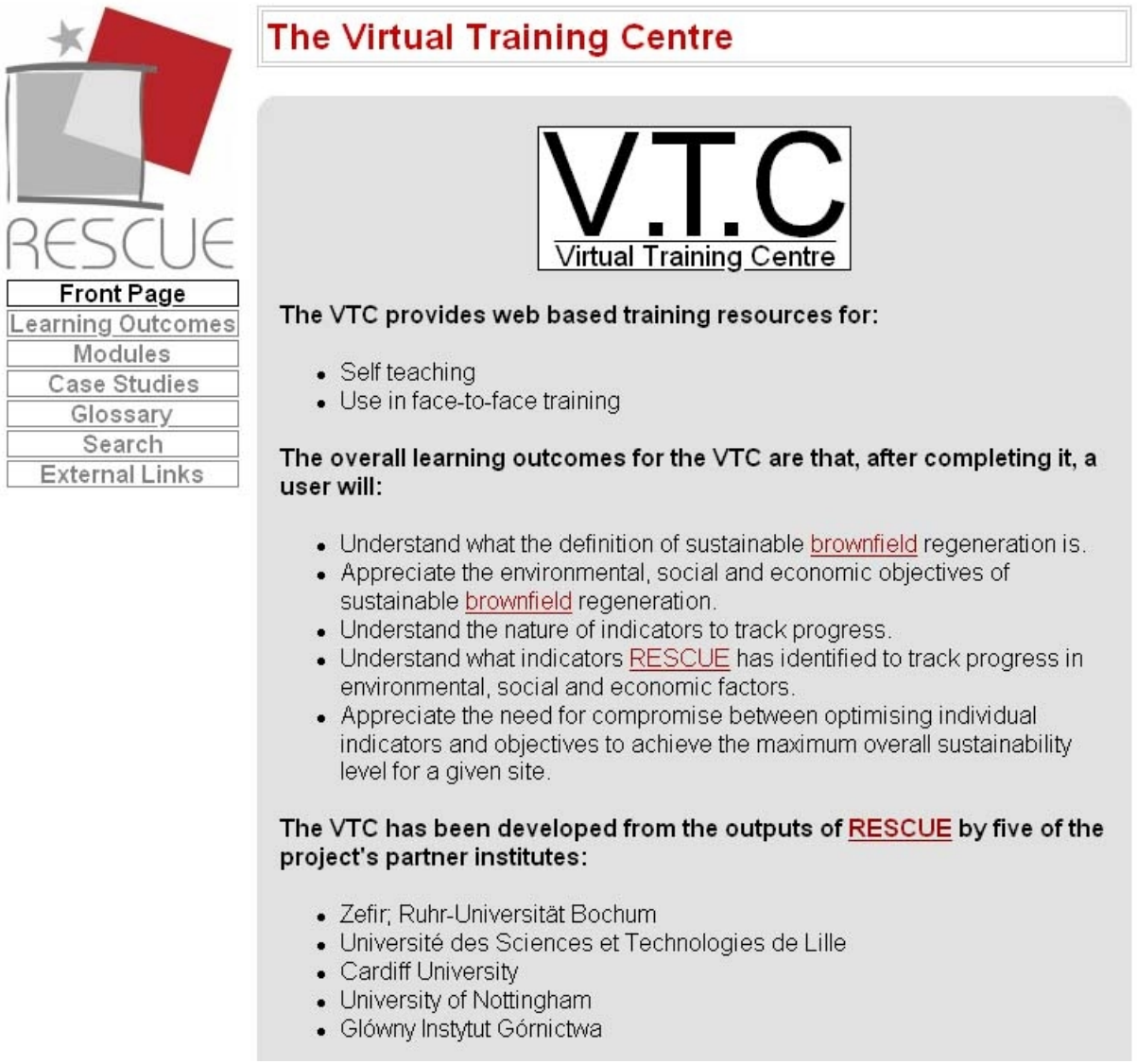


Figure 4.1.Virtual Training Centere Frontpage (RESCUE 2005)

4.5 Learning outcomes

Learning Outcomes describe what the user should know, understand or be able to do after completing the learning materials that they are attached to.

Learning Outcomes are defined and testable. There are levels of comprehension implicit in each outcome. The weakest outcomes define student Awareness, the stronger outcomes define

Understanding, with Ability for the strongest. The stronger outcomes are more precisely defined, and therefore, more useful**.**

There are three levels to the learning outcomes:

- Level one: Awareness
- Level two: Understand
- Level three: Able to Use

Examples of each level taken from our work on the sustainable rehabilitation of existing buildings and infrastructures:

- Level one: Awareness of the need to improve the site's image and to appreciate the site's industrial heritage,
- Level 2: Understanding processes and practical problems appearing at site development concerning financial and development aspects
- Level 3: Coping with problems concerning Health & safety and institutional regulations.

The Learning Outcomes are developed in collaboration with European partners. The level one will be developed in the chapter one however the level two and three will be carried out deeply and consecutively in the chapters two and three.

4.6 Methodology

The basic design process of VTC is illustrated by Figure 4.2. Initially, the responsible of each topic (e.g. USTL responsible for the management of existing buildings and infrastructures) has been asked to propose the content of the VTC (outcomes and materials) and to define the level of courses and lessons i.e. awareness, able to understand, and able to use. These lessons should be accessible and understandable by large public (student, experts, and citizen) going through it, on their own without need of trainer. During the Second step, meetings have been organized to discuss and to validate the proposed materials within the RESCUE team. After validation of the content of VTC related to each topic, a deep work was carried out by the responsible of the topic to elaborate and establish the content (inputs from RESCUE project, literature, good practice, quiz, etc), the format and the design (animation, links, presentation, etc) of the topic. Second exploration and evaluation by RESCUE team concerning all the aspect of the web-content and web-design was established and transmitted to the developer of the topic in order to change and modify certain aspects if it is necessary. Finally, external

validation has been carried out via several presentations and tests involving external publics (students, experts, researchers etc). Analysis of their remarks and suggestions and written feedback, will provide interesting insights into group evaluations, design and working in virtual environments.

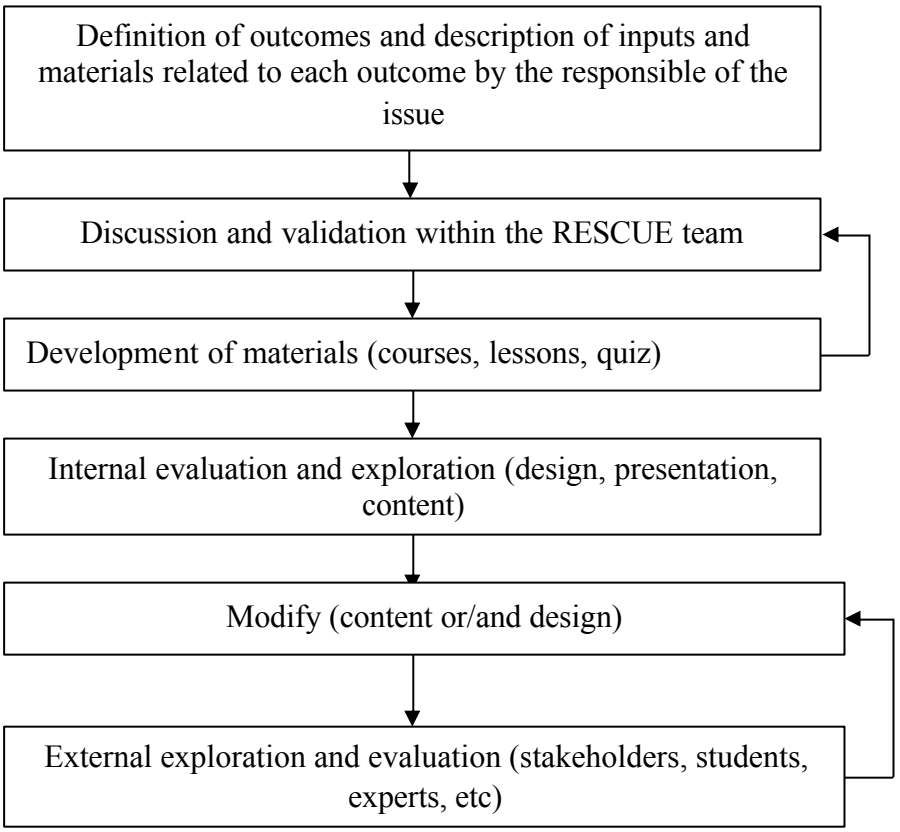


Figure 4.2 VTC developing process

4.7 Awareness level

With the collaboration of Rescue partners we have developed the objectives related to this level, these objectives should be achieved by the user at the end of his training courses. These objectives are:

- To make the user aware with problems to be tackled during the management of existing buildings and infrastructures on brownfields.
- To convince VTC users why certain sustainable objectives should be achieved.
- To draw up the scope of alternatives and their economical, ecological and social effects, using short best practice examples.
- To visualize main trends using sustainability objectives.

The following questions:

- How to deal with natural resources and waste management on a brownfield site?
- How to deal with industrial heritage?
- How to deal with financial and development aspects?
- How to find a better way to comply with health and safety regulations for reused buildings and infrastructure in a brownfield site.

This level is composed of four outcomes as understanding and able to use to levels, the outcomes remained unchangeable for all the levels; however, they have been developed depending on the level of training and the advance of RESCUE project.

4.7.1 Outcome 1: Natural Resources and Waste Management

This outcome aims to make VTC-users aware of the necessity:

- To save natural resources (minimise water demand and reduce waste water production),
- To minimize construction and demolition waste (minimise waste generation from buildings and civil infrastructure and to optimize recycling and reuse
- and to save energy and to produce renewable energy

4.7.2. Outcome 2: Site image and appreciation of industrial heritage

This outcome deals with the awareness of the need to improve the site's image, in order to appreciate the site's industrial heritage, within this outcome, we have explained the impact on social and economical values due to the change of the negative image of brownfield sites. Some examples have bee introduced as illustration of this issue.

4.7.3. Outcome 3: Financial & development aspects

This outcome is about Awareness of the need to make the reuse or dismantling of buildings and infrastructure economically viable (respecting regional public demands).

4.7.4. Outcome 4: Health, safety and institutional regulations

The aim of this outcome is the awareness of health and safety problems posed by the rehabilitation of old buildings and of the problems of - how to deal with corresponding institutional regulations

4.8 VTC-Understanding level

As Understanding level is higher than awareness one, that's why, the issue of rehabilitation of existing buildings, was more explained and detailed. The goals in this level are:

- To Explain to VTC users the Interlinkages (e. g. between legislation, practical process)
- To show the technical, economical and social obstacles in the process of buildings reuse.
- To use sustainability objectives and indicators developed as a checklist tool for sustainable management of old buildings.
- To explain the national frameworks (legal, taxation) of the four countries (France, Germany, Poland and Unites Kingdom).

4.8.1. The Learning Outcomes -Understanding level

We have the same outcomes as awareness level however; the content and the materials included were different.

4.8.1.1. Outcome 1: Natural Resources and Waste Management

We have included materials and data to help the VTC users to understand, the practical processes and problems appearing at site redevelopment concerning saving natural resources (water and energy) and the management of construction and demolition waste.

4.8.1.2. Outcome 2: Site image and appreciation of industrial heritage

The objective aims to help the users to understand in practical view, the difficulties and the obstacles that may face the developers when they deal with the issue of negative site image and the industrial heritage appreciation.

4.8.1.3. Outcome 3: Financial & development aspects

This outcome dealts with financial incentives, taxation and legal aspects that encourage stakeholders to manage in sustainable way the existing buildings and infrastructures, thus, Processes and practical problems appearing at site redevelopment concerning financial and development aspects could be overcame. Though the financial aspect is very important in the regeneration process of brownfield sites, we met certain obstacles to get information about real practices in order to measure and compare the impact of these existing financial incentives for supporting sustainable project, these obstacles due essentially to confidentiality (no answers to questions related to project cost). As result, we have limited this outcome to the understanding level.

4.8.1.4. Outcome 4: Health, safety and institutional regulations

This outcome explaines the healthy and safety problems that could arise during the rehabilitation process of old buildings such as:

- fire protection,
- occupant health and safety,
- accessibility to the buildings,
- seismic risks,
- mine subsidence,
- health and Safety at work,

Also, regulations and legislation concerning this issue were illustrated via an example.

4.9 VTC - Able to Use Level

As, numerous scholars from wide range of disciplines have contributed to expanding academic body of knowledge on sustainable built environment, it is not possible for us to list all the relevant books, guidelines, and tools (scientific, technical, economical, legal etc.),on this issue. The intent of this level is to provide a sampling of references and tools addressing the various aspects of sustainable management of existing buildings and infrastructures of from multiple sources such as:

- ✓ general references on sustainability of the built environment,
- ✓ sustainable buildings web sites,
- ✓ scientific Softwares,
- ✓ books etc

They were selected to provide VTC users with an initial point of departure toward the application of sustainability approach buildings regeneration in brownfield sites. The proposed tools cope with:

i. Outcome 1: Natural Resources and Waste Management
ii. Outcome 2: Site image and appreciation of industrial heritage
iii. Outcome 3: Health, safety and institutional regulations

4.10 Assessment of the VTC

No formal assessment was conducted online for the VTC, because of time constraints in establishing the website and as this was an innovative method of instruction for the brownfield redevelopment. Hence, assessments were carried out using traditional methods, such as a face-to-face debate involving students at the University of Lille, scientific researchers and some experts. As, The VTC is freely available on line learning resource in RESCUE web site (www.rescue-europe.com), it will be interesting to get a feed-back from end users to improve the VTC. The external evaluation of this tool will allow for better understanding of the use of this tool and on its impact on users.

4.11 Conclusion

The Virtual Training Centre was developed to allow newcomers and practitioners in brownfield regeneration to acquire awareness and understanding of the large spectrum of topics encountered in sustainable redevelopment of brownfield. This tool simplifies access to information. Any user can obtain desired information from the web-site. Moreover, the VTC improves the currency information of stakeholders have, it provides them information about the best practices in term of sustainability, policies, regulations, tools. Despite these advantages, Hoogveld et al., (2001), pointed out that the training via the Web has some disadvantages:

- It gave the participants a lot of freedom in dividing their time between the different activities and over the relatively long time available for the training and test
- the fact that during the training and test periods there was no opportunity for face-to-face contact between the participants and the tutors appeared to be demotivating for the participants.

Thus, to improve the VTC we have to evaluate it by users for example by distributing evaluation sheets to them or by taking into a count remarks or suggestions of anyone to offer more

suitable training environment, moreover we hope also that the VTC will improve awareness and enhance knowledge and commitment to sustainable redevelopment of brownfield.

General conclusion and recommendation

General Conclusion and recommendation

A sustainability approach for management of existing buildings and infrastructures in brownfield sites is developed based.The sustainability approach takes into account the interaction between the four dimensions of sustainable development and the different socio-economic, legal and political conditions in four European countries. This approach aims to:

i. Promote the maintenance and reuse of existing building and infrastructures in the redevelopment process, by discouraging demolition or dismantling as options and encouraging integrated life cycle assessments that can assist in highlighting historic, social, economic, heritage and aesthetic values as part of the planning process.

ii. Enhance the integrated reuse and recycle of building components and construction/demolition waste in the redevelopment phase by improving building components assessment and selective dismantling practices that can make the reuse/recycle more cost effective and taking into account potential monument regulations that could restrict or promote reuse reducing the consumption of natural resources;

iii. Assist in minimising energy demand and to promote the use of renewable energy on site by promoting building energy efficiency audit and subsequent design of improving measures and supporting in overcoming possible financial obstacles related to investments in heating systems renovations, renewable energy production and energy saving measures;

iv. Optimise water resource on site, promoting sustainable water management options for the reduction of water demand and waste water production on site.

This sustainable approach offers a starting point for studies of redevelopment of brownfield sites. It makes possible and feasible to choose and assess the different scenarios of a future use of the existing structures based on the sustainable objectives and indicators, thus, stakeholders could choose between preservation or/and dismantling of the industrial heritage and reach the level of the best practice in term of sustainability.

As the redevelopment of brownfield sites includes several disciplines (land use, soil contamination, industrial heritage and citizen participation) which are closely interlinked, an understanding of these aspects is essential by stakeholders involved in the process of brownfield regeneration.

The Virtual Training Centre is web-based tool which represents a good tool to understand sustainable brownfield regeneration.

Recommendations for sustainable management of the industrial heritage

A sustainable approach for the rehabilitation of existing buildings and infrastructures in France requires the understanding of the different issues related to the redevelopment of the brownfield such as; land planning, soil contamination, public participation, and the sustainable development dimensions. The application of this approach requires:

- More legal incentives and regulations are needed to encourage the retention and the refurbishment of existing buildings and infrastructures on brownfield. Direct and indirect financial incentives should be developed for this purpose.Moreover,the industrial heritage should be considered as assets and not aobstacls in brownfield regeneration projects and the decision of dismantling or keeping existing strtucture should be taken on the base of public participation and not on a political decision (eg Loisinord and les Tretials sites)
- New code for historic buildings, which includes a level of flexibility with regard to the rehabilitation of historic buildings, should be developed. In addition, there is a need to support building maintenance by developing a building maintenance manual. This would need to provide documentation on building systems, facilities management programs to record important information on the operation of a building or property, schedules for cyclical maintenance, custodial procedures and for regular inspections of important features.
- More interesting legal incentives and regulations should be developed to encourage planners and investors to reuse recycled demolition arising on brownfield projects. For example by improving the competitiveness of reused and recycled materials. And by increasing landfill taxs
- The use of sustainable urban drainage systems such as the "techniques alternatives" in France and any others techniques or instruments in order to reduce water consumaption and wastewater production.
- More financial incentives for investors and owners to encourage them to use renewable energy which considered uncompetitive in France comparing to nuclear energy.
- Integrate a set of sustainability criteria to guide funding towards sustainable brownfield projects.
- Promote the inclusion of industrial buildings in the listings of culture heritage monuments.

- Establishing education and training programs to advance sustainable design and to engage the full range of stakeholders to become more effective. This work develops specific collaborative education programs and initiatives through a multiple strategic alliance of educators, practitioners, professional associations and funding resources.
- Sharing the sustainable design knowledge base through the collaboration efforts with other countries for the exchange of information on design principals and practices.
- Use of engineering, planning and management tools (planning instruments, guidelines, checklists, softwares, etc) to achieve the sustainability objectives.

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ANNEXES

ANNEX 1.1 Matrix on proposed pilot sites and selection criteria

Name of the project	Starting year/year of intended finalisation	Previous land use: heavy industry	Size of the site in (1000m2)	Contaminated soil and debris	Buildings and infrastructures	Urban context
Loisinord (F)	1990-1998	+*	240	+	-*	+
Les Tertiales (F)	1993-?	+	20	+	+	+
L'escarpelle (F)	1997-?	+	Ns +*	+	-	+
11-19 de Loos-gohelle	1988-?	+	ns	+/ -	+	+
Centre Ville Libercourt (F)	1985-?	+	Ns -	+	+	+
Carbolux Bruay	80-?	+	ns	+	+/-	+
Rieulay (F)	75-04	+ / -	Ns +	+	+	+
Espenhain (G)	90-02	Chemical works	Ns +	+	+	+
Brikettfabrik Witznit (G)	91-00	Briquette factory	Ns +	+	+	+
Borna (D)	99-02	-	ns	+	+	+
Ewald1/2/7 (D)	99-05	+	600	+	+	+
Radbod (D)	95-01	+	210	+	+	+
Dolomites (PL)	01-03	+	376.4	+/-	+/-	+
Szombierki area (PL)	At the stage of conception	+	390	+	+	+
Sosnowieck (PL)	01-03	+	315	+/-	+	+
Porabka-klimontontow (PL)	At the stage of conception	+	570	+	+	+
Markham (UK)	02-04	+	2.000	+	+	+
Gateshead Quays (UK)	99-05	+	200	+	+	+

ANNEX 1.2 Matrix on proposed pilot sites and selection criteria

Name of the project	Integrates social and engineering sciences	Sustainability	Participation	At least one follow-up land utilisation is in use	Ranking selection	Fulfilment
Loisinord (F)	+	**+/-**	+	**+**	1	78 % + 11% +/- 11% ns
Les Tertiales (F)	+/-	**+**	+/-	**+**	2	78 % + 22% +/-
L'escarpelle (F)	+/-	**+**	**-***	**+**	4	67 % + 11% +/- 22% -
11-19 de Loos-gohelle	+	**+**	+	**Ns**	3	67 % + 11% +/- 22%
Centre Ville Libercourt (F)	+/-	**-**	**-**	**Ns**	5	44 % + 33 % +/- 11 % - 11% ns
Carbolux Bruay	+/-	**+/-**	**-**	**Ns**	7	33 % + 33 % +/- 11 % - 22% ns
Rieulay (F)	+	**+**	+	**+**	6	89 % + 11 % +/-
Espenhain (G)	+	+	+	**+**	**1**	100 % +
Brikettfabrik Witznit (G)	+/-	+	+	**+**	**2**	89% + 11 % +/-
Borna (G)	+/-	**+**	+/-	Ns	3	44 % + 22 % +/- 11 % - 22 % ns
Ewald1/2/7 (G)	+	**+/-**	+	**-**	**2**	77 % + 11 % +/- 11 % -
Radbod (G)	+	**+/-**	+	**+**	**1**	89 % + 11 % +/-
Dolomites (PL)	+	**+**	+	**+**	**1**	78 % + 22 % +/-
Szombierki area (PL)	+	**+**	+/-	**-**	4	78 % + 11 % +/- 11 % -
Sosnowieck (PL)	+/-	**+**	+	**+**	2	78 % + 22 % +/-
Porabka-klimontontow (PL)	+	**+**	+/-	**+**	3	89 % + 11 % +/-
Markham (UK)	+	**+**	+	**+**	**1**	100 % +
Gateshead	+	**+**	+	**+**	**2**	100 % +

Quays (UK)						

***** The different topics are assessed with:

- +: existing,
- +/-: partially
- -: Not existing
- Ns: No specification.

F: France, PL: Poland, G: Germany and UK: United Kingdom

Annex 2.1: French site data- Les Canonniers

A. General situation			
A. 1	**Contact person(s)**		**DATA**
A. 2	**I. local Authority** - Valenciennes Town hall : 1.Former director of the Installation service of the town planning and habitat and currently general manager of the engineering departments Community of agglomeration Valenciennes Metropolis. 2. Director of urban service development and public spaces. 3. Head of Roadway service systems and Urban Cleanliness. 4. Director of Habitat and Housing service **II.Association**: 1.Director of Ageval association The purpose of this association is the safeguarding of the Inheritance and the history of Valenciennes districts.		- In 1990 the district of Canonniers was very degraded and devalued by: - Industrial waste lands and public equipment in abundance (Barracks, old people's home). - Very many vacant small bock of buildings (a score of urban waste lands localized in the street of Canonniers). - Unhealthy or very uncomfortable habitat. - The presence of warehouses and places of storage for the trade neighborhood. The frame is in drove state and date for the majority of the 19 Th century. - Between 1982 and 1990, the district lost 16% of its population, there was a strong proportion of old people because of the presence of the old people's home. the rate of unemployment was up to 24% in 1990, 25% of the population was of foreign nationality. Only 80% of the residences were equipped with baths or showers. The rate of vacancy was up to 18%, there was practically no social housing. - In 2001: the district completely changed its image, but still preserves some small bock of degraded buildings which has specific problems as : - the small block of buildings where concentrated with unhealthiness phenomena ,discomfort and waste lands: La Cour de Lion and part of Hon-Hon street - A portion of Hon-Hon street in which the owners remained refractory with the process of revalorization of their inheritance: small surfaced Houses on two occupied levels maximum in majority by their owners. - Lille street of with buildings with ground floors occupied by small trade of proximity and habitat in vacant stage or in drove state.

B. Site information and spatial structure			
B. 1	National list of historical monuments History of buildings The general Hospital (Canonniers district). Date of protection MH 1945/06/18: Classified MH General hospital: classification by the June 18, 1945 decree		
B. 2	Quality, volume and area of (natural) soil below (if known) The traditional building style out of brick and blue stones is presented in the form of a regular quadrilateral of 90*110 metres with an interior court of 50*70 metres; the main buildings depth being 20 metres. In the east, one second irregular court including one with dimensions 30 metres in length and the others 40 metres is delimited by two of the same wing width which are prolonged to the arm of Escaut street. Distribution of hospital surfaces *Ground floor +/- 9000 m2. First stage +/- 9000 m2. Second stage +/- 8500 m2. - Roof +/- 8500 m2. - Central Court 3500 m2 - side Court 1500 m2 Current total: - Building: 2650 m2. - Courts: 5000 m2		
B. 3	. History of the General Hospital Date of construction: 1752-1774. Architect: Charles All Saints' day Cut. The plans of the hospital were drawn up on July 15, 1751 and the final estimate established on June 8, 1752 by the civil engineer Charles All Saints' day Havez. The building work was undertaken in July 1752 and essentially completed in 1766; the establishment was inaugurated on July 1, 1767 but work continued until 1774 with in particular, the construction of the vault. The Army obtained in 1831 the concession of the whole left wing of the building to transfer its military hospital to it and it remained there until 1894. The roof burnt in 1940 and was replaced by a reinforced concrete roof. Current name: Hainaut Old people's home Ronzier Barracks: An XVIII century old building..	Survey of the building with respect on health and microclimate conditions	

C. Natural space management			
C. 1	Measures foreseen for nature protection District Tertiales, Les Canonniers measurements are defined in the Zone De Protection Du Patrimoine Architectural Urbain Et Paysager. (Z.P.P.A.U.P) (Zone Of Protection Of The Architectural Urban And Landscape Heritage).		

D. Infrastructure			
Internal transport system (roads, rails) For the district of Canonniers the system of transport is composed of Roads		**Technical documentation** **Physical assessment of the transport system**	
D. 1	Type and condition of roads The roads were in drove state		
D. 2	Costs of improvement for planned use category Cost of rehabilitation. 15 143 126 Euros		
D. 3	Costs of dismantling NO DATA.		
D. 4	Benefits associated with recovering materials. Not considerable profits associated with recovered materials. Indeed, It is a question of recovering certain types of materials primarily bricks and pave. These materials are dealt with by Ageval association, and will be used in other building rehabilitation sites.		
D. 5	Dismantling of roads, pavement recycling, rubble and other waste management NO DATA.	LCA (Life Cycle Assessment) or LCC (Life-Cycle Cost) if available, or any other methodology used for comparing environmental and economical aspects of development NOT AVAILABLE.	

Water supply			
D. 6	Is the water supply adequate for the planned site use? Yes.	- Characteristics of water supply system (pressure, main pipeline diameter, flow capacity) - Pumping station (technical characteristic)	
D. 7	Is the water quality satisfactory? Currently, water "suitable for human consumption" must fill 63 principal criteria, divided into seven groups: * Organoleptic parameters * Physicochemical parameters in relation to the natural structure of water * Parameters concerning the "undesirable" substances * Parameters concerning the toxic substances *Microbiological parameters phone * Related pesticides and products * Parameters concerning the softened water delivered for human consumption		
D. 8	Evaluation of the technical conditions (age, stage of wear) NO DATA.		
D. 9	Reasons for and costs of dismantling or rehabilitation of the water supply NO DATA.		
D. 10	Techniques applied for dismantling, waste management, material recycling - Mechanical Machines. - No management of waste. All the wastes are evacuated into discharge material.		
D. 11	Usefulness of rain water collection NO DATA	- Amount of rain water that can be collected from the roof area; - Area of parking lots and roads belonging to the site NO DATA.	

Sewerage			
D. 12	Is the system adequate for new plan? Yes.	- Characteristics of sewer system (pressure, main pipeline diameter, flow capacity) - The number of persons using the building - The quantity of the water used for the production - Evaluation of technical condition (age, stage of wear)	
D. 13	Is there a need to improve, or replace? Yes there is a need to replace.		
D. 14	Reasons for and costs of dismantling or rehabilitation The old sewer system was in drove state.		

D. 15	Techniques applied for dismantling Mechanic machines		
D. 16	Waste management, reuse, materials recycling No waste management. No reused materials.		
Heat networks			
D. 17	Is the heating system adequate for the new demand? YES.	What type of heat networks have been used on site (high temperature or low)	
D. 18	Assessment of environmental balance NO DATA.		
D. 19	Assessment of financial balance NO DATA.	Cost Benefit Analysis or other studies	
D. 20	Reasons and costs for dismantling or rehabilitation NO DATA		
D. 21	Techniques applied for dismantling - Mechanical machines.	- Evaluation of technical condition and efficiency (quality of insulation, corrosion, stage of wear) - Heat capacity of network - Estimation of heat losses	
D. 22	Waste management, reuse, materials recycling No waste management. No reused materials		

Electricity networks			
D. 23	networks bury	Characteristic of networks (Transformer capacity, voltage, underground or on the surface)	
D. 24	Power demand (previous and future) NO DATA		
D. 25	Evaluation of technical condition (quality of insulation, corrosion, stage of wear) NO DATA.		
D. 26	Reasons for and cost of dismantling or rehabilitation To pass from apparent network to bury network		
D. 27	Techniques applied for dismantling Mechanical machines.		

D. 28	Waste management, reuse, materials recycling No waste management. No reused materials.		

Tele-communication networks			
D. 29	bury network	Characteristics of networks	
D. 30	Reasons for and cost of dismantling or rehabilitation To pass from apparent network to bury network.		
D. 31	Techniques applied for dismantling Mechanical machines.		
D. 32	Waste management, reuse, materials recycling No waste management. No reused materials		
E. Building use			
E. 1	Reason for retaining, adopting or dismantling of the building/buildings. - Architectural quality. - The quality of building. - The availability of the financing.	- Building value as a monument - Imperative need for renovation (regardless of future use). The restoration of the buildings which have monumental values enters within the framework of the reconquest of the district whose objectives are: - The requalification of the degraded old habitat. - The reconquest of the waste lands by the new building. - The rehabilitation and the installation of new public equipment. - Improvement of public spaces and architectural valorization	
Building or construction characteristics			
E. 2	Length, width, height NO DATA.	Technical documentation, drawings, maps	
E. 3	Type of buildings or constructions (monolith, frame structure, bricks, mixed, etc.) - Buildings with bricks		
E. 4	Aesthetic and cultural value of the building NO DATA		

E. 5	Technical condition of the building (age, degree of wear of the building) NO DATA		
E. 6	Types of materials and construction techniques used The Z.P.P.A.U.P defines the processes and the materials which it is necessarily used for the construction of the buildings.		
E. 7	Safety and fire standards of the building NO DATA		
E. 8	Any evidence of building contamination NO DATA.		
E. 9	Evaluation of stability of the building No data		
E. 10	Construction of the building, basic parts of the building (roof, outside walls, windows, doors) NO DATA	- Complex Engineering Survey of the Building - Calculation of stability	
E. 11	Basic data of the building ventilation NO DATA.		
E. 12	Special attributes of the building - Residences: 12.201 m2 - Trade-Horeca -Rooms: 1.321 m 2 - Offices 252 m2		
E. 13	Functional aspects of the building compared to the future plan (e.g. wheel chair access) NO DATA.		
Buildings and constructions value assessment			
E. 14	Use value- (space volume of existing buildings) Surfaces of the buildings used on the district of Canonniers are: 13774 m2	Techniques applied for building evaluation (LCA- Life Cycle Assessment, Life-Cycle Cost) if available	
E. 15	Technical value of the building (durability, level of the wear) The technical study is ensured by the Architects of Buildings of France	Not available.	

E. 16	Context of the heritage-historical, artistic, semiotic value of the building. * Separated by other districts from the city by an arm of Escaut, a long time ranging between this one and the fortifications, the gunners did not certainly have good reputation. The concentration of soldiers had made a hatch of houses with master keys, the general hospital accomodated the beggars, the wounded people, the old impotent men, the orphans…, in short, left for count and sporadically in times of war, the soldiers and refugees, the arm of Escaut was only one nauseous sewer with open sky which was used for the tanneries, malts factory, breweries and other factories. Moreover the presence of the imposing Espies barracks, holy Vincent and postern, hospitals and convents had involved a network of rare and not very practical streets and the inhabitants and users were constrained to make long turnings. The wars did not improve the district situation. Fires, bombardments and plunderings punctuated its history between the end of the general hospital building site in 1774 and the second world war which will see its imposingly covered slate roof left in smoke under the bombs. The installation of immense workshops gave the site fortifications and glacis which will contribute to the XIX and XX centuries with the maintenance of the reserved character of the district. Another district percieved like as necessary evil in a garrison town.	Any methodology applied for evaluation: - Commercial software or - National guidelines, standards No methodology applied for any evaluation.	
E. 17	Common criteria used for deciding the buildings fate - The state of the buildings. - Architectural quality. - The availability of funds.		

E. 18	Techniques applied for dismantling. The procedure of dismantling comprises two phases : - phase of diagnosis: Within the framework of the safeguarding of Inheritance and history of the districts, AGEVAL, in partnership with Hainaut-Archaeology, the Committee of Safeguard of Valenciennes Inheritance and the services of Inheritance and Archaeology intervene to recover materials and furniture concerned with the inheritance and being able to be employed again within the rehabilitation framework (restoration of frontages, public monuments …). - Demolition phase by using the mechanical machines.		
E. 19	Waste management, reuse, materials recycling. the materials recovered after the phase of diagnosis are treated, cleaned and stored according to their dimensions, their colors and their natures (Doors, windows, tiles, bricks, pave.....). These materials are re-used for The restoration of frontages, and monuments public.		

E. 20	Economical viability of new development opportunities. For the majorities of the projects there was neither of the feasibility studies nor analyzes benefit.	- Feasibility study - Cost Benefit Analysis	

F. Financing questions			
F. 1	Availability of funding for renovation - A public financing (Agence Nationale pour l'Amélioration de l'Habitat "ANAH") within the framework of a operation of improvement of the habitat (OPAH) centre town, - A public financing State-town, - Feder, - C.D.C (Caisse des Depots et Consigantions) within the framework of the F.S.H (fond de solidarité Habitat)	- Tools for assessment of support of site redevelopment - Incentives used for promoting the maintenance of post - industrial buildings	
F. 2	Availability of funding for the application of new technology or environmental improvements - There are no cash in hand.		
F. 3	Availability of funding for monument protection - the Rehabilitation of Frontages: Vacant buildings: Buildings: - Percepain street. - Canonniers street. - Espies Barracks. Financing: - Feder: 65 % - Town of Valenciennes:17.5% - Owner: 17.5 % * The Rehabilitation of Ronzier Barracks: Financing: Feder: 50%. Town of Valenciennes: 50 %		
F. 4	Possibility to finance improvements by "contracting models" (e. g. for saving energy) No possibilities of the financings.		

G. Assessment of organisation of dismantling or renovation works			
Assessment of organisation of dismantling or renovation works			
	Checking for the existence of plans or permits associated with access to the site for dismantling or construction works: The checking for the existence of plans or licences relating to the site. For dismantling or construction work. The modification of the buildings included in the perimeter of the zone of protection, is subjected to special permit. This is granted by the proper authority as regards of building permit, after the assent of the architect of the buildings of France. The building permit and other authorizations of the town planning Code holds a place of its own if they are covered by ABF visa.		
G. 1	Installation of a Z.P.P.A.U.P. A Zone of Protection of the Architectural Heritage, Urbain and Paysager (Z.P.P.A.U.P) is a portion of territory to be protected for aesthetic or historical reasons.	Procedures with official authorities (e. g. concerning monument protection)	
G. 2	The local authorities launched a study which relates to the old city of Valenciennes and mainly to the district of Canonniers and the cour de lion, the purpose of this study is to present projects of rehabilitation and development, taking account of various aspects of life in a district by integrating historical dimension in the evolution of the district. The study was under the French Institute of Architecture	Procedures with authorities finding better or innovative solutions	
G. 3	NO DATA	Estimation of masses of parts to demolish	
G. 4	NO DATA	Concept for waste management time planning	
G. 5	NO DATA	Communication with authorities	
G. 6	NO DATA	Localisation of underground infrastructure in form of documentation	
G. 7	NO DATA.	Compliance with personal rights (e. g. right of property, ways, cables...	
G. 8	NO DATA.	Advance training for workers for labour safety?	

Contamination management			
G. 9	Is a legally binding plan for remediation set up, in order to treat and keep soil on the site and to reduce costs?	NO DATA.	
Dismantling process			
G. 10	No compliance with all regulations dust, noise, working, labour safety	Compliance with all regulations: dust, noise, working, labour safety	
G. 11	NO DATA.	Any complaints?	
G. 12	NO DATA	Estimation, sampling, analysis and classification of contaminated waste.	
G. 13	NO DATA	Expert survey of demolition process if needed	
G. 14	NO DATA	Care for explosion hazard	
G. 15	NO DATA	Waste management – permits for disposal or recycling onsite or offsite	
G. 16	NO DATA	Overall health and safety plan	
Rebuilding process			
G. 17	No compliance with all regulations dust, noise, working, labour safety.	Compliance with all regulations: dust, noise, working, labour safety	
G. 18	NO DATA	Any complaints? (→ see WP 2!)	
G. 19	NO DATA	Estimation, sampling, analysis and classification of contaminated waste	
G. 20	NO DATA	Expert survey of demolition process if needed	
G. 21	NO DATA	Precautions against explosion hazard	
G. 22	NO DATA.	Waste management – permits for disposal or recycling onsite or offsite	
G. 23	NO DATA.	Overall health and safety plan	

H. Quality management			
H. 1	Is there any quality management system presented in the companies responsible for works associated with dismantling or construction on site? The quality management was ensured by the project superintendent. - Roadway systems' work • Collet agency • Valenciennes Town hall.		

Annex 2.2: French site data- Loisinord

A. General situation			
A. 1	**Contact person(s)**	**Data**	
A. 2	Loisinord site **I.Local authority:** The manger of Loisnord project.	At the beginning of the **1980's ,** the town of aiming Noeu-les-Mines elaborated a strategy of urban recombining which has to create a new strong axis of development of the east relying on the principal criteria of the following installation: In the east:the creation of a park of sporting leisures and activities of more than 150 hectares, LOISINORD aiming to reabsorb 90 hectares of industrial waste lands located on the edge of the A26 and improving the attractiveness of the area by creating a product- tourist structuring, able to collect flows of transit while offering to the regional population an innovating product of proximity and quality. In 1990 the first work of reconversion and installation of the park of sporting leisures started. In 1994, the opening of the nautical base of 22 hectares instead of an old spoil heap. **May 26, 1996** the biggest ski-on-synthetic surface in Europe (16000 m2) on a well-organised terrain, was opened to the public	
B. Site information and spatial structure			
B. 1	National list of historical monuments No historic buildings		
B. 2	Quality, volume and area of (natural) soil below (if known) NO DATA		
B. 3	History of buildings NO DATA	Survey of the building with respect on health and microclimate conditions	
C. Natural space management			
C. 1	Measures foreseen for nature protection - The city made a Study of landscape installation**.**	- Treatment of *ruderal* areas Measures for compensation? - Creative solutions - The town of Noeux –Les- Mines constitutes a reserve of forest seedlings which covers 20 ha, This reserve was used for the change of the site image indeed on the whole 150000 plants will be thus planted before April 15, 1993. the site knew - a plantation of trees: 490. - a plantation of scaffold-poles: 5.500. - a plantation of plants: 218.460. - a neat turfing: 8500.	

D. Infrastructure		
Internal transport system (roads, rails) Composed of roads, the technical documentation and the physical assessment of the transport system isnot availabale		
D. 1	Type and condition of roads Principal roadway systems: - Water plan and Axis ski course – in 2*2 ways (VR2). - Connection 2*2 ways of Loisinord to the Street Moussy VR1	
D. 2	Costs of improvement for planned use category - 2.417949.6 euros (Rehabilitation and dismantling)	
D. 3	Costs of dismantling -2.417949.6 euros (Rehabilitation and dismantling)	
D. 4	Benefits associated with recovering materials - No profits associated with materials all the products with demolitions are evacuated towards public discharge	
D. 5	Dismantling of roads, pavement recycling, rubble and other waste management. - No recycled materials. - No LCA (Life Cycle Assessment) or LCC (Life-Cycle Cost) was applied on the site.	
Water supply		
D. 6	Is the water supply adequate for the planned site use? - Yes, it is.	
D. 7	Is the water quality satisfactory? A good quality of water.	
D. 8	Evaluation of the technical conditions (age, stage of wear) The lake of loisinord is filled with drinking water.	
D. 9	Reasons for and costs of dismantling or rehabilitation of the water supply Cost of work for food of drinking water * 91215.4 euros including taxes	

D. 10	Techniques applied for dismantling, waste management, material recycling - Mechanical machines		
D. 11	Usefulness of rain water collection NO DATA.	- Amount of rain water that can be collected from the roof area; - Area of parking lots and roads belonging to the site Loisinord makes it possible to evacuate 1500 m3 of rain water.	
Sewerage			
D. 12	Is the system adequate for new plan? Yes	- Characteristics of sewer system (pressure, main pipeline diameter, flow capacity) - The number of persons using the building - The quantity of the water used for the production - Evaluation of technical condition (age, stage of wear)	
D. 13	Is there a need to improve, or replace? No DATA		
D. 14	Reasons for and costs of dismantling or rehabilitation The cost of drainage work is: 843089.73 euros. Including taxes.		
D. 15	Techniques applied for dismantling Mechanical machines.		
D. 16	Waste management, reuse, materials recycling - No profits associated with waste materials, all demolition and construction wastes were removed to landfill.		
Heat networks			
D. 17	Is the heating system adequate for the new demand? NO DATA	What type of heat networks have been used on site (high temperature or low)	
D. 18	Assessment of environmental balance NO DATA		
D. 19	Assessment of financial balance NO DATA	Cost Benefit Analysis or other studies	
D. 20	Reasons and costs for dismantling or rehabilitation NO DATA		

D. 21	Techniques applied for dismantling Mechanical machines	- Evaluation of technical condition and efficiency (quality of insulation, corrosion, stage of wear) - Heat capacity of network - Estimation of heat losses	
D. 22	Waste management, reuse, materials recycling - No profits associated with waste materials,		
Electricity networks			
D. 23	Buried network	Characteristic of networks (Transformer capacity, voltage, underground or on the surface)	
D. 24	Power demand (previous and future) The ski course: Electric lighting and installation on skis: - 50 posts of a power of 400 Watts.		
D. 25	Evaluation of technical condition (quality of insulation, corrosion, stage of wear) NO DATA		
D. 26	Reasons for and cost of dismantling or rehabilitation * The harbour office: Networks electrical supply: 38568.9 euros. * The ski course The price includes the installation of electric post and the connections of the system to the networks 91467.6 euros Including taxes		
D. 27	Techniques applied for dismantling Mechanical machines		
D. 28	Waste management, reuse, materials recycling - No profits associated with materials all the products with demolitions are evacuated towards public discharge .		
Tele-communication networks			
D. 29	Characteristics of networks NO DATA		
D. 30	Reasons for and cost of dismantling or rehabilitation NO DATA		

D. 31	Techniques applied for dismantling Mechanical Machines		
D. 32	Waste management, reuse, materials recycling - No waste management		
E. Building use			
E. 1	Reason for retaining, adopting or dismantling of the building/buildings The reason of demolition was: - The political good-will to change the image of the city while proceeding with the reduction of the mining frame.	- Building value as a monument - Imperative need for renovation (regardless of later use)	
Building or construction characteristics			
E. 2	Length, width, height Loisinord includes: 1) Building of reception located at the bottom side of the ski course: Under ground: surface + boiler room: 400m2. Ground floor: Workshop: 18m2 Reserves skis, shoes: 105 m2 Cloakrooms, Fitting: 120 m2 Medical 12 m2 Case 6m2 Reception Hall 100 m2 Various areas of animation: 225m2 Cafeteria, reception: 130 m2 Cloakrooms, toilets: 40m2 Reserves 64 m2 Total surface of Ground floor: 820 m2. Stage: Mezzanine terrace. 350 m2 Total surface of reception building: 1570 m2. 2) A Harbour office: built on a surface of 4Ha.	Technical documentation, drawings, maps	

E. 3	Type of buildings or constructions (monolith, frame structure, bricks, mixed, etc.) 1) The building of reception: Mixed Structure. 2) The Harbour office: Mixed structure.		
E. 4	Aesthetic and cultural value of the building Not existing buildings		
E. 5	Technical condition of the building (age, degree of wear of the building) NO DATA		
E. 6	Types of materials and construction techniques used The project of loisinord is made on several steps: Step 1: includes: - The demolition of old buildings. - The general cleansing by connecting the station of loisinord to the purification station in Beuvry. - Principal roadway systems: center water level- ski course and the connection of loisinord to Moussy Street. Step 2: includes - The adjustment of the water zone includes the sealing of the basin and the treatment of the banks. Step 3: includes: - The modeling of the ski course. - Adjustment of the accesses to the lake. Step 4: includes - The installation of the ski course. - The installation of the Forum (the Modeling of the esplanade, the Modeling of the spoil heap with contribution material, the creation of carparks and work accesses to the reception building) - The construction of a reception. building Step 5: includes: -Work relating to the nautical base. -Work relating to the harbour office - Work relating to Nautical Tele-seki		

E. 7	Safety and fire standards of the building The Harbour office includes: - Emergency lighting: standby blocks with 60 lumens. - A fire alarm; alarm box with class II poles for EBP 4 Legrand. standard - Lightning protection.		
E. 8	Any evidence of building contamination No Data		
E. 9	Evaluation of stability of the building No Data		
E. 10	Construction of the building, basic parts of the building (roof, outside walls, windows, doors) The Harbour office is made up of: * Metal frames: - Metal framework supporting the curved cover. - Metal framework support of boarding. - Metal framework forming bandages with the right to openings. • Aluminum Joineries and curtain walls. • Interior joinery made of wood. • False ceiling.	- Complex Engineering Survey of the Building - Calculation of stability	
E. 11	Basic data of the building ventilation The Harbour office: - A Mechanical Ventilation of toilets, cloakrooms and boat hangars		

E. 12	Special attributes of the building 1) Reception building : Located at the bottom side of the ski course, the reception building constitutes an essential element of accompaniment of the station by fulfilling various functions: * Reception centre: it will receive and inform the visitors of the various possibilities of attractions offered by the site and will direct them towards the activity of their choice. * Management centre: treasury as well as the various services offered to the customer skiers (cloakrooms, personal trunk, hiring of material, and reservation for ski lessons) will be installed there. This building will also be managed by personnel, the fluidity of the tracks and the correct operation of mechanical reinstallation. * Animation center: the cafeteria, with its terrace which imposes on the tracks and the restaurant. This place is also used as a center of organization and reception. 2) the harbour office includes: • A club house, cafeteria. • Hangars with boats, • Surface for monitoring * Conference room.		
E. 13	Functional aspects of the building compared to the future plan (e.g. wheel chair access) No existing buildings, all the buildings are new		
Buildings and constructions value assessment			
E. 14	Use value- (space volume of existing buildings) No existing buildings	Techniques applied for building evaluation (LCA- Life Cycle Assessment, Life-Cycle Cost) if available	
E. 15	Technical value of the building (durability, level of the wear) No DATA		
E. 16	Context of the heritage-historical, artistic, semiotic value of the building. NO DATA	Any methodology applied for evaluation: - Commercial software or	

E. 17	Common criteria used for deciding the buildings fate NO DATA	- National guidelines, standards	
E. 18	Techniques applied for dismantling Mechanical machines		
E. 19	Waste management, reuse, materials recycling - No waste management - All waste was evacuated towards the public discharges.		

E. 20	**Economical viability of new development opportunities** In order to validates the feasibility of the project, the city made many studies by specialized cabinets. 1) Economic feasibility studies: - Market research: Cegma Topo Cabinet 1) Economic feasibility study: Cabinet Relaxation Consultants (bets) - validation study of the site and its development: Bérénice cabinet (bets) - potentiality study of the creation of a ski resort in Noeux –les -Mines by Briton Engineering developement (London) - Impact study: Isis Cabinet (Paris) - market research analysis is carried out by the Regional committee for tourism: * Parisian market trends and tourist strategy of promotion of Nord-Pas-Calais * German market trends by Basis Research (Franckurt) - B&R Councils: Studies of their valorization and access roads of the site. 2) Technical feasibility study: For the spoil heap n°42: * Institut National Polytechnique de Lorraine. - Higher National school of Geology. - Laboratory of Géomechanics * Higher Nationalschool of Agronomy and Food Industries (ENSAIA of Nancy). Study of the methods of establishment and development of the herbaceous layer. * Cogema general Company for nuclear matters: Soil exploration of the spoil heap n°42. For the Nautical base: DRIRE: Analyze grounds in order to determine, according to the last industrial use a classification of the grounds. BRGM: Analyze under ground and the potentiality of realization of drillings in order to feed the lake. Pasteur Institute: Validation of the quality of water	- Feasibility study - Cost Benefit Analysis	

F. Financing questions			
F. 1	Availability of funding for renovation The work financings came primarily: - From Feder. - From the Northern Regional Council/Pas-de-Calais. - GRIZOM. - Town of Noeux-le-Mines. From the Trade union of the Industrial parks.	- Tools for assessment of support of site redevelopment - Incentives used for promoting the maintenance of post - industrial buildings	
F. 2	Availability of funding for the application of new technology or environmental improvements No cash in hand		
F. 3	Availability of funding for monument protection No cash in hand		
F. 4	Possibility to finance improvements by "contracting models" (e. g. for saving energy) There was no financing available		
G. Assessment of organisation of dismantling or renovation works			
Assessment of organisation of dismantling or renovation works			
	Checking for the existence of plans or permits associated with access to the site for dismantling or construction works:		
G. 1	No consideration for the protection of monuments	Procedures with official authorities (e. g. concerning monument protection)	
G. 2	No Data	Procedures with authorities finding better or innovative solutions	
G. 3	No Data	Estimation of masses of parts to demolish	
G. 4	No Data	Concept for waste management time planning	
G. 5	No Data	Communication with authorities	
G. 6	No Data	Localisation of underground infrastructure in form of documentation	
G. 7	No Data	Compliance with personal rights (e. g. right of property, ways, cables...	
G. 8	No Data	Advance training for workers for labour safety?	

Contamination management			
G. 9	Is a legally binding plan for remediation set up, in order to treat and keep soil on the site and to reduce costs? No Data		
Dismantling process			
G. 10	NO DATA	Compliance with all regulations: dust, noise, working, labour safety	
G. 11	NO DATA	Any complaints?	
G. 12	NO DATA	Estimation, sampling, analysis and classification of contaminated waste	
G. 13	NO DATA	Expert survey of demolition process if needed	
G. 14	No risk of explosion.	Care for explosion hazard	
G. 15	NO DATA	Waste management – permits for disposal or recycling onsite or offsite	
G. 16	NO DATA	Overall health and safety plan	
Rebuilding process			
G. 17	NO DATA	Compliance with all regulations: dust, noise, working, labour safety	
G. 18	NO DATA	Any complaints?	
G. 19	NO DATA	Estimation, sampling, analysis and classification of contaminated waste	
G. 20	NO DATA	Expert survey of demolition process if needed	
G. 21	NO Risk of explosion.	Precautions against explosion hazard	
G. 22	NO DATA	Waste management – permits for disposal or recycling onsite or offsite	
G. 23	NO DATA	Overall health and safety plan	

H. Quality management			
H. 1	Is there any quality management system presented in the companies responsible for works associated with dismantling or construction on site? YES. - The quality management was ensured by the local authority: the manager of the project - The control office VERITAS. - Architectes		

ANNEX 2.3.French site data. Coron N°3

. General situation			
A. 1	**contact person(s)**	**Data**	
A. 2	The Director of " la Mission De Bassin Minier" Local authority: The Management Departmental Of the equipment (subdivision of Béthune).	The rehabilitation of coron N° 3 by the town of Noeux -les-Mines aims : • To keep to the maximum the population on the site. • To change the image of district and especially the part in front of Loisinord lake.	
B. Space site information and structure			
B 1	National list of historical monuments Not historic buildings.		
B 2	Quality, volume and area of (natural) soil below (yew known) No Data		
B 3	History of buildings No Data	Survey of the building with respect one health and microclimate conditions	
C. Natural space management			
C 1	Measures foreseen for natural protection Landscape treatment of the part in front of leisure loisinord park.	- Treatment of ruderal areas? - Measures for compensation? - Creative solutions	
D. Infrastructure			
Intemal system transport (roads, rails) The internal system of transport is composed of roads.		Technical documentation Physical assessment of the system transport	
D. 1	Type and condition of roads The roads were in drove state The architect was obliged to move certain roadway systems for safety reasons.		
D. 2	Costs of improvement for planned uses category No Data		
D. 3	Costs of dismantling No Data		
D. 4	Benefits associated with recovering materials No benifits associated with recovring materials.		
D. 5	Dismantling of roads, pavement recycling, rubble and other waste management. Recovery of bricks following the demolition operation	LCA (Life Cycles Assessment) gold LCC (Cost Life-Cycle) yew available, but any other methodology used for comparing environmental and economical aspects of development	

Water supply			
D. 6	Does adequate Is the toilets supply for the planned site use? Yes	- Characteristics of water supply system (presses, hand pipeline diameter, flow capacity) - Pumping station (technical characteristic)	
D. 7	Is the water quality satisfactory? Water is of good quality.		
D. 8	Evaluation of the technical conditions (age, training course of wear) No Data		
D. 9	Reasons for and costs of dismantling gold rehabilitation of the water supply The reasons of demolition are due to the drove state of network and the leakage of water.		
D. 10	Techniques applied for dismantling, waste management, material recycling All demolition waste was evacuated towards public discharge		
D. 11	Usefulness of rain toilets collection No Data	- Amount of rain toilets that edge Be collected from the roof area; - Area of carpark batches and roads belonging to the site	
Sewerage			
D. 12	Adequate Is the system for new plane? The old system of cleansing was not adequate for a new use.	- Characteristics of sewer system (presses, hand pipeline diameter, flow capacity) - The number of let us persons using the building - The quantity of the toilets used for the production - Evaluation of technical condition (age, training course of wear).	
D. 13	Does Is there have need to improve, but replaces? There was a necessity to replace the existing networks.		
D. 14	Reasons for and costs of dismantling gold rehabilitation The reasons for demolition of existing networks are: * The existence of leakages. * The drove state of the conduits. * No existence of the network of cleansing in certain streets.		
D. 15	Techniques applied for dismantling Mechanical machines		
D. 16	Waste management, reuse, materials recycling No reused materials		
Heat networks			
D. 17	Adequate Is the heating system for the new demand? Installation on the city of central heating in gas.	Standard What of heat networks cuts been used one site (high temperature gold low)	
D. 18	Assessment of environmental balances No data		

D. 19	Assessment of financial balances No data	Cost Benefit Analysis gold other studies	
D. 20	Reasons and costs for dismantling gold rehabilitation. No data		
D. 21	Techniques applied for dismantling Mechanical machines	- Evaluation of technical condition and efficiency (quality of insulation, corrosion, training course of wear) - Heat capacity of network - Estimate of heat losses	
D. 22	Waste management, reuse, materials recycling No reused materials.		
Electricity networks			
D. 23	Buried networks	Characteristic of networks (To transform capacity, voltage, underground but one the surface)	
D. 24	Power demand (previous and future) No Data		
D. 25	Evaluation of technical condition (quality of insulation, corrosion, training course of wear) No Data		
D. 26	Reasons for and cost of dismantling gold rehabilitation The network was apparent but following the rehabilitation of district the network becomes buried.		
D. 27	Techniques applied for dismantling Mechanical machines		
D. 28	Waste management, reuse, materials recycling No reused materials		
Tele-communication networks			
D. 29	Buried networks	Characteristics of networks	
D. 30	Reasons for and cost of dismantling gold rehabilitation * The network was apparent but following the rehabilitation of the district, the network becomes buried.		
D. 31	Techniques applied for dismantling * Mechanical machines		
D. 32	Waste management, reuse, materials recycling No reused materials		

E. Building uses			
E 1	Reason for retaining, adopting gold dismantling of the building/buildings The criteria of maintenance or demolition of housing are: * The state of housing. * The position of housing as regards to the lake.	- Building been worth have has monument - Imperative need for renovation (regardless of later uses)	
Building gold construction characteristics			
E 2	Length, width, height The residences on coron N°3 site are In bands.	Technical documentation, drawings, maps	
E 3	Type of buildings gold constructions (monolith, frame structure, brigs, mixed, etc.) - the buildings are in bricks		
E 4	Farming Aesthetic and been worth of the building No data		
E 5	Technical condition of the building (age, degree of wear of the building) No data		
E 6	Types of materials and construction techniques used The building materials are composed of bricks		
E 7	Safety and fire standards of the building There were measures against fire for the rehabilitated residences and the new residences.		
E 8	Any evidence of building contamination No Contamination		
E 9	Evaluation of stability of the building No data		
E 10	Construction of the building, BASIC shares of the building (roof, outside walls, Windows, doors) * Rehabilitated residences: Change of wood joinery for windows by an aluminum joinery	- Complex Engineering Survey of the Building - Calculation of stability	
E 11	BASIC dated of the building ventilation No Data		
E 12	Special attributes of the building Social housing		
E 13	Future Functional aspects of the building compared to the plan (e.g. wheel flesh access) For the rehabilitated buildings, there was no adoption for the future plan.		

Buildings and constructions been worth assessment			
E 14	Use been worth (space volume of existing buildings) No data	Techniques applied for building evaluation (Lca- Life Cycles Assessment, Cost Life-Cycle) yew available	
E 15	Been worth Technical of the building (durability, level of the wear) No data		
E 16	Context of the heritage-historical, artistic, semiotic been worth of the building. No historic heritage on the site	Any methodology applied for evaluation: - Commercial software gold - National guidelines, standards	
E 17	Common criteria used for deciding the buildings fate * The position of the building as regards to leisure park. * The state of building.		
E 18	Techniques applied for dismantling. Mechanical machines		
E 19	Waste management, reuse, materials recycling No use of materials recycled for the construction of the buildings.		
E 20	**Economical viability of new development opportunities** - There was a feasibility study which was made by the town of Noeux-les- Mines - The rehabilitation of coron N°3 enters within the framework of a social and public operation without particular benefit.	- Feasibility study - Cost Benefit Analysis	
F. Financing questions			
F 1	Availability of funding for renovation Several types of the funds: 1) Roadway systems: * Girzom: a government stock which finances has 100 % work of civil engineering. * Electricité De France (EDF) and France Telecom. * Water company. 2) The rehabilitate residences: 3) * Arrange Nationale for the Improvement of Habitat (the ANAH). 4) New residences: * Prêt Locatif d'Aide (PLA)	- Tools for assessment of support of site redevelopment - Incentives used for promoting the maintenance of post - industrial buildings	
F 2	Availability of funding for the application of new technology gold environmental improvements Not available		

F 3	Availability of funding for monument protection Not available		
F 4	Possibility to finance improvements by "contracting models" (E G for saving energy) No possibility		
G. Assessment of organization of dismantling gold renovation works			
Assessment of organization of dismantling gold renovation works			
	Checking for the of existence plane gold permits associated with access to the site for dismantling gold construction works:		
G 1	No procedures with official authorities concerning monument protection.	Procedures with official authorities (E G concerning monument protection)	
G 2	The architect proposed to demolish a part of the district of Coron n°3 which was in front of the lake, in order to create a great place and to build new residences on this part of the district.	Procedures with authorities finding better but innovative solutions	
G 3	No DATA.	Estimate of masses of shares to demolish	
G 4	No DATA	Concept for waste management time planning	
G 5	The project was drawn up following a dialogue between the state, habitat associations and the town of Noeux les Mines.	Communication with authorities	
G 6	No DATA.	Localization of underground infrastructure in form of documentation	
G 7	NO DATA	Compliance with personal rights (E G right of property, ways, cables…	
G 8	NO DATA	Advance training for workers for ploughing safety?	
Contamination management			
G 9	Does Is have legally binding plan for remediation set up, in order to treat and keep soil one the site and to reduce costs? The soil is not polluted on the site.		
Dismantling process			
G 10	No Data.	Compliance with all regulations: dust, noise, working, ploughing safety	
G 11	There were complaints by certain inhabitants Concerning the demolition operation because of fear of increase in rents after the operation of refitting in district.	Any complaints?	
G 12	No Data	Estimate, sampling, analysis and classification of contaminated waste	

G 13	The project architect	Expert survey of demolition process yew needed	
G 14	No care for explosion hazard	Care for explosion hazard	
G 15	Waste was recycled outside the site.	Waste management – permits for disposal gold recycling onsite gold offsite	
G 16	No Data	Plane Overall health and safety	
Rebuilding process			
G 17	No Data	Compliance with all regulations: dust, noise, working, ploughing safety	
G 18	At the beginning of work, there were complaints.	Any complaints?	
G 19	No Data	Estimate, sampling, analysis and classification of contaminated waste	
G 20	The project architect	Expert survey of demolition process yew needed	
G 21	No explosion hazard	Precautions against explosion hazard	
G 22	Recycling offsite	Waste management – permits for disposal gold recycling onsite gold offsite	
G 23	No Data	Plane Overall health and safety	

H. Quality management			
H. 1	Responsible Is there any quality management system presented in the companies for works associated with dismantling gold construction one site? Yes, there was the architect and the owner of the district (Soginorpa company).		

RESUME

L'objectif de cette étude est l'élaboration d'une approche basée sur la notion de développement durable pour les bâtiments et les infrastructures caractérisant ces friches industrielles. L'approche est développée en collaboration avec quatre pays européens : la France, l'Allemagne, l'Angleterre et la Pologne. Des données socio-économiques, environnementales, institutionnelles de huit friches industrielles sont reparties sur ces quatre pays européens. Deux sites français font l'objet de cette étude : les Tertiales à Valenciennes et Loisinord à Noeux-Les-Mines. Des analyses des pratiques européennes pour la réhabilitation de patrimoine industriel ont été faites et des évaluations ont été réalisées selon cette approche durable en se basant sur des objectifs et des indicateurs développés. Les résultats mettent en évidence, l'insuffisance des pratiques européennes en terme environnemental, comme : l'utilisation limitée de l'énergie renouvelable ou l'absence de réutilisation et de recyclage de matériaux de construction ainsi que la non récupération de l'eau pluviale. De même, des problèmes importants concernant la discontinuité culturelle et historique entre le projet de réaménagement du site et son passé industriel sont constatés. Ces projets de réhabilitation de friches optent souvent pour une démolition totale des bâtiments et des infrastructures existants sur site tout en privilégiant l'aspect économique. La confrontation de cette analyse entre experts européens a débouché, sur des recommandations pour l'élaboration d'une approche durable pour l'étude de différents scénarii pour la réhabilitation des structures existantes. Elle a permis aussi l'élaboration d'un outil sous forme d'un site web afin d'aider les parties intéressées de projets de réaménagement à adopter une démarche durable intégrant tous les aspects liés à la pollution et l'utilisation du sol, la participation citoyenne et l'étude des bâtis existants.