THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Demonstration Projects for Sustainable Building:

Towards a Strategy for Sustainable Development in the Building Sector

based on Swedish and Dutch Experience

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Abstract

Demonstration Projects for Sustainable Building: Towards a Strategy for Sustainable Development in the Building Sector based on Swedish and Dutch Experience

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This thesis explores demonstration projects as a potential strategy for supporting processes towards sustainable development in the building sector through making mainstream building more sustainable. The research question has been approached in four empirical studies carried out in Sweden and the Netherlands, which study demonstration projects for sustainable housing from different perspectives. These are: 1) two case studies, 2) qualitative interviews with key actors, 3) a study of the image conveyed by the Swedish trade press, and 4) a study of the image conveyed by *The Swedish Architectural Review*. The findings are discussed using a framework presenting the notions of sustainable development and sustainable building, conditions for learning and development in the building sector as well as the findings from earlier research in the field. The thesis indicates that demonstration projects have an important role in the processes towards sustainable development in the building sector. The demonstration project provides real-world data, makes sustainable building a tangible and visible concept and is a means of learning through doing for the actors involved. The demonstration project becomes a reference to what sustainable building is and how this can be accomplished. The demonstration project has the potential of becoming a strategy for systematic successive learning and development on the path to reaching long-term abstract objectives for sustainable development through realistic advancements and in accordance with conditions for learning and development in the building sector. However, in order to become an effective strategy, deficiencies in contemporary demonstration projects have to be solved. This concerns the lack of incentives and interest for learning; deficiencies in the production of reliable and useful information; and the lack of institutions for information dissemination. The fact that demonstration projects are handled as special projects also impedes their influence on mainstream building. Moreover, ideals in contemporary demonstration projects often fail to address ideals and interests among actors in the building sector. The thesis provide a basis for the enhanced understanding and use of demonstrations projects, both from a theoretical and a practical view, and discusses the production and dissemination of reliable and useful information as well as factors that will affect the influence of demonstration project on mainstream building.

Keywords: demonstration projects, sustainable building, sustainable development, architecture, housing, building sector, case studies, information dissemination, change agency, learning from experience, discourse in trade press

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Paula Femenías, July 2004

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Chapter 1 Introduction

This thesis explores the significance and the relevance of the *demonstration project* as a strategy to develop contemporary building practices in a process towards sustainable development as described by the Brundtland Commission (WCED, 1987). The demonstration project and the 'good example' are increasingly common features in support of sustainable development in the building sector, as well as in other societal sectors, both nationally in Sweden and internationally (VROM, 1997; Sustainable Building: Framworks for the Future, 2000; Miljövårdsberedningen, 2000; Rethinking construction, 2002; The Swedish Environmental Protection Agency, 2003; WGSC[1], 2004). Accordingly, it is motivated to explore and analyse the effectiveness and mechanisms behind the demonstration project and the 'good' example as strategies for the process of change towards sustainable development in the building sector.

1.1 The demonstration project as research field

In the background to this thesis, we find contemporary political visions and objectives for *sustainable development* together with commitment and involvement in the building sector for the setting of an agenda for *sustainable building*[2] and the implementation of the same. The building sector and the built environment have been pointed out as two key areas of concern for sustainable societal development both in a Swedish and an international perspective (CIB, 1999; Miljövårdsberedningen, 2000). Sustainable development concerning building activities and the built

[1] The Working Group for Sustainable Construction for the European Commission, in this thesis called by the abbreviation WGSC.
[2] In the thesis the shorter abbreviation, *sustainable building,* will be used when addressing questions concerning building practices that support sustainable development.

environment must be seen as a necessary process for change. The notion of sustainable development and the agendas for sustainable building are further discussed in Chapter 2.

A starting point for this thesis is found in earlier compilations of examples of sustainable building projects in Sweden and the Netherlands (Femenías, 1994; Femenías, 1999a). The purpose of these compilations has been to gather and to spread experience from sustainable building projects and to provide inspiring examples. Through the work with the compilations two questions were formulated that have been further developed in this thesis, namely: *how to study* and *how to present* examples of sustainable building in order to provide useful information for actors in the building sector.

A strategy for promotion of sustainable building

The 'good example' and the demonstration project are currently propagated as being instruments for supporting sustainable building in Sweden as well as within the European Community and the rest of the world. The European Commission (for example through DG Environment and DG Tren) has made considerable efforts with regard to supporting and disseminating results from demonstration projects for sustainable building[3] (WGSC, 2004).

The demonstration project is emphasized as being a proven and effective tool for introducing and testing new policy (Sustainable Housing Policies in Europe, 2003 p. 19). The 'good example' is currently used both as a strategy and as a method for highlighting results achieved within the work for sustainable development (The Swedish Environmental Protection Agency, 2003; WGSC, 2004). Furthermore, the demonstration project is a method for innovation, development and knowledge build-up within the building sector (Miljövårdsberedningen, 2000; Rethinking Construction, 2002), and as exemplified in the following statement by the British project *Rethinking Construction*[4] (website http://www.rethinkingconstruction.org, January 2004):

[3] For example, through the projects: Thermie, SHINE, Expo Cities, RE-START, Green Cities, Meduca, CIVITAS, LIFE Urban etc. see website http://www.europa.eu.int/

[4] A joint partnership between United Kingdom clients, industry and government for a better building sector.

> The Demonstration Projects are at the heart of the Movement for Innovation and provide the seedbed where ideas and innovations are put to practical use and measured.

The practical experiment as method for innovation and knowledge build-up is intimately connected to the building practices (see for example Levón, 1986; Lundequist, 1995b; Linn, 1998). New ideas, technologies and concepts are tried out in practice, evaluated, and experiences and findings are diffused to the rest of the building sector. This practical-empirical method is the basis for the knowledge build-up within the building practices (Linn, 1998) being especially articulated in the building experiment and the demonstration project. The experience from the demonstration project will have an internal influence on the actors and organisations involved in the project as well as an external influence on the actors and parties outside the project organisation. The internal and the external influences are dependent on the diffusion of experience within the organisations involved in the demonstration project as well as the diffusion to the rest of the building sector and other interested parties.

The dissemination to mainstream building

The main aim for demonstration projects for sustainable building is to disseminate experience that will have an influence on mainstream building practices. The following example found in contemporary research on energy efficiency in buildings indicates the relatively small influence of demonstration projects on mainstream building. Despite contemporary political objectives and sector targets for reduced energy utilisation in the built environment, and despite the fact that energy efficiency in buildings can result in obvious advantages regarding economic savings, energy utilisation in new buildings has not radically decreased (Lovins, 1992; Lutzenhiser, 1994; Nässén and Holmberg, in press). As demonstrated by Nässén and Holmberg, contemporary demonstration projects for energy efficient housing have proved to result in reduced energy utilisation (Figure 1.1). However, as seen in Figure 1.1, mainstream building does not approach these lower levels of energy utilisation. Evidently there is a gap between good results from demonstration projects and what is diffused into mainstream building. Furthermore, Figure 1.1 shows that the energy utilisation in new multi-

residential housing in Sweden in later years even tends to exceed that of the housing stock in general. Accordingly, this also indicates a gap between contemporary ambitions for energy efficient and sustainable building and what has been built to date.

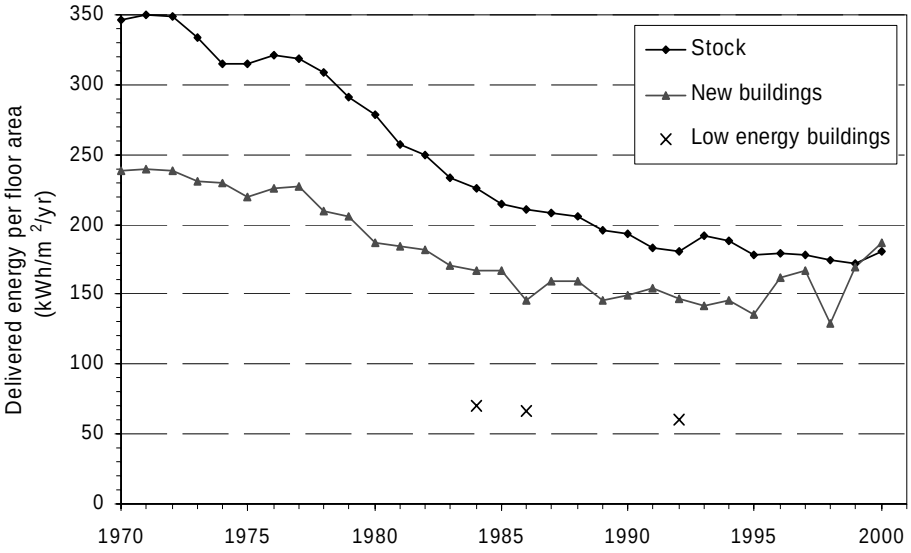


Figure 1.1 The efficiency gap between the development of delivered energy utilisation for floor heating per floor area of Swedish multi-residential buildings and a few examples of Swedish low-energy housing. The stock represents all heated area in a certain year. (Nässén and Holmberg, in press)

1.2 Aim and scope

The aim of this thesis is to contribute to an increased understanding of how demonstration projects for sustainable building can support and promote the further development of sustainable building. The two concepts, the demonstration project and the building experiment, are discussed as well as their potential for being able to influence mainstream building. The aim is to contribute to the understanding of the learning processes associated with demonstration projects for sustainable building.

Furthermore, the findings aim to provide a basis for the enhanced influence from future demonstration projects for sustainable building on mainstream building. Accordingly, the research deals with the particular

problems connected with sustainable building but that lie adjacent to general problems in contemporary building practices that show shortcomings in innovation and knowledge build-up (cf. Building for Growth, 1999; Construct for Excellence, 2001[5]; Rethinking Construction, 2002; Swedish Government 2002:115).

Target groups for the findings are found at different levels. On the one hand, those behind the project in the building sector are addressed, especially the key actors: the client and the architect. On the other hand, authorities (governmental and private[6]) as well as researchers are addressed as these are in position of being able to propagate for 'good' examples to their audiences in different ways and also promote new demonstration projects.

In addition, this thesis has the aim of contributing to advances in architectural research regarding developing ways of carrying out studies with an open research problem and also to develop ways of studying, understanding and presenting built examples. The built example has an important role in transmitting the practical knowledge of building practices (see Chapter 3). As emphasized by the architectural researcher Lundequist (1995a), an important role for architectural research is to continuously study and transmit experience carried out in practice. Architectural research should consequently evaluate and transfer experience and distribute practically based knowledge.

Methods and empirical material

The open-ended character of the research problem has directed the choice towards an *explorative* approach and the use of *qualitative* methods. An understanding of the research problem has been sought for in an iterative process between the findings from empirical material, existing theory and earlier research in the field. This understanding is based further on interpretations of sustainable development and sustainable building and against a background of the conditions of the

[5] Dulaimi et al. (2003) concerning these questions refer to: Building for Growth (1999*) An Analysis of the Australian Building and Construction Industries*. Industry Science Resources. Commonwealth. Australia, and Construct for Excellence (2001) *Report of the Construction Industry Review Committee*. January. SAR. Hong Kong.

[6] In Swedish: Branschorganisationer

practice in the building sector. A full description of the research approach, research design and methods used is found in Chapter 5.

The empirical material consists of studies in Sweden and the Netherlands, which provide different perspectives on demonstration projects for sustainable building. In all a total of four studies have been carried out using different methods for data collection and analysis.

The first perspective of demonstration projects is through two case studies. One case is GWL—terrein in Amsterdam, the Netherlands, and the other is a housing project at Lindholmen, in Göteborg, Sweden.

In the second perspective the demonstration project is approached through the view of the actors involved. In all, 27 actors in the Swedish and the Dutch building sector have been interviewed. Three categories of actors have been interviewed: architects, clients and environmental consultants. The respondents have been chosen for their involvement in demonstration projects in each respective country and through their position of having an active influence on the discourse about sustainable building, either as individuals or through the company in which they are employed.

The third and fourth perspectives study the demonstration project as portrayed by the Swedish trade press[7]. The third study focuses on the image conveyed from three influential Swedish demonstration projects from the later part of 1990s. The fourth perspective focuses specifically on the discourse on sustainable building in *The Swedish Architectural Review, Arkitektur*, between 1973 and 2002.

The scope

This thesis addresses *demonstrations projects for sustainable building*. The term and concept of sustainable building is still rather new for actors in the building sector, and remains largely unknown to the public at large. Also used by the Swedish building sector are other terms such as ‘ecological’ building or ‘environmentally adapted’ building parallel with the term ‘sustainable building’ with either similar or varying

[7] This study was carried out in co-operation with doctoral candidate Pernilla Gluch at the Department of Building Economy and Management at Chalmers University of Technology, partner of the former MISTRA Sustainable Building programme.

significations (see discussion in Chapter 7)[8]. Furthermore, contemporary ambitions for sustainable building have merged with earlier ambitions from the 1960s and 1970s for 'ecological' and energy efficient buildings (see Chapter 7). Environmental adaptation taking into account energy and resource efficiency, material utilisation, limitation of hazardous substances, etc. is one important part of the sustainable building concept. However, sustainable building involves other important factors of social, economic and cultural character. These are often expressed through consideration given to indoor climate, health, comfort, etc. at the individual level and economic growth and the sharing of resources at the collective and global level (see Chapter 2). The fact that demonstration projects for sustainable building constitute a rather new field with limited previous experience has led to the inclusion of earlier experience of the state of the art (Chapter 4) from demonstration projects and experiments in the building sector where main focus was on energy issues.

The thesis addresses demonstration projects in the building sector regarding activities at the *building level*. Furthermore, for the empirical studies, demonstration projects have been chosen in which the ambition has been to provide experience and knowledge applicable on a *broad scale*. Moreover, the demonstration projects in the empirical studies are all *housing* projects. The focus on housing can be explained by the limited number of cases of completed demonstration projects for sustainable building at the time when the doctoral studies were initiated. At the end of the 1990s there were still few demonstration projects for sustainable building in other areas than housing, which were of interest for this study. Consequently, the findings and the discussions in this thesis apply to *demonstration projects for sustainable housing*. In spite of this, the findings and discussions should also be of interest for issues about demonstration projects for sustainable building in other areas than housing.

Finally, the perspective is that of *Europe and the industrialized world*. In order to enlarge the Swedish national perspective, parallel

[8] As revealed through the interview study presented in Chapter 7, many actors in the Swedish and the Dutch building sectors interpret 'environmental adjustment' as a part of the wider sustainable building concept that also involves social and economic dimensions. Some respondents see 'ecological building' as an older and incorrect term, while some find the term more encompassing and human compared to the term sustainable building.

studies have been made of the situation in the Netherlands. The intensive development of sustainable building in the Netherlands in the middle of the 1990s explains the supplementary choice of the Dutch perspective. Since the early 1990s, the Netherlands has had political goals for the environmental adaptation of the built environment. Moreover, the Netherlands has a similar background to Sweden regarding activities in the environmental area. As in the case of Sweden, the Netherlands has had the ambition to play the role of environmental leader within the European Union and the United Nations (Haneberger et al., 2002 p. 39). The first and the second empirical studies mentioned above involve a supplementary perspective from the Netherlands, while the third and the fourth studies of the trade press are only carried out on in relation to the Swedish context.

Theoretical basis for analysis and discussion

Sustainable building as a research field within the architectural domain is still relatively new. There are no clearly defined frames of reference or theories to relate to. The theoretical basis in this thesis has been chosen in order to provide useful frameworks for the analysis and discussion of the findings from the empirical material. On a broad level, the demonstration project is discussed in relationship to the concepts sustainable development and sustainable building. Furthermore, theory has been selected from among other sources design theory, organisational theory, and innovation theory. Design theory and organisational theory are used to discuss the knowledge build-up and lessons from demonstration projects as well as how the experience should be presented in order to be useful. Together with innovation theory and a description of the routines and the organisation of work in the building sector, this theory also provides a basis for discussing the conditions for the diffusion of experience and findings from demonstration projects to mainstream building practices.

Moreover, the research has been inspired by discourse analysis for discussing the construction of meaning and the interpretation of the main concepts of demonstration projects and sustainable building, both among actors in the building sector and in the Swedish trade press.

1.3 Research questions

As already described the aim of this thesis is to contribute to an increased understanding of how demonstration projects can support and promote the development of sustainable building. On the one hand, the findings have a practically oriented aim at providing a basis for the enhanced outcome and influence from demonstration projects. On the other hand, the thesis has a scientific aim in order to contribute to advances in architectural research and to develop ways to approach an open research problem, and to study, understand and present built examples. From these aims, three specific research questions have been formulated:

1. *What is the importance of the demonstration projects for sustainable building to support sustainable development in the building sector?*

2. *How should demonstration projects for sustainable building be studied and presented in order to provide useful information for the target groups: the clients, architects, and/or other project owners*[9] *in new projects?*

3. *What are the conditions for diffusion and the reproduction of experience and findings from demonstration projects to mainstream building practices?*

1.4 Report structure and reading instructions

The thesis can be regarded as being comprised of three parts. The first part, Chapters 2 – 5, provides the background; the theoretical basis; the state of the art of the research field; as well as the research approach and methods used. The second part, Chapters 6 – 9, presents the four empirical studies. The third part is comprised of Chapter 10, which presents discussions, conclusions as well as the continued work.

[9] The term 'project owners' (in Swedish projektägare) is frequently at present (see for example on the Internet) but no definition of this could be found in any Swedish or British encyclopedia or dictionary. In this thesis the term is used to name the actor or group of actors responsible for the project with regard to initiation, financing and/or legal conditions.

Chapters 2 to 9 are concluded with summaries thereby providing a shortcut through the thesis. Consequently, after the introduction in Chapter 1, the reader can concentrate on the summaries and then move on to the discussions and conclusions in Chapter 10.

Chapter 1 provides an introduction to the research field, the research questions as well as the research approach.

Chapter 2 presents the concepts of sustainable development, ecological modernisation and sustainable building. It further presents strategies undertaken for sustainable development on a comprehensive level in Sweden, as well as the agendas for sustainable building in Sweden and in the Netherlands.

Chapter 3 firstly begins with a general description of the structure, routines and organisation of work in the building sector. This description is mainly based on the Swedish circumstances, but on a general level the implications for the development of sustainable building should be similar in the case of the Netherlands and other countries (cf. Hal, 2000; Rethinking Construction, 2002). Secondly, theories from the research fields-dealing with design, organisation, and innovation are presented to provide a framework for a discussion about conditions for knowledge build-up, learning, innovation and development in the building sector.

In Chapter 4, earlier studies of experience and influence from building experiments and demonstration projects are presented. Derivations are made regarding the terms building experiment and demonstration project based on their application. Furthermore, earlier experience of disseminating results from building experiments and demonstration projects to mainstream building practices are discussed.

Chapter 5 presents the research approach, the methodological approach and the research design. This chapter also introduces a discourse analytical perspective on the empirical material. Moreover, the four empirical studies are introduced together with a description of the specific methods used for data collection and analysis for each of the studies.

Chapter 6 presents the first empirical study, comprising of two case studies of demonstration projects for sustainable building. The cases are described, both in terms of the product and the process, and through the image conveyed by project owners and the media. An analysis is made of each case. The findings from both cases are then brought together

providing specific lessons from the cases, in addition to a general discussion on the value of demonstration projects. The discussion also addresses ways of studying and presenting experience from demonstration projects.

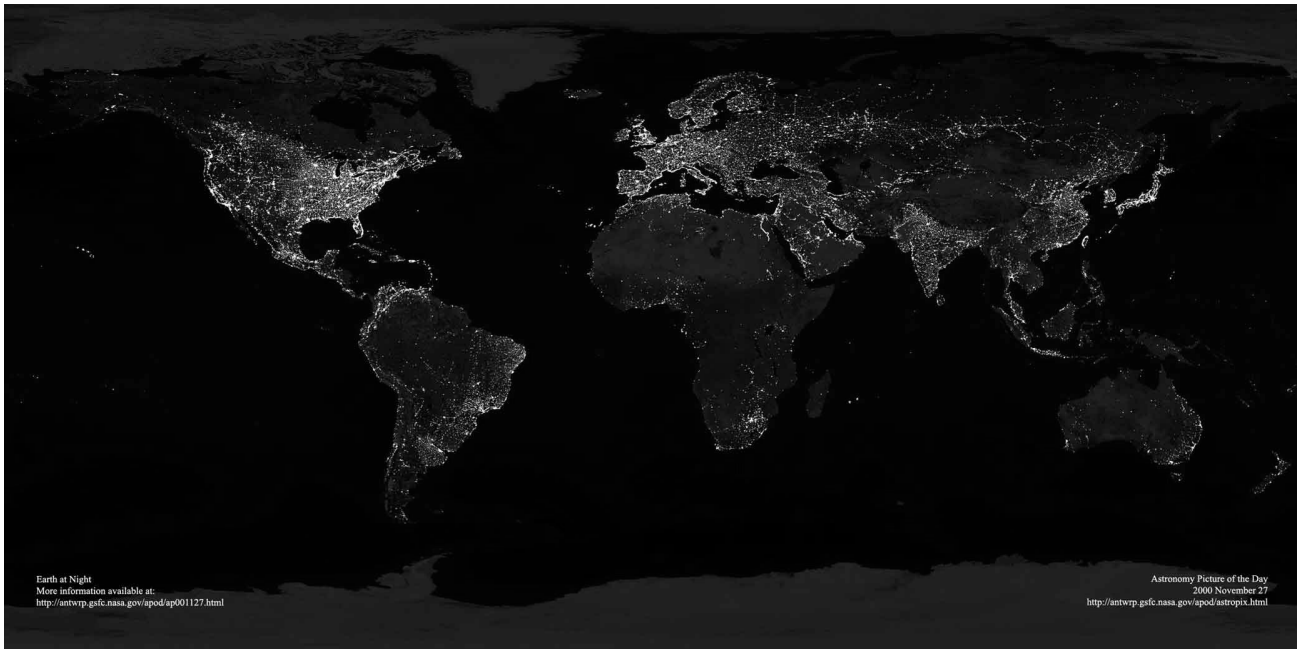
Chapter 7 presents the second empirical study, an interview study with 27 actors in the Swedish and the Dutch building sectors. The actors have been chosen with regard to their active involvement in sustainable building, and from their position as opinion leaders in the field. The findings presents the actors' current view on the development of sustainable building, their personal interpretations of sustainable building and their approach to working with these questions in practice. Furthermore, the interview study reflects the respondent's views on demonstration projects.

Chapter 8 presents the third empirical study, a study of the Swedish trade press. The image portrayed in the trade press of three well-known Swedish demonstration projects is studied using mainly textual analysis and content analysis. The aim here has been to answer the following questions: what is the image conveyed about demonstration projects for sustainable building and what information is given? Also, does the trade press fulfil the role as a communicator of information about demonstration projects and sustainable building?

Chapter 9 presents the fourth study, a study of *The Swedish Architectural Review, Arkitektur*. The architectural press is of prime importance for presenting good examples and must be seen as having a large influence on architects as a professional group. Architects that are in favour of sustainable building as well as advocating good examples of sustainable building fulfil important roles as opinion leaders for the rest of the building sector and the general public. This study discusses how sustainable building has been debated in *Arkitektur* during the period 1973 – 2002.

Finally, *Chapter 10* discusses the relevance and the effectiveness of demonstration projects as a strategy for making mainstream building more sustainable. Based on the findings from the empirical studies, weaknesses in contemporary demonstration projects with regard to knowledge build-up, learning and the reproduction of results are discussed. An enhanced model for demonstration projects is proposed through incremental and successive development. The chapter also

discusses the power of the example and the influence of information and images about demonstration projects for sustainable building that by among other means are spread via the trade press. The chapter is ended with some concluding comments and proposals for continued work in the field.



Picture 2.1 Visualizing unsustainable development. Satellite photo Nasa November 2000.

There are other things (in life) than subscribing to the feeling of one's own inadequacy. If we can't afford a more beautiful vision of the world – then who can? Every day people die from starvation so that we can keep up our material standards. Are they doing this in vain? Do we feel even half as free/rich as we really are? We are privileged. I find it hard to believe that we have ended up in the richest part of the world just to invent sudden adult death, walk in to a multitude of walls and then wonder how we can feel so empty inside even though we've been so creative. I've met several people wondering about that. The revolution has become mainstream. Possibly that's our only salvation. Because there is an us.[10]

Bob Hansson, poet, In *Här ligger jag och duger*, W&W 2002

[10] Det finns andra grejer att prenumerera på än känslan av sin egen otillräcklighet. Om inte vi har råd med en vackrare vision av världen – så vem då? Folk svälter dagligen ihjäl för vår materiella standard. Gör dom det i onödan? Känner vi oss ens hälften så fria/rika som vi är? Vi är priviligerade. Jag har svårt att tänka mig att vi hamnat i världens rikaste del bara för att uppfinna plötslig vuxendöd, gå in i en massa väggar och sedan undra hur det kan kännas så tomt fast vi varit så kreativa. Jag har träffat fler som undrar det. Revolutionen håller på att bli mainstream. Möjligen är det vår enda räddning. För det finns ett vi.

Chapter 2 Sustainable Development and Sustainable Building

This chapter presents the concepts of sustainable development and sustainable building, i.e. sustainable development concerning building activities and the built environment. The chapter begins with a description of contemporary problems regarding the environment and development. The notion of sustainable development is discussed from the view of mainstream sustainable development and ecological modernisation, what must be seen as the dominating view in Sweden and many other countries in the industrialised world. The chapter also presents investments in Sweden regarding sustainable development on a political level as well as the Swedish and the Dutch national agendas for sustainable building.

2.1 Contemporary problems of environment and development

The state of the world at the beginning of the 21st Century gives witness to an unsustainable development characterized by a growing population, increasing consumption and unequal distribution of resources[11]. The growing population as well as the modern western lifestyle involves large burden on the natural environment that in our time has resulted in climatic changes, holes in the ozone layer, loss of species and natural habitats etc. (see for example, Starke, 2003, Starke 2004).

Many contemporary environmental problems are characterized by an increased complexity. Environmental problems are often concealed in mechanisms, structures and organisms and their effect scan be delayed long after the actual discharge (Figure 2.2). New organisms and

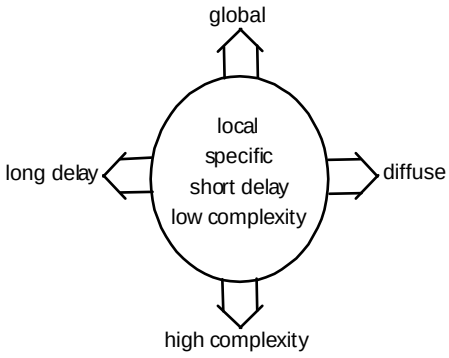


Figure 2.2 The changing character of environmental problems (drawing based on lecture by Professor Emin Tengström at Chalmers University January 14th 1999)

[11] About 15% of the world population at present uses 80% of the resources (Miljövårdsberedningen, 2000).

chemicals, which have never existed before, are today brought into the societal and natural metabolism (Holmberg, 1995). These technological and scientific artefacts are introduced without any certainty of their long-term effects on either humans or nature.

Many environmental problems, especially in the western world, are further characterized by their lack of 'sensuousness'. We need the 'prolonged senses' of scientific methods and instruments to reveal them. Beck (1992) has thoroughly described the risks in contemporary society and points out environmental problems as being dependent on science. The recognition of an environmental problem is thus a matter of interpretation dependent on scientific methods and instruments, as well as political, cultural and social value systems (ibid). Furthermore, technological risk in contemporary society is characterized by being capable of transcending generations and by exceeding the capacity of current mechanisms for compensating victims (Beck, 1992).

Andersson and Molander (1995) argue that an environmental problem can be defined as a human caused (anthropogenic) effect on an ecological system that is regarded as a problem. Environmental equilibrium can be preserved as long as the environmental system is kept within the limits of self-regulation (Edman, 1998). When the limit is reached and nature gets out of balance we will have serious problems. In their extreme, environmental problems can be defined as 'the wrong quantity at the wrong place' (Lidskog et al., 1997).

2.2 Sustainable development

Sustainable development has become one of the most prominent phrases in the development discourse since the United Nations Conference on Environment and Development (UNCED or 'Earth Summit') in Rio 1992 (Adams, 2001 p. 1-2). Behind the concept lies, on the one hand, strives to solve environmental problems, the science of ecology and concern for nature preservation mainly in the Western world, and on the other hand, the development and poverty problems of the Third World (Adams, 2001 p. 51).

Among other instances, sustainable development has been codified through the *World Conservation Strategy* (WCS) prepared by the International Union for the Conservation of Nature (IUCN) in 1980. It

was then further developed through the report of The United Nations World Commission on Environment and Development (WCED), *Our Common Future* in 1987, and the follow up to the WCS, *Caring for the Earth* in 1991 (Adams, 2001). In 1992, the concept became widely known through the *Agenda 21* and the Rio Conference. According to Adams (2001), although different the mentioned documents have a remarkably consistent core of ideas - a 'mainstream' strongly influenced by science, ideas about wildlife conservation, concerns about multi-lateral global economic relations and emphasis on the rational management of resources to maximise human welfare.

Mainstream Sustainable Development

One of the key events in the emergence of the concept of sustainable development was the United Nations Conference on the Human Environment held in Stockholm in 1972 (Adams, 2001 p. 54 – 57). At this conference many of the Third World countries insisted on the fact that long-term environmental protection should not hinder economic growth to resolve urgent short-term problems, such as poverty, hunger and disease. Attempts to address the problems of the Third World set forward that environment and development should be seen as an integrated whole, and that development should not be impaired by environmental protection.

As a result of the Stockholm conference the United Nations Environmental Programme (UNEP) was created. The UNEP commissioned the IUCN to prepare a document that would become the *World Conservation Strategy*. The *World Conservation Strategy* contributed to the diffusion of the term 'sustainable development'. However, the view in this document is mainly environmentalist and theoretical. Consequently it failed to involve ideas about economics and politics, which are fundamental to the development process (Adams, 2001 p. 59 – 69).

The United Nations World Commission on Environment and Development presented in 1987 their report *Our Common Future* (also known as The Brundtland report). This report placed sustainable development within the economic and political context of international development, thus returning to the ideas of the conference in Stockholm

1972 (Adams, 2001 p. 70). In *Our Common Future* (WCED, 1987) sustainable development is defined as:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs' in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

The Brundtland definition, according to Adams (2001 p. 71), is based on two concepts: the basic needs for the poor and the idea of environmental limits from impact from the human society. These limits are not however set by the environment, but by technology and social organisation. This meant an important change from the ecologically based concept of sustainable development to the socio-economic context (ibid). So though the answers in *Our Common Future* were similar to the ones proposed by the *World Conservation Strategy*, The World Commission on Environment and Development was far more effective in their ability to address and engage government policy-makers.

Important ingredients in the sustainable development proposed by the Brundtland report were the concern for basic needs, to merge environment and economics and the focus on economic growth as one important way to tackle poverty as well as environmental and development objectives (Adams, 2001 p. 72). The basis for these ideas is mainly found in theories of market economy and not in concern for the environment. The overall assessment is that the international economy should speed up growth and development on a global level while respecting environmental constraints. However, according to Adams, the Brundtland report did not mention how this should be done.

The Earth Summit in Rio 1992

The World Commission on Environment and Development, and their report *Our common future,* played a major role in the United Nations Conference on Environment and Development in Rio 1992. The conference experienced tension between Northern and Southern governments, and the outcomes can be seen as compromises to satisfy the needs for all parties (Adams, 2001 p. 83). One important outcome

from the Rio Conference was the *Agenda 21,* a vast document with a large scope from water quality to the role of women and children in sustainable development. As in its predecessors, *Agenda 21* depends on economic growth both globally and nationally. The view, according to Adams (2001 p. 88), is techno-centrist; it is built on information, science and environmentally sound technology. *Agenda 21* calls for sustainable development through public participation, but according to Adams (2001 p. 89) ”like its predecessors, it is much stronger on hopeful sentiments about involvement than political analysis on power”.

Doubts have been raised concerning the significance of the achievements from Rio and *Agenda 21*. Many of the problems addressed in *Agenda 21* have become worse, for example, poverty and the gap between rich and poor countries (Brown, 1997 quoted in Adams, 2001 p. 95). In that sense Rio did little to promote sustainable development as such, however, it opened the debate about choices in development. One main factor for failure is that the financial support necessary to implement *Agenda 21* was not stimulated (Adams, 2001 p. 96). Others see hope for real change in the backwater of Rio (Murphy and Bendell, 1997, quoted in Adams, 2001 p. 98). Sustainable development can be seen as ”a new organising principle” and potential to join diverse and often-competing ideas.

2.3 Ecological modernisation

According to Adams (2001), the mainstream sustainable development developed through the Rio conference is based on a free market, the continuation of growth and on the application of technology. Mainstream sustainable development shares the dominant ideas of modernisation and economic growth in the modern world, and does not suggest any fundamental or radical changes. The fact that mainstream sustainable development has been within reach of conventional tools and environmental and market regulation has contributed to the persuasion of governments all over the world (Adams, 2001 p. 104). Moreover, mainstream sustainable development offers good opportunities for the market of clean technologies. However, there also exist counter currents in the sustainable development discourse, such as Green critics of developmentalism, Eco-socialism, Eco-anarchism, Eco-feminism etc.

Alternative ideas were also presented at Rio in 1992, although these counter currents did not find favour among the negotiators (Adams, 2001 p. 141).

Adams identifies three important groupings of thought within the idea of mainstream sustainable development: *market environmentalism, environmental populism* and *ecological modernisation* (ibid). Market environmentalism is based on continued capitalist growth, and therefore in strong opposition to ideas of 'zero growth' and 'limits to growth', prominent ideas of the 1970s. As stated by Adams (2001 p. 110), it is quite literally 'business as usual'. Environmental populism is based on the participation by ordinary people in decision-making (Adams, 2001 p 114-115). This idea is based on the voluntary cooperation in a process in which people have has the possibility to intervene.

Ecological modernisation, with its root in the 1980s, combines economic growth with environmental improvement without implying any derivation from the path of modernism (Cohen, 1997; Adams, 2001; Fudge and Rowe, 2001; Anshelm, 2002). Ecological modernisation is techno-centrist in its pursuits of rational, 'clean' technological solutions to environmental problems and more efficient institutions for environmental management and control. Ecological modernisation is based on a belief in science to solve human and environmental problems and dependent on governmental regulations to promote innovation in environmental technology. Consequently, environmental protection is not seen as a burden on the national economy but instead a source for future growth, mainly in western countries. Discussions on eco-efficiency and 'factor 10'[12] are in line with ecological modernisation (Falkheden, 1999 p. 54).

Ecological modernisation is also built on the principle that institutions can change, and that actors within them can learn, on a shift in values and a wider 'greening of society' (Adams, 2001 p 114 – 115), at the same time (Adams, 2100 p. 112). It can be seen as a necessary stage in a process of industrial transformation (Cristoff 1996, quoted in Adams, 2001 p. 13). Sweden and the Netherlands are two nations in the industrialised world that have entered the path of ecological

[12] The idea behind the concept of factor 10 etc. is that industrialized countries should within one to two generations render their use of resources and decrease their total impact on nature by 10 times, maintaining or increasing contemporary living standards. The concept has been developed by the Wuppertal institute (see, Swedish Government 1998/99:5).

modernisation (Cohen, 1997 p. 114; Adams, 2001 p. 12; Fudge and Rowe, 2001 p. 1528).

Ecological modernisation is in many ways contradictory to the risk society perspective established by Beck (Cohen, 1997). Beck is sceptical and even negative to the possible contribution of science and technology to mastering environmental problems. Beck points out the threats of technology due to their failure to develop effective institutional control and the limits of a reductionist science.

Weak and strong ecological modernisation

Fudge and Rowe (2001) refer to a development or maturation of the concept of ecological modernisation, where the early focus on technological innovations, the state and the market has turned to focus on socio-economic and institutional and cultural dynamics.

Cristoff (1996, quoted in Adams, 2001 p. 141) identifies several differing and sometimes conflicting versions of ecological modernisation. He distinguishes 'weak' ecological modernisation, which is 'economistic', technicalogically narrow and national, from 'strong' ecological modernisation that is ecological, systematic and international (Table 2.3).

Table 2.3 Weak and strong ecological modernisation (adapted after Cristoff 1996 quoted in Adams 2001 p. 141)

Strong ecological modernisation	Weak ecological modernisation
Ecological	Economistic
Institutional/systematic (broad)	Technological (narrow)
Communicative	Instrumental
Deliberative democratic (open)	Technocratic (closed)
International	National
Diversifying	Unitary

Similar reasoning can be found in Jensen (1994 quoted in Falkheden, 1999 p 103). Jensen finds that contemporary demands for sustainable development have lead to two differing strategies for planning and building. On the one hand, *urban ecology* can be seen as efforts to solve *all* environmental tasks in *one* locality. On the other hand, *environmental management* can be seen as efforts made to solve *one* environmental task in *all* places (Table 2.4). Parallels can also be drawn

to the metaphor of two strategies for sustainable development proposed by The Swedish Environmental Protection Agency (1998). In their scenarios for Sweden in 2021 they distinguish between two strategies: the 'path-finder' strategy with small-scale local solutions and a large divergence in solutions, and the 'way-winner' strategy using large-scale solutions applicable in a broad perspective.

Table 2.4 Urban ecology and environmental management as different strategies for sustainable development regarding planning and building (Based on Falkheden, 1999 and Edén et al. eds 2000, based on Jensen 1994).

URBAN ECOLOGY	ENVIRONMENTAL MANAGEMENT
All environmental tasks in one locality	One environmental task in all localities
Offensive measures	Defensive measures
Urban planning	Public measures
Design	Implementation of new techniques
Small scale	Large scale
Interdisciplinary development	Economy and legislation
Education/training	Administration/information
Practical experiments	Demonstration projects
Grass-roots activity	Civic involvement
Cultural development	Social experiments

2.4 Operational models for sustainable development

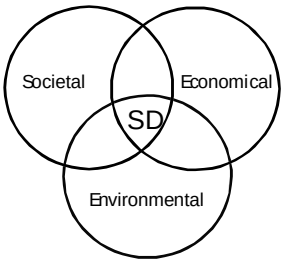


Figure 2.5 Basic notion of sustainable development comprising of three dimensions.

In the Brundtland Report, as well as in earlier documents that set the direction for sustainable development, little was said as to how sustainable development should be accomplished. When moving from an ethical and visionary level of sustainable development to an operational level we need further developed models.

The basic notion of sustainable development is often illustrated by a simple three-circle diagram (see Figure 2.5). Sustainable development is achieved when the three dimensions: economic, environmental and social coincide or overlap. Although informative, this static representation can distract us from the original complex vision of sustainable development (see more Edén et al., 2000). Other parts, outside sustainable development, can be seen as legitimated, competing, unsustainable, political and scientific areas. Furthermore, the model opens up for the possibilities to distinguish, for example, 'economic sustainability' or 'environmental Researchers at the German Wuppertal

Institute have developed a four dimensional conceptual model, 'the prism of sustainability', for the operationalisation of sustainable development (Valetin and Spangenberg, 2000). Here the notion of sustainable development has been increased with a fourth dimension or imperative, the institutional. The institutional imperative refers to the societal and individual capacity to handle information, knowledge build-up and development. It further involves public participation, democracy and regulation. The prism model has the advantage in representing a space in which the issue of sustainable development can be approached from any dimension. Shortcomings in the Wuppertal prism are the choice of dimensions. Kain (2003 p. 326) argues that the economic notion in most conceptualisations of sustainable development is not useful since it *'celebrates a confusion between human-made capital, market system, and financial and monetary assets.'* Further the difficulties in distinguishing between the concept of social capital[13] and the notion social in general make the Wuppertal prism vulnerable for interpretations. Kain has further developed the prism into the MAIN^{tetra} (Figure 2.6) the dimensions: mind, artefact, institution and nature (2003 p. 327).

The MAIN^{tetra} can be rotated and flipped in any direction putting the issue in hand at the top. The MAIN^{tetra} is scale-less, or applicable to all scales, does not refer to any time-scale and mainly supports operationalisations on a local level. The MAIN^{tetra} has several advantages to the Wuppertal prism in conceptualising sustainable building. The articulation of the artefact is important and congenial to architects and planners in clarifying cultural values that otherwise can be difficult to manifest. The replacement of 'environment' for 'nature' makes it easier to point to the values of nature in itself.

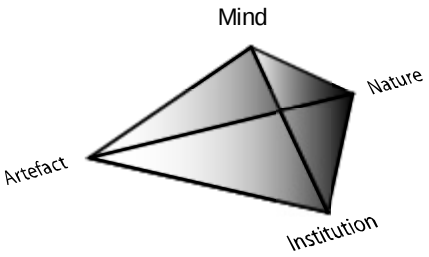


Figure 2.6 The MAIN^{tetra}- Mind-Atrefact-Institution-Nature, a model for the dynamic understanding of sustainable development (after Kain, 2003 p. 326).

Mind – ethics, world-view, knowledge, skills and other human attributes

Artefact – works of art, instruments, machines, buildings and physical networks

Institution – formal and informal relation webs of all sizes and directions, formal and informal norms, information systems and codified knowledge

Nature – all kinds of natural elements from the ecosphere and the lithosphere

2.5 Sustainable building

Sustainable development in relation to building activities and the built environment is often called sustainable building or sustainable

[13] The four different forms of capital used by the World Bank, i.e. human, social, natural and human-made (see, www-esd.worldbank.org). In the MAIN^{tetra} these have been replaced by: mind replacing the human capital, artefact replacing the human-made capital, institution replacing the social capital, and nature replacing the natural capital (Kain, 2003 p. 327).

construction. The building sector is one of the largest societal and economic sectors in Europe (CIB, 1999), and together with the built environment contributes significantly to the pressure on the natural environmental. The building sector and the built environment have been pointed out as two key areas of concern for global sustainable development (CIB, 1999; Miljövårdsberedningen, 2000).

There does not exist any unique or single internationally accepted definition or recommendation for sustainable building (CIB, 1999; WGSC, 2004). As pointed out by The European Working Group Sustainable Construction Methods & Techniques (in this thesis called by the abbreviation WGSC), and The International Council for Building Research, CIB, short common definitions are not possible due to local conditions and constraints, specific features and national and cultural priorities.

The setting of an agenda for sustainable building is a task that occupies national governments, the European Union, as well as the research community and the national building sectors in many countries around the world. The International Initiative for a Sustainable Built Environment, iiSBE, and the Green Building Challenge[14], the GBC, are examples of international organisations that work with international exchange and cooperation regarding knowledge build-up on sustainable building.

The buildings and the environment

While the characteristics of sustainable building demand more effort to be determined in figures, the unsustainable features of contemporary western building practices are easier to describe: The building sector in the European Union is attributed with more than 40% of the total energy use, 30% of the CO_2 emissions, and is estimated to generate 40% of all man-made waste (CIB, 1999). Buildings and building activities affect the environment through the use of resources, the use of land and through emissions. Large amounts of resources in the form of materials, energy etc. flow through the building sector. Furthermore, the built environment contributes to the global degradation of nature, such as the devastation of forests, the degradation of fresh water, the continuous

[14] See website: http://www.greenbuilding.ca for more information about iiSBE and GBC.

exhaustion of natural capital resources such as gravel etc. The WGSC (2004 p. 11) points out figures estimating that the building sector accounts for approximately 50% by weight of all the materials taken from the earth's crust (also natural and non-renewable) and that these are being depleted beyond sustainable levels.

The interaction between the built environment and nature is highly complex. Buildings have a relatively long lifespan compared with other artefacts, and will have an impact through all stages from planning, construction, utilisation, and demolition or reuse. A building is a complex product involving a range of materials and compounds that will interact. In addition, buildings have a considerable effect on human health. For example, in Europe people spend 90% of the time indoors (Miljövårdsberedningen, 2000; WGSC, 2004). The lifespan of a building can average 100 years, the initial costs, equivalent to 7 to 20 years running costs, are thus relatively small (WGSC, 2004 p 11). In Sweden, research has claimed that up to 85% of the energy use is allocated to the operational and user phase (Adalberth, 1997).

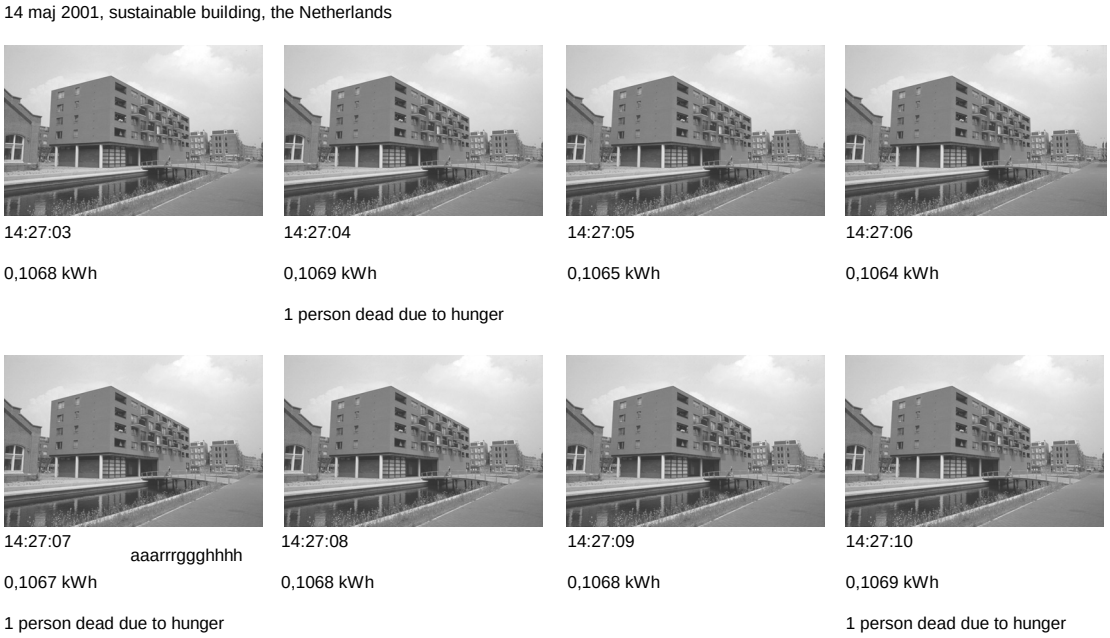


Figure 2.7 Image of sustainable building made by the author.

Basic features in sustainable building

Sustainable building is often considered as confronting two challenges (see for example Buijs and Silevster, 1996): On the one hand, the interrelation between buildings and building activities, resource use and environmental impact has to be determined and objectives have to be set up. On the other hand, these objectives have to be implemented in the fragmented and complex building sector (see Chapter 3). The challenge with sustainable building concerns an integrated solution for environmental consideration, at the same time as attaining levels of quality of life, comfort, social, economic, cultural values (WGSC, 2004).

In general, a life-cycle approach is advocated when addressing sustainable building, including the whole cycle of construction from planning to demolition. Moreover, the joint efforts among all the actors involved in the building sector from material producers to end-user are considered important (CIB, 1999; Miljövårdsberedningen, 2000; WGSC, 2004). Some of the main overall objectives for sustainable buildings are: energy efficiency, reduction in use of resources that cannot be replenished, reduction of waste, reduction of fresh water utilisation, rejection of hazardous substances, minimisation of the impact on bio-diversity, and the quality of the indoor climate (CIB, 1999; Miljövårdsberedningen, 2000; WGSC, 2004). Even though the building design is influential, main performance parameters for sustainable building are usually considered as being decided upon at the urban policy and planning level (cf. WGSC, 2004). The WGSC (2004 p. 13) emphasizes that sustainable building is performance based and independent from any architectural style.

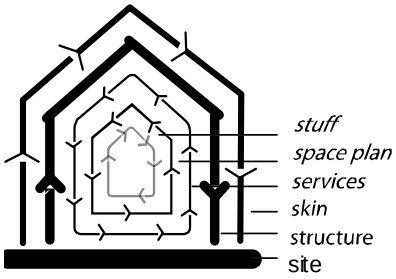


Figure 2.8 Shearing layers of change in a building (after Brandt, 1994 p. 13 built on Duffy).

Several authors propose a systemic approach to sustainable building interlinking the different components, materials and functions of the buildings (Brand, 1994; Cole and Lafreniere, 1997; Edén et al., 2003; Thuvander, 2004). Based on ideas by Duffy, Brand has created a time model for different layers in a building (Figure 2.8). The site has the slowest change cycle and interior material (called 'stuff' in Brand's model), the quickest. Layers with a quicker life-cycle span should be designed for change[15] (Brand, 1994 p. 17). Cole and Lafreniere (1997)

[15] Brandt refers to the biologist O'Neill (1986), who through studying ecosystems came to the conclusion that *"The dynamics of the system will be dominated by the slow components, with the rapid components simply following along".*

have further developed the ideas of Duffy and Brand into a framework for environmental design referring to three different scales. The temporal framework establishes an order between materials and components regarding lifespan. The scale-based framework refers to system boundaries in space, such as the building, the site, the neighbourhood, the city etc. (Fig. 2.9). The contextual circumstances are the most open-ended framework that refers to the physical environment as well as to politics, financial systems, cultural aspects etc. Furthermore, adaptability and flexibility are often mentioned as key words in sustainable building (Brand, 1994; WGSC, 2004).

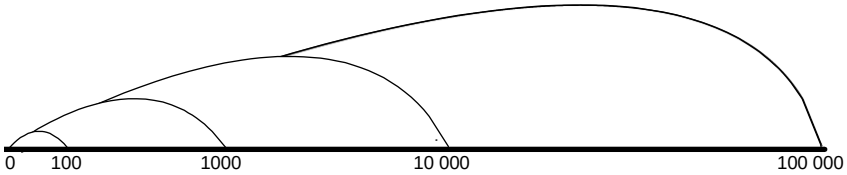


Figure 2.9 Space scale: building, building site, neighbourhood, area, city, region etc.

The contemporary building process[16] is characterized by being largely fragmented, with many different actors having different cultural backgrounds, tasks and responsibilities that render the implementation of sustainable building more difficult (see Chapter 3). For the individual actor the consideration for sustainable building will be fragmented and will concur with other interest, obligations and values in everyday practice. The importance of co-operation for achieving sustainable building and the need of an *Integrated Design Process* has often been underlined (see for example CIB, 1999; WGSC, 2004). Some factors for an enhanced Integrated Design Process (IDP) are: inter-disciplinary co-operation among actors, common objectives, consensus on performance issues, a *design facilitator* or *process champion* etc. (Larsson, 2000; Wallin, 2002). The design facilitator or process champion has the task of safeguarding the issues of sustainable building through the whole process and to provide specialist knowledge in the field.

Falkheden (1999; in prep) emphasizes on an additional value of the built environment in supporting processes of change towards sustainable development: In enabling connections amongst people, between people

and nature and in creating links between the local context and global processes (see also, Örneblad, 1997). Such *designed links* visualize the interactions between the human and the natural systems and give concrete feedback between actions and environmental consequences through daily use (Falkheden, 1999). They advocate the tangible and sensuous, to counteract the intangible and non-sensuous environmental and sustainable problems. Thus, the built environment can be given a more active, supportive and transformation promoting role. An example of such a designed link is a local bio-cleaning system for water and wastewater in Kolding, Denmark (Picture 2.10).

Picture 2.10 The local bio cleaning system is accomodated in a glass pyramid in the centre of the residential area of Kolding, Denmark. One of the tenants said the following about the relevance of this feature: *"It is so tangible – so that everyday I am met with something that reminds me of ecology and the environment"*[17]. The daily, obvious, and manifested reminds people of the interrelation between humans and nature (Falkheden, 1999). (Photo by Lena Falkheden)

[16] The term building process is used here to include the planning, design and construction of a building.
[17] "Det er så synligt – så jeg hver dag bliver mødt med noget der får mig til at tænke på økologi og miljø." (Falkheden, 1999, p. 211)

2.6 The Swedish approach to sustainable development and sustainable building

In his 1996 statement of government policy, the Swedish Prime Minister, Göran Persson, stated (Swedish Government, 1997/1998:13):

> Sweden should be a driving force and a model when it comes to efforts to achieve ecological sustainability.

In this first national policy document for sustainable development from 1997, the ecological and environmental dimensions were emphasized and the official term was 'ecological sustainability. Actions over the last years have increasingly encompassed financial, social, employment, educational, and cultural measures (Swedish Government, 2000:52; Swedish Government, 2001/02:172).

The Commission on Ecologically Sustainable Development appointed by the government in January 1997, set up three headline objectives for Sweden (Swedish Government 1997/1998:13): *protection of the environment* (environmental impact should not exceed nature's capacity), *sustainable supply* (long-term productivity and conservation of forests, land, and water resources/use of raw materials able to be relenished), and *efficient resource utilisation* (regarding energy and natural resources). Based on these three headlines, *15 national objectives for environmental quality* were proposed and approved by the Swedish Parliament in April 1999 (Swedish Government, 1997/1998:145). The 15 national objectives[18] point out the direction to take and what should be achieved within a generation (Table 2.11). Objective number 15: *A good urban environment* is especially addressed to the building sector and the built environment. However, building activities are also affected directly or indirectly by several of the other objectives, in particular numbers 1, 2, 4, 5, 6, 7, 9 and 12.

In January 1999, a new Swedish *Environmental Code* came into force. This new law states that consideration for the sustainable resource efficiency with regard to land and water and of energy and natural resources should be taken in all planning and building activities. The

1	Reduced climate impact
2	Clean air
3	Natural acidification only
4	A non-toxic environment
5	A protective ozone layer
6	A safe radiation environment
7	Zero eutrophication
8	Flourishing lakes and streams
9	Good quality ground-water
10	A balanced marine environment flourishing coastal areas and archipelagos
11	Thriving wetlands
12	Sustainable forests
13	A varied agricultural landscape
14	A magnificent mountain landscape
15	A good urban environment

Table 2.11 The 15 Swedish national objectives for environmental quality as restructured and developed in Swedish Government 2000/01:130.

[18] An additional 16th objective on biodiversity should be included at the latest by 2005 (Swedish Government 2001/02:172).

1	The future environment
2	Limitation - the climate changes
3	Population and health
4	Social unity, welfare, and safety
5	Occupation and learning in a knowledge society
6	Economic growth and competitiveness
7	Regional development and unity
8	Planning

Table 2.12 The eight strategic areas for major concern in the Swedish national strategy for sustainable development (Swedish Government 2001/02:172).

'best available technique' should be used. However, the technique is not defined and should continuously be developed (Miljövårdsberedningen, 2000). From a societal point of view, the law emphasizes that a good living environment should be created. The law should ensure a good environment for current and future generations[19]. It gives nature its proper value of protection, not only as part of the human living space.

As part of the Swedish Government's work with sustainable development, a *National Strategy for Sustainable Development* has been formulated (Swedish Government, 2001/02:172). The national strategy is based on already established objectives and decisions and will be a basis for the continued work. The national strategy provides long-tem visions and values, instruments, tools and processes necessary for the development. Even if it is mainly national, the strategy has an international and global perspective. The objectives will be approached via different instruments: legislation, planning, co-operation and integration between societal sectors, economic instruments, indicators, research and development, education and information etc. The Swedish Government has pointed out eight strategic areas of major concern (Table 2.12). The building sector is directly or indirectly concerned with strategic area numbers 1, 2, 5, 6, and 7, but mainly concerned with number 8 about *Social structure*. This strategic area is closely linked to the national objectives for environmental quality; *A good urban environment*. Objectives for the area are: a good living environment, good technique and system solutions and environmentally adapted building and effective management. The focus is on energy efficiency, but also on a good environment satisfying comfort, healthy indoor climate, resource efficiency etc. The national strategy emphasizes the value of our cultural heritage as a resource. At the end of last year a special secretariat for sustainable development was established for the Cabinet Offices and the Ministries (Cabinet Office, 2003). The secretariat will have the function of integrating the work with sustainable development between the Ministries. Furthermore, it has the

[19] Information collected from The Environmental Code education homepage. Five basic headlines support the law: Human health, Valuable natural and cultural environments are to be protected and conserved, Biological diversity is to be preserved, Long-term good management of resources should be secured, and Reuse and recycling should be supported. Webpage: http://www.miljobalksutbildningen.gov.se, and the Environmental Protection Agency webpage: http://www.environ.se

task of developing the national strategy and international action in environmental and sustainability questions.

The agenda for sustainable building

In Sweden no national definition of sustainable building has been spread. The environmental impacts of activities in the building sector and the built environment have been discussed together with agendas formulated by governmental organisations and by the building sector.

The work by a large number of governmental agencies to concretise the 15 national objectives for environmental quality into sub-objectives and sector specific objectives was presented in the summer 2000 (Swedish Government, 2000:52). The Swedish National Board of Housing, Building and Planning, Boverket, has the main task of concretising number 15 of the national objectives for environmental quality: *A good urban environment.* Boverket has proposed a number of sub-objectives (Boverket, 1999a) and sector specific goals (Boverket, 1999b). The sector specific objectives focus on four main areas: energy efficiency, improved indoor climate, resource management, education in the sector as well as the use of environmental management. In order to achieve objectives for energy efficiency, bought-in energy should be limited to 60 kWh/m^2 in new buildings by 2020. In public buildings, a 50% reduction of bought-in energy should be achieved by 2050. Regarding indoor climate, humans should not be exposed to emissions, bad ventilation, noise, dampness, radon or electrical and magnetic fields. Research and experiments should certify a reduction in health related problems in buildings. By 2020, no negative health effects from known chemicals should be found. To achieve the objectives for resource management, the use of raw materials and water should not exceed the capacity of each area. Waste volumes and disposal from building and engineering works should decrease and reuse and recycling increase. All standards, documents, organisations and administrations within the building sector should have an increased environmental and eco-cycle perspective. In this way, all actors within the sector should gain knowledge in the field.

The Eco-cycle Council for the Building Sector[20] is a voluntary organisation with representatives from a large range of actors within the building sector (clients, property owners, architects, technical consultants, contractors and building material producers). The Eco-cycle council works on a voluntary basis to set up an agenda and an action programme for the building sector. As a result of a survey from 2000 (The Eco-cycle Council for the Building Sector, 2000), four main areas of concern for sustainable building were detected: reduced energy use, reduced waste disposal, reduction of unwanted substances in building and engineering works, and a good indoor environment. In an environmental programme published in 2003, the Eco-cycle Council for the Building Sector (2003) has set up objectives to be fulfilled within a single generation. Within one generation the sector should have reached a considerable reduction in energy use and an almost total stop in the use of fossil fuels. Furthermore a considerable reduction should have been attained regarding the exploitation of virgin land. Buildings should be designed to be flexible and with good quality for a long period of utilisation. The buildings should be designed from a life-cycle perspective in order to reduce the use of materials, to increase reuse and recycling and minimize building waste and disposal. The unwanted substances in building materials should be at a minimum level and hazardous waste handled correctly. The building material industry should be encouraged to provide extended information about materials. The building industry should use materials with the lowest environmental impact. The ambition is that within a single generation, all buildings should as a matter of course provide a good healthy indoor environment. That is to say, it should be free from dampness, provide good sound reduction and good natural lighting as well as good thermal insulation. This, the environmental programme of the Eco-cycle Council for the Building Sector, should be systematically updated and revised to achieve a gradual progress of improvement in the building sector.

The Environmental Advisory Council[21] for the Swedish Government has invited 20 of the leading companies in the building sector and three municipalities to a dialogue called Building/Living.[22] The result from this unprejudiced dialogue is a vision and a strategy for a sustainable

[20] Byggsektorns Kretsloppsråd, website http: www.kretsloppsradet.com
[21] In Swedish: Miljövårdsberedningen

building and real estate sector in 2025 (Miljövårdsberedningen, 2000 p. 6). This vision and strategy has been the basis for pointing out priority areas for the continued work and for formulating seven objectives (Table 2.13). Three areas of major concern have been detected: energy and resource efficiency, indoor climate, and the 'sound' use of materials. The 'ecological' part of sustainable development is in focus for the objectives proposed by the Building/ Living dialogue, even if they have tried to propose solutions that are also *'socially attractive and economically feasible'* (Miljövårdsberedningen, 2000 p. 7). The need for increased research and development is pointed out as one priority area. The dialogue group emphasizes the need for special knowledge centres to take charge of the development (Miljövårdsberedningen, 2000 p. 57). Among the many tasks for this knowledge centre should be to initiate and run demonstration projects and to disseminate experiences from these projects to the sector.

Local investments and demonstration projects

During the later part of the 1990s, the Swedish Government launched several programmes with economic support for environmental investments. *The 'Eco-Cycle Billion'*[23] had as its purpose to support the technical development mainly through the eco-cycle adaptation of buildings and infrastructure. Just as the following *Local Investment Programme*, LIP, the programme had the added advantage of creating employment in the building sector and elsewhere. Consequently these investments had the double function of being an instrument for ecological conversion and at the same time economic policy tools to address unemployment (Anshelm, 2002 p. 42; Baker, 2002 p. 110). This strategy to promote sustainable development and *'at the same as taking advantage of the opportunities that adjustment will offer Sweden'* (Swedish Government 1998/99:5) expresses the Swedish Government's strategy in line with 'ecological modernisation' (Anshelm, 2002; Baker, 2002). As such the LIP programme (1998 – 2002) was a broad programme for the ecological modernisation of investments to stimulate the modernisation of buildings, infrastructure and energy systems at a

1	No fossil fuels should be used for central heating or hot water after 2025. By the latest 2015, more than 50% of the energy needs should be met through renewable energy resources.
2	The use of purchased energy in the building sector should decrease by at least 30% by 2025 as compared to 2000.
3	By the latest 2005, sector relevant information will be available that makes it possible to reject building materials/constructions containing or giving rise to substances known to be hazardous to health and the environment.
4	By the latest 2010, all new buildings and 30% of the existing building stock are declared and classified with respect to building related health and environmental impact.
5	By the latest 2008, the use of substances and metals covered by the Government's guidelines for chemical use1 should be phased out within the building sector.
6	By the latest 2010, no more than 25% (counted in tonnes from 1994 levels) of the waste from new construction and refurbishment is used as landfill. By 2005 no more than 10% is used as landfill.
7	By latest 2005, the extraction of natural gravel should be limited to specific purposes and should not exceed 3 million tonnes per year in 2020.

Table 2.13 Seven objectives for sustainable development in the building sector proposed by the Building/Living dialogue (Miljövårdsberedningen, 2000 p. 28).

[22] In Swedish: Bygga/Bo dialogen
[23] The 'Eco-Cycle Billion' programme was never completed due to few applications and due to problems in the administration of the programme (Hanberger et al, 2002: 29).

local level (Swedish Government 1997/98:117 p. 8). Since 1997, Swedish municipalities have been able to apply for grants for local investments. A requirement to receive financial support has been the co-operation with different partners. Furthermore, a considerable part of the investments should be made locally. The Government has allocated 7.2 billion SEK (app. 0,7 billion Euros) for LIP until 2003. The initiatives that have been given support include investments for energy efficiency, conversion to renewable energy resources and building measures. For example, the demonstration project for sustainable building Bo01 in Malmö, Sweden received LIP support.

2.7 The Dutch agenda for sustainable building

The Netherlands has a similar background to Sweden regarding activities in the environmental area. The Netherlands and Sweden have had the ambition to play a role as environmental leaders within the European Union and the United Nations (Haneberger, 2002 p. 39).

The Netherlands set up political goals for the environmental adaptation of the built environment in the early 1990s. A first National Environmental Policy Plan was published in 1989 as a result of attention given to issues brought up by the Brundtland Report. A follow-up was published already in 1990, including an appendix regarding building activities (Hal, 2000; Hal et al., 2000). In 1995, the Ministry of Housing, Spatial Planning and the Environment introduced a National Plan of Action for sustainable building, in Dutch known as *Duurzaam Bouwen*, named *Sustainable building – Investing in the future* (VROM, 1995). This was followed up by a second National Plan of Action in 1997 (VROM, 1997). In the first action plan from 1995, the term 'sustainable building' is stated to mean (VROM, 1995 p. 3): *that consideration is given to environmental quality as a matter of course at every stage of the building process, i.e. from design to management'*. Sustainable building is described in terms of energy conservation, resource efficiency, adaptability to meet future needs, and the use of environmental friendly materials. Sustainable building should be seen as an 'extra quality'.

The main objective in the National Plans of Action for sustainable building has been to find ways to adopt environmental measures on a broad scale within the building process. This is brought about through

several steps, making all construction a little bit more sustainable rather than focusing on gaining a very high level of sustainability in just a few projects (Hal van, 2000:13) Within these National plans, financial support has been provided for a large number of activities implemented together with the private sector. Another governmental investment, aimed at integrating environmental measures to building regulations, was the introduction of the *Energy Performance Normative*, EPN with the Energy Performance Coefficient, EPC (the lower the better[24]), in the Dutch building regulations in 1995 (Figure 2.14). Furthermore, a new chapter on environmental issues was added to the Housing Act. A drawback for the development of sustainable building in the Netherlands is that no further tightening up of the EPC is planned at the moment, a fact that works against the initiatives from the building sector towards energy efficient goals (Sustainable Building: Frameworks for the Future, 2000).

Figure 2.14 The EPC value is successively decreased.

The Dutch government introduced a Policy Programme for Sustainable Building 2000 – 2004. Since this, no further investments have been planned for; instead the development should depend on voluntary actions from the market motivated by the advantages of sustainable building.

Instruments in the Dutch approach

An important instrument in the Dutch approach aimed at reaching an agreement upon a common definition of sustainable building was the introduction of the National Sustainable Building Package[25] in 1996, in continuation referred to as the National Package, (VROM, 1996). The National Package was prepared in co-operation with actors in the Dutch building sector. The National Package contains a set of voluntary measures for sustainable building. It is constantly updated and revised. The first package was addressed to new housing and was soon followed by packages for non-residential buildings, refurbishment, urban planning, and infrastructure. Among other things, measures for building design regard: energy, materials and water utilisation, design for

[24] EPC is defined by two components: the building technology factor with heat transmission through the structure, and by installationtechnology aspects. When introduced in 1995, the EPC demand in building regulations was 1.4, and was successively lowered to 1.0 in 2000.
[25] The first National Sustainable Building Package for housing has been translated into Swedish by the author, and this can be acquired from the author (Femenías, 1999b).

prolonged lifecycles and adaptability, and indoor climate. The ambition level in the National Packages will gradually be increased, while the lowest level of ambitions will be transferred to the building regulations[26]. The introduction of sustainability measures in the building regulations should insure that the actors are forced into sustainable building (Hal van, 2000). A report, *Monitoring Duurzaam Bouwen* from 1999, shows that 32% of all building permits from 1998 complied fully with the measures in the National Package (Hal van, 2000 p. 13). Another central point in the Dutch effort to harmonise knowledge was the establishment of the National Sustainable Building Centre in 1996 with the task of collecting and distributing knowledge and information for the entire building sector. The activities within the field of sustainable building have been a part of a larger governmental investment in environmental management and in fiscal instruments such as *groen beleggen*, green mortgages, low interest finance (linked to criteria in the National Package) through the *groenfonds* (green funds) (Baker, 2002).

Another important factor has been the national demonstration project programme for energy efficient and sustainable building assigned between 1996 and 1998. This national demonstration programme was initiated by the governmental organisations, the Steering Committee for Housing Experiments (Sustainable Building: Frameworks for the Future, 2000) and the Netherlands Agency for Energy and the Environment (Novem), and commissioned by the Ministry of Housing, Spatial Planning, the Environment (VROM) and the Ministry of Finance. The building projects, that have been selected and allotted finance within the demonstration programme, range from newly-built housing and office buildings to refurbished areas. The projects were chosen in a competition based on sustainable measures as stipulated by the first National Package from 1996. In all a total of 44 demonstration projects spread all over the country have been completed and evaluated[27] (Sustainable Building: Frameworks for the Future, 2000). Besides this demonstration project programme for energy efficient and sustainable building, other kinds of demonstration projects within the field of

[26] This refers to “measurements for which there is no possible debate” (measures applicable on a large scale). (Hal van, 2000)
[27] The results from this demonstration projects programme will be discussed in Chapter 2.

sustainable building and urban planning have been carried out[28] (for example, for energy efficiency - mainly for urban development and for municipal agendas).

The large national investments in sustainable building made in the Netherlands at the end of the 1990s have not been continued into the present century. Among other reasons, this is due to a change of the politicians in charge. According to actors in the Dutch building sector, there is little interest in sustainable building within the sector and among the general public at the beginning of the 21st Century (see Chapter 7). In order to involve the building sector and the public (who are clients for private housing), those who work with sustainable building issues today focus on other than environmental aspects when promoting sustainable building[29]. For example, health issues, indoor climate, quality, comfort, aesthetics, beauty etc. are set in focus. The national sustainable building periodical, *Duurzaam Bouwen* recently changed name to *Puur Bouwen*, which means 'pure building' or healthy building.

2.8 The state of sustainable building in Europe 2004

Since 1992, the European Union, EU, has engaged in action for sustainable development, even if this is not part of a coherent or deliberate strategy or policy thrust (Fudge and Rowe, 2000:42). According to Fudge and Rowe (2000, p. 42), the EU policy-making remains sectoral. The activities are divided over several of the Directorate General of the European Commission bodies (Sustainable Housing Policies in Europe, 2003 p. 37-42). The early focus on environmental protection has gradually been shifted to encompass social aspects of sustainable development. In 1990, a Green Paper on the Urban Environment was published, and in 1991 the EU Expert Group on the Urban Environment was established. The EU's Fifth Action programme on the Environment *Towards Sustainability* emerged in 1992 at the same time as the United Nations Earth Summit in Rio.

The European Union has defined sustainable housing to include three perspectives: the construction perspective, the social and economic

[28] See The National Sustainable Building Centre, www.dubo-centrum.nl (April 22nd 2004).
[29] Based on personal communication, June 7th 2004, with Anke van Hal PhD, environmental consultant and chief editor of the periodicals *Puur Bouwen* and *Puur Woonen*.

perspective and the eco-efficiency perspective[30]. The Working Group for Sustainable Construction Methods and Techniques (WGSC, 2004) was established by the EU Expert Group on the Urban Environment in order to give advice to the European Commission on sustainable building. In their final report on sustainable construction, the WGSC concludes that sustainable building has come a long way in Europe today, and has gained visibility not least through the success of numerous best practice examples. However, although we find relevant examples all over the EU, sustainable building is far from being a 'stream' and much less a 'mainstream'. The working group points out several factors that indicate the development of sustainable building at present. The WGSC states that there is a considerable amount of quality literature available on sustainable building. The relevance of sustainable development has been understood in the sector, and there is widespread popular support for sustainable building. Furthermore, there is a trend towards integrated solutions where the cultural heritage has been determined as an important factor in enhancing the quality of life.

The WGSC points out several barriers and constraints regarding sustainable building: economic constraints, availability of technologies, gaps in research, and major non-technical barriers. Among these non-technical barriers we find unclear political messages, culture and value related constraints, the difficulties in changing old methods and routines in the building sectors, market barriers etc. It will be necessary to study what different incentives and penalties are necessary to motivate each actor to become involved in the change towards sustainable building. The WGSC points out that until now the focus has been on housing, and less efforts and research have been made in the fields of refurbishment and non-residential building. Furthermore, the WGSC finds that there is a significant lack of widespread and practical design principles, and that existing tools lack clear definition and interpretation of sustainable building. There is an important gap between current knowledge and actual application, which must be addressed by dissemination. The WGSC emphasizes on the necessity to make information available, and to raise awareness through education and clear political messages. The

[30] Findings from the Third European Minister Conference on Sustainable Housing available at Website:
http:///www.mrw.wallonie.be/dgatlp/logement/logement_euro/Pages/Reunions/Genval/Colloque.htm

WGSC further emphasizes demonstration projects as an important means of disseminating concepts, ideas and solutions (see further Chapter 4). Interesting to note is that in the WGSC's objectives for sustainable building there are also less quantifiable quality-oriented objectives emphasized, such as identity and user's sense of belonging, and diversity of texture, colour and form. So far such quality objectives are unfortunately scarce in the discourse on sustainable building.

2.9 Summing up

The concept of sustainable development has its roots in earlier discourses of nature protection, environmentalism and the science of ecology, and has been integrated with the discourse of development in a global perspective. Adams (2001) in his extensive exploration of the concept has found that it has been codified and developed through the last three decades in several documents, where the Brundtland report *Our Common Future* from 1987 and the *Agenda 21* from 1992 have had main impact. The concept of sustainable development has been widely spread and known through two key events: the United Nations conference in Stockholm in 1972 and the United Nations conference on the Environment and Development in Rio, or Earth Summit, in 1992.

Although there are counter currents within the discourse of sustainable development, the concept is characterised by a mainstream of ideas. This mainstream is based on the power of government, science, technology, and the rational management of resources to maximise human welfare. This mainstream sustainable development is not mainly founded on ecological based concepts but on a socio-economic context. Its success in engaging governments all over the world can be explained by it being built on existing economic systems of growth, and that it does not imply radical changes of governing procedures. Sustainable development is usually perceived as consisting of a social, economic and environmental dimension.

Ecological modernisation, market environmentalism and environmental populism are important thoughts within mainstream sustainable development. Together they build up a mainstream sustainable development based on capitalist growth, a techno-centric view of solving environmental problems, and public participation with

the purpose of legitimising governmental action. Several authors distinguish what can be called weak from strong ecological modernisation. The weak ecological modernisation is then characterised by a defensive, economist, instrumental, unitary, and technological/technocratic view. The strong ecological modernisation is characterised by an offensive, ecological, communicative, diversifying, and broad and democratic/grass-roots' view.

Both Sweden and the Netherlands have approached ecological modernisation in their national policy work for sustainable development. The Swedish government's work since 1996 is based on the idea of sustainable development. Among other results from these endeavours are a national strategy for sustainable development, the 15 national environmental quality objectives for the environment, and an environmental code. Both in Sweden, and within the European Union, a shift has been observed from an early focus on environmental issues towards an acknowledgement of social and cultural aspects as being important for sustainable development.

Sustainable building

The building sector and the built environment contribute considerably to the degradation of the natural environment and are regarded as two areas of major concern for sustainable development, both nationally in Europe and globally. There does not exist any single internationally accepted definition of the concept of sustainable building. Such a definition is not even realistic due to local conditions and constraints, specific contexts, as well as national and cultural preferences and priorities.

Sustainable building, on the one hand, concerns determining the complex relations between building activities and the built environment, and the natural environment as well as determining the influence on the social, human, cultural spheres etc. Firstly, it must be determined *what* sustainable building is. On the other hand, an agenda has to set the guidelines for *how* to accomplish sustainable building. The implementation of sustainable building is constrained by the complexity and fragmentation of the building process involving many actors from different cultures and differing interests (see, Chapter 3). In general a life-cycle approach and a systemic approach are proposed for the planning, design and maintenance of buildings aiming for prolonged

lifetime and flexibility of design. Other important factors are the collaboration between actors in the building sector in order to accomplish their tasks, as well as an Integrated Design Process. The Integrated Design Process focuses on co-operation on a project level as well as the important involvement of a 'process champion', or 'process master', with the task of safeguarding the ambition to produce a sustainable building throughout the project.

The national agendas for sustainable building in Sweden and the Netherlands must be seen as emerging from their respective national strategies for ecological modernisation and mainstream sustainable development. In Sweden, the government has set up objectives and consensus has been reached between different partners in the building sector as to the objectives and agendas for sustainable building. The main areas of concern are energy efficiency, a limitation or stop for the use of fossil energy resources, rejection of hazardous substances in building materials, limitation of natural resources (gravel, metals etc.), and the reduction of building waste (also reuse and recycling). The built environment should provide a healthy indoor climate, be socially attractive and economically feasible. The agenda for sustainable building further involves the spreading of information and to support education in these issues within the sector. Furthermore, it involves changed standards, as well as changes in organisation and administration in the sector.

In the Netherlands, political directives for sustainable building were set up in the early 1990s as part of the National Environmental Policy Plans. The involvement increased through two National Actions Plans for sustainable building published in 1995 and 1997. Since the beginning of this century the issue is receiving less political attention. The National Action Plans provided several instruments for the implementation of sustainable building in the Netherlands: definitions, information, subsidies, green mortgages, demonstration projects, etc. One of the major instruments was the National Sustainable Building Package, prepared in co-operation with the Dutch building sector, with definitions and measures for sustainable building that are constantly revised and up-dated as measures are diffused to mainstream building. Another important instrument has been to carry out and evaluate a large number

of widely spread demonstration projects for energy efficient and sustainable building.

The European Working Group for Sustainable Construction Methods and Technique, the WGSC, has in a final report on sustainable building concluded that sustainable building has come a long way in Europe. Sustainable building has gained visibility not least through numerous best practice examples. However, sustainable building is far from being a ‘stream’, and much less a ‘mainstream’. Barriers and hindrances are found among available technologies, economic constraints, gaps in research etc. There are also major non-technical barriers such as unclear political messages, culture and value related constraints, the difficulties in changing old methods and routines in the building sector, market barriers etc. The WGSC states that it will be necessary to address incentives and penalties to motivate the actors in the building sector. There is an important gap between existing knowledge and the actual application. The WGSC places emphasis on information, education, clear political messages and the implementation of demonstration projects.

Chapter 3 The Building Sector: Conditions for Development, Learning and Innovation

This chapter provides a theoretical basis for the thesis in discussing conditions for development, learning and innovation in the building sector. The chapter presents theory within the fields of design, innovation, organisation and management. Firstly, a general description of the building sector is provided: its actors, the structure, and the organisation of work. The description is mainly based on the Swedish context but the conditions for knowledge build-up and development should generally be similar in other national contexts (see for example Hal van, 2000). Secondly, a presentation is given of the conditions for knowledge build-up in the building sector, the professional know-how and the role of the example. Thirdly, an introduction is provided about organisational learning and fourthly about the innovation-diffusion process. Lastly, an outline is presented of the factors that will influence development, learning and innovation as well as in other areas for sustainable development within the building sector. Altogether, this chapter provides a background for understanding the initiating and receiving context regarding demonstration projects for sustainable building.

In several countries around the world, including Sweden attention is currently being given to the need for improving the mainstream building process. These commitments are based on similar structural problems and lack of incentives for innovation and development in the building sectors (Swedish Government, 2002:115; Building for growth, 1999; Constructing for excellence, 2001[31]; Rethinking Construction, 2002).

[31] Building for Growth (1999) *An analysis of the Australian Building and Construction Industries*, Industry Science Resources, Commonwealth of Australia; and Construct for Excellence (2001) *Report of the Construction Industry Review Committee*, January, SAR, Hong Kong. Both Quoted in Dulaimi et al. (2002)

3.1 The building sector

Included in the *building sector* are all institutions, organisations and actors that contribute to the production and management of buildings (or civil engineering works). This includes the *building industry* that is directly involved in the production, renewal, repair and maintenance of buildings and civil engineering works. Thereby the management of buildings is not included in the building industry. Furthermore, the building sector includes the designers, the financing companies, the insurance companies, the producers and sellers of materials as well as the real estate agents (Swedish Government, 2002:115; Lutz and Gabrielsson, 2002).

The building sector in Sweden is the second largest sector in society after the health care sector and is of considerate importance for the national economy (Swedish Government, 2002:115). Altogether the building sector is the European Union's largest industrial sector, contributing approximately 11% to the GNP, and having more than 25 million people directly and indirectly involved (CIB, 1999).

The structure of the building sector

The building sector is in general largely national or even local, diversified and fragmented (CIB, 1999). The majority of the construction companies in Europe are small or medium-sized operating with few employees.

In Sweden, structural changes provoked among other factors by the economic recession of the 1990s, have resulted in a few larger national actors dominating the market among building contractors (Swedish Government 2002:115 p. 86). A similar development towards a few larger, and a range of very small actors, has for instance affected the consultancy firms, the building material industry, and installation engineering firms. The stronger contractors have nowadays taken on the function of clients and developers for their own production. At the same time the traditional clients have lost competence and power for among other reasons: the detailed regulation of buildings during the 1960s and 1970s, and the low volume of housing construction during the 1990s. At the same time many government-owned and municipal clients have disappeared. As a result a change in the power balance can be observed

with a weakened position for the traditional clients to the favour of a stronger building contractor (ibid).

The main actors

The *client* is a key actor in the building process with the responsibility for the production and the product as well as the investments and financing. The client also has the *legal* responsibilities that the design and construction is carried out according to the legislation and regulations (Swedish Government, 2002:115 p 67). Even if the client, for example, commissions a contractor, the client has the ultimate responsibility.

The *users*, for example the tenants, are the actors that have the least influence on the building process, even though being those most affected by the results (Swedish Government, 2002:115 p. 68). The client is the one who indirectly is supposed to satisfy the users' interest in the building process by identifying the presumed need and wishes of the users.

The *architects* and other *consultants*, such as constructional engineers, contract managers, contract co-ordinators etc., in practice contribute with the main part of the competence and knowledge that the client and the constructor need to carry out their tasks. This presumes that the main resources should be invested in the initial parts of the building process. In reality less time is set out for the design, in relationship to the total size and budget of the project, and architects and other consultants are not given sufficient resources to use their competence (Swedish Government, 2002:115 p. 70). For example, the larger architects' offices in Sweden currently use only 50% of the time on a project in comparison with the 1970s (Swedish Government, 2002:115 p. 70).

The *contractor* constructs, changes, repairs and maintains buildings and engineering works according to the commission of the client. Most works are carried out on a design and construct basis (termed turn-key contracting) or general contracting[32] (Swedish Government, 2002:115 p 70). In a design and construct contract the contractor is responsible for the commission and the co-ordination of designers and other consultants.

[32] In Swedish: totalentreprenad or generalentreprenad.

Usually the lowest tender is the ultimate criteria for the commission. A large part of the construction work as well as specialised tasks, such as electrical installations, ventilation, and plumbing, are carried out today by sub-contractors commissioned by the contractor. At present, many contractors also take the role of clients for their own production.

The *government* has several roles in the building process (Swedish Government, 2002:115 p. 71). It has the ultimate responsibility for deciding housing policy legislation, building regulations and laws affecting the building sector etc. The government is also a large actor on the real-estate market through governmental authorities and government-owned real-estate companies. The housing production in Sweden during the period from the 1930s until the mid 1990s was to a large extent directed through political strategies, subventions and loans (see for example Ericson and Johansson, 1994). Since the mid 1990s, the political directions in the housing sector together with subventions and loans have diminished drastically (see for example, Turner and Vedung, 1997).

The *local authorities* also have several important roles in the building process through which they can influence building activities and their costs. The local authorities can act as: landowners, holders of the planning monopoly, as actors on the building and housing markets or as a permission-granting or supervisory authority, for example, in building or environmentally related questions (Swedish Government, 2002:115 p 73).

The role of the *finance companies* is to evaluate the projects concerning risk, yield and profitability (Swedish Government, 2002:115 p. 78). Since the building crises of the 1990s, the demand for high and quick yields on invested capital has forced the production speed and set the focus on the granting of venture capital to projects considered to give quick and secure yields (ibid). As a consequence, the long-term advantages from investments in techniques and materials that will provide low costs in the management and administration spheres are underestimated.

3.2 The organisation of work in the building sector

The major difference between the building sector and other industry is that the building process is *fragmented* with many actors that possess specialist knowledge. The building process can be characterized as being similar to a relay race where the different actors succeed each other (see for example Kadefors, 1997). This fragmentation and specialisation, according to Ericson and Johansson (1994 p. 21), is a consequence of the specialization in society in general, and especially in the technological sphere, with roots in the 'Taylorism' and the logic of the capitalist market economy.

The temporary project organisation

The building sector is mainly organised in what might be called *temporary organisations*. The building project can be characterised as a temporary organisation[33]. Lundin and Söderholm (1994) have developed a 'theory' of temporary organisations using four concepts: *time, task, team and transition*. Firstly, the temporary organisation can be characterized by being limited in time. Secondly, the temporary organisation is motivated by a special task. Thirdly, the temporary organisation is designed by and around a *team* of actors formed for the task. These actors normally belong to a 'home' organisation before, during and after being involved in the temporary organisation. From this team organisation emerges two concepts. Firstly, the relationship between the individual and the team, and secondly, that between the team and the team environment in which it is working[34]. The expectations and experiences of each individual in the team can merge or not merge with those in the team. It is not possible for one single profession to codify the whole team. Lundin and Söderholm (1994 p. 442) argue that the very fact that the organisation is temporary may be a condition for the acceptance of conflicting interests in the team.

[33] One of the most well known definitions is stated by the non-profit organisation 'The Project Management Institute' (PMI): "[A] project is a temporary endeavour undertaken to create a unique product or service" (Engwall, 1998 s. 25).

[34] The temporary organisations' or the building projects' environments can be: the physical environment, the economic environment, the political environment, the juridical environment, the cultural environment and other environments, such as professional groups, sector organisations private persons etc. (Josephson, 1994 p. 64)

Individuals will also enter and exit the team at different times so the 'rules of the game' may change (ibid). Lundin and Söderholm argue that the relationship between the team and the team context/environment mainly focuses on the legitimisation of the team and the task it should accomplish. The team has to relate to the context, which may include competing organisations, or organisations that are simply uninterested in the temporary organisation. Team members may even be 'isolated' inside the temporary organisation and create their own norms.

Lundin and Midler (1998 p. 233) use the words 'arena', and the metaphor with a bullfighting arena, to characterize a project in order to mark that there is a social frontier between those 'inside' the project and those 'outside'. Being inside or outside that frontier provides different roles for the actors. Those inside have the role to act or perform, whereas those outside are safe to look on and judge. The frontier of the arena can create a radical change in behaviour. For the participant it creates a focus and for the spectators visibility and control. The arena is thus a social construct by which a singular problem is extracted from a 'messy' context.

The fourth basic concept for understanding temporary organisations described by Lundin and Söderholm (1994 p. 442), the *transition*, is justified by the concern with progress and accomplishment. This orientation towards action is the very reason for having a temporary organisation; to fulfil the task, in our case the building project. The transition can be described as a change from 'before' to 'after' and also involve changes in instrumental behaviour, changes in meaning, culture and ideology. Lundin and Midler (1998 p. 232) point out that a project at the same time has an *action* perspective and a *learning* perspective, even though it is primarily a goal-orientated problem-solving process. Usually there is dialectic in the relationship between the two perspectives implying that one perspective will be neglected as the focus is on the other. The existence of a hard and clear arena frontier in a temporary organisation would be counter-productive to the learning imperative. The clear frontier is motivated as it has a focusing effect in the implementation phase of the project and minimizes disturbance through isolating the organisation from the context (Lundin and Söderholm, 1994 p. 447).

3.3 Knowledge build-up in the building sector

Knowledge in the building sector is mainly developed through practice; through the building of projects (see for example Linn, 1998). Information is searched for when needed and solutions to problems are normally sought for as they emerge within the specific project (Ericson and Johansson, 1994; Wallin, 2002; Josephson et al., 2003). This empirical-practical knowledge building process is not systematic or controlled by scientific methods but based on personal experiences. It is often characterized as being subjective and contextual (Ericson and Johansson, 1994; Linn, 1998). Contemporary fragmentation and specialisation of activities in the building sector have lead to an increased need for controlling competence and knowledge using different models and systems for the control of activities as well as the quality assessment of results (Ericson and Johansson, 1994 p. 20). However, on an everyday building project level the knowledge processes are driven mainly by decisions taken on the spot and in relation to a specific situation (see also Larsson, 1992).

Several authors indicate that the process of knowledge build-up in the building sector, as well as changes in the building practices, is slow and takes place in small steps (Rudberg and Winqvist, 1990; Larsson, 1992; Ericsson and Johansson, 1994). The practical-empirical method for knowledge build-up in the building sector is based on a chain of planning, design, construction, evaluation, feedback and reflection. There will be several years between the planning of a project and the feedback of results.

Learning in general is closely related to previous activities and experience (see for example Molander, 1993). In the building sector several factors challenge the efficiency of learning and knowledge build-up processes (Dubois and Gadde, 2002; Josephson et al., 2003). Firstly, the project organisation does not promote learning. One reason for this is the temporary nature of the building project that does not guarantee any further contact among team members. The temporary building project is problematic as it has no long-term organisational memory. Building projects can be seen as a *host for knowledge* (Bröchner et al., 1991; Lundin and Söderholm, 1998). The ideal is that the individual actor that participates in the temporary project will bring his/hers experiences back to the ‘home’ organisation and into new temporary project organisations.

However, often little effort is devoted to transmitting knowledge and experience from one building project to another (Dubois and Gadde, 2002; Josephson et al., 2003). An obstacle to learning is that each building project is considered as a *unique* event (Ericson and Johansson, 1994; Dubois and Gadde, 2002; Lutz and Gabrielsson, 2002). Next time there will be new circumstances, new prerequisites and new actors. This is also related to the fact that there are seldom long-term relationships between actors in the building sector.

A second explanation is found in the fragmentation of the building process involving many actors from different professional groups sometimes resulting in difficulties in mutual understanding and communication. Moreover, the fragmented building process is divided in clearly defined phases and knowledge is often lost in the transition from one phase to another as actors enter and exit the project (Linn, 1998; Josephson et al., 2003). Some key actors enter late in the process and consequently do not have the same knowledge base for their participation in the project (Josephson et al., 2003).

A third factor is the decentralised decision-making process and ad-hoc problem-solving at the spot does not encourage systematic long-term thinking with regard to knowledge build-up (Dubois and Gadde, 2002; Josephson et al., 2003). The work situation for the individual is also characterised by stress due to the limits of expenditure in the building project leaving little time for reflection over the work before a new projects starts. The building project organisation is further characterized by uncertainties and indistinctiveness (Sahlin-Andersson, 1986, 1989; Josephson, 1994). This refers to the characteristics of the final product as well as the building process. The uncertainties are reduced as the project proceeds. The indistinctiveness in future conditions can provoke irrational acting, which in turn works against flexibility and efficiency (Josephson, 1994).

A fourth factor can be found in the individuals' interest in and attitude to learning (Josephson et al., 2003). The individual actor in the building sector is part of a profession and an organisation that will have an influence on the individual. In the following sections, professional knowledge and learning as well as organisational learning will be discussed.

3.4 Professional knowledge and the role of the example

Linn (1998 p. 28) identifies three kinds of sources for knowledge concerning building practices: the products (buildings, landscapes etc.), written documents (documents from the process etc.), and the living *praxis* (with tools, methods, values, problem views etc.). The first two of these sources are concrete and explicit in that sense that they can be made available and accessible for an observer. The third source, the praxis involves implicit and *tacit* knowledge that in some cases can be difficult to make explicit and understood for an observer.

Lundequist (1984 p. 31) describes the concept of praxis as an abstraction that is made up by the common ideas and patterns of actions carried out by an identified group of people. Praxis is constituted by the rules and the institutions, with surrounding forms of praxis that altogether make up the specific context for the praxis. Winch (1958/1988 cited in Lundequist, 1995b p. 45) has concluded that if people act in the same manner in different situations they follow a rule. These rules are difficult to make explicit and to explain in words, as they have to be understood in their context. To be a part of praxis means that one has learnt to handle the rules and concepts used in the praxis. This means that one has learnt to conceptualise a certain part of reality. According to Winch (1958 cited in Lundequist, 1995b p. 50) research can articulate praxis through making the essential concepts for the praxis explicit.

Professional knowledge can be defined as the ability to function and act in a professional praxis (for an extensive introduction to professional knowledge, see Schön, 1984, Molander, 1993 and Rolf et al., 1993, Lundequist, 1984, 1995b). All members of the group that constitute the praxis are collective bearers of this praxis. Some of the rules in praxis are explicit while others are implicit: they are transmitted from a mentor to an adept, through *learning-in-action* (Schön, 1984; Molander, 1993). As stated by Schön (1984 p. 49), professional knowledge is characterized by being familiar with a phenomenon. Professional knowledge is characterized by a method to approach a problem-solution for which the professional cannot explicitly state the rules or the procedures. Such tacit knowledge or ‘know-how’ (see Rolf et al., 1993) is according to Polanyi (1964, 1966 quoted in Lundequist, 1995b, p. 62)

both bodily knowledge that is accumulated and taught, and contextual knowledge that is supported by cultural traditions. A professional praxis functions as a supporter for tacit knowledge. Tacit knowledge is acquired when a person learns to function in praxis (Lundequist, 1995b p. 62 drawing on Rolf, 1991 and Polanyi, 1964, 1966).

A complementary dimension to the tacit part of professional knowledge is the *reflection* or *reflection-in-action* (Schön, 1984; Molander, 1993; Rolf et al., 1993). The reflection is the basis for development of the professional knowledge. While acquisition of professional knowledge or know-how belongs to single-loop learning, reflection upon the normal procedures is a necessary element to trigger double loop-learning i.e. changes in collective procedures and know-how (Rolf et al., 1993 p. 34; Argyris and Schön, 1996).

Furthermore, Rolf (1991 quoted in Ericson and Johansson, 1994) introduces the expression *intimate knowledge* to characterise a dimension of professional knowledge. Intimate knowledge can have a conservative effect on a profession. A profession can be so intimate with an activity that the *real* conditions will remain hidden. The confidence can, if based on more or less false ideas, be a hindrance for competence and knowledge development, a 'confidence trap'. Ericson and Johansson (1994) discuss that emphasise on tacit and intimate knowledge concerning professions in the building sector does not mean that this knowledge should be left outside a critical discussion.

Transfer of information and experience

When referring to acquisition and transfer of professional knowledge a distinction has to be made between *information* and *knowledge* (Molander, 1993; Lundequist, 1995a). Information can be objectified and stored, communicated or elaborated, like for example in written documents, drawings, videos etc. Knowledge on the contrary is something that only a person can have. Information is a product of a sender's knowledge, but it is not knowledge. In order to become knowledge, the information has to be interpreted by a person (Lundequist, 1995a). The information itself does not carry the interpretation, but has to be presented in such a way that the message is communicated (Lundequist, 1995b p. 10). Moreover, Molander (1993) distinguishes between orientation-knowledge and knowledge-in-

disposition. The orientation knowledge is based on understanding, identity and pre-understanding and gives us the means to make decisions based on a trained ability to see what is important and correct. The knowledge-in-disposition refers to the instrumental knowledge, general rules, and knowledge that give us the tools to be in command, for example, of a technical procedure.

A model involving four factors is normally used when explaining the process of transfer of information/knowledge: the sender, the receiver, the information/knowledge, and the ability to express the knowledge in text (Rolf et al., 1993 p. 19). Rolf et al. (1993) point out two problems in this model for the transmission of knowledge. One the one hand, there may be problems in the communication. For example, if the receiver has insufficient pre-knowledge in the field to be able to interpret the information communicated. The interpretation has to be made against a background of a context. It can also be a case that the sender has not been able to adapt the information to the situation of the receiver. On the other hand, problems can occur in the articulation of the knowledge in text. For example, this concerns procedures that cannot entirely be reproduced solely through a description, and for example what concerns tacit knowledge. Molander (1993) argues that all kinds of knowledge have a tacit side. No kinds of knowledge are entirely tacit and all kinds of knowledge are basically tacit. Janik (1991 quoted in Lundequist, 1995b p. 63) distinguishes two kinds of tacit knowledge: one that can be externalised but has not been given expression via language, and one that is not possible to articulate entirely. This latter kind of tacit knowledge concerns knowledge that involves the use of rules that are frequently taught through identified good examples.

The role of the example

The example has an important role in the transmission of professional knowledge. The practitioner builds up a personal repertoire of precedent familiar examples, images, understandings, and actions to be used in new unfamiliar situations (Schön, 1984 p.138). Such a repertoire of ‘good examples’ is usually shared and developed by individuals in a profession or praxis.

In general, examples have the role of making the abstract comprehensible. According to Ramirez (1995, 1997), the general can

only exist in our imagination. Solely the concrete example exists in the world (Ramirez, 1995 p. 2):

> Concretisations and examples verify the generally valid and make it visible and communicative.

Once the comparison or metaphor is understood the example can be forgotten (Ramirez, 2001). The example has been reduced to its essential. The exemplification results in a general experience to be used in similar situations. The example becomes a bridge between the specific and the general. In such a process the good as well as the bad example fills a function (Ramirez, 1997 p. 257). The example should not be followed mimetically. It is not a rule that can be followed literally. According to Ramirez, the example talks to the reason and not the instrumental action (ibid).

The example also has the advantage of illustrating comprehensive views on a subject (Molander, 1993; Lundequist, 1995b). Complex artefacts as in the case of buildings must be studied and understood as non-reducible entities (Linn, 1998). The function of the parts and components cannot be defined unambiguously as the building is not only a physical object but also the basis for certain life situations, cultures, social relationships etc. The concrete example will facilitate the understanding of the complexity of the building. The comprehensive understanding of an example is not only based on our personal understanding but also influenced through the communication with others, for example, in a profession (Lundequist, 1995b).

Of special relevance for this thesis is the transfer of experiences from a built example to be used in new decision-making situations. As argued by several authors, the transfer of experiences from a built example must include the contextual circumstances in which the building was produced (Sahlin-Andersson, 1989; Birgersson, 1996; Karlöf, 1997). A building project involves many contextual and unique conditions. In order to make the example useful, that which is generally applicable has to be distinguished from that which is specific. The example can be found to be product related or process related. For instance, it may be a technical innovation with general applicability, but it may also be the implementation of a technical innovation through a process with special conditions (project organisation, co-operation, subventions etc.) that

cannot unduly be reproduced in a new context (see further Birgersson, 1996). Birgersson et al. (2001) have discussed this problem using the conceptual pair of space – place. Space relates to the general non-contextual laws applicable on a large scale while place is the specific and situation bound.

3.5 The learning organisation

The building sector includes both the temporary building project organisations and the more stabile 'home' organisations for the actors in the sector. In the following conditions for learning regarding the stabile organisations will be presented from the point of departure of theory on organisations and organisational learning.

An important criterion for measuring the success of the stabile organisation is the survival, and in order to survive the organisation has to develop (Holmblad Brunsson, 2002). This continuous development can be seen as a learning process. Furthermore, the organisation has to interact in some way with its environment and to care for its legitimacy. It has to fulfil certain expectations from its environment (ibid). Consequently, in order to learn the organisation has to respond to its environment. Through its actions the organisation will in turn have an influence on its environment. Accordingly, organisational learning can be characterised as an iterative process where the organisation 'maps' the environment and uses these maps to change the same (Josephson, 1994 drawing on Hedberg, 1984). As the information about the environment is often incomplete and difficult to access or to use, the organisation has good reason for being slow in development. Consequently, it may be safest to continue in the old routines (Holmblad Brunsson, 2002 p. 22-26). Argyris and Schön (1996) call this phenomenon the 'competence trap'. The organisation persists in familiar patterns beyond within which it yields successful outcomes.

It can be argued that organisations often develop through observation and imitation of other organisations (DiMaggio and Powell, 1983). In this way the organisation can either legitimate its own behaviour, or find other models to imitate or to reject. In insecure situations, when objectives are ambiguous or uncertain, organisations have a tendency to

imitate and model themselves upon other organisations they for example find to be more legitimate or successful (ibid).[35]

Models for organisational learning

On the one hand, individual learning is a necessary condition for organisational learning (Argyris and Schön, 1996 p. 6-7). On the other hand, in many cases knowledge held by the individual fails to enter the organisation and consequently the organisation knows less than its members. Conversely, there are also cases when the organisation seems to know more than its members, for example, in an army (ibid). From this point of view, organisational learning can be seen in terms of 'organisational environment' or 'arenas' within which the individuals think and act (Hedberg, 1984 quoted in Josephson, 1994; Argyris and Schön, 1996).

As already discussed, individual learning can be described as an iterative trial-and-error process involving action and a reflection over this action (see, Kolb, 1974 quoted in Josephsson, 1994; Schön, 1983; Molander, 1993). The individual learning will also be influenced by the context and by personal and professional representations and concepts (see section 3.3). For the small organisation with a few individuals, organisational and individual learning are similar. The large organisation, however, needs some kind of system to disseminate the individual knowledge to the organisation as a whole.

Bröchner et al. (1991 p. 100) highlight two ways for actors in the building sector to build-up knowledge. Either the organisations generate their own experiences or they use experiences generated by others, which are transmitted through media, literature, lectures etc. The organisational researchers Dibella and Nevis (1998 p. 86) distinguish between incremental and transformative, internal and external

[35] Besides this mimetic isomorphism, DiMaggio and Powell recognize coercive and normative isomorphism. Coercive isomorphism is the results from formal and informal pressure exerted on an organisation from other organisations upon which they are dependent or by cultural expectations in society. Such pressures can be felt like a force but also as invitations. This can also be governmental mandate, for example, to conform to sustainable development. The normative isomorphism is associated with professionalism. The collective profession has as occupation to define the conditions and methods to

organisational learning (see further section 3.6). While the internal incremental learning refers to a basic correction of existing procedures and products, the internal transformative learning refers to innovation. The external incremental learning is called adaptation. This means that the organisations take basic ideas from external sources, knowledge developed elsewhere, and use these to improve their own procedures. The external transformative learning demands some amount of acquisition, usually that the organisations purchase capabilities developed by others.

Dibella and Nevis (1998, p.89 – 92) further distinguish four possible styles of learning capacity within an organisation: The first, role modelling handles the intuitive silent skills or implicit knowledge that is disseminated in an informal manner through person-to-person relations. The second, communities of practice, involves collective learning in an informal manner. Individual experiences are shared, and in this process new learning takes place by collectively generated insights that the individual could not have produced alone. The third, the mode of the authorized expert, uses formal ways of dissemination through an expert that functions as an adviser within the organisation. Finally the fourth, bureaucratic mode disseminates experiences mainly through written sources.

Bröchner et al. (1991) found in Sweden that the formal systems for knowledge transmission within organisations in the building sector were fairly good among building contractors, but less developed among the consultancy firms. Among the consultants (architects, engineers) informal methods, such as person-to-person contact, were the most common ways of dissemination. In the architectural firms, knowledge dissemination within the organisation often works through mentorship between the experienced and the less experienced. Furthermore, architects often go on study trips and read national and international trade press (Bröchner et al., 1991 p.103). The authors in their study find it remarkable that the organisations in the building sector do not find the build-up of knowledge to be of specific interest for their future.

As already discussed in Section 3.4, Argyris and Schön (1996 p. 20 – 25) distinguish between two kinds of organisational learning processes:

establish a base and legitimate the members. This is exceeded, for example, through professional networks, education etc.

the single-loop learning and the double-loop learning. By single-loop learning is meant instrumental learning that changes strategies of action in ways that do not consider the values of the theory of action or *theory-in-use*. That is to say that the dominating values and representations on which the organisation has built up its activities are unchanged. The single-loop learning can be characterised as an incremental process where the organisation adjusts action strategies or assumptions within the range set by existing organisational values and norms. Single-loop learning is 'instrumental incremental' and concerned primarily with effectiveness. More difficult to achieve is the double-loop learning, which implies change in theory-in-use. According to Lundin and Midler (1998 p. 239), double-loop learning is connected with innovation and radical change. The theory-in-use, according to Argyris and Schön, can be embedded in norms, strategies, assumptions, etc. The theory-in-use may be tacit rather than explicit, and may even be in opposition to the organisation's formal documents, such as policy documents and job descriptions. Since theories-in-use are supported by organisational and social cultures, individuals have little reason to be aware or to explore these further.

Hindrances for organisational learning

Through their empirical work, Argyris and Schön (1996 p. 76) have found that the theories-in-use in the studied organisations were systematically counter-productive for double-loop learning especially when the issues are embarrassing or threatening. The organisation reacts defensively and thus responds to the environment that is focused on success through suppressing the errors. The organisation falls back to single-loop learning.

Holmblad Brunsson (2002 p. 183) mentions other hindrances for organisational learning. She argues that through the choice of information systems and procedures the organisation can disregard its own experiences. The information systems are selective and large parts of reality may be forgotten. In structural changes and in the adoption of new procedures it is advantageous for the organisation if its members forget quickly. Bröchner et al. (1991) point out the necessity of liquidating old knowledge in an organisation in order to prepare for renewal. The liquidating of old knowledge, however, can meet

opposition as those individuals with special knowledge within an organisation usually have an influential position that they are not prepared to loose. Moreover, organisations with many new members or new directors forget more easily (ibid).

Other hindrances for learning are found in organisations that are either highly specialised or have the strategy of simplifying their work. When simplifying, the organisation focuses on one task and disregards others (Holmblad Brunsson, 2002).

3.6 Innovation and adoption

The innovation and adoption processes represent two ways for the organisation to learn and thus develop. On the one hand, the organisation can invest in innovations (internal transformative learning according to Dibella and Nevis, 1998), and on the other hand, the organisation can adopt innovations made by others (external incremental learning according to Dibella and Nevis, 1998).

The term innovation means 'the introduction of something new' or 'a new idea, method, or device' (Merriam and Webster's Collegiate Dictionary online, www.m-w.com, March 2004). Rogers, the founder of a well-known model for innovation-diffusion processes, defines innovation as (Rogers, 1995, quoted in Hal van, 2000 p. 16):

> An innovation is an idea, practice, or object that is perceived as new by an individual or another unit of adoption.

Dosi (1992 drawing on Freeman, 1974) emphasizes the distinction between *invention* and *innovation,* where the former is potentially marketable and the later marketed. Accordingly, an innovation is first accomplished with the first commercial transaction.

An innovation can be attributed five characteristics through which it becomes interesting for potential adopters (Rogers, 1962 p. 124 – 134): 1) the relative advantage, 2) the compatibility (to existing values and experiences), 3) the complexity (the degree to which it is difficult to understand and use), 4) the divisibility (the degree to which it can be tried on a limited basis), and 5) the communicability (the degree to which the results may be diffused to others). Other factors that will influence the potential adopter are (Rosegger, 1981 quoted in Larsson,

1992 p. 28): the technical characters of existing systems in the organisation; profitability and economic conditions, technical competence in the organisation; market position and alternative strategies; and the attitude of the direction of the organisation.

A few individuals or groups of individuals within an organisation take the decision to use or reject and innovation. In general larger firms have better finances to innovate and adopt as this involves risk. Some factors however work against this; as for example large firms are more bureaucratic and consequently reluctant to innovation (for an introduction to innovation and adoption theory in construction see Larsson, 1992).

Diffusion of innovations and adoption

There are four crucial elements in the analysis of the diffusion of innovations: 1) the innovation, 2) its communication from one organisation/individual to another, 3) in a social system, 4) over time (Rogers, 1962 p. 12). Rogers distinguishes between the *diffusion processes*, which is the spread of a new idea from its source of invention or creation to its users and adopters, and the *adoption process*, which is the mental process through which the potential adopter passes from introduction to adoption. Rogers presents the adoption process as consisting of five stages: awareness, interest, evaluation, trial and adoption. He further discusses different categories of adopters from the innovators to 'laggards'. The innovators are the venturesome eager to try new ideas. The early adopters are more integrated in the social systems and more locally bound than the cosmopolitan innovators. Rogers indicates several kinds of adopters from early adopters down to the 'laggards' who are traditionalists and the last to adopt. The early adopters have the shortest time period between awareness to trial while the late adopters and the 'laggards' have longer time periods before adopting.

Rogers and Shoemaker (1971 quoted in Larsson, 1992 p. 26 – 27) highlight three factors that determine the ability to adopt: the socio-economic status, personal variables and communication. Within the first they find that organisations with individuals with higher education are more likely to adopt. The personal variables are more difficult to determine, but Rogers and Shoemaker make some generalisations and

state that individuals that adopt are less dogmatic, more rational, intelligent and venturous. Individuals that adopt are more integrated in social systems, they are cosmopolites and they search for first-hand information.

Rogers (1962) recognizes the importance of *opinion leaders* and *personal communication* in the adoption process. The personal, face-to-face communication is even more important for the late adopters. The innovators and early adopters are more likely to rely on first-hand sources. However, the personal communication is most influential in the later stages of the adoption process when approaching an adoption or rejection of the innovation. Awareness of an innovation is mainly caused by impersonal communications such as media. Interesting to note is that Rogers (1962 p. 225) finds that we are often less selective in our exposure to personal influence than in exposure to mass media.

Finally, Rogers (1962) points out the importance of *change agents* or *change agencies* that serve as a communication link between a professional system and the clients system. A change agent, according to Rogers, is a professional person and there can be many kinds of change agents. Change agents can be commercial change agents, such as salesmen or local-level bureaucrats. According to Rogers, the change agents should concentrate their efforts upon opinion leaders in the early stages of the diffusion of an innovation.

Hughes (1987 in Kain, 2000 p. 71) points out the importance of understanding the characteristics of the system that will adopt a new technology. The technology has to be appropriate for a specific time and place.

3.7 Development, learning and innovation dynamics in the building sector

This last section discusses the development, learning and innovation dynamics in the building sector. The point of departure for the discussion is found in several articles exploring such dynamics in the building sector as well as how these impede or support the implementation of sustainable building and energy efficient building (Lovins, 1992; Lutzenhiser, 1994; Dubois and Gadde, 2002; Andersen et a., 2004; Nässén and Holmberg, in press).

To take a case in point, the advantage of energy efficient solutions that would mean economic savings are not for example a sufficient argument for the building sector to invest in such solutions (Lovins, 1992; Lutzenhiser, 1994). As argued by Lutzenhiser (1994 p. 868), innovation, organisation and technological changes are also socially regulated matters, and as such regulated by non-economic factors. Lutzenhiser argues that organisations seldom act solely on the basis of rational self-interest. He point to studies of economic behaviour that suggest that all forms of exchange are strongly influenced by social obligations and normative expectations. The behaviour of the organisation as well as its ability to innovate can instead be seen as influenced by a combination of cultural, institutional, socio-economic, and technical factors. This approaches theories of large technological systems by Hughes (see an introduction to theories by Hughes, 1987 in Lutzenhiser, 1994 and Kain, 2000). Hughes presents technological systems as both socially constructed and shaped by society. The change of technological systems involves several stages from invention, development, and adoption. Hughes recognizes the influence of momentum in a system dependent on organisation as well as people committed to various interests in the system that can offer resistance to change. Large-scale systems exhibit considerable momentum but evolve at uneven rates due to differences of interest and ways of thinking among the actors involved. Consequently, some innovations will be successful while others will fail.

The organisation of work

It can be argued that the building sector provides an optimal ground for technology diffusion through multiple connections and interfaces with different actors, technologies and practise (Dubois and Gadde, 2002; Andersen et al., 2004). In practice this represents a challenge, as potential adopters of new technology are risk averse and cautious concerning the cost and efficiency of changing established procedures. The prevailing short-term thinking in the building sector as well as the focus on the production has led to a concentration on small innovations with quick yield (Larsson, 1992; Ericson and Johansson, 1994). Moreover, initiatives taken by a single actor will meet resistance as this may challenge the effectiveness of existing networks. It could also lead

others to bear the risk for implementing new innovations. As already discussed in Section 3.3, the temporary project organisation creates uncertain relationships with respect to perceived benefits from joint development (Andersen et al., 2004).

Among other factors the prevailing short-term thinking can be explained by the building project often being considered as unique, and that a new project organisation is formed for every new project (Ericson and Johansson, 1994; Dubois and Gadde, 2002; Lutz and Gabrielsson, 2002). In such a system, either evaluations of product or process become valuable (Lutz and Gabrielsson, 2002 p. 14). The idea of the unique building project might be over-emphasized. Even if the building process is considered as unique it does contains repetitive parts. Furthermore, beneath the project management level the work consists of tasks and activities that are both repetitive and of a routine nature (Engwall, 1998 p. 30). Lutz and Gabrielsson (2002 p. 14) refer to The Egan report *Rethinking Construction* in the United Kingdom and state that about 80% of the activities that are part of the building process are the same in every project

Competition and risk aversion

Another factor mentioned in the literature is the lack of competitiveness in the building sector. The reasons for this lack are numerous (see for example Swedish Government, 2002:115). Here only a few of them are discussed.

The building sector is rather conservative and does not change its procedures. Even though the company stock changes in the building sector market, the products they offer or the techniques and procedures used do not do so (Lutz and Gabrielsson, 2002 p.8). Thus a renewal of the company stock does not lead to the introduction of new techniques, products or organisational forms. Consequently, productivity will develop more slowly in the building sector than in other sectors where existing and new companies need to innovate in order to be able to compete.

Furthermore, innovation is not economically defensible for first-movers and the building sector is characterised by static competition

(Lutz and Gabrielsson, 2002; Andersen et al., 2004)[36]. The actors are afraid of unknown costs and afraid to innovate in fear of damage to their reputation if alternatives fail (Lutzenhiser, 1994). The acting of the end-users is also special in the building sector as they have not been able to create incentives for change and innovation through market pressure. The end-users of buildings only have limited knowledge, and cannot see the feasibility, drawbacks and pay-offs and thus conservative in nature (Green et al., 1994 cited in Andersson et al., 2004; Nässén and Holmberg, in press).

Information and education

In such a system, as described above with low incentives for innovation, investments in research and development strategies for the future are not interesting (Lutz and Gabrielsson, 2002 p. 9). Nor is there any interest to employ highly educated personal. Consequently, the educational level among employees within the Swedish building sector is low in comparison with other sectors (Nutek, 2000[37] quoted in Lutz and Gabrielsson, 2002; Swedish Government, 2002:115). The same observations have been made in the Netherlands (Pries, 1995 quoted in Femenías and Hal, 2003). This also affects the level of interest in research and development. In Sweden not more than 1% of the annual turnover in the building sector is invested in research and development projects (Miljövårdsberedningen, 2000).

Another factor that strongly contributes to contemporary problems in the sector is that existing knowledge is not used (Swedish Government, 2002:115 p. 228). Although there exist many articles, research reports etc. the actors in the building sector have the impression that there is a lack of accurate knowledge. The knowledge is strongly fragmented, not easily accessible and many actors experience difficulties in getting an overview (ibid). Lutzenhiser (1994 p. 872) points to the need for a better understanding of how technical information is generated and disseminated. A parallel can be drawn with the debate on the sick-building syndrome of the 1980s. The problem with the sick-building

[36] For a more detailed description of competitiveness and development in the building sector see Swedish Government, 2002:15.
[37] "Svenskt näringslin på rätt väg?" Appendix 3 in investigation 1999/2000 published in Swedish Government 2000:7

syndrome depended to large extent upon the fact that important existing knowledge about health-risks, materials and building methods did not reach the actors in the sector (Ericson and Johansson, 1994 p. 31; Lundequist, 1995b p. 9). As pointed out by Ericson and Johansson, actors in the building sector rely on their own experience in situations when information is missing or difficult to access.

Contextual factors

As already stated, the building sector is regulated by political objectives as well as by fiscal systems, regulations and laws. The building sector is also dependent on the loaning institutions, and thus indirectly upon larger financial systems (Lutzenhiser, 1994 p. 873). Furthermore, for example, energy prices will be either motivating or discouraging for energy-efficient innovations (Lovins, 1992; Lutzenhiser, 1994; Nässén and Holmberg, in press).

An important issue that affects the diffusion of innovations in the building sector is the cyclic nature of demand (Lutzenhiser, 1994 p. 871; Andersen et al., 2004 p. 353). For example, the building sector in being the second largest industrial sector in Sweden has an important role in the national economy. For this reason it has been used for labour market policy measures. The cyclic and unpredictable nature of demand and supply affect the innovation capabilities of the building sector.

3.8 Summing up

The Chapter has presented a general description of the building sector, the structure and the organisation of work, mainly based on Swedish circumstances, as well as the specific conditions for development, learning and innovation within this sector. The building sector is a large societal sector within the European Union with considerable importance for the national economies of its member states. The building sector is largely national, diversified and fragmented.

Knowledge in the building sector is mainly developed through the practice, through the construction of projects. This empirical-practical knowledge building process is not systematic or controlled by scientific methods. It is subjective and contextual. The knowledge build-up, as well as all changes, in the building sector is usually characterised as

being slow and taking place in small incremental steps. Knowledge building is a long process of planning, construction, evaluation and feedback, which can take many years from start to results. Several factors challenge the efficiency of the knowledge build-up within the building sector. One factor is the temporary nature of the building project, which has no organisational memory. The building project is usually considered as a unique event, and there are seldom long-term relationships between actors. A second factor is the fragmentation of the building process involving actors from different professional cultures. The fragmented building process has several clearly defined phases and knowledge is lost as actors in the project team enter and exit the process during its course. A third factor is the decentralised decision-making process and the ad-hoc problem-solving on the spot, which does not encourage long-term thinking. A fourth factor concerns the individual actor's interest and attitude to learning.

This chapter gives an introduction to professional knowledge as the ability to function and act in a professional praxis. All members of a professional group are collective bearers of praxis. Some of the rules in praxis are explicit, while other will remain implicit or tacit. Professional knowledge can be characterised as an approach to problem-solving in which the rules cannot be explicitly explained but taught through practice. As pointed out by Rolf (1991 quoted in Ericson and Johansson, 1994), a profession can become so intimate with an activity that it will hide the real conditions. Rolf calls this the confidence trap. Furthermore, a distinction is made between information and knowledge, where knowledge is information that has been interpreted by a human and transformed into living knowledge. The practical and concrete example has an important role in the transmission of professional knowledge. In the case of knowledge about buildings and architecture, the built example is necessary, as such complex artefacts cannot be understood other than as comprehensive units.

The building sector consists of organisations that will learn and develop while reacting to their environment. As it can be difficult to access or acquire complete information about the environment regarding economic, technical or social phenomenon, the organisation can find it safer to persist with old routines. It can be argued that organisations in insecure situations when objectives are ambiguous or uncertain develop

through imitating other organizations they find successful or normative (DiMaggio and Powell, 1983).

Organisational learning is dependent on the individual learning. In a small organization, organisational learning and individual learning is the same amounts to the same, but in larger organisations, experience must be diffused between individuals in the organisation. These forms for disseminating experiences can be informal in person-to-person contact or formal in written sources etc. A study by Bröchner et al. (1991) shows that construction firms in Sweden use formal systems for internal learning, while consultant and architectural firms use informal person-to-person methods. The organisational learning model by Argyris and Schön (1996) distinguishes between single-loop learning and the more radical double-loop learning that also involves changes in theory-in-use, those values and ideas (often tacit) on which the organisation has based its activities. The authors point out that the theory-in-use is often counterproductive for double-loop learning.

The organisation can learn either by gaining their own experience or by using experience gained by others. Rogers (1962) make a distinction between the diffusion process, which aims at spreading a new idea, or the innovation and the adoption process, which involves adopting and using a new idea or innovation. Essential parts of these processes are the innovation and the communication of this innovation in a social system over time. Rogers further argues that there are five stags in the adoption process: awareness, interest, evaluation, trial and adoption. He also distinguishes between different categories of potential adopters from innovators, early and late adopters to the ‘laggards’. The innovators are venturesome, cosmopolitan, less dogmatic and search for first hand information. The ‘laggards’ are those that will adopt last. The ‘laggards’ are those most influenced by opinion-leaders and personal communication in order to adopt. However, the personal communications are most important in the later phases of adoption. The awareness of innovations is mainly cared for by impersonal sources such as the media. Finally, Rogers points out the importance of a change agent or change agency for the communication of innovations.

The chapter is concluded by a discussion of a few features that will challenge the innovation and learning dynamics in the building sector. One important factor is the short-term thinking in the building sector that

can be attributed the organisation of work within the sector with temporary and unique building projects. This short-term thinking has also lead to a course of development via small innovations providing a quick yield. Furthermore, organisations in the building sector are characterized as being averse to taking risks. Another feature is the low competitiveness in the building sector. There are few incentives for innovations in order to be competitive and the end-users have limited knowledge of the process and the product and to date do not exert any market pressure for change. This lack of competitiveness can be seen as one factor that influences the limited interest in research and development within the building sector. Consequently, the formal level of education in the sector is low in comparison to other societal sectors. The actors within the building sector seldom read existing research. The building sectors actors usually find research and information as being fragmented and difficult to access. In situations where there are shortcomings in information the actors tend to rely on their own personal experiences.

Finally, a number of contextual factors will influence the innovation and learning dynamics of the building sector, such as the highly cyclical demand within the sector, the fiscal systems, building regulations, political directives, determination of prices etc.

Chapter 4 The Demonstration Project and the Building Experiment

This chapter provides a state of the art on research about demonstration project and building experiment. First, the terminology for demonstration projects and building experiments are derived both etymologically and through the application in the literature. Second, earlier experiences and empirical studies of demonstration projects and building experiments mainly in Sweden and the Netherlands are presented.

The sources for the chapter are found among literature on experiments and demonstration projects concerning building activities (excluding engineering work, and urban systems and structures). Only demonstration projects and building experiments relating to sustainable building and the key indicator energy are referred to.

Building experiments exists since earlier in the Swedish building history[38] but the development accelerated remarkably with the 1973 oil crises (Holm, 1978; Bröchner and Månsson, 1997). Governmental support has in Sweden, according to Holm and Bröchner and Månsson, mainly been given for experiments and demonstrations in the energy field. Similar activities with experiments as a part of a political strategy to promote energy efficient building could be observed in other countries. The United States and Canada were first and in Europe Germany, France and Austria were ahead of Sweden in particular concerning solar technique (Bröchner & Månsson, 1997 p. 11).

[38] Cronsted's tiled stove (kakelugnen) was tried as an experiment in the Stockholm castle the winter 1766/77 and was found using half the wood used in other conventional heating system at that time (Bröchner & Månsson, 1997). During the post-war period a political program was set up to fulfil the need for housing. The so-called machine-loan-fund (maskinlånefonden) preceded later experimental funds and was set up to rationalize the building process. In the 1950s there were still scope for qualitative experiments in housing while the 1960s were focused on quantitative production. The housing production diminish during the 1970s and with that the interest in building experiment (Holm, 1978).

4.1 Etymological explanations

The term experiment can be explained as to test (a trial), a tentative procedure or policy or as (Merriam and Webster's Collegiate Dictionary on line, www.m-e.com, November 2003):

> …an operation carried out under controlled conditions in order to discover an unknown effect or law, to test or establish a hypothesis, or to illustrate a known law.

An experiment is thus an operation or process carried out to resolve an uncertainty.

The word 'demonstration' as a noun dates to the 14th century and can be explained as (Merriam and Webster's Collegiate Dictionary on line, www.m-e.com, November 2003):

> …an act, process or means to demonstrating to the intelligence: as a (1)**:** conclusive evidence: proofs (2)**:** derivation b**:** a showing of the merits of a product or service.

A demonstration is an outward expression or display. The word originates from the Latin 'demonstratus', a combination of 'de' and 'monstrare' (to show). The meaning of 'demonstrate' is (Merriam and Webster's Collegiate Dictionary on line, www.m-e.com, November 2003):

> …to show clearly; to prove or make clear by reasoning or evidence; or to illustrate and explain especially with many examples.

Synonyms for 'demonstration' and 'demonstrate' are 'exhibition' and 'show'.

The use of the word 'project' dates according to Webster's Collegiate Dictionary on-line back to the 15th century. Etymologically the term originates from the Latin, neuter of 'projectus', past principle of 'proicere' to throw forward combining 'pro' and 'jacere' (to throw). According to Engwall (1998) the modern use of the term 'project' originates from the cold war[39]. The traditional concept that denoted a

[39] The French philosopher Jean Pierre Boutinet has in his "Anthopologie du projet" (1996) (cited in Lundin & Midler, 1998, p. 234) traced the project notion in history. He shows that its modern meaning is rather recent: the Greeks and Romans had no equivalent. Based on Latin the XIV century French words 'pourjet' or 'projet' named architectural elements in

proposed idea or object then became subordinated to the new concept, which emphasizes the process of realising an idea or objective.

So where the experiment defines a process in which a hypothesis is tried out under controlled conditions, the demonstration project is to show clearly or to illustrate and explain. Neither the term building experiment nor the term demonstration project can be completely derived in an etymological way. Instead the meaning has to be found in its application.

4.2 The research and development chain

Earlier research point out the necessity of building experiment and demonstration projects as part of innovation and development in the building sector (see for example Holm, 1978; Levón, 1986; The Swedish Energy Research Comission, 1987; ByACTH, 1990:1; ByACTH, 1992:2; Edén ed., 1992; Byggforskning 1992:4; Buijs and Silvester, 1996; Jensen, Elle & Jensen, 1998; Hal, 2000). In his study of building experiments in the Nordic countries Levón (1986 p. 7) finds that:

> Experiments and product development is organically linked to building planning and construction...[40]

The former director of The Danish Building Research Institute, SBI, Philip Arctander makes the same conclusion (ByACTH, 1990:1 p. 35):

> Without experiments no development.

Arctander emphasizes that this does not mean that all building experiments lead to progress. An experiment can also lead to a sidetrack or a dead-end but then at least these paths can be excluded from further attempts.

The experiment and the demonstration project are seen as necessary parts of a chain from development of new technique and concepts to the diffusion of the same in the building sector (Figure 4.1). The experiment

front (as balconies). Boutinet has in studies of the history of architecture found the beginning of the modern project precisely when Brunelleschi separated the design from the execution of the building. The architectural project had for the first time won autonomy from the realisation against the medieval tradition where the architects' role was not separated from that of the chief of the construction.

[40] Experiment och produktutveckling hör orgnaiskt samman med byggplanering och byggande. (Levón, 1986 p. 7)

is followed by a demonstration project in the last stage before the diffusion. According to The Swedish Energy Research Commission[41] (1987 p. 33) the demonstration cannot be accomplished until the second or the third full-scale trial plant:

> There is an obvious risk that the first full-scale plant leads to a negative demonstration, i.e. that a technique that in due time could function well gets a bad reputation[42]

Also Dutch researchers Buijs and Silvester (1996) emphasise hat experiments should be clearly distinguished from demonstrations in order to avoid exposition of innovations not reliable for introduction.

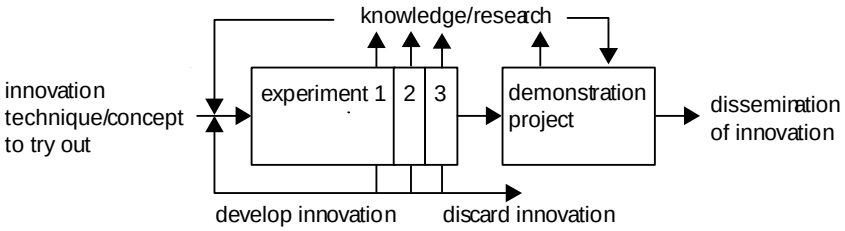


Figure 4.1 The research and development chain (adopted after The Swedish Energy Research Comission, 1987 p. 10)

Some authors point out the fact that the research and development chain is seldom chronological or linear in the building sector[43] (Rudberg and Winqvist, 1990 p. 25; Bröchner and Månsson, 1997 p. 19). The research and development chain can give the idea that research is a driving force for development, while instead development is usually triggered off through the search for problem solutions in practice (Rudberg and Winqvist, 1990 p. 25). Futhermore, there is need for continuous evaluation, and revision of objectives, techniques and concepts through the whole chain of development (Bröchner and Månsson, 1997 p. 19). The fact that the chain is seldom chronological can explain why the

[41] In Swedish: Energiforskningsnämnden
[42] "Det finns istället en påtaglig risk att den första fullskaleanläggningen leder till en negativ demonstration, dvs att en teknik, som så småningom fungerar väl, får dåligt rykte." (Efn, 1987 p. 33)
[43] Research in the medical field is closest to the theoretical picture due to pressure from authorities on a well-organized procedure for registration of new medicines. (Bröchner and Månsson 1997 p. 19)

definitions of, and motivations for, building experiments given in the literature approaches the ones given for demonstration projects.

4.3 The building experiment

The Danish Building Research Institute concluded some characteristics for building experiments in the 1980s (ByACTH, 1990:1 p 34): 1): The client should be prepared to try something new; 2) The experiment will involve extra costs; 3) The experiment should be made in connection to a real building project; and 4) Emphasise should be set on the follow-up and evaluation.

In a retrospective of building experiments in the Swedish Journal for Building Research, Ekemar (1992a) points out several purposes for building experiments:

- To mobilise good forces among researchers, architects, clients, and builders.
- An instrument for a dialogue between research and practice.
- Demonstrating and trying new technical solutions in full-scale.
- A pedagogical tool and medium for information that attract the attention over a long period.
- Shortened time period between development and practical implementation.
- Decreased risk for the spread of unsuitable technical solutions.

Several authors point out the importance of clear objectives in building experiments (Holm, 1978; ByACTH, 1990; Edén ed., 1992). Arctander (ByACTH, 1990:1 p. 37) emphasizes that building experiments also must serve a desirable vision of the future:

> An experiment demands first of all that you do something different but in addition that there are clear objectives.

According to Holm (1978 p. 5) this ‘different’ has to be accompanied with a hypothesis about something better, a hypothesis that should be tested in the experiment. Holm state that the experiment, as method, should be applied when there is no other way of obtaining knowledge than through a full-scale trial. Moreover, this full scale experiment should have a clear hypothesises and an evaluation plan (Holm, 1978).

Many other authors emphasizes on the importance of evaluations, post-hoc evaluations, and repeated post-occupancy evaluation in building experiments (for example The Swedish Energy Research Comission, 1987; ByACTH, 1990; Edén ed., 1992).

In the report *Warning – experiment!* (Edén ed., 1992), the authors conclude that the building experiment has two values: to show and to prove. Edén et al. further note that when involving in an experiment one should not be afraid of the unknown. Caldenby (1992 p. 16), states that the etymological derivation of the term experiment is close to the words 'danger' and 'experience'. Gromark (1992 p. 13) finds that an experiment is a demonstration project with higher ambitions than usual. Even so, the search for something new should not be an end in itself.

Another issue brought up by Edén et al. is the importance of 'soft' measures in building experiments such as quality of life, identity, and sensuous experiences. Even though these values can be difficult to measure in an evaluation they are important ingredients to consider in the set up of an experiment (Edén ed., 1992).

Finally, as brought up by several authors, an experiment involves an economic risk for the project owners. In the case of government supported experiments there is usually some kind of risk protection for the project owners (The Swedish Energy Research Comission, 1987; Bröchner and Månsson, 1997).

4.4 The demonstration project

Whereas the term demonstration project[44] is increasingly used in the discourse of sustainable building the term experiment is seldom mentioned (see for example VROM, 1997; Sustainable Building: Frameworks for the Future, 2000; Miljövårdsberedningen, 2000; Rethinking construction, 2002; The Swedish Environmental Protection Agency, 2003; WGSC, 2004). 'Demonstration' is often seen as one characteristic in building experiments (see for example Levón, 1986; Ekemar, 1992a) while the 'experiment' is totally absent in the discourse

[44] Beside the term demonstration project we find a range of kindred concepts. The term 'pilot project' should be interpreted as a first project or trial in a chain of experiments or demonstrations (Efn, 1987). 'Front-line project' should indicate a project with the ambition to be in head of the development. For example, the ambition for the front-line project Hammarby Sjöstad in Stockholm was to use the most environmentally adjusted approach available at Website: www.stockholm.se/politik/dokument/98/utlatanden/arkiv/U98004.htm

of contemporary demonstration projects for sustainable building. Sjökvist, responsible for the development at the Swedish Construction Federation in the beginning of the 1990s, finds that the word experiment gives negative associations to energy experiments with bad results (Ekemar, 1992b). Caldenby (1992) also points out the problem that with what he sees as 'extraordinary' building experiments difficult to reproduce.

Several authors point out the demonstration project as as a way to introduce new ideas and prepare for the diffusion on the regular market, thus acknowledging the research and development chain presented in Figure 4.1. Dutch researchers Buijs and Silvester (1996 p. 196) give the following definition of demonstration project:

> …a project in which innovative technologies are being used in more or less normal situations to foster the development and diffusion in the regular market of these technologies.

The United Nations Human Settlement Programme has made a description of demonstration project as a tool for development. The United Nations Habitat Programme presents the following characteristics for demonstration projects (website: http://www.unhabitat.org/cdrom/governance/html/dp.htm, November 2003)[45]:

> A demo project provides the means to introduce and experience innovative ideas and approaches and prepare the way for replication and up-scaling. /…/ A demo project shows in practice how a particular problem may be addressed. It facilitates the replication and up-scaling of an action through visible accomplishments and lessons of experience. /…/ Demonstration projects show case approaches and solutions that can inspire and further catalyse change.

[45] The cited document is based upon the following documents: 1) Formulating Issue Specific Strategies and Action Plans, Volume 4 of the SCP Source Book Series, UNCHS & UNEP, Nairobi, 1999.; 2) Establishing A Demonstration Project Clearing House, Draft Concept Paper, written for use in the Philippines, SCP UNCHS/UNEP, 2000 (Unpublished); 3) Sustainable Chennai Project: Documenting Experiences and Drawing Lessons of Experience from Environmental Planning and Management Application in Chennai; A documentation prepared for UNCHS, CMDA and UNDP, April 1999; .4) Implementation and Replication of the Sustainable Cities Programme Process at City and National Level: Case studies from Nine Cities; Working Paper No. 2, SCP, UNCHS, Nairobi, March 2001; 5) Framework for organising neighbourhood - based Demonstration Projects

The European Working Group Sustainable Construction Methods and Technique (WGSC, 2004 p. 17) promoted demonstration projects for development of sustainable building with as it is:

> an important means of disseminating concepts, ideas and solutions to promote the acceptance, implementation and replication of sustainable construction methods and techniques, predominantly within the local context of the building.

The WGSC finds that the demonstration project should be a reference that proves that proposed construction methods and techniques live up to their promises.

American researchers Keating and Peach (1989) point out the advantages of demonstration projects, compared to simulations, in giving real world data. Keating and Peach (1989) give the following advice for the successful demonstration project:

- The objectives must be clearly laid out in advance, be agreed upon by all parties, and measurable.
- Demonstration projects must be well designed so that results will be scientifically defensible.
- The project should be carried out in an open public manner so that all parties recognize that it is a fair test.
- The research should be designed so that the most information can be obtained without overloading the project with conflicting objectives. The authors propose a balance between 'learning as much as possible' and overloading the project with research objectives.
- Furthermore, a good demonstration project will carefully collect and maintain a good database to be used for answering unanticipated future questions as well as to serve as a resource for planning similar projects. The authors further propose that the research should be continued beyond the time of the actual demonstration project and that the lessons should be communicated, the success as well as the mistakes.

Most authors in the literature (Keating and Peach, 1989; Buijs and Silvester, 1996; UN Habitat, 2003; Hal van, 2000) insist on the value of evaluation and repeated post-occupancy evaluations of demonstration

projects. Keating and Peach (1989) and The United Nations Habitat Programme emphasize on an 'open' and public character of a demonstration project. The United Nations Habitat Programme emphasizes that the demonstration projects should be designed from the beginning to serve as demonstration. Furthermore, the United Nation Habitat Programme puts forward the special character of the demonstration project (http://www.unhabitat.org/cdrom/governance /html/dp.htm, November 2003):

> All demonstration projects are projects, but not all projects are demonstrations.

The political strategy

Besides developing new ideas and inspiring for change, Buijs and Silvester (1996) point out the use of demonstration projects as an instrument to implement and test new policy in the field of sustainable building. Moreover, results from demonstration projects provide a basis for new building regulations (Buijs and Silvester, 1996; Sustainable Building: Frameworks for the Future, 2000)[46]

In general, private or governmental authority can use three kinds of steering instrument: 1) constraint/regulation, 2) reward-penalties, and 3) information (Etzioni, 1975 cited in Hanberger et al, 2002). Constraint is a stronger form of steering instrument than rewards, which in terms are stronger than information. All three categories can be subdivided in positive and negative instruments expanding the map of possible instruments[47], Table 4.2 (Bemelmans-Videc et al., 1998 cited in Hanberger et al., 2002).

[46] This is also mentioned as motivation for the European demonstration programme 'Thermie': http://europa.eu.int/comm/energy/en/thsumary.htm (July 2003)

[47] The authorities (private or governmental) can also choose *not* to actively intervene and let the development depend on: 1) democratisation (the public get increased knowledge and power to formulate objectives and to carry these through), 2) the market (let the economy guide the development 3) jurisdiction (juridisering) (the responsibility is left to legislation), or 4) experts/technique (let experts define problems and solutions and to develop new technical)[47] (Hanberger et al., 2002).

Table 4.2 Six kinds of possible steering instruments for authorities (after Bemelmans-Videc et al., 1998 cited in Hanberger et al., 2002).

Instrument	Positive	Negative
Regulation	Instructions	Prohibitions
Economical	Subventions	Taxes/charges
Information	Encouragement	Warnings

In this context demonstration projects may be seen as a positive instrument in the information category. Buijs and Silvester (1996) find demonstration projects along with covenants, communication and network management to be 'second generation steering instruments'. Where classical instruments, such as legislation, mostly fall short concerning the complex questions of sustainable building, Buijs and Silvester argue that the second generation steering instrument manage barriers encountered by the government (cf. Nutek, 1993a/b). The demonstration project will be appealing to an offensive strategy among actors in the building sector whereas a defensive strategy would need other kinds of instruments such as regulation. Accordingly, the demonstration project would mainly sustain the 'front-runners' while regulations are needed for the 'laggards'[48] (compare to the innovation-diffusion theory in section 3.6). The strategy for development proposing building experiments and demonstration projects are usually slow processes with successive changes (Nutek, 1993a).

4.5 Experiences from building experiments and demonstration projects in Sweden

In Sweden, several evaluations of government supported experimental programmes in the energy field have been carried out (The Swedish Energy Research Comission, 1987; Rudberg and Winquist, 1990; Nutek, 1993a; Nutek 1993b; Bröchner & Månsson, 1997). These evaluations show that investments in building experiments result in positive

[48] According to a report from United Kingdom (quoted in CIB, 1999 p. 95) can actors within the building sector take four types of strategies towards sustainable building, on a gradual scale: defensive, offensive, eco-efficient, and sustainable[48]. The defensive strategy has lowest levels of innovation towards sustainable building and need building regulation as

advancement for energy efficient building and the introduction of renewable energy resources. For example, The Swedish Energy Research Commission concludes that successful experiments for energy-efficient buildings have accelerated the introduction of new energy technologies in Sweden with three to five years[49] (The Swedish Energy Research Comission, 1987 p. 11). Moreover, in a few of the 15 cases studied by The Swedish Energy Research Commission unsuitable technology have been identified and discarded. Rudberg and Winqvist (1990) in their evaluation of experiments in the energy field found that over 40% of the completed projects have given results that are actually applied or are ready for implementation. The authors state that few experiments have lead to technical leaps or commercial success. Instead, the experiments have the character of successive achievements through persevering improvements (cf. Nutek, 1993a). Such successive achievements are common in all innovation in the building sector (see section 3.6).

Although claiming positive results, Swedish Energy Research Commission (1987) finds that the accumulation of knowledge, documentation, and dissemination of information varies considerable between the experiments. Other evaluations confirm the weak points in the dissemination of results from the experiments to mainstream building (Nutek, 1993a; Bröchner and Månsson, 1987). Bröchner and Månsson (1987 p. 10) refer to an earlier government communication (Swedish Government 1974:72) that concludes that:

> …valuable research results have not come to practical implementation due to deficiencies in resources for information about and practically demonstrations of advancements that have been made[50].

The Swedish Energy Research Commission (1987) points out the double function of the full-scale experiment. On the one hand the full-

steering. The sustainable strategy has the highest involvement in sustainable development based on insight and responsibility.

[49] It is underlined that the support for experiments was part of a larger package of energy political measures.

[50] "…värdefulla forskningsresultat [har] inte kommit till praktik användning beroende på bristande resurser att informera om och I praktiskt bruk demonstrera de gjorda framstegen." Swedish Government 1974:72 as quoted in Bröchner and Månsson, 1987 p. 10.

scale experiment serve as source for empirically based knowledge about new techniques. On the other hand the full-scale experiment forces the introduction of these new techniques on the market. These two functions for the full-scale experiment are often found to concur (cf. *Planera, Bygga, Bo*, 1989; Keating and Peach, 1989). An article in the Swedish trade press periodical *Planera, Bygga, Bo* (1989) points out the difficulties in achieving satisfactory results both in knowledge build-up and in the diffusion of innovations in the same project. The author of the article in Planera, Bygga, Bo advocates knowledge build-up to be the most important in experiments and demonstration projects and not primarily the introduction and commercialisation of new technique on the market. American researchers Keating and Peach (1989) have found that when commercialisation is in focus for demonstration projects the knowledge build-up tends to become neglected.

Bröchner and Månsson (1997) in their study of Swedish building experiments that received support from The Swedish Council for Building Research, BFR, in the period 1977 to 1994, found that the diffusion of innovations is dependent on technique. For example, the diffusion of heat pumps and solar energy[51] has showed good results while other techniques have had difficulties entering the market. However, Bröchner and Månsson point out the difficulty in clearly establishing the effect of building experiments as many experiments also have had the advantage of other kinds of subventions (Bröchner and Månsson, 1997 p. 7). Moreover, Bröchner and Månsson found that diffusion of results to mainstream building from experiments carried out in individual project, for example in single villas, where the owner has been the project initiator is negligible.

Svane and Wijkman (2002) have in a recent report concluded lessons made from two recent influential demonstration projects of sustainable building in Sweden (Understenshöjden and Ekoporten, see also section 8.2). The authors claim that the projects have been important in the continued development of sustainable building in Sweden. Not least in showing the importance of investing in the social dimension for moving towards sustainable development. In the example of Ekoporten, the project owners have explicitly used their experiences in continued activities.

[51] Solar energy is being spread today after a long chain of successful experiments.

Several authors in the studied literature are in favour for a continued investment in building experiments. However, they advocate enhanced organisation of the projects and enhanced dissemination of results (The Swedish Energy Research Comission 1987; *Planera, Bygga, Bo*, 1989; Rudberg and Winquist, 1990; Ekemar; 1992a; Nutek, 1993a; Bröchner and Månsson, 1997). Bröchner and Månsson propose a continuation of building experiments initiated and carried through by an organisation that is not related directly to sector authorities, the industry or the research community. They further propose an expert group to be connected to the project in order to identify and reduce risk in investments. They also find it important to have a municipal connection in order to facilitate for the dissemination of results.

4.6 Experiences from building experiments and demonstration projects in the Netherlands

According to the Dutch researchers Silvester and Kruijssen (1996 respectively 1999 in Hal van, 2000, p. 9) experience shows that many environmental innovations in the Netherlands are only diffused through demonstration projects. Application without a demonstration project is often left out.

Buijs and Silvester (1996) in their research on effect from building experiments and demonstration projects refer to a series of successive projects with ‘high energy efficient housing’ that took place in the Netherlands between 1980 and 1986. Results from these energy demonstrations show a 25% reduction of energy use. As in the Swedish building experiments there have been weaknesses in the reproduction of results in mainstream building. Buijs and Silvester (1996 p. 199) state that there has been an effective information transfer from one demonstration project to the next in cases where the group of involved actors were almost unchanged. However, hardly any effects could be observed on mainstream building practice. The authors state this to be a problem on the one hand of responsibility within governmental organizations and on the other hand due to information transfer not being targeted.

Problems with dissemination and reproduction of results from these earlier building experiments were according to Buijs and Silvester

(1986) corrected in *Ecolonia*, the first national demonstration project for sustainable building in the Netherlands (Picture 4.3). In Ecolonia an information centre was set up early. Although, Buijs and Silvester state that no direct diffusion of the design concepts used in Ecolonia can be noticed, a number of technical innovations like water-saving equipment, passive solar energy, and higher insulation were soon implemented in mainstream Dutch building. The effect of Ecolonia as demonstration project could be observed only three years after the completion whereas the effect of the earlier high-energy efficiency programme was delayed up to 15 years (Buijs and Silvester, 1996 p. 201). However, as in the earlier demonstration projects the networks and organisations around Ecolonia fell apart after the completion of the project and the closing up of the information centre.

Picture 4.3 Ecolonia, Alphen aan den Rijn, The Netherlands. The first national demonstration project for sustainable building in the Netherlands from 1991.

The national demonstration project programme 1996 – 1999

In the Netherlands a national demonstrations programme for sustainable and energy efficient building was carried through from 1996 to 1999 with the main objective to (Sustainable Building: Frameworks for the Future, 2000 p. 7):

> Build examples of the possibilities available in the field of sustainable building showing what is projected to become standard over a few years.

The demonstration projects were to contribute to the broadening of the perspective of sustainable building and altogether 47 demonstration projects (31 housing projects and 16 non-residential projects), spread over the country, were completed and monitored. According to Remkes, the former Dutch State Secretary for Housing, Spatial Planning and the Environment these demonstration projects *"…have become an enormous success."* (ibid p. 3). Remkes point out that the demonstration projects have with their quality and user comfort demonstrated that:

> …sustainable building is possible and that it is also practicable, affordable and marketable.

Moreover, Remkes points out the wealth of know-how and experiences that have been acquired through the demonstration programme.

The Dutch demonstration programme focused on the value of demonstration projects to make sustainable building visual and tangible using the motto '*To see is to believe*' (ibid p. 9). According to Remkes this point also been successful (ibid p.3):

> Sustainable building has become not only a familiar, but also a tangible concept in the Netherlands.

Though claiming positive results from the demonstration programme, many improvements can be made. The demonstration projects are merely claimed to be guiding for continued development in the country (ibid p. 9). A number of measures in the demonstration projects have become standard in Dutch construction: measures for energy efficiency, low-energy heating boilers (natural gas), and wood from managed resources. Still, most sustainable building measures[52] have not become embedded in mainstream construction and further investments are needed. Former State Secretary Remkes concludes that with the experiences from the demonstration programme the Netherlands can continue to the next step, the implementation of sustainable building on a large scale (ibid, 2000 p. 3). However, at the moment the development

[52] As defined by the Dutch National Sustainable Building Package.

of sustainable building is receiving less political support in the Netherlands also for demonstration projects (see section 2.7).

4.7 Evaluation and dissemination of results

Experiences in Sweden, in the Netherlands and elsewhere claim important deficiencies both in evaluation and in dissemination of results from building experiments and demonstration projects (The Swedish Energy Research Comission, 1987; Rudberg and Winquist, 1991; Nutek, 1993a; Buijs and Silvester, 1996; Jensen, Elle & Jensen, 1998; Hal van 2000; WGSC, 2004). The value of evaluations for the continued development cannot be underestimated. Several authors propose that documentation, follow-up and reporting should be *formalised* in order not to be neglected in these work intensive projects (The Swedish Energy Research Comission, 1987; Nutek, 1993a; Bröchner and Månsson, 1997). Buijs and Silvester (1996) as well as Bröchner and Månsson (1997) emphasize on the importance to expose not only successful results from building experiments and demonstration projects but also negative results. Buijs and Silvester (1996) further point out the risk in holding on to a positive image of the demonstration project. In one of their cases the project owners persisted in a positive image which resulted in a conflict with the inhabitants whose complaints were not recognised.

Buijs and Silvester (1996) find that the long run effect of demonstration projects never has been systematically identified. Studies have never lasted longer than two heating seasons. Swedish evaluations of building experiments also show that measurements have been made during only a few years (Levón, 1986). One explanation could be that national organisations providing loans and subventions for the experiment need quick reporting of results.

Some authors propose international co-operation and synchronization of demonstration projects and standardization of evaluation methods to facilitate information exchange (Nutek, 1993a; Buijs and Silvester, 1996; Bröchner and Månsson, 1987; Hal van, 2000). The Swedish Energy Research Commission (1987) points out the importance of independent evaluations.

The Swedish Energy Research Commission brings up the question of financing evaluations and dissemination of results. The Swedish Energy Research Commission estimates that initial studies, evaluations etc. often reach the same cost levels as the actual investments for innovations. This would justify that research and development in the experiments and demonstrations would need funding of the same magnitude as funding for investments (The Swedish Energy Research Comission, 1987 p 8).

The Swedish Environmental Protection Agency (2003) in their empirical study has found that information from demonstration projects or 'best practice projects' seldom is targeted. The existing collection of best practice examples is not customized to fit a certain target group. The information is driven by supply rather than by demand. Hal from the Netherlands confirms that information presented from many Dutch demonstration projects for sustainable poorly corresponds to the demand of the users (Sustainable Building: Frameworks for the Future, 2000 p.35):

> Knowledge transfer is an important part of the Demonstration Project. The only thing I'm afraid of is that the information corresponds poorly with the needs and demands of the users. Much is merely picture-perfect hot air, presented with care. Clear and instructive information designated for specific target groups is rare.

The need for change agencies

As brought up by The Swedish Energy Research Commission (The Swedish Energy Research Comission, 1987), the dissemination of information and reproduction of innovations and ideas from building experiments and demonstration projects can be referred to an internal and an external process (Table 4.4).

Table 4.4 Variables for analysis of result of experiments (The Swedish Energy Research Comission, 1987 p. 8).

	TECHNIQUE (Hard ware)	**KNOWLEDGE** (About the technique)
INTERNAL	Verification about use of the application	Knowledge build-up
EXTERNAL	Diffusion of technique or application	Knowledge dissemination

The important role of both internal and external dissemination of information can be attributed a kind of 'ambassadors' or change agencies[53] (Nutek, 1993b; Buijs and Silvester, 1996; Hal van, 2000). The Swedish Business Development Agency (Nutek, 1993b) points out the network of involved actors from different areas as having the role of change agencies. The involved actors will bring their experiences back to their 'home' organisation and into new projects (cf. Lundin and Söderholm, 1994, section 3.3).

The Swedish Energy Research Commission recommends that administrators of governmental support programmes play an active role in feedback of knowledge. Their undertakings should include: independent evaluations, quick reporting of results (as soon as there is significant new knowledge), the forming of expert groups to monitor progress and to give advice, and financial support for extra planning, monitoring, evaluation and dissemination of results. Bröchner and Månsson (1997) find it important that the change agency is an independent organization, not directly involved in the project or in the financing of the project. An example of a change agency of this kind could be the former Swedish Council for Building Research and the Universities. Hal (2000, p. 44) points out the importance that information is targeted, credible and that it 'speaks the language' of the user.

4.8 Conditions for transferring experiences

Several authors refer to difficulties in reproducing findings and experiences from successful experiences and demonstration projects in mainstream building (Buijs and Silvester, 1996; Hal, 2000; WGSC, 2004). Silvester (1996 cited in Hal, 2000 p. 42) concludes that a number of developments in Dutch demonstration projects for energy saving have not been fully worked out in follow-up projects. On the one hand, a good result was not proof enough for products to be re-applied, and some successful products even vanished from the market. On the other hand, products having negative results in test were re-applied and even so products that at earlier stages had been rejected. In many cases Silvester could not find any clear cause for this although financial advantage for

[53] Change agency is the term of Rogers (1962) see section 3.6.

some innovations could be concluded to have an importance for the diffusion. Buijs and Silvester (1996) in their study point out the lack of change agencies as one hindrance for the transfer of results. As already mentioned, Buijs and Silvester have found that transfer of experience functioned when the same actors joined in a follow-up project. Accordingly, one can say that the internal learning processes worked better than the external diffusion.

Economic conditions for innovations as well as the organisation of the information transfer are two important factors for diffusion of experiences and results. However, they are not the only factors for the up-scaling and reproduction of results from demonstration projects. Rudberg and Winqvist (1990) mention a few other factors from a Swedish perspective: political strategies, conditions for experimental loans and subventions, and building regulation. The WGSC (2004 p. 17) has found that demonstration projects carried through within the European Union has not yet reached the desirable impact. One of the main reasons mentioned is that cultural and aesthetic dimensions for the built environment have not been taken in account in the selection of demonstration projects. The WGSC find that neglecting such dimensions can lead to negative demonstrations, i.e. that demonstration projects risk becoming references for what *not* to do. The WGSC also find that strive for novel and unusual solutions in demonstration projects, as a mean in itself, can damage the demonstrational effect.

Hal (2000 p. 145), referring to research in the Netherlands as well as in several other European countries, distinguishes four factors that will be of importance for the diffusion of environmental innovations: 1) The quality of the innovation, 2) The organisation of the project, 3) The organisation of the information transfer, 4) and government policy. Apart from these factors, Hal finds that there are external factors beyond the influence of the project organisation such as international agreements, influence from the European Union, power structures in large corporations, national crises etc. The demonstrational quality of a project depends on the chronological and conditional connection between the first three factors mentioned. A successful demonstration must be secured so that the innovation has sufficient qualities and so that it is commercially marketable. Hal further noticed that when the innovation had other advantages such as lower costs and comfort

together with flexibility and ability to adapt to new situations, the acceptance among adopters was wider. The influence of these factors for adoption has earlier been stated by Kruijssen (1999 in Hal 2000 p. 43). The success of a demonstration project is further determined by the project organisation, for example the involvement of a product or process 'champion' (see section 2.5), and the involvement of someone with an influence on their colleagues, an 'opinion manager'. Concerning the information transfer, Hal concludes that if the involved actors are willing to share their experiences, the innovation is more likely to be received positively. Hal (2000) states that the adopter wants to see previous examples with proven success which have been evaluated over a longer time. The fourth factor in Hal's model, governmental policy, concerns the long-tem perspective that only the government can have with influence on regulations, subsidies etc.

Time lags and threshold for diffusion

Örneblad (1997) studied a building experiment in Järnbrott, Göteborg where air-solar collectors were applied to a refurbished flat block from the 1950s along with a greenhouse for the tenants[54] (Picture 4.5). An earlier technical evaluation of this 'solar multi-family block' showed a 40% reduction in bought energy in comparison to a reference house (Gustén, 1992 cited in Örneblad, 1997). Örneblad through her study has put into evidence the major contribution of the green house for the good social environment after the refurbishment. The relevance of the social gain and pedagogical values of the greenhouse as paths for sustainable development was not included in the technical evaluation.

[54] The green house is not part of the solar heat system. Photo by Sten Gromark

Picture 4.5 The solar house in Järnbrott in Göteborg, Sweden.

Despite good results, the Järnbrott project did not get a follow-up until ten years after it was built. At the moment, the architect and innovator of the air-solar collector in Järnbrott has initiated a new demonstration project (with support from the European Union programme SHINE) using solar energy, and with the complement of a green house (not part of the energy system), in a refurbishment in Gårdsten a residential area from the 1970s in Göteborg (see Chapter 8). Örneblad explains the delayed follow-up as a lack of public instruments that favour environmental initiatives, and as a result of the sceptical attitude in the building sector towards buildings with environmental ambitions (Örneblad, 1997 p. 54, compare with results from Hal above). Further, it can be explained by a reorganisation of the public housing company, the client for the project, resulting in a loss in interest in the Järnbrott experiment. Another explanation given by the architect and initiator himself is that the positive results from Jörnbrott were presented too early when the market was not yet ready (Nordström, 1990). Such *time lags* are often observed in the introduction of new technologies (Hughes, 1987 qouted in Kain 2000; Koomey and Sanstad, 1994). It takes time for new technologies to be accepted and used, for example due to the time and effort needed for practitioners to learn about the new technique (cf. Rudberg and Winquist, 1990). As described by Hughes (1987 qouted in Kain 2000) change in large socio-technical systems can be inhibited by existing stabilized networks (see also section 3.7).

The special character of the demonstration project

Ericson and Johansson (1994) have in their study of ideas and knowledge in the Swedish housing construction sector distinguished three types of housing production projects: ordinary projects, city condensation, i.e. rising of development density, and *special projects*. Within each of these types of projects there is according to Ericson and Johansson a certain and predetermined way of communicating among involved actors that will decide the structure of their meeting. The building experiment, the demonstration project and the sustainable building project belong to the third category of *special projects*. According to Ericson and Johansson these projects distinguish from the rest as they have a basic idea or image as supporting component in the project. As a result some resources will be given a larger value than in the other kinds of projects. For example, the co-operation between actors is different in an experiment or demonstration project and the engagement to fulfil the special objectives larger. The actors have, tough they might have different objectives for their engagement in this special project, joined in the common task to carry through the project (cf. Kadefors, 1992; Lundin and Söderholm, 1994).

Ericson and Johansson (1994 p. 316) point out that the idea of how these special projects can contribute to the knowledge build-up in the building sector in general has to be changed. An innovation or concept cannot unbiased be taken from a special project and be incorporated in an ordinary project where the conditions for new ideas and technologies do not fit into the normal routines. In the ordinary project there are usually less resources, engagement or time to deviate from the ordinary routines.

Granath (1991 p. 26) points out that results achieved in projects having the character of a ‘research event’ cannot be counted on to succeed or survive in the real world. Granath refers to similar results by a Norwegian sociologist in Norway in the 1960s. Experiences from Denmark show a risk that demonstration projects with insufficient local involvement become ‘installations’ created by outside experts and researchers without local connection (Jensen, 1996). Accordingly, the processes initiated by the experts or researchers have difficulties to continue after the time-limited project has been completed.

4.9 Summing up

In this chapter the definition of the terms building experiment and demonstration project have been derived from an etymological explanation as well as from their application. Moreover, experiences from earlier studies of building experiments and demonstration projects have been presented. These experiences point out the importance of building experiments and demonstration projects for the continued development of building practices but they also indicate necessary changes for an enhanced effect of such investments.

According to the literature, the building experiment and the demonstration projects belong to a chain of research and development from new ideas or innovations through one or several experiments to a demonstration project and then final diffusion to mainstream building. The chain should not be understood as strictly linear as more often driven by practice than by research (Rudberg and Winquist, 1990). The demonstration is the last step before the diffusion into mainstream building practices and some authors find this step to be a necessary phase (Buijs and Silvester, 1996). It is important to distinguish the experiment from the demonstration to avoid that technique or concepts are introduced too early, which in the case of failure can lead to negative demonstrations.

The etymological derivation of the term experiment is to try a hypothesis while the term demonstration means to exhibit and show. In the literature no large difference is made between the full-scale building experiment and the full-scale demonstration project. They should both prove and proof though there is usually larger risk involved in an experiment than in a demonstration project. In both kinds of projects focus should be on clear objectives, evaluation and dissemination of results. The experiment is by one author seen to have higher ambition than the demonstration project (Gromark, 1992). Whereas some authors point to the demonstrational values in building experiments, the experimental part of demonstration projects is absent.

The majority of the referred studies point out deficiencies in documentation, evaluation and dissemination of results from demonstration projects. The double function of the building experiment and demonstration project in commercialisation of innovations at the same time as contributing to knowledge build-up often implies that one

of the functions is neglected. The lack of evaluations and dissemination of results, and a badly functioning or non-existing change agency, have both in Sweden and in the Netherlands resulted in successful results not being implemented. In the Netherlands this has even lead to repeated mistakes (Silvester 1996 in Hal van, 2000).

However, shortcomings in evaluation and dissemination of results and experiences are not the only factors that will venture the reproduction of successful results from experiments and demonstration projects. As pointed out by Hal (2000) the quality of the innovation and the organisation of the demonstration project will influence the diffusion of results. Other factors that will have an influence are economical conditions, risk, governmental policies etc. (compare with section 3.7, factors that set the conditions for changes in the building sector in general). Furthermore, the introduction of new technologies is often delayed by time lags.

Finally, Ericson and Johansson (1994), with support by other authors, state that special conditions connected to building experiment or demonstration project will imply that the results cannot unduly be transferred to an ordinary project where not the same conditions are found. This refers to conditions such as engagement of involved actors, and time and finances for the project. Lundin and Söderholm (1994, see section 3.2) argue that the very fact that the organisation in a building project in general is temporary can be a prerequisite for the acceptance of conflicting interest in the team in order to carry out the main task the building project. Granath (1991), indicates that the label ‘experiment’ or ‘demonstration’ can in itself be a hindrance for the application of results as this refers to an ‘research event’ and special conditions.

Chapter 5 Methodology and Approach

This chapter presents the overall research approach, the research design and the methods used in this thesis. The thesis can be described as explorative, making use of qualitative research methods. An introduction is given to discourse analysis, which has been an inspiration for the discussion of findings in the empirical material. Furthermore, the chapter presents the empirical material consisting of four separate studies and the different methods used for data collection and analysis. These four empirical studies provide a complementary perspective in the understanding and exploration of demonstration projects for sustainable building.

5.1 Research approach

The approach to the research area has been *explorative*, aiming at an *understanding* of a certain problem or phenomenon i.e. demonstration projects for sustainable building. The methods used are *qualitative*, and the research process can be described as *abduction*.

In general, two types of 'ideal' research approaches can be distinguished: deduction and induction (Alvesson and Sköldberg, 1994, p. 42). Deduction starts from theory and searches evidence for, or falsification of, a hypothesis through the empirical material. This could be called the 'way of justification' (Starrin et al., 1991, p. 14). Induction, on the other hand, has its point of departure in the empirical material, and from this creates theory through a 'way of discovery' (ibid). Glaser and Strauss (1967) have thoroughly described an inductive method in formulating their 'grounded theory'.

Abduction is basically found in between deduction an induction, even if more towards induction than deduction (Alvesson and Sköldberg, 1994). Abduction as induction is based on empirical observations, but

does not reject a theoretical pre-understanding of the field, thus approaching deduction. In abduction, the analysis of the empirical material can be combined with earlier theory as a source of inspiration. Abduction can be characterized as an *iterative* process between collection and analysis of empirical material and the study of theory in literature (Starrin, 1994). As described in the inductive 'grounded theory' the researcher should not have any fixed ideas or theories in mind (Glaser and Strauss, 1967). This is also valid for the adductive approach in this thesis. Even so, the research question cannot be approached without some pre-knowledge in the field (Glaser and Strauss, 1967). There should be a balance between pre-knowledge about the field and openness of mind.

Omong other things, my personal experience of the research field 'demonstration projects for sustainable building' is based on three earlier studies of demonstration projects for sustainable building. The first of these studies, published as a guidebook, presented a number of examples of sustainable buildings, mainly private houses and schools, in the western parts of Sweden (Femenías, 1994). The second study gave a description of, and the background to, the emerging 'eco-municipality' of Bergsjön in Göteborg in the late 1990s (Femenías, 1998). The third study, also a guidebook, presented a larger number of national demonstration projects and private initiatives for attaining sustainable building in the Netherlands together with a description of the Dutch political investments for supporting sustainable building in the 1990s (Femenías, 1999a). Through these earlier studies of demonstration projects for sustainable building my pre-understanding of the research field have been formed. My point of departure has thus been directed by the experiences from these earlier studies (see discussion in Hartman, 1998 p. 136). For example, the questions of how to study, evaluate and present demonstration projects for sustainable building in order to provide useful information for actors in the building sector has emerged from these earlier studies.

5.2 The research design and the empirical studies

The empirical material for this thesis has been collected through four separate studies in which demonstration projects for sustainable building

have been studied from different perspectives. The first study consists of two case studies of demonstration projects for sustainable building, one in Sweden and one in the Netherlands. The second study is an interview study with actors in the Swedish and the Dutch building sectors. The third study is a study of the image and information of demonstration projects for sustainable building conveyed in the Swedish trade press. Finally, the fourth study is a study of how sustainable building and demonstration projects have been presented and debated in *Arkitektur, The Swedish Architectural Review*.

For the first two studies, material was collected in both Sweden and the Netherlands. The third and fourth studies, of the trade press and the one presented in *Arkitektur*, were only carried out in the Swedish context. Together, these four studies give an enriched empirical basis for a discussion about demonstration projects for sustainable building. Moreover, the use of multiple sources and methodologies improves the validity of the findings.

The research process can be described as an iterative process between the empirical material and literature studies. The problem space was initially *expanded* in order to capture the larger picture of the research field, and then successively narrowed down in order to establish the research objectives. Such successive delimitation of a problem space, according to Newell and Simon (1972 cited in Lundequist, 1995a), is central in all problem solving.

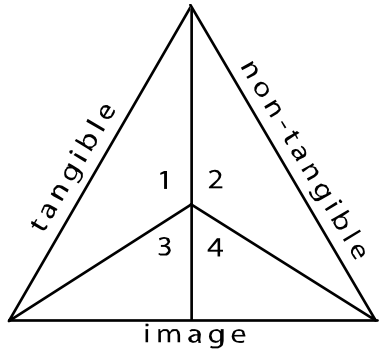
Basically, findings from the first explorative study of demonstration projects have been guiding for the design of the remaining research. Findings from this first study include a model for presenting and understanding the influence of demonstration projects for sustainable building. This consists of three dimensions: 1) the *tangible*, the visible features; 2) the *non-tangible*, features hidden in systems and in the realisation process; and 3) the *image* spread by the projects landlords themselves and the media. These three parts provide complementary information for a comprehensive understanding of demonstration projects for sustainable building.

A model based on these three perspectives described above was used for the research design (Figure 5.1). The first study, the case studies, includes all three dimensions even though the tangible or physical, i.e. the built environment and the buildings, have a central role. The

conclusion after the first study was that more cases studies of this kind would not add to the understanding of the influence on and relevance of demonstration projects for sustainable building with regard to mainstream building development. Instead, studies focusing on other dimensions of demonstration projects, as described in the model above, were found as being more relevant. This refers to the role of the actors and the every-day practice in the building sector (the non-tangible dimension) and the role of the trade press as information carrier (the image dimension). A second study, an interview study, was designed with the aim of acquiring a better understanding of the non-tangible parts of a demonstration project. This study focuses on the actors involved in demonstration projects including the respondents' knowledge base, approach to sustainable building and frames of reference. Whereas the tangible dimension in the three-legged model refers to knowledge that is easily reached and externalised, the non-tangible dimension refers to knowledge that is seldom externalised or difficult to externalise (see discussion in section 3.4).

The third perspective, the image, has been approached through two studies focusing on the image of demonstration projects and sustainable building conveyed through the Swedish trade press. These studies were deemed to be motivated as the first and the second studies indicted that the trade press form one important source of information about demonstration projects for sustainable building for actors in the building sector. The third study takes in a wider scope of the Swedish trade press in general[55], while the fourth study focuses exclusively on the architectural press through a study of the Swedish architectural periodical, *Arkitektur*.

[55] This study was carried out in co-operation with Pernilla Gluch, doctoral student at the Department of Building Economy and Management at Chalmers University of Technology, and part of the former MISTRA Sustainable Building Programme.



1. case studies (Sweden/The Netherlands)
2. interview study (Sweden/The Netherlands)
3. study of the Swedish trade press
4. study of the Swedish review *Arkitektur*

Figure 5.1 The empirical material: Four separate studies based on different empirical material and using different methods for data collection.

The empirical material is rich in detail and is extensively presented in this thesis. This is motivated by the value of such descriptions in themselves. Accordingly, , on the one hand, the empirical material has the purpose of providing valuable descriptions of the world of practice, and how this world of practice handles the issue of sustainable building. On the other hand, the empirical material has been a means of exploring the research field and to find themes for discussion, future research and practical implications. A third purpose for the empirical material is explanatory. The empirical material has been the basis for an attempt to explain why the world of practice acts and works as it does (compare with Yin 1994, p. 10 explanation building). This 'explanation building' addresses large questions for research and practice concerning sustainable building. It is outlined in this thesis, and opens up for continued discussions and research in the field.

5.3 A discourse perspective

Sustainable building as a research field within the architectural domain is relatively new and there do not exist any clearly defined frames of reference. The theoretical basis in this thesis has been chosen from different theoretical fields in order to provide a useful framework for understanding and explaining the findings in the empirical material.

Theoretical approaches have been chosen from: design theory, organisational theory, and innovation theory (see Chapter 3). Moreover, the approach has been inspired by discourse analysis. The interest in discourse analysis can be explained by the thesis approaching the question of the (social) construction of knowledge and the understanding of demonstration projects for sustainable building among actors in the building sector, through practice, and through the information in national strategies and in the trade press etc. Even though the specific methods for discourse analysis have not explicitly been used, discourse analysis has inspired the interpretation of findings in the empirical material.

Discourse analysis

There does not exist any clear definition of the concepts of *discourse* and *discourse analysis*. The following presentation is mainly based on Winther Jørgensen and Philips (2000)[56]. The term discourse usually involves ideas of how language is structured in different patterns that we follow when acting within different social domains (Winther Jørgensen and Philips, 2000). One can say that a discourse is a certain way of talking about and understanding reality (or a part of reality). Discourse analysis, according to Burr (1995 cited in Winther Jørgensen and Philips, 2000 p 11), is based upon a social constructionist[57] view implying the acceptance of four premises: 1) a critical view upon objective knowledge; 2) an acknowledgement of the dependence on history (previous events) as well as the specific in all social situations; 3) the underlining of the relation between knowledge and social processes; and 4) the underlining of the relation between knowledge and social actions.

A usual contemporary apprehension is that there does not exist any ruling ideology or discourse in contemporary society, but different discourses (Winther Jørgensen and Philips, 2000 p. 23). Consequently, there are different possible positions for the actor (subject) to speak and act from. Different discourses can also be seen as struggling to dominate the discursive arena. A discourse will be established through the

[56] The work by Michael Foucault is an important basis in discourse analysis, but his work is not referred to in this thesis.
[57] Winther Jørgensen and Philips use the term social constructionist instead of social constructivist in order not to confuse with the constructivist theory of Piagets.

definition of central concepts, but also through *exclusion* of other interpretations. The users/actor can take elements from different mass-medial and interpersonal communications in the creation of hybrid discourses. In this production of such new discourses the individuals will become actors in a discursive and cultural change.

According to Winther Jørgensen and Philips (2000 p. 23), discourse can either been seen as completely *constituting reality*, or *constituted by reality*. Consequently, discourse can be seen as not only reflecting but also constructing reality (constituting), or to be a mechanical reproduction of other social practices (constituted). The former does not separate discursive practices from non-discursive practices. All practices (also material such as infrastructure, institutions and economy) are seen as discursive. The latter does not in reality belong to discourse analysis, as for example historical materialism does not recognise the influence of discourse on other forms of social practices.

The critical discourse analysis of Fairclough

Discourse can be seen as *one of several aspects* that create the social world. This view, based upon the critical discourse analysis of Fairclough (Fairclough 1992; Fairclough 1993; Winther Jørgensen and Philips, 2000), is relevant for this thesis where different kinds of theory, and not exclusively discourse analysis, are used to explain features found in the empirical material. The critical discourse analysis recognizes dialectic interplay between different social practices. The discourse does not only contribute in forming and transforming social structures and processes, but also reflects them. The critical discourse analysis is critical in that sense that it has as a task of elucidating the role of the discursive practices in the social world. The focus is *both* on the discursive practices that constitute our world-views, social relations etc, *and* on the role these discursive constructions have in supporting certain social groups' interests. The discourse in the critical discourse theory is both constituting and constituted. The discourse contributes in constituting: social identities, social relations, as well as knowledge and value systems.

With social structures, Fairclough means social relations in society that have both discursive and non-discursive elements (Winther Jørgensen and Philips, 2000 p. 71). Practices like construction are seen

as primarily non-discursive. The discursive practices do not only reproduce an already existing discursive structure, but question the structure by pointing out that which is outside the structure.

The methodologies proposed by Fairclough include both textual analysis and the analysis of social practices where everyday social relations are based on a set of 'common-sense' rules and procedures (see practice and praxis section 3.4). Fairclough does not consider textual analysis sufficient, as this does not focus on the interrelation between the texts and the social and cultural processes. Instead, an interdisciplinary perspective is needed combining textual and social analysis. Fairclough (1992; 1993) uses a three-dimensional model for discourse analysis distinguishing: the text (speech, texts, pictures or a mixture of the textual and visual); the discursive practices, including production and consumption of texts; and the social practices.

5.4 Methodology used in study 1: The case studies

The case study methodology used in study 1 is mainly built on Yin (1994). Case study methodology is an often-used method in architectural research (Linn et al. 1998/2000 p. 101 – 102). An architectural project is complex and contextual and best understood through the study of concrete cases (compare with section 3.4). As described by Yin (1994), case study methodology can be used when a contemporary phenomenon should be investigated, especially when the contextual conditions are sought for. Case study methodology will be useful in reconstructing an understanding of the architectural project as a comprehensive unit.

According to Yin (1994), case study methodology is relevant when searching for the answers *how* and *why*. It approaches historical studies in that no manipulation of the observed can be done. In contrast to an experiment, in the case study the boundaries between the studied phenomenon and the context are not clearly distinguished or 'controlled' (Yin, 1994 p 13). Furthermore, Yin proposes that the researcher formulates in advance different possible outcomes of the case study. This to avoid that the case study will merely confirm assumptions formulated beforehand.

The validity of case studies increases when using multiple sources of evidence (Yin, 1994 p. 79 – 101). The use of multiple sources and

several interview respondents should prevent the case description from being based on the biased information from a few actors (see, Yin, 1994 p. 90 – 92). Actors involved in the complicated process of bringing about a building project only master one part of the problem. As described by Sahlin-Andersson (1986 p. 16):

> The phenomenon appears for the individual actor as fragmented and sectored, as each actor only takes part in and has knowledge about a part of the whole process.[58]

Another problem with interviews is that a few years after the completion of the project, the actors have a tendency to 'create a story' that will be told over and over again, and thus confirmed (Sahlin-Andersson, 1989).

Westlander (1992) argues that case study methodology originally has the implicit signification that only one specific, unique or deviating case is studied. Yin (1994) claims the value of multi-case studies or cross-site analysis in comparisons involving several cases. The case study carried out in this thesis is built on two different cases. They are carried out and analysed separately, but not independently, and findings from both cases are brought together in a joint discussion.

The cases

The cases are two demonstration projects for housing planned and built in the 1990s. The first case is a Dutch demonstration project, the GWL–terrain, with over 600 dwellings in the central parts of Amsterdam. The project includes the car-free urban plan for the area, as well as 17 housing blocks and a few offices, shops and other premises. The project was one of the first of its kind and has attracted considerable attention in the Netherlands as well as abroad. The second case is found at Lindholmen, Göteborg in Sweden. It is a housing block with 13 flats in a district of listed 19th Century buildings.

The choice of cases was motivated by several factors (see further section 1.2). Firstly, these projects are intended to be demonstration projects and not experiments. Secondly, they are built in an urban

[58] "Företeelsen framstår för den enskilde aktören som fragmentiserad och sektoriserad, då varje aktör deltar I och har kännedom om endast en del av hela processen". (Sahlin-Andersson, 1986 p. 17).

environment and provide housing for the 'normal' user, who is perhaps not willing to radically change his or her behaviour. Thirdly, both project have architectural ambitions and have involved prominent architects that also function as opinion-leaders among architects. Altogether these factors indicate potential broad interest in the results and applicability of the demonstration project.

The cases have been studied regarding both product and process in order to reach a comprehensive understanding. This will be necessary when searching for applicable and reproducible concepts and techniques from the demonstration projects. Birgersson (1996) argues that in order to distinguish that which is generally applicable in a case, in this study the demonstration project, from that which is specific, both product and process must be studied simultaneously. Problems can arrive when a specific solution observed in one case or demonstration project is applied to another project, or to another process, where the conditions are not the same. Sahlin-Andersson (1989 p. 62) argues that the process in a building project loses its logic if the time and place is excluded. According to Sahlin-Andersson, it is important to know exactly what the model in the example is: whether it is the product or the process.

Data collection

The case studies are based on multiple sources: documents and proceedings from the process, drawings and early sketches, brochures and information from the client, interviews with actors (mainly key actors - but also a few peripheral actors and residents), as well as newspaper articles and trade press articles[59]. Furthermore, the cases have been visited and photographed on several occasions. Data was collected for the Dutch GWL—case from 1998 – 1999. Interviews with the actors were carried out in the summer of 1998. In all a total of 16 actors and persons living in the area have been interviewed. In addition, other studies carried out by GWL—terrain was used (W/E Adviseurs, 1995, Boels, 1997, Hal, 2000), as well as an evaluation (Nieman adviesburo, 1999). Quotations from articles and brochures have been translated from Dutch to English by Barbara Motel.

[59] Sources for the case studies as well as all persons interviewed are listed in the references.

Data for the Swedish Lindholmen-case was collected in the summer of 1998 and complemented in February 2000, parallel to the collection of data for the GWL—case. Only a few documents and minutes could be collected from the process in the Lindholmen-case. Here seven interviews were carried out with: key actors, persons living in the area and the local administrator.

Interviews in both cases were conducted with the aid of an interview guide[60], and the interview methodology was identical to the one for study 2 (presented in section 5.5). However, the interviews were not recorded. Instead notes were taken and the interviews were typed out immediately after. The interviews lasted about 1 – 2 hours and the interviews in the Netherlands were carried out in English. The transcribed interviews were sent back to the respondents for approval and correction. Furthermore, two independent key actors have read and corrected the case description of the GWL—case before being published[61].

Analysis

Data for the GWL—case has been analysed at two levels. Firstly, a description and structuring of the vast material was carried out. Such a description in itself provides an understanding about the case (Sahlin-Andersson, 1986; Falkheden, 1999). Secondly, an evaluation was made using methods from evaluation research. For the Lindholmen case, only the first part of the analysis has been carried out. It was not found necessary to carry out the same long procedure for the second case in order to arrive at applicable findings.

In the description data has been sorted, and that not found to be relevant to this particular study has been left out. What material was selected, and the way in which this material was presented, is important for understanding the case and will have an influence on the following evaluation and results. Accordingly, the structuring was carried out to put the specific research questions into focus.

[60] An example of an interview guide is found in appendix A. The guides were not identical but adapted for the actor to be interviewed.
[61] The original description was presented in the licentiate thesis (Femenías, 2000a), and has been reorganised and shortened in Chapter 6.

The deeper analysis of the GWL—terrain was carried out using methods from evaluation research (Nilstun, 1980, 1988; Nydén, 1992). According to Nilstun (1980, p. 15), an evaluation should explain why a specific measure gave a certain result. Nilstun identifies six partial analyses and six questions that should be considered (Nilstun, 1980 p. 15):

1. Analysis of the program in question
2. Analysis of the effort: What efforts were made to reach the goals?
3. Analysis of the effect: What was the result of the efforts?
4. Analysis of the process: Why the efforts gave this result.
5. Analysis of the fulfilment of goals: How does the result relate to the goals?
6. Analysis of efficiency: Were the efforts an efficient way to reach the goals?

These partial analyses do not have to be considered in this order, or even to be specified like this. The important thing is that the evaluation contains these questions. When making an evaluation the first and most important question is: What is the focus for the evaluation? What type of knowledge should the evaluation provide? Why should the evaluation take place?

An evaluation matrix found in Nydén (1992), originally designated for evaluations of research and development programmes was found useful and was altered to suit the purpose of evaluating the case studies. The matrix separates product and process related issues and indicates 14 **issues** that were posed in the material. Table 5.2, shows the structure of the evaluation guide used for the GWL—case.

Table 5.2 The evaluation matrix used for the GWL—terrain case based on Nydén (1992). For further explanation of each field in the matrix see Femenías 2000a).

	Product	**Process**
Relevance of ambitions and goals	Regarding sustainability goals in the country.	Regarding learning processes in sustainability issues.
Efforts	Environmental programs, advisors, etc.	Problem solving and ways to achieve goals.
Prerequisites	Site, infrastructure, etc.	Organisation, motivation, etc.
Result	Environmental impact, "green" lifestyle, etc.	The *internal* influence of the project, among actors involved.
Fulfilment of goals	According to the environmental program.	Regarding initial intentions.
Hindrances	To implement environmental issues.	Hindrances for a good process.
Effect	The importance as a demonstration project.	The *external* influence of the project – knowledge spread.

The outcome of the project regarding knowledge build-up has been of special interest. This is referred to in the evaluation as the internal influence among the actors involved and the external influence on the rest of the building sector, decision-makers and the public.

5.5 Methodology used in study 2: The interview study

In the second study interviews have been carried out with 27 actors in the building sector, 14 in Sweden and 13 in the Netherlands. The actors were chosen among clients/developers, architects and environmental consultants. The scope is wider here than in the first study as it includes respondents that have been involved in a large range of demonstration projects in both countries. These respondents have been selected with regard to their position of having an active influence on the practice and discourse concerning sustainable building in their respective countries. They were selected with the help from authorities within the field of sustainable building in both countries[62]. The selection can be seen as

[62] Help to select the respondents was provided by Professor Micheal Edén and Professor Björn Malbert at Chalmers University of Technology as well as Dr Anke van Hal and Architect Tjerk Reijinga in the Netherlands.

strategic and qualitative in order to obtain the desired information[63] (see for example Falkheden, 1999, p.262 – 270).

The interviews were carried out from June 2001 to February 2002. The interviews are *half-structured qualitative interviews* carried out with a supporting thematic guide[64] (Kvale, 1997). The interview guide has not been strictly followed, and has been developed during the course of the study. Initially two *pilot interviews* were carried out (see for example Yin, 1994, p. 75) in order to develop the interview guide and try out the methodology. The interviews could also be characterized as *open-ended* and *focused* (Yin, 1994, p. 84). The respondents' opinions in matters have been asked for with a point of departure from a prefixed set of themes. The respondents have been able to decide upon the length and focus of their answers. There has also been free scope in the interviews for themes taken up by the respondents. Kvale emphasizes that the qualitative research interview is a social interaction, a dialogue and interchange between two persons about a common area of interest (Kvale, 1997 p. 9). The qualitative interview is characterized by discovery and is primarily searching for an understanding.

The interviews averaged 1 hour to 1 and ½ hours in length. In general, the Swedish respondents have had more time, and for this reason the Swedish interviews have been longer and more consistent than the Dutch ones. Interviews in the Netherlands have been carried out in English. Deficiency in the English language among the respondents has occasionally resulted in reduced information. Quotations from the Swedish interviews presented in Chapter 7, have been freely translated by Marie Carlsson.

All the interviews have then been transcribed word-by-word resulting in a total of about 680 pages[65]. Interviews as empirical material have various weaknesses (Yin, 1994, p. 80): bias due to poorly constructed questions; response bias- inaccuracies due to poor reflexivity – the interviewee gives what the interviewer wants to hear. In order to increase the validity of the interview study, the interviews have been sent back to the respondents for commentaries. Before the publications of the findings, the respondents have had the opportunity of giving their reactions to the material.

[63] A larger number of respondents would have made the study to difficult to handle.
[64] An example of this interview guide is found in Appendix B.

The analysis has been carried out manually departing mainly from the already defined themes in the interview guide. This could be referred to as what Glaser and Strauss (1967) call selective coding compared with open coding that is not based on prefixed themes[66]. Furthermore, the analysis has been carried out in two phases. A preliminary and limited analysis was carried out in spring 2002[67]. A continued and deeper analysis was then carried out in autumn 2003[68].

5.6 Methodolgy used in the study of trade press (study 3 and 4)

The third study focuses on the image and information conveyed from three Swedish demonstration projects for sustainable building in the Swedish trade press. The fourth study, on the one hand, has a somewhat narrower scope than study 3, and focuses solely on articles in *Arkitektur*, a Swedish architectural periodical. On the other hand, study 4 is broader in the respect that all the articles focusing on sustainable building during the period 1973 – 2002 have been included.

The studies are mainly analyses of the content of texts, even if also illustrations, pictures etc. have been taken into consideration. Fairclough (1992) argues that one cannot properly analyse content in a text without simultaneously analysing form. The study aims at discussing the value of the content in the articles studied for a presupposed audience of actors in the building sector. However, in this study, the text itself is in focus, and not the producing or the receiving contexts (cf. Bell and Garett, 1998).

The method used has mainly been inspired by earlier studies making use of text analysis by Djerf-Pierre (1996) and Thompson (2001). The methodology has been developed and applied by Gluch and Femenías (2002a, 2002b) in study 3 of the trade press, and applied in study 4 on *Arkitektur*. Mainly qualitative content analysis has been used involving

[65] 420 pages Swedish interviews, and 264 pages Dutch interviews were transcribed.
[66] According to Glaser and Strauss (1967), open coding should be followed by selective coding once the main variables are detected. In this study, what could be called main variables were already decided upon.
[67] Findings from this preliminary analysis were presented at the Sustainable Building Conference in Oslo September 2002 (Femenías, 2002a).
[68] The analysis was delayed due to for the fact that I took parental leave for one year followed by a doctoral exchange with an Institution in France during spring 2003.

features from quantitative text analysis. For the qualitative analysis, the text must be analysed according to a systematic procedure like in quantitative analysis, but with the difference that the categories are iteratively tested and revised as they emerge (Djerf-Pierre, 1996; Thompson, 2001). The qualitative analysis is in this case also a result of the researchers pre-knowledge about the field of architecture and sustainable building. The result from a qualitative content analysis can be said to be an inclusive representation of patterns found in a body of articles, the corpus (Thompson, 2001). A theme or pattern is a significant idea appearing in the core corpus of articles considered as a whole.

5.7 Validity and reliability

Validity and reliability are two central concepts for the applicability of the findings from research. The validity of the findings in this thesis is strengthened as four separate studies have been carried out, and that the findings are confirmed by results from one study pointing to similar issues or supporting results from the other studies. The validity is further strengthened as similar results and problem identifications have been made in other studies in the field (see Chapter 4). This can be referred to as external validity (Yin, 1994), and should imply a generalisation of results.

The validity also relies on several types of triangulation (see Patton 1987 referred to in Yin, 1994, p. 92; Larsson, 1994). First of all, several kinds of data sources, referred to as *data triangulation*, have been used as well as several methodologies, (*methodological triangulations*: case studies, interviews, and textual analysis) to approach the problem field through different studies. The case studies alone also use multiple sources of evidence and methods, including interviews, studies of documents from the process and plans/drawings, studies of the built environment, and studies of brochures and journal articles. In discussing the material using several different theoretical approaches, the thesis thus further uses *theoretical triangulation*.

In the case of the study of the Swedish trade press, the validity of the findings has been improved through the joint analysis of two doctoral

students with different scientific backgrounds[69]. This is referred to as *investigator triangulation* (Patton 1987 referred to in Yin, 1994, p 92; Larsson, 1994). The analysis was partly carried out individually with the individual results later being compared, and partly the analysis was carried out in a group discussion.

Furthermore, the validity of the case studies has been improved as an outline of the case study and transcripts of the interviews were sent to the actors and respondents involved for approval and correction. The same procedure was used in the interview study were transcripts of the interviews and later an outline of the analysis were sent to the respondents[70].

The reliability of the findings is supported by what Yin calls a case study database, which is the collection of all the empirical data used and a description of how the study was done (chain of evidence) (Yin, 1994, p. 94 – 99). In this way it is possible for the reader to follow the derivation from description to conclusions, and if necessary return to the empirical material. However, as is the case of a qualitative study it can be difficult or even impossible to repeat the studies identically.

5.8 Summing up

This chapter has presented the methodological and research approach, the research design as well as the specific methods used in the four empirical studies. The research approach is explorative and qualitative and the process can be described as an iterative process between the collection and analysis of empirical material and studies of theory in literature.

The empirical material consists of four separate studies based on different content. Together, these four studies provide different perspectives on demonstration projects for sustainable building, and thus an enriched empirical basis for a discussion. The use of multiple sources and methodologies furthermore improves the validity of the findings. A three-dimensional model recognizing the tangible, the non-tangible and

[69] PhD student Pernilla Gluch has a background as engineer and is currently a doctoral student at the Department of Building Economics and Management at Chalmers University of Technology.
[70] Even though sent to all the respondents, only a few of these reacted and sent commentaries and corrections.

the image dimensions of demonstration projects has been used for designing the four empirical studies. The empirical material provides themes for further discussion and a basis for the understanding of demonstration projects. In addition, the empirical material has a value in itself in providing concrete descriptions of real-world situations.

The first study, two case studies of demonstration projects for sustainable building, based on case study methodology by Yin (1994) mainly belong to the tangible part of the demonstration project model. The data used for the case studies are interviews, studies of documents from the process, studies of the buildings as well as studies of articles and brochures about the projects. The analysis has been inspired by evaluation research. The second study, an interviews study with actors in the Swedish and the Dutch building sectors, aims at an understanding of the non-tangible part of demonstration projects. The method used for data collection is qualitative half-structured interviews with a thematic guide. The third and fourth studies focus on the image part of demonstration projects and study how the Swedish trade press has portrayed demonstration projects and sustainable building. The main method used is text analysis.

Besides relevant theoretical approaches chosen from design theory, organisational theory, and innovation theory in position of providing useful frameworks for understanding and explaining the empirical material, discourse analysis has been found useful in the understanding of the different interpretations and approaches to sustainable building found in the empirical studies and in the literature. Even though the specific methods for discourse analysis have not been used; the discourse theory has inspired the frame of reference for interpretation. Thus the discourse analysis is seen as one of several aspects that create an understanding of the empirical material. The discourse is seen as both constituting and as constituted by: social identities, relations, and knowledge and value systems.

The validity and reliability of the findings is supported by data triangulation, the use of multiple sources through different empirical studies. It is further improved as findings from one study point to findings from the other studies and to similar findings in earlier studies of demonstration projects and in the literature. The third study uses investigator triangulation as the analysis was carried out in co-operation

with another doctoral student. In addition, several theoretical basis approaches have been used in the discussion of the findings, thus making use of theoretical triangulation.

Chapter 6 Two Case Studies of Demonstration Projects for Sustainable Building

This chapter presents findings from the first empirical study carried out in this doctoral project. The study consists of two case studies. The first case study presents GWL–terrein (in previous texts, this can be found as GWL–terrein) a national demonstration project in Amsterdam, the Netherlands. The second case study presents an 'ecological' housing and demonstration project at Lindholmen, Sweden. The material was originally presented in a licentiate thesis (Femenías, 2000c). The case studies have been shortened in this thesis especially the study of GWL–terrain. Moreover, some changes have been made in the presentation of the material. The study of GWL–terrein had a dominant role in the licentiate thesis, as a more extensive material collection and analysis were made for this case than in the study of Lindholmen. Similar in-depth material collection, historical recreation and evaluation were not found necessary for the Lindholmen case to arrive at applicable findings.

The case studies were carried out between June 1998 and February 2000. For a detailed description of method, analysis and how the case studies were carried out, see Section 5.4.

6.1 Aim of the study

The aim of the first study was, by means of two concrete examples create an understanding of demonstration projects for sustainable building. The aim was to explore the relevance of these two cases as demonstration projects, *what* can be learnt and in what way these examples have contributed to the development of sustainable building in each respective country.

Another aim was to explore *how* to study and describe demonstration projects in order to make the information useful in new design and decision-making situations. It was thus initially decided that both cases

should be studied as regards both product and process. Architecture is bound in time and space, and an architectural object cannot be examined without considering the context in which it is built. According to Sahlin-Andersson (1989, p. 62), the building process loses its logic if time and space are excluded from the study of the same. The building process will influence the design/product and vice versa due to different kinds of constraints and preferences related to each specific case and context. In studies of buildings, the focus is often set on the object/product, the building itself *or* the process behind its realisation. Problems arise when specific solutions from one case are applied to another project, to another process, where the conditions are not the same (Sahlin-Andersson, 1989, p. 57, Birgersson, 1996, p. 221). So which should be the model, the product or the process? In order to create useful models from case studies, that which is specific to each case should be distinguished from that which is generally applicable.

6.2 Describing the GWL-terrain

GWL terrein in Amsterdam, built 1995 – 97, was nominated as a national demonstration project for energy efficient and sustainable building. The process was, however, initiated already in the late 1980s as a vision of a 'green' living area on the local municipal level and by people who lived in the neighbourhood. GWL–terrein was one of the first projects in the Netherlands with the ambition to combine environmental and architectural values and a car-free area in the central parts of a major city. The project consisted of an urban plan and of building design. The ambition was also to realise a socially diverse residential area that would attract a wide group of potential inhabitants without any specific interest in environmentally correct habits and from different social groups.

The following description of GWL–terrein is based on the three-dimensional model for presenting demonstration projects that distinguishes between: the tangible, the non-tangible and the image (see Section 5.2).

The tangible

GWL–terrein, Gemeente Waterleidingbedrijf (GWL), is the former grounds of the Municipal Waterworks in Amsterdam. On the 6 ha large site, 17 housing blocks with 600 dwellings have been realised, including a residence for elderly people and for disabled people together with 1200 m^2 of office-space, including also restaurants and shops. The area lies in the Westerpark district within walking distance from the central station and the old centre of Amsterdam (Figure 6.1). The area has good communications with public transport.

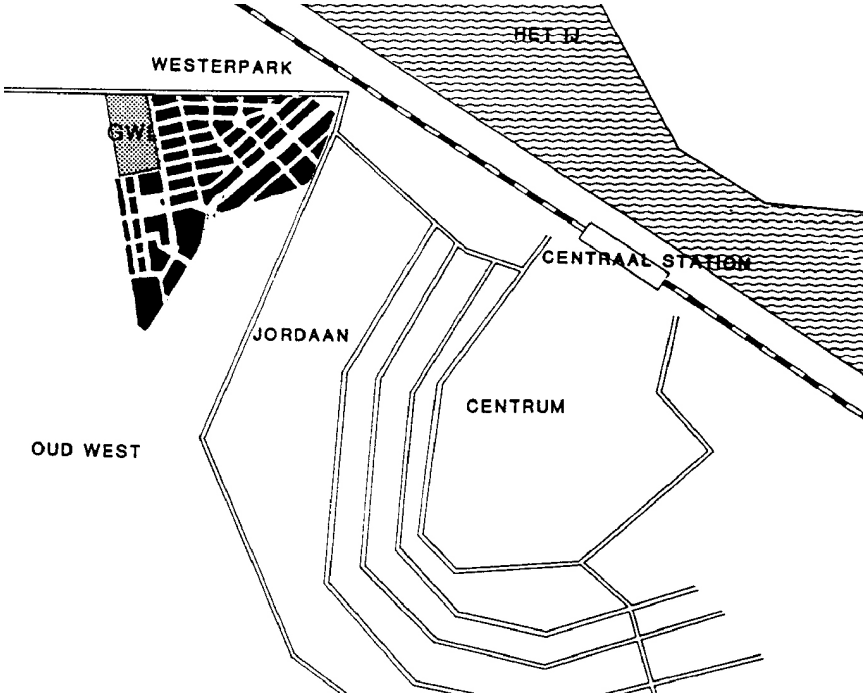


Figure 6.1 Location of the GWL–terrein in Amsterdam. (North is up in the picture).

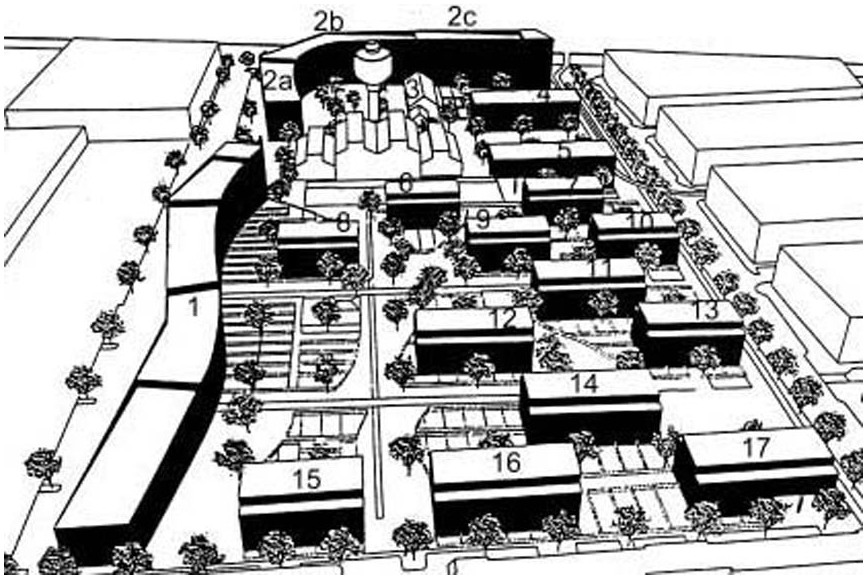


Figure 6.2 Drawn perspective of the layout of GWL–terrein.

Sustainable building measures on the urban level include a car-free area with a low-parking ratio, a shelter for bicycles, public green areas, as well as either a private garden, balcony and terrace for everyone as well as allotments. Two long, slightly curved high-rise building blocks at the northern and the western borders of the site serve as protective shields against northern winds, as well as noise from surrounding roads and the adjoining industrial area. In the central part of the area there are fourteen free-standing, three-level housing blocks orientated in a north-south direction (Figure 6.2). A few preserved listed buildings which once belonged to the former Waterworks have been restored and used for housing and offices, and a TV studio. The area provides a variety of leases with 50% rented flats in social housing, 25% subsidised owner-occupied flats and 25% flats on the free-market.

The sustainable building measures for the buildings include: reduced energy use (through increased insulation, energy-efficient windows, passive solar gain and district heating with a heat and power generator); rainwater-flushed toilet systems (in the three-level blocks); green roofs (on high-rise buildings). At GWL–terrein, material choices are based on environmental preference lists provided by the city of Amsterdam.

Picture 6.3 Mixture of high-rise and low-rise buildings and allotments, 1998.

According to Hal (2000), incorporating so many and diverse measures has resulted in no single high-points. The idea to provide as many dwellings as possible with a garden, balcony or terrace was an early programme point for the project (Gemeente Amsterdam, 1993b). Focus was also set early on architectural quality and innovative housing (Figures 6.4, 6.5, and 6.6). Another early ambition was to create a car-free residential area with a low parking ratio (0.2). Tenants moving in to GWL–terrein had to sign a contract renouncing their right to a parking place. The existing 120 parking places found at the border of the area were distributed by lottery.

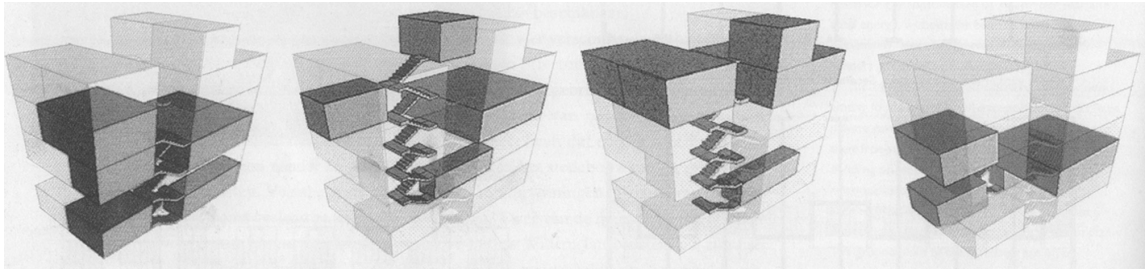


Figure 6.4 Volumetric studies and typological studies for dwellings at GWL–terrein by Neutelings Architects, Rotterdam (Figure from *Archis*, 5/1996 p. 40).

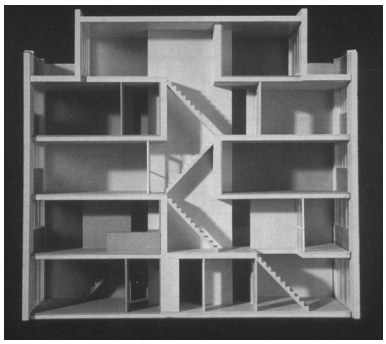


Figure 6.6, above Principle of zigzag solution at GWL–terrein with two interwoven flats in five levels and one room at each level (Architect Zeinstra/Van der Pol, Amsterdam, Figure from *Archis*, 5/1996 p. 39).

Picture 6.5, left Inside zigzag dwelling designed by Atelier Zeinstra/Van der Pol at GWL–terrein.

Date/year	Phase in process
End of 1980s	Initiative
Sept 1991	Preliminary investigation and initiative note:
Nov 1993	Note with starting points:
July 1993	Program for the urban design.
July 1993	Competition for urban design
July-Nov 1993	Urban design
Jan 1994	Commission to architects for building design.
Oct 1994	Description ready for building design
Nov 1994	Tendering, 1st phase.
Feb-May 1995	Procurement
Sept 1995	Construction starts
Oct 1996	Delivery of the first block
Oct 1998	Last delivery

Table 6.7 Short description of the process behind the GWL–terrein

The non-tangible

The history behind the realisation of GWL–terrein is long and the planning process has involved many actors from experts to public participation through a reference group of people from the neighbourhood. The initiative for transforming the former Waterworks into a residential area with a green profile was taken in a discussion between people in the neighbourhood and the Westerpark district in Amsterdam in the late 1980s. The process was realised in roughly four phases (Table 6.7): programming, urban design, building design and construction.

The developer ECO-Plan, a co-operation comprised of five municipal housing corporations, was formed especially for the project and dissolved after project completion, leaving the management to be executed by separate organisations. Not less than five architect offices and two contractors were involved in the project in order to achieve innovative housing and attractive architecture, as well as speed up the process. The architects for the urban design were selected through a competition in which two highly renowned Dutch architects offices where invited to participate. The local authorities together with the developer and the urban designer appointed the architects for the

building design. The architects, including the one for the urban design, were chosen for their architectural design abilities. They had no earlier experience of sustainable building. Instead, an external environmental consultant provided the environmental expertise. This was a decision taken to ascertain high and attractive architectural quality and thus give a new image of sustainable building contrary to the prevailing image of sustainable building as low quality architecture.

The environmental ambitions were regarded in all legal documents and programmes for GWL–terrein. Environmental experts were equally engaged during all phases of the process to ascertain the environmental profile[1]. The urban design of the area is the result of intense co-operation between the architect and the environmental consultant. The building design, on the contrary, was realised under great time-pressure and shortened by one year, and consequently omitted the phase of definite design. This period of reduced preparation led to problems during later phases and construction was started before the designs were finished. The reason for the time-limit was that 1994 was the last year that considerable subsidiaries were given for social housing. Due to the time-limit and the fact that money was running out in the process, less co-operation was possible between he architects and the environmental consultants during the building design phase. The environmental consultants' contribution was reduced to checking the designs, which were already completed.

The environmental consultant used their own model, the DCBA model, as a tool for setting ambitions for the project and for guiding the design processes. At the time, the National Package for Sustainable Building (see explanation Section 2.7) was yet not published. The DCBA model distinguishes between different levels of ambitions for sustainable building, ranging from the A—level, the highest level for sustainable building to the D-level, the level of contemporary building in the Netherlands. Ambitions for GWL–terrein were found in the B— and C—levels (The DCBA model chart for GWL–terrein can be found in Appendix A1). In the later stages of the design, the local municipality provided a list for material choice.

[1] Not less then three different environmental experts were involved: Two in the earlier phases of the programming of the project and one in the later phases for urban design and building design. The local municipality was not satisfied with the work of the earlier consultants which led to to new commitments.

The project received ‘green loans’ from the Ministry of Housing, Spatial Planning and the Environment (VROM). In addition, the rental housing could profit from ‘green mortgage’. Furthermore, subsidies were given by the Amsterdam municipality for extra costs for sustainable building based on their material list. As the project was recognised as a national demonstration project, the project organisations could profit from national subsidies. The use of innovative techniques was granted subsidies, as was the use of rainwater toilets.

Picture 6.8 Block number 5 at GWL–terrein with housing for elderly people. This was the last block to be designed and of the seventeen housing blocks, it was *the* official building nominated as a demonstration project, even if the whole area is commonly regarded as such.

The image

The image found in information material distributed by the developer ECO—plan in trade press and in newspapers gave a positive picture up until 1999. The area was still new and the image was based mainly on the developer’s expectations. The developer presents their project with the following words (ECO—Plan, c):

> Close to the centre of Amsterdam, opposite Westerpark, ECO—plan has realised a unique project: a varied peaceful urban area with environmental-friendly flats, many gardens and public green areas, and completely car-free streets. An area in which you will not miss

> your car, thanks to its central location in the city, there are good connections with public transport, and there are services located around the area.[2]

That GWL–terrein is a model for future housing is emphasised both in a brochure from the developer and in an article in the Dutch architectural review, *Archis*. The developer writes (ECO—Plan, a):

> The unique project at the GWL–terrein shows us the relation between high ambitions, environmental building, and finance. We can use this experience in future projects. [3]

In his article about GWL–terrein in *Archis*, Westrik describes the project positively (1996 p. 38):

> The resulting architecture and environmental solutions overlap as if it was the most natural thing. They include environmentally sound building materials, Gustavsberg rainwater-flush toilets, a norm for gas consumption of 750 m^3 per year and total energy, without the building costs rising excessively (an environmental subsidy of 3,000 guilders per dwelling is available). /…/ Moreover, the plan includes rules dealing with the implementation of both architectural and environmental factors. This formula could serve as a model for many a housing development.

GWL–terrein has been an example that lifts the discussion from the marginal 'ecological' building to the larger scope of sustainable building. Bernard Hulsman writes in *Architecture in the Netherlands 1996/1997* about GWL–terrein (Hulsman, 1996 p. 159):

> The number of architects working with 'green building' is also growing. If the first ecological neighbourhoods were designed mainly by 'ecological' architects, in recent years designers with[4] ecological reputations are also turning their attentions to it. For example, the urban design for the green neighbourhood in Amsterdam has been made by Kees Christiaanse. His name is as little associated with green architecture as that of Liesbeth van der Pol, Willem Neutelings, DKV and Meyer and van Schooten who are filling in the GWL site

[2] "Dicht bij het centrum van Amsterdam, tegenover het Westerpark, realsieert ECO-plan een uniek project: eengevarieerde, rustige stadswijk met milieuvriendelijke woningen, veel tuinen en openbaar groen, en volledig autovrije straten. Een wijk waarin men de auto niet snel zal missen, dankzij de centrale ligging in de stad, goede verbindingen met het openbaar vervoer en buurtvoorzieningen rond de wijk." . "Buurtvoorzieningen" means children's pre-school, medical centre, post offices, etc. Translation by Barbara Motel.
[3] "Het unieke project op het GWL-terrein toont ons hoe een hoge ambitie, milieuvriendlijk bouwen en financien zicht tot elkaar verhouden. Die ervaring kunnen we gebruiken bij volgende projecten." Translation by Barbara Motel.
[4] Probably Mr Hulsman means *without.*

> together with him. In this neighbourhood, whose construction is now fully underway, there will be no trace to be found of the grass roof aesthetic of green building. 'Ecological conscious building does not have to be lowrise with grass roofs', said Christiaanse in an interview. 'The environment has become just a technical requirement which you can incorporate in high quality architecture'.

6.2 Analysis and results from the GWL—terrain case

The analysis of GWL–terrein has been based on the evaluation matrix presented in Chapter 5 (Table 5.3). In the following, only a few central themes from this analysis will be presented. For more details, the reader is referred to the licentiate thesis (Femenías, 2000a).

The Nieman evaluation

As part of the national demonstration project programme, an evaluation of GWL–terrein[5] has been conducted by a consultant who focuses on the fulfilment of measures for sustainable building as set forth in the National Package (Niemans Adviesburo, 1999). The evaluation includes a roundtable discussion with involved key actors about the process but does not include the performance of the project or energy use, which was one of the main focuses of the demonstration programme. Neither does the evaluation include the function of the area today, e.g., as concerns user habits and functions of other technical systems. In the year 2000, the involved actors had still not disseminated any internal evaluations. The information disseminated by the developer and the media had up to the point of this study (1998-1999) focused merely on predicted functions of GWL–terrein.

Ambitions for reduced energy use

A complete environmental assessment of GWL–terrein was beyond the means of this study. Instead, the energy use for space heating as the factor of highest importance for sustainable building has been studied[6]. As no measured values have been possible to obtain only the ambition level is discussed. The ambition for space heating in Block 5 at GWL–

[5] Basically of block 5.
[6] The licentiate thesis examines water use, building material choice and the ambition to create a car-free and green area.

terrein was 60-100 kWh/m^2/year[7] (see Table 6.9). This is a reduction by 42 – 65% compared with the average energy use for space heating in housing in the Netherlands in 1993, at the time the ambitions we set. A theoretical value for space heating at GWL–terrein was calculated by an external expert to be 89 kWh/m^2/year , thus a reduction by 48% in energy use compared to Dutch average usage for housing in 1993 (W/E, 1995). It remains to be proven that these ambitions have indeed been fulfilled[8].

Another comparison can be made of the ambitions for energy reduction by looking at the EPC value[9]. The calculated EPC for Block 5 was 1.10 (the lowest calculated value for all blocks at GWL–terrein). In 1995, the national EPC was set to 1.4 and in year 2000 lowered to 1.0. Thus ambitions for EPC at GWL–terrein failed to fulfil the building regulations less than three years after completion.

Table 6.9 Theoretical values for energy use for space heating at GWL–terrein Block 5 compared to the average situation for housing in The Netherlands in 1993 (source DCBA chart for GWL–terrein see Appendix A1).

		Space heating for housing (kWh/m^2/year)
Ambitions for GWL Block 5	C-level	100
	B-level	60
Theoretical value for GWL[10]		89
Average Dutch situation 1993		172

Hindrances in the process

Planning and carrying out a project as complex as GWL–terrein has resulted in some problems, especially in the later phases. The cause can

[7] Original figures were presented in cubic metres of natural gas per household, I have translated this into kWh and divided that by the average size of apartment in Block 5, which is 73.3 m.

[8] The actual energy use in GWL-terrein has not been measured or, in any case, has not been communicated by project owners. Neither has it been possible to obtain any data from the local energy company. An interviewed tenant (a former energy engineer) IP12 who lives in Block 5 at GWL-terrein has studied the energy use in the 35 flats in his block for two years. According to him, energy use 30% compared to the original Dutch situation in year 2000. However, the fact that Block 5 is a residence for elderly people presumably results in less energy use than the 'normal' household. Another interviewed tenant IP9, living in another block with her family and children also reports a 30% reduction in energy use compared to the average.

[9] See Section 2.7.

[10] Source (W/E, 1995)

be identified as a combination of careless preparation of the construction (due to the high time-pressure in the later stages), the involvement of untried environmental innovations, as well as the complexity of the project with an unconventional design and a large variety of designs for flats. The introduction of new materials, such as wood and cellulose insulation, entered a bottleneck in common practice and standard procedures in the building industry and in regulation. An early decision to use a combined natural gas-driven heat and power generator omitted the use of renewable energy. Furthermore, the process suffered from discontinuity due to the change of the project leader at the local municipality. The process also suffered from communication problems and lack of trust between actors due to unclear directives and late involvement of some consultants and contractors. A disagreement over the environmental ambition, in which the participating public had higher ambitions than the project organisation, resulted in some controversies.

The environmental consultant had an active role during the design of the urban plan, but was less involved during the building design. According to the environmental consultant, this influenced the building design so that it had a lower environmental ambition level than the urban design. Poor coordination of ambition and budget at early stages resulted in some environmental measures being left out. The fact that the level of ambition did not correspond to the financial situation seems to have been a source of irritation among several of the architects.

Other hindrances have been found in existing systems and local routines. For example, the rainwater toilets in GWL–terrein save water but use more electricity, and since water bills are still paid in full, the cost-cutting incentive for users has thus had the opposite effect on motivating the user.

The internal influence

Involved actors are satisfied with their contribution and think that GWL–terrein has been an important step in the development of sustainable building. As expressed by the project leader at the developer (IP1):

> A project like this costs energy, but it also gives energy. It inspires your work a lot. And now when people live in it and are greatly satisfied, that is good to see.

Few actors have had time to evaluate their own work or disseminate their experiences. Soon after the project was completed, the organisation and networks were dissolved and as a result, knowledge has been lost. For example, the developer was formed especially for this project and dissolved when the area was built. And as the project leader from the developer expresses it (IP1[11]):

> Now we know what we should have done differently at the GWL–terrein, but the next project will be different, will have new problems and new tasks. /…/ If we would do another GWL we would know better and also know what parts of the process that is most important.

In response to the question if they would do a project like this again, some interviewed actors answered yes while others seem to have been exhausted by the complexity (and cost) of the project. Some of the architects engaged for the building design and one of the contractors would have liked to have entered the process earlier. A representative from the environmental consultant says in an interview that she found that the developer showed more interest in the showcase and marketing aspects then in the long-term management of the area.

The project leader at the local municipality has listed some important prerequisites for realising a demonstration project like GWL–terrein: political enthusiasm, willingness to pioneer and to accept extra costs, coaching by an environmental advisor, cooperation between developer and architect, well-organised public participation, ability to negotiate with public works services and early recruitment of future tenants.

The external influence

GWL–terrein has gained considerable attention in the country and abroad and the tenants that were interviewed in this study are satisfied[12]. The project has also been a subject for discussion in the architectural press in the Netherlands. The project manager from the local authorities underlines in an interview that GWL–terrein is a demonstration project and not an experiment. It is a starting point for a new way of building sustainable and car-free areas.

[11] IP1 = Interview Person 1, see list in references.
[12] Those with rainwater toilets are not satisfied with the fact that they pay more for the electricity but do not receive any reduction on their water bills.

Today, many technical solutions and environmental measures used at GWL–terrein are no longer innovative and some can be questioned. However, GWL–terrein has been an important step in the development of sustainable building in the Netherlands. As the developer's project manager said in the interview (IP1):

> Now all these things are very normal.

The project manager from the local authorities commented the project in 1998 (IP5):

> GWL-terrain was a milestone, but what was realised in the project in environmental terms is already old[13].

Representatives from one of the contractors confirm in an interview that some environmental measures applied in GWL–terrein are normal praxis today. However, this is mentioned not only due to their environmental quality but because these solutions are also durable and economically defensible.

To the question on the importance of demonstration projects for continued development of sustainable building, all interviewees in the case study answered affirmatively. As expressed by one of the architects (IP4):

> It is crucial! It is important to have things tested to see if it is worthwhile designing.

GWL–terrein as a demonstration project and example of sustainable building can be seen as a tool for sustainable building design, as stated by one architect (IP3):

> You look to learn from other's mistakes.

6.3 Description of the Lindholmen

At Lindholmen in Gothenburg, a residential block was built in 1997 in culturally sensitive surroundings (Figure 6.10). The block is owned and managed by the Public Housing Company, Bostadsbolaget, providing 13 flats for rent. The project has been marketed as providing ecological

[13] The urban design was made in 1993, the building design 1994-1995, see Table 6.8.

living and has challenged the task of implementing sustainable building in an urban context, as an addition to a housing block in a culturally sensitive environment.

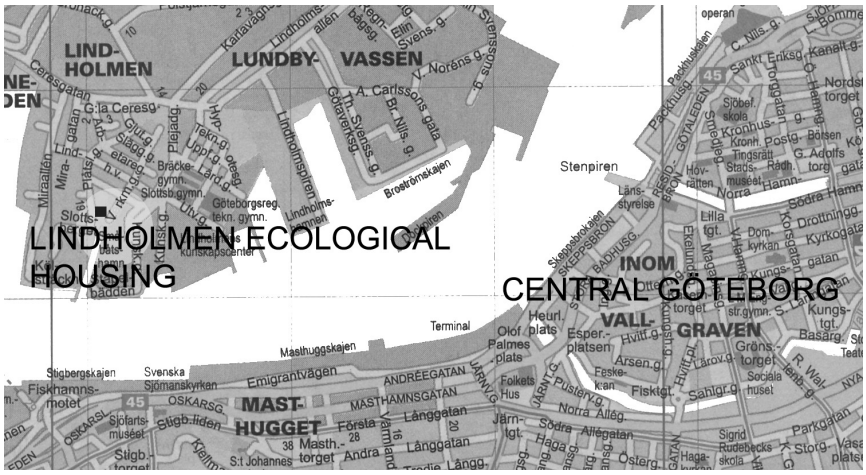
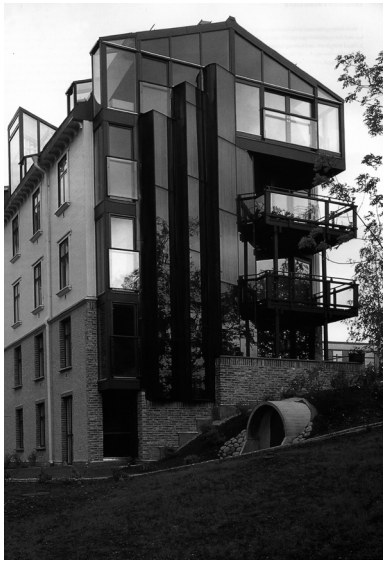


Figure 6.10 Location of the case at Lindholmen

The tangible

The four-level building with an inhabited attic was added as an extension of a listed 19th century block. In line with the conditions set up by the county antiquarian, the façade of the new building facing the town Göteborg on the other side of the river Göta Älv, imitates almost meticulously the details of the facades of the 19th century buildings typical for Göteborg, called Governor's houses (Picture 6.11 Landshövdings hus).

Picture 6.11 The façade facing town. The 'ecological' housing is to the far left in the picture. (Photo Liane Thuvander).



Picture 6.12 The gable, the solar panel and the earth-cellar.

On the facades facing the inner court, hidden from view, the architect has been authorised to use modern forms of expression. The gable facing the harbour dock is manifested with an unconventional solar-panel design (Picture 6.12).

The building is constructed in brick at ground level, mostly recycled. The upper floors have a wooden construction designed to facilitate dismantling, using screws instead of nails and glue. The façade is linseed oil painted wood. The environmental investment includes the use of good quality materials, respecting aesthetic values, such as solid and oiled pine wood flooring, wooden window frames and tiled bathrooms. Attention has been given to selecting materials that will not provoke allergies.

Special environmental features are a urine-separating toilet system and a solar panel for hot-water heating. Urine from the system is stored in tanks underground and the urine is collected and is to be used as fertiliser. The rest of the waste goes to the public sewage system. The building is connected to the district heating system in Göteborg and the solar panel contributes to hot-water production.

Flats have an open-plan solution and have balcony floors of thick glass that provides extra daylight in the flat below. All materials and components, as well as machines provided, are eco-labelled. Among the energy saving installations, there is a low-energy elevator and presence-sensitive lighting in the communal stairs. A communal laundry room with low-energy washing machines is located in the cellar. In the courtyard, there is a green house, a warm-compost, a collection post for recycling waste, a bicycle shelter and an earth cellar for the tenants' use (Picture 6.13).

The non-tangible

The project was initiated as part of the public housing company's commitment to investments in environmental policy in the late 1990s. The ambition was to provide environmentally sound living for the 'normal' tenant, without any specific knowledge or expressed interest in environmental issues. The idea to realise a housing project with environmental ambitions coincided with the desire expressed by the Göteborg municipal government. The municipality wanted to have an

example of ‘ecological’ building to demonstrate in connection with the IFHP[14] conference that was to be held in Göteborg during the autumn 1997. The date of the conference set the deadline for completion and the whole project was realised within less than a year.

Picture 6.13 The inner court with green house and earth cellar.

The environmental measures applied in the building project were largely influenced by an earlier not realised project planned by the public housing company and the architect in charge. The architect, a well-known Swedish architect, has in recent years profiled himself as working with ‘ecological’ architecture.

Early in the programme phase, seminars were held with the involved actors to discuss the potential for an environmental adjustment of the project. At these seminars, experts were invited to raise the level of knowledge of the project. For example, samples of sustainable design from Sweden and Europe were presented, as well as solar-energy solutions. From interviews with the developer, the author has understood that there was no explicit environmental programme set up for the project and no quantitative measures, only formulations, such as ‘reduced energy use’. The ambition was to realise environmental

[14] IFHP – The International Federation for Housing and Planning.

measures as far as possible within the frame of a rather normal budget. This investment was to provide the owner with information about environmental solutions possible to use in the management of their housing stock.

Ambitions and goals for the building:

- Housing adopted to the eco-cycle and to the ordinary customer.
- A modern Governor's house[15]
- The building should distinctly be identified as an ecological one.
- The building should be adapted to the existing urban environment.

Ambition and goals for the process:

- Marketing – environmental profile for the company.
- Development of products.
- Development of competence.

The image

At the time of the case study, few articles had been published about the 'ecological' housing at Lindholmen. Later, in the autumn 2001 a search was made for articles about Swedish demonstration projects in the preparation for a study of the Swedish trade press (see Chapter 8). Also this search resulted in few articles about the Lindholmen case.

The architect Wingårdh presented his project in the Swedish Architectural Review number 5, 1998 (Wingårdh, 1998). The text is dominated by descriptions of all kinds of hindrances that they met in carrying out the project. Hindrances mentioned are antiquarian restrictions on the architects' design, time-pressure, and a few aesthetic defects due to poor workmanship. The architect is nonetheless satisfied with the project, which he finds provides good living qualities and interesting architectural design that, like a centaur mixes the old and the modern:

[15] The Governor's house (Landshövdings hus) is a typical form of residential building in Göteborg developed during the 19th century. The basement is of stone and the two upper floors are of wood. The type of structure was developed to get around existing fire safety rules.

> The house is a rush job with the freshness and undeliveredness of the sketch.[16]

6.4 Results from the Lindholmen case

Three years after the tenants had moved in to the 'ecological' housing at Lindholmen, no evaluation of the project had yet been done. Interviewed tenants and the project manager from the public housing firm are satisfied with the project. The architect is rather disappointed due to the time-pressure and difficulties in combining environmental ambitions and architectural quality with strong cultural restrictions.

As an example of sustainable building in the late 1990s, Lindholmen has some shortcomings; for instance the lack of quantitative objectives for energy use. High ambitions can be found in material choice and construction methods. Some visual attributes like the small greenhouse and earth cellar cannot be taken as more than symbolic gestures for the ambition of creating sustainable building. No evaluation has been conducted and the client has not engaged in any new innovative projects aimed at sustainable building. The project manager for the client says that environmental adjustment is now more common in all building projects and does not need to be pronounced. Instead, safety factors are getting higher attention at the moment. Thus, the project at Lindholmen stands as a solitary monument of the client's investment in an environmental profile in the late 1990s. However, the project still offers some very good housing qualities.

The high ambition shown by the public housing firm in this project has not been enough to achieve interesting and lasting results. To the project organisation's defence, it can be said that the time-pressure was high, that, at the time, less information was available and few good examples had been built. Difficulties in reaching agreements with the antiquarian authorities resulted in the less advantageous position of the solar panel to the southwest. The antiquarian authorities were against placing the solar panel to the south, which would have made them visible from the city. The southwestern placement together with a vertical position does not provide maximum outcome for the investment. The solar panel is an articulation of the building's special character, and

[16] "Huset är ett hastverk med skissen fräshör och oförlösthet."

a malfunction can damage the image of the whole project. Another example of this kind of conflict is the toilet system. Questions have been raised in the neighbourhood about the performance of the project, as rumours have said that the collected urine was let out in the public sewage system. In fact, the urine was let out in the public sewage system in the beginning due to initial problems that later were solved[17]. However, the rumours remained.

One ambition with the project has been to inspire people to engage in environmental action and change daily habits. The tenants have, so far, treated the high quality materials used, not only in the flats but also in common areas, with a lot of respect and care. Little harm has come to the common spaces, but this can also be due to the fact that at the moment very few children live in the building. Tenants say that they have unusually good contact with each other and that the building provides some good natural meeting places like at the compost pile and in the waste separation shed.

The project has attracted many visitors, and in 2004, is still one of the few projects of its kind in Göteborg and Sweden. The involvement of an architect of well-repute has probably increased the attention. The project has been presented in the *Swedish Architectural Review*, *Arkitektur*.

6.5 Discussion and conclusions

These two cases studies provide us with specific lessons from planning and carrying out demonstration projects for sustainable building. The case studies also point to general findings about demonstration projects confirmed by earlier studies (see Chapter 4). The following discussion will be on the initial issues for the study: the relevance of the cases as demonstration projects for sustainable building: What can be learnt from them? How can we learn? How should demonstration projects be studied in order to learn, and in what way should demonstration projects be presented in order to be useful?

[17] As the contract was broken with the farmer that used the urine, the urine is today let out in the public sewage system once again (Thuvander, 2004).

The relevance of the cases for the continued development

From interviews with actors in the GWL–terrein case study, it can be seen that built examples, in general, are considered to be important in transmitting information and inspiration about sustainable building. The actors thought that GWL–terrein had been an important milestone for the development of sustainable building in the country. Also the evaluation of GWL–terrein conducted by Niemans Adviesburo considers the project as having value as a demonstration project for the nation, especially as regards urban design. The Lindholmen case cannot be attributed the same impact as a demonstration project for sustainable building in Sweden.

As pointed out by actors in both cases, an individual demonstration project should not be judged for mistakes made, instead should it be seen as part of a development process. When the cases in this study were initiated, limited information and experience of sustainable building were at the project group's disposal. Today, as development advances, many of the measures taken in these specific cases are considered to be old or not relevant any longer as technological development advances and maybe also due to contextual changes in society. This is, for example, illustrated with the investment in alternative toilet systems in both cases. However, both cases show shortcomings in setting an adequate ambition for the important issue of energy use. A demonstration project for sustainable building should secure long-term sustainable development objectives for the built environment for energy and resource efficiency.

There is a risk that demonstration projects and sustainable building become a solitary venture for the client or developer, as is the case with both GWL–terrein and Lindholmen. The developer for GWL–terrein was set up only for this special case and did not continue with other projects of the kind. As revealed in interviews with Bostadsbolaget's (the client's) project manager, environmental consideration is becoming a part of normal building practices today. Consequently, the client does not see any further incentives for continued demonstration and innovation of sustainable building. According to the project manager, customers ask for other qualities today, for example, safety.

What can be learnt form the cases?

Both cases show contextual obstacles to carrying out initial ambitions and objectives, for example, due to standard procedures in the building sector, the availability of certain building materials on the market, antiquarian restrictions, etc. Other obstacles can be related to managerial issues in the projects. For example, in GWL–terrein there was a gap between ambitions and the budget and time-plan. This led to lower levels of, or the exclusion of, initial ambitions, in particular as regards building design. Several interviewed actors from GWL–terrein mention the importance of making the right decisions at an early stage. In later stages when more actors are involved, it is more complicated to change decisions. They say, too, that it is important to reach agreements to assure a successful outcome of the process. It is important to have common ambitions and objectives and to consider the environmental issues from the beginning. Several interviewees among the contractors and architects said that they would have liked to have entered into the process at an earlier stage.

In GWL–terrein, the environmental consultant asserted the sustainable building profile especially during the urban design phase. The environmental consultant thus had the role of a 'process champion' (see Section 2.4), however limited. The environmental consultant was less involved during the building design, which had consequences for the outcome of the project. Other incidents show the importance of continuity in the process. For example, the change of the municipality's project manager created problems as the new project manager did not have any personal experience of the history of the project. Furthermore, there had been problems when moving from one stage of the project to another.

Some decisions at an early stage had a major influence on the outcome of the project. The decision to invest in a co-generator hindered the use of renewable energy resources, such as solar energy. Furthermore, the choice of a co-generator for heating and warm tap water indirectly influenced insulation levels. As the co-generator is efficient, a lower level of insulation could be used and still meet the EPC level in the norms.

In the Lindholmen case, the antiquarian restriction lead to an unfortunate placement of the solar-collectors, thus resulting in less

energy gain from the installation. The project also shows some shortcomings in the programming and management of the project. The programme does not involve any quantified objectives for energy use and some measures taken seem to be more symbolic (solar-collectors, green house, earth cellar) than the results of a consistent problem analysis from a sustainability point of view.

Most actors are satisfied with the projects even though they have experienced problems, such as disagreement on the environmental ambition and, that several actors, the contractors and architects responsible for housing design, would prefer to have entered earlier in the process. Several architects declare that they would make another GWL–terrein if they were given the chance.

How can we learn from the cases?

One main result from the case studies is that there is an obvious lack of evaluation, feedback and dissemination of results. This can be compared to similar results observed in earlier studies in the field (see Chapter 4). No internal evaluations of the GWL or the Lindholmen case had been presented to the public at the time when this study was carried out. Only one external evaluation of GWL–terrein had conducted, as the project was part of a national demonstration project programme. However, this evaluation did not include a study of environmental performance or energy use.

Findings from the case studies show that a distinction must be made between the internal knowledge gained by actors involved in the process, and the external knowledge gained by those outside the project. The internal knowledge is useful for the individual actor in their future work and in the home organisation if disseminated. Experience gained from the case studies reveals a lack in both the internal learning build-up and the dissemination of information and knowledge to the external world. The lack of internal evaluations challenges the possibilities for internal learning capacities in the organisations. The internal learning capacities are also threatened as in the GWL case study when the developer organisation was dissolved after the completion of the project. In both case studies after only a few years, several of the actors that had worked for organisations that were involved in GWL–terrein had

changed organisations. Consequently, the knowledge acquired in a project tends to get dispersed and lost.

In order to make a demonstration project useful, an evaluation should be planned and budgeted for from the project start. Experiences from the GWL case study show that the evaluation should be planned from the beginning in order to make it possible to monitor certain flows. If the evaluation is not planned for, it can be difficult, or even impossible to monitor separate flows, such as energy and water.

Proposing a model to present demonstration projects

It has been revealed in interviews with actors in the above cases studies, especially among architects, that information is sought in the process when it is needed. Many architects do not have time to search for knowledge if it is not to be used in a problem they are currently working on. As the information is needed quickly in the problem-solving situation, relevant information should be presented in a way that is adapted to the actors' working situation (cf. Cole and Lafreniere, 1997).

One of the findings from the case studies is that the description of a case study is an analysis in itself. The way in which the material is structured and presented influences how the material is understood. The presentation emphasises certain aspects, as the case cannot be described in its complex totality. In architecture, the visible tends to dominate, which can lead to visual or symbolic attributes being copied and less attention given to the actual environmental gain of the investments. In order to emphasise the non-tangible parts of the demonstration project, the above mentioned three-dimensional model can be an aid (Figure 6.14). This model also distinguishes the 'image' dimension. Through the case studies it was discovered that a part of the material disseminated from the demonstration projects, apart from the building you can visit on the spot (the tangible) and the information from the actors and documents from the process (the non-tangible), will be filtered through, for example, articles in the press and brochures by the project owners (the image).

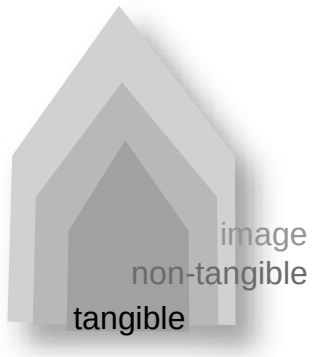


Figure 6.14 Three-dimensional model for understanding and presenting demonstration projects for sustainable design.

Chapter 7 Interview Study with Actors in the Swedish and the Dutch Building Sectors

This chapter presents an interview study with actors in the Swedish and the Dutch building sectors carried out between June 2001 and February 2002[18]. For a description of the method, analysis and approach see further Section 5.5. The interviews focus, on the one hand, on questions regarding the actors' own approach to handling issues regarding sustainable building. On the other hand, the interviews aim at discussing the actors' view of the present state of sustainable building with support for and obstacles to continued development. The respondents' view of demonstration projects has also been of special interest. So far, there is still little known about how the building sector actually handles sustainable building in practice.

After a short introduction to the respondents and the specific themes that were addressed in the interviews, the results are presented thematically and sometimes the Swedish answers are separated from Dutch. At the end of the chapter, some conclusions from the interview study are presented.

7.1 The respondents

Qualitative interviews have been carried out with 27 actors, 14 in Sweden and 13 in the Netherlands. The respondents were selected according to their position of active influence on discourse on sustainable building in their country through building projects, through articles/books and/or statements in media. Four categories of actors were chosen: architects, environmental consultants, clients and architects who

[18] Publications from the study: Femenías (2002a; 2002b).

also work as environmental consultants. The respondents were selected with the help of authorities in the field in both countries[19].

Among the actors, three categories were identified (Table 7.1)[20]. First, we have the pioneers who have been working with sustainable building[21] since the 1960s and 1970s. They have been the driving force behind development, and their work, as well as their personalities, is strongly identified with the issue. The second category consists of actors from a new generation with strong personal commitment, but with less experience. The third category consists of employees in a company profiled as pro-sustainable building. Respondents in the latter group often have personal commitment but are not known to a wider audience as being spokespersons for sustainable building. One of the pioneers holds a position as Professor of Architecture (where) while two more are professor emeritus. All total, five respondents have engaged in doctoral studies of which two have attained a doctoral degree. All except one Swedish and one Dutch respondent (clients) have a Master of Architecture degree[22]. The low participation of women in the study (5 of 27) could be seen as reflecting the current situation in the building sector. When referring to the respondents, a code is used. For example, S1A stands for S for Sweden, 1 for respondent 1, and A for architect. In the same way N stands for the Netherlands, E for environmental consultant, AE for architect and environmental consultant and finally C stands for client.

[19] Professor Michael Edén and Professor Björn Malbert at Chalmers University of Technology as well as Dr Anke van Hal and architect Tjerk Reijinga in the Netherlands assisted in the choice of respondents.
[20] A list with date and length of the interviews is found among the references.
[21] Sustainable building is a rather new term and has in many cases replaced earlier terms for ecological or energy-efficient/environmental building. Some of the respondents still prefer to use terms other than sustainable building, see Section 7.3.
[22] This was not a criterion for choosing respondents but just happened to be so.

Table 7.1 Respondents in Sweden and the Netherlands according to defined categories.

	Swedish interviews				**Dutch interviews**			
	Driving force Pioneer	"Less experience"	Employee	**TOTAL**	Driving force Pioneer	"Less experience"	Employee	**TOTAL**
Architect	5	4	0	**9**	3	1	0	**4**
Architect/environmental consultant	0	0	0	**0**	1	1	0	**2**
Environmental consultant[23]	1	1	0	**2**	1	1	2	**4**
Client	0	2	1	**3**	0	1	2	**3**
TOTAL	**6**	**7**	**1**	**14**	**5**	**4**	**4**	**13**

7.2 The themes for the interviews

The interviews and the analysis of the same are focused on a number of themes:

- The situation of sustainable building in each respective country at the moment.
- Obstacles to and support for continued development of sustainable building.
- Interpretations and characteristics of sustainable building.
- The personal or organisational approaches to sustainable building in practice.
- The actors and the building process[24].
- Innovations, experiments and demonstration projects.
- Information retrieval/dissemination, knowledge-build up and tools.
- The personal driving force for engagement in sustainable building and inspiring examples.
- The role of media in influencing public opinion for sustainable building.

[23] The category environmental consultant is less common in Sweden than in the Netherlands which explains the uneven distribution in categories between the countries
[24] By building process I mean the whole process from program to design to construction.

7.3 The sustainable building practice at present

This section examines the respondents' view of sustainable building in 2001 – 2002 in each respective country. It also indicates whether or not they find that sustainable building has become a natural part of the building practice in their country.

The Swedish respondents

Swedish respondents agree along two sides of the development of sustainable building in Sweden. On the one side, environmental issues are on the agendas and implemented at a low level. Many building projects have environmental programmes, building material declarations are becoming the norm and energy issues are always seen over. On the other side, the respondents consider the interest in environmental issues to be more on paper than in practice and the development is too slow. Furthermore, the major environmental issues are not addressed. There are few concrete changes but the national programmes have become more robust. Some respondents find that a few movers and shakers drive development forward.

The pioneers are found to be more disappointed with development than the rest of the respondents, and in particular in comparison with the interviewed clients. All respondents agree on a general backlash for environmental issues as expressed by on pioneer (S2A): [25]

> Well, the situation, *I* would say, is that we have moved several steps backwards from where we were before.[26]

The three respondents who were most positive to the development of sustainable building think that it is just as much in focus today in practice but that the subject receives less attention in media. When the subject was first introduced, it naturally received more attention. One of the clients looks back and gives her view of the situation (S12C):

> The interest in society as a whole was much larger in 95. The environmental question was trendy and exciting. I remember that

[25] All Swedish quotations are freely translated with help by Marie Carlsson and the original text in Swedish is given in a footnote. Italicising is mine as is used to indicate words that are emphasised in the interviews.
[26] "Jo, då är det ju så tycker jag att det tagit flera steg tillbaks mot vad det varit tidigare." S2A

> people where so eager to hear what you had to say about it/…/ Because people suddenly understood what it was all about. That it was of concern for us and for coming generations. That it was not about going back to the Stone Age. /…/ So in that sense it was much easier. In practice much more is happening now.[27]

Two of the architects (S6A, S7A) think that one reason for the loss of interest in sustainable building is the lack of hard facts. The industry is no longer interested in 'empty symbols' that characterised early examples of sustainable building.

According to one pioneer (S2A), development has regressed in the past 7-8 years, which he explains by the economical regression turning into prosperity. The paradox is that during an economical boom there is no time to consider these issues. During a regression you search for new innovative solutions. Another respondent (S8A) expressed this with the following words:

> We have come far in some areas, and in other areas we're going nowhere or are even regressing.[28]

Large building companies are seen as making efforts in the direction of sustainable building but small- and medium-sized companies lag behind in development. The pessimistic respondents think that the building industry adjust their efforts to minimum levels, they do not innovate. They do not go further then standard regulations, instead they try to escape. The respondents find that there are mainly marketing objectives behind the few investments that are made. The industry has become good at 'motivating and formulating ecology'[29] as one pioneer (S3A) says. To cope with the major issues we will need a change of lifestyle and a change within the systems, for example against short-term economic thinking.

Some pioneers (S1A, S3A9 S11E) see the development of sustainable building as a wave movement with coming and going tides in attention. The 1970s were the time for experiments. During the 1980s

[27] "Intresset i hela samhället var mycket större 95. Miljöfrågan var liksom häftig och spännande. Jag vet det var så tacksamt att komma ut och prata om det.../.../ För folk fattade plötsligt vad frågan handlade om, Att det var en angelägenhet för oss och för kommande generationer. Och att det inte bara var någonting tillbaka till stenåldern. /.../ Så på det sättet var det mycket lättare. I praktiken händer det mycket mer nu." S12C

[28] "Vi har kommit långt på en del håll, på andra kommer vi ingenstans och utvecklingen går I motsatt riktning." S8A

[29] "motivera och formulera i ekologi". S3A

Picture 7.2 Low energy, passive, energy houses in Lindås outside Göteborg. Swedish demonstration project from 2001. In these houses the traditional heating system has been replaced by a heat exchanger in combination with an exceptionally well insulated construction. For more information see http://www.formas.se/docs/Bokhandel/houses_without_heating_systems.pdf (Photo Liane Thuvander)

the sick building syndrome appeared and at the end of the 80s, in connection with the economic regression, 'eco-villages' emerged. The 1990s broadened the perspective. The first years after the Rio Conference no change was seen but then development speeded up with the declaration of the Swedish Prime Minister in 1996 to invest in ecologically sustainable development (see Section 2.6). During the last decade we have finally got some real evidence and seen the effect of environmental changes, says one pioneer (S3A), which has been positive for development. Another pioneer (S11E) sees that with every coming wave, the concept of sustainable building develops, is enlarged and incorporates new themes. Today, we have instruments and tools that we did not have earlier. The development advances a one step every time. Pioneer S11E thinks that a new wave in urban planning is coming. A Swedish demonstration project of passive houses with low energy use in Lindås, Göteborg (Picture 7.2) also indicates the direction of the future.

From an international perspective, several respondents think that Sweden has lagged behind in development. Sweden can no longer be seen as a forerunner for energy efficient and sustainable building. This also concerns the use of wood in construction. One of the reasons pointed out by the respondents is that there is no longer money for research and development projects. One pioneer also mentions that the low cost of energy in Sweden does not motivate energy efficiency. In contrast, several respondents think that Sweden has come further than many other countries, for example, in demanding and using environmental specifications for building materials.

The Dutch respondents

Dutch respondents show more diverging ideas of the state of sustainable building. The interviewed clients and a few of the architects think that sustainable building has become a natural part of the Dutch building industry, while the remaining respondents are very disappointed with development. The strong political support for sustainable building from the mid-1990s is gone. The government decided in 1999 that their investments should be diminished and that responsibility in 2004 should be left to the market to continue development on its own (see Section 2.7). According to the pessimistic respondents, this does not work as the

market shows no interest in that direction and does not go further than standard building regulations.

All respondents agree on the National Package (see Section 2.7) with volunteer measures to make sustainable building widely known and used. Furthermore, energy issues are always part of new building projects. Energy is motivating to work with for the building sector as energy can be translated into money, according to several respondents. The municipalities have incorporated sustainable building into their agendas and together with governmental institutions they lead the development as clients. However, according to several respondents, sustainable building is still on a low level in the Netherlands. At the moment, public discussion of sustainable building on the whole merely prevents the worst from being built. One pioneer says that there is a lot of awareness among the actors but the building industry is slow in making changes, so governmental and financial support is needed. The pessimistic respondents think that the market's motivation is restricted to subsidies and marketing. One obstacle mentioned by some of the pioneers is the high pressure on the housing market at the moment and everything that is built regardless of quality will be sold. Another younger architect experiences the opposite, where the high building prices at the moment tolerate some of the extra costs connected to sustainable building. As in Sweden, the Dutch respondents find less general interest in these questions at the time of the interviews. Sustainable building is not a trend, and a few movers and shakers uphold the development. One pioneer (N10E), like the Swedish pioneers, finds that the interest in sustainable building comes and goes in waves.

Just as their Swedish colleagues, some Dutch respondents think that the lack of money for development projects is an obstacle. Design tools are found to be supportive. One of the clients (N12C) says that as sustainable building is becoming the norm the focus has now turned to new areas, like health. She thinks that in two years nobody will speak about sustainable building anymore.

Who has the responsibility for a continued development?

A majority of respondents in both countries think that strong political support is the most important factor for continued sustainable development. Only the government can have the long-term perspective.

Without political support, only the idealists have the strength to continue. According to the pessimistic respondents, such political will is absent in both Sweden and the Netherlands. On the one hand, the politicians are not seen as competent enough on these issues, while on the other hand the market is not seen as able to further the development by itself. The building industry is not seen as a very progressive industry. Some Swedish respondents think that with higher demands on the building sector it will reorganise itself. Co-operation and conventions between the government and the building industry would be necessary. One Swedish respondent (S8A) thinks that a new oil crisis or a similar event will naturally provoke a change in the behaviour of politicians and the building sector.

The municipalities with the responsibility for urban planning have an important role. According to two Swedish clients (S13C, S15C) as clients they cannot continue to invest in the field without the support from society. For example, authorities should provide economic incentives for alternative sewage systems and disposal for sorted building waste. Swedish clients also emphasise the importance of co-operation between actors in the building sector. Everybody has to take his share of the responsibility.

Respondents in both countries think that front-line demonstration projects are a powerful instrument to achieve sustainable building but many respondents find that more could be done if sustainable building is to reach a broader level. Six out of fourteen of the Swedish respondents and three out of thirteen Dutch respondents, think that more severe building regulations could be supportive especially for the 'laggards'. As one Dutch architect (N1A) puts it:

> I think if, well if we had rules, then I wouldn't have to fight all the time.

Regulations and laws should be followed up and controlled to be effective. Respondents that are against more severe building regulations prefer regulations that stimulate creativity. In the Netherlands, the National Package is seen as supportive especially in a pedagogical way, as the measures so far are on a rather low level.

According to Dutch respondents, the government has to make sustainable building more attractive through financial instruments but also through opinion builders, for example, prominent architects who

take interest in the issue. They should create more demonstration projects and show the advantages of sustainable building. Several Swedish respondents do not consider the Swedish political support for sustainable development, LIP (see Section 2.6), as successful. The programme has been used only as a political instrument and what has been built is housing for the rich. Instead economic incentives and tax regulations should be used. One Swedish respondent thinks that insurance companies could support sustainable building by relating premiums, for example, to energy use. Higher prices on energy are seen as supportive in both countries as well as higher prices on water in the Netherlands[30].

Several of the Swedish pioneers consider the strongest force for necessary change to be the general public. We would need large educational programmes to gain insight into and to provoke lifestyle changes on a broad level.

Is sustainable building possible to accomplish? A Swedish pioneer expresses the opinion of several respondents (S3A):

> We have to believe it is possible to accomplish sustainable building, the ambition has to be that.[31]

7.4 Interpretation and characteristics of sustainable building

Terminology

The term 'hållbart byggande'[32] is, in Sweden, gaining ground as the official translation of 'sustainable building' among professionals. However, 'hållbar' can refer to buildings that are structurally sustainable. The term is probably poorly understood by the public at large. This has resulted in the use of more easily comprehensive terms like 'environmentally adjusted' or 'ecological' building. However, the term 'ecological' building is rejected by a majority of the Swedish respondents as misguiding or as an old term that has had a previous use.

[30] In Sweden tenants in apartments do not pay for the water and hot water is normally included in the rent.
[31] "Vi måste tro att det går at genomföra ett hållbart byggande, ambitionen måste vara det." S3A
[32] The terms 'bärkraftig' and 'uthållig' also figure in this discussion.

One Swedish respondent (S11E) prefers the more 'living' term 'ecological' before the 'dead' sustainable. He argues that 'ecological' is widely known and more encompassing. Sustainable building is seen by a large number of the Swedish respondents as a better term even though the translation into Swedish is difficult. A minority of the Swedish respondents (5) considers 'sustainable building' and 'environmental adjustment' to be different terms for the same thing. The remaining respondents (9) think that 'sustainable building' includes more aspects than 'environmental adjustment' as expressed by a Swedish developer:

> I think there is a significant difference because I would say that sustainable that's worth ten times more in its own way.[33]

Or as one of the pioneers (S2A) says:

> Environmental adjustment is a necessary condition, but not sufficient to obtain a sustainable society. [34]

Another pioneer (S11E) says:

> Environmentally adjusted building is when you try to avoid the worst scandals, while ecological building to me is when you, so to speak, try to create healthy houses and resource management, eco-cycles and adaptation to the site.35

Several of the Swedish respondents seem to agree that 'environmental adjustment' is merely a technical part of sustainable building. Sustainable building embraces more social aspects and the larger societal system. Sustainable building is also more long-term and holistic than 'environmental adjustment'.

Even the Dutch respondents have been confronted with the problem of finding a correct translation of 'sustainable building'. However, 'duurzaam bouwen' is *the* official term, has been spread by official sources and is also the term preferred by the respondents in this study. The term has its basis in the Bruntland report, which makes the concept

[33] "Jag tycker det är en oerhört väsentlig skillnad. För jag menar [att] hållbart det är tio gånger mer värt på sitt sätt." S13C
[34] "Miljöanpassat är en nödvändig förutsättning men inte en tillräcklig förutsättning för att nå det hållbara samhället." S2A
[35] "Miljöanpassat byggande, det är när man försöker undvika dom värsta skandalerna, medan att ekologiskt byggande det är för mig när man försöker så att säga skapa det här med sunda hus och resurshushållning, kretslopp och anpassning till platsen." S11E

clear, according to several respondents. However, according to respondent N10E, the term 'duurzaam' can, as is the case in the Swedish translation of 'sustainable', be understood as constructionally durable/sustainable, strong, robust and with long life. The term is probably among many understood as constructionally durable. The term 'environmental adjusted' is not widespread in the Netherlands. One respondent (N7E) says that there used to be a difference in the Netherlands between 'sustainable' building and 'ecological' building[36]:

> Ecological building was more focused on the health part. Not more, but it was sustainable building plus health things. Although at the moment, you can see that health is becoming more and more a topic in sustainable building.

One Swedish (S1A) and one Dutch (N1A) architect prefer to use the term 'smart' buildings for their activities. The Dutch architect thinks that the use of the term 'sustainable building' can be negative for his marketing, as this would put him in a special niche. Another Dutch architect (N3A) calls his activities 'healthy' buildings. Two Swedish pioneers (S5A, S4A) want to designate their activities 'environmental and sustainable eco-cycle adapted building activities',[37] respectively 'building for a sustainable society'[38].

Common frames of reference

Several respondents in both countries think that the term 'sustainable building' has been misused and that there has been inflation in the use of 'environmental correct' at the moment. As one Swedish pioneer (S3A) says:

> I mean, each and every one of us can define sustainable building as he wants. Each and every one of us can define Ecology as he wants. So, simultaneously with the increased attention and the increased willingness, the interpretations have diverged somehow so that each individual has his democratic right to make the interpretation he wants and… And for me, that makes it more confusing now then it was 30 years ago. The willingness is stronger, but the descriptions of objectives and the definitions are confusing. Because 'sustainable building' could simply mean that people are happy and comfortable.

[36] Other term used are 'biologisch', 'bio-ecologisch', 'energiebewust' and 'milieubewust bouwen' according to respondent N10E.
[37] 'miljö- och hållbart kretsloppsanpassat byggande' S5A
[38] 'byggande för ett hållbart samhälle' S4A

> /…/ As soon as everything goes well and as soon as we earn money and as soon as we don't commit suicide then it is sustainable[39]

Only two respondents in the study (N8E, N10E) work in an organisation that shares a common explicit model for sustainable building. A majority of the respondents (some have developed models of sustainable building) work alone or in small organisations where they have no established 'model' for sustainable building in common with their employees or colleagues. Several of the larger Swedish organisations have an environmental policy without further definitions. Respondents from smaller firms say that they share a tacit value system with their colleagues formed, among others ways, through formal or informal discussions. The perception of sustainable building still remains as based on personal interpretations. As expressed by a Swedish pioneer (S4A):

> So each of us has in some way interpreted these things in his own way.[40]

In the Netherlands, the government defined 'sustainable building' early on, while in Sweden no official 'definitions' have been set up. Swedish attempts to define the concept 'eco-village'[41] are strongly criticised by some Swedish respondents in the study (S2A, S4A, S11E). The list is criticised for being too detailed and thus exclusive.

About half of the Swedish respondents have official environmental policies in their organisations (mainly the larger organisations). A majority of the respondents, ten of the Swedish and eight of the Dutch, have decided to make clear statements that they work with sustainable building while others do not wish to make such statements or do not think it is necessary to do so.

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[39] "Jag menar hållbart byggande det kan ju var och en definiera som han vill. Ekologi kan var och en definiera som den vill. Så samtidigt som uppmärksamheten har ökat och viljan har ökat så har tolkningarna divergerat på nåt sätt så var och en har sin egen demokratiska rätt att tolka som han vill och...Och det gör ju att för mig är det mer förvirrat nu än det var för 30 år sedan. Viljan är starkare, men målbeskrivningarna och definitionerna är förvirrande. För hållbart byggande kan vara att människor är glada och trevliga bara."; "Så fort det går bra och så fort vi tjänar pengar och så fort vi inte tar livet av oss så är det hållbart." S3A

[40] "Så var och en av oss har ju på nåt sätt tolkat dom här sakerna på eget sätt." S4A

[41] Ta med Boverkets lista:

Characteristics of sustainable building given by the Swedish respondents

The very point of departure for their engagement differs from one respondent to the other and thus also their view of 'sustainable building'. Several respondents mention that measures taken on an urban level are of more importance than those on a building level. Following this, focus should be on the energy issue and then material choices, in that order. Several respondents think that 'sustainable building' includes social, economic and technical aspects. However, the economic part is doubted by some respondents as expressed by a pioneer (S3A):

> I find it strange that it should be economical and not more expensive. I mean a changeover costs more. But that is something they have incorporated to make the market happy.[42]

Many key words mentioned by the Swedish respondents belong to the technical sphere: resource efficiency; minimising the harm on the natural environment; caring for biological diversity; recycling and reuse of materials; minimising the use of hazardous materials; closing the eco-cycles, etc. Even so, some respondents (S2A, S3A, S12C) find that the social issues exceed the technical in importance. The participation of the user in the design processes and the social contact in the neighbourhood, with the 'eco-village' as a good example, is brought forward. Necessary changes need deeper changes of the general publics' awareness, which can be achieved through the every-day life and through larger educational programmes in a slow and gradual process. This is expressed by one of the pioneers (S2A):

> The participation of people is the absolutely most important. /…/ I usually say that when we talk about ecological planning…/…/…then the human being is the main point of departure. After that comes the site and then the technology to perform from the long-term perspective[43]

[42] "Det här att det skall vara ekonomiskt att det inte skall kosta mer det tycker jag är konstigt. För en omställning kostar ofta mera. Men det är ju någonting man tagit in för att marknaden skall bli på gott humör." S3A

[43] "Människors deltagande är det absolut viktigaste." "Jag brukar säga att när vi pratar om ekologisk planering, [det pratade vi om i början,] då är det människan som är den viktigaste utgångspunkten, och sen så är det platsen och sen har vi tekniken för att kunna genomföra det långsiktiga." S2A

Another pioneer (S3A) makes a longer statement (that has been shortened here) about the importance of the social, departing from a discussion about people living together in an eco-village having to find solutions to common satisfaction:

> Living with these conflicts every day. /…/ That's what I think is the beginning of the discussion about the environmental adjustments. /…/ Socially, now I only talk about the social. It gives, it influences the technical. /…/ Now people say 'I don't want to, I haven't got the energy, I haven't got the time'. And that's how we act, but that's because we don't really know /…/ From social engagement you can move on to an environmental engagement, but this demands knowledge and education.[44]

For one Swedish architect and pioneer (S1A) 'sustainable building' is a smart way to build. This smart building should be resource efficient, would provide a healthy interior climate and would be beautiful with a clear expression of function. Technique and architectural expression should be integrated. He thinks that this is the 'natural' way to build houses at low cost, with good materials, etc.

> It's just that it becomes a term for something that should be self-evident. /…/…it is natural that everybody that works with these issues, architects and others, tries to build decent buildings. /…/ You can say that it is a way of building that creates as little nuisance as possible for the environment, for coming generations, everything. [45]

Many respondents put forward the aesthetic values as part of the sustainable building concept. Others have aesthetic values as the foundation for sustainable building as expressed by an environmental consultant (S10E):

> If we build ugly houses they will not last long and that is not good from a sustainability perspective. Our idea is to design durable buildings.[46]

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[44] Så att leva med konflikterna i den här lilla vardagen /.../ Det tror ju jag är början till samtalet om miljöanpassningen.../.../ /.../ Socialt, nu pratar jag bara om det sociala. Det ger, det spiller över på det tekniska/.../ Nu heter det att jag vill inte, jag orkar inte, jag hinner inte. Och det är så vi agerar men det beror på att vi inte riktigt vet. /.../ Från ett socialt engagemang kan man komma till ett miljöengagemang men där krävs det kunskap, och pedagogik." S3A

45 "Det är bara att det blir ett begrepp på något som borde vara självklart. /.../ ...det är väl naturligt att alla då, arkitekter och andra som arbetar med de här sakerna försöker att åstadkomma vettiga hus.. /.../ Man kan väl säga att det är väl ett byggande som ställer till så lite elände som bara är möjligt för omgivningen, kommande generationer, allt." S1A

46 "Om vi bygger fula hus kommer dom inte att leva längre och det är inte bra ur hållbarhetssynpunkt. Vår idé är att rita långlivade byggnader". S10E

One architect (S6A) finds that the interesting parameters are those that are possible to measure: operational cost and the lifetime of the building. The conclusion is thus:

> Do not tear down, but build durably with good quality and low energy use.[47]

The same respondent is suspicious of solar energy technology and does not focus on materials use due to deficient information about their environmental characteristics. One of the pioneers (S4A) also focuses on quality but from another perspective:

> S4A: So for me, sustainable building is to build with very good quality from the beginning.
>
> Q: So that it lasts longer?
>
> S4A: So it lasts longer. Yes… or no, not that it will last longer but to get a low impact on the environment during use.[48]

The same respondent mentions the terms *flexibility* and *generality*, which are supported by other respondents in both countries.
Several pioneers (S2A, S3A, S5A, S1E) point to the unique in every situation and advocate locally based solutions to close the eco-cycles on the spot. As expressed by a pioneer (S2A):

> …I do not believe in any general solutions because every situation has to be solved according to the specific prerequisites. But if you solve the problem as close to the source as possible then that has to be better then transporting the problem and using large-scale solutions.[49]

The clients in the study are not in favour of small-scale systems for sewage systems. They have not been found to be reliable, they are more expensive and as long as society does not support local systems with economic incentives, they can, as clients, take the entire responsibility for carrying out development.

47 ”Inte riva, bygga varaktigt med kvalitet och låg energianvändning”. S6A
48 ”Så för mig, hållbart bygge det är att bygga med väldigt bra kvalitet i början. Q: Så att det håller länge? S4A: Så att det håller länge. Ja eller, nej inte så att det håller länge, så att det blir låg påverkan på miljön utav driften.” S4A
49 ”...jag tror inte på några patentlösningar för varje situation skall lösas utifrån sina förutsättningar. Men om man löser problemen så nära källan som möjligt så måste det vara bättre tycker jag än att transportera bort problemet och gör storskaliga lösningar av det.” S2A

Some of the respondents say that they have the global issues and factor 10 in mind when planning new developments even if the factor 10 concept can be difficult to directly use in practice, as expressed by this pioneer (S3A):

> Nobody will deny that global equity is important, but it's difficult to implement in the sector. /…/ Working globally can't be about working on singular large scale, but producing small scale in great quantities.[50]

The respondents reflect opposite opinions in some questions. For example, two of the pioneers (S4A, S11E) advocate impermeable buildings to reach good energy efficiency. However, impermeable buildings are surrounded with rumours of being too sealed and providing an unhealthy indoor climate. This is based a complete misunderstanding of the physical laws, argues pioneer S4A. If you instead want mould problems then you should build permeable buildings. He gets support from another pioneer (S11E):

> Per definition an ecological building cannot be unhealthy. I mean that an impermeable building is a healthy building.[51]

One of the younger architects (S9A) reflects a more suspicious attitude to impermeable buildings. He also points out a possible negative effect of the wider use of larger quantities of insulation in energy efficient buildings from a global resource economic perspective.

To the question whether there are different truths about 'sustainable building' one pioneer (S11E) says that there are not different truths but different interpretations. If you have the idea, for example, to sell ventilation systems then you will use this as a basis for your definition. The same respondent is, for example, convinced of the sustainable qualities of wood, relying on a recent Life-Cycle Analysis of wood:

> Wood is better then metal, it is hard to argue anything else.[52]

[50] "Ingen kommer ju att förneka att det är viktigt med global rättvisa men det är svårt att få in i branschen. /.../ Att arbeta globalt kan ju inte vara att arbeta i stort, utan att göra allt i mängder av smått." S3A
[51] "Definitionsmässigt så kan inte ett ekologiskt hus vara ohälsosamt. Jag menar, ett tätt hus är ett sunt hus" S11E
[52] "Trä är bättre än metall, det är svårt att säga emot." S11E

Another architect is convinced that concrete is a better choice than wood (S6A):

> In my opinion, although you currently cannot give a clear answer whether wood, for example, is 'ecologically' preferable to concrete, it is perfectly clear that concrete is much more durable than wood. So then a natural, ecological conclusion would be to use concrete and not wood.[53]

Few respondents exhibit explicit models of how they perceive and work with sustainable building. Pioneer S11E uses a model in form of a tree. At the roots we find the fundamental issue and in the branches and leaves the details.

Characteristics of sustainable building provided by the Dutch respondents

The Dutch respondents also have different interpretations of sustainable building. One environmental consultant responds as follows:

> Well, I find that very difficult, myself, and I think most people at [name of office] have accepted the Brundtland definition. That is quite a radical definition, I think. And when you compare it to the things that happen now in the practice of sustainable building, sustainable building is only little part of what should be this [definition according to Brundtland]. And then I find it very difficult to imagine how really sustainable building would be. Because, it is something that is far away I think in imagination and in practice. And maybe it would also require another way of using a building not only designing it.

Several of the Dutch respondents set energy as the main ingredients in sustainable building. And most respondents mention that initiatives for sustainable building should be taken on an urban and societal level. As one architect (N4A) puts it, saving energy is also a matter of money while it is more difficult to economically defend reuse/recycling of materials. The material issues are also rendered difficult to resolve due to lack of reliable information.

[53] "Och jag menar, eftersom man inte idag kan ge ett tydligt svar på att t.ex. trä skulle vara mer ekologiskt att föredra än betong så är det väldigt tydligt att betongen är mycket mer hållbarare än träet. Så då skulle en naturlig, ekologisk slutsats vara att använda betong och inte trä." S6A

One of the environmental consultants (N9E) finds that within his organisation there are two different prevailing views of sustainable building, belonging to two separate working groups:

> …the 'Energy team' focuses on technical measures, its goal is CO_2 reduction. The 'Sustainable building team' focuses on integral quality, architectural design, and indoor climate, also temperature, ventilation, natural ventilation. Its goal is sustainability.[54]

Two of the Dutch architects (N1A, N6AE) share the latter of these views. They emphasise that sustainable building should be human, have a good atmosphere, fit into the surroundings, be beautiful and provide a healthy indoor climate, etc. Energy and material use come second. It is important that people are happy in the buildings (N4A):

> I think that's also a very sustainable aspect of building

Two of the representatives from clients (N1C, N13C) say that they base their practice on a 'wider' view of the sustainable building concept than the official definitions. Architectural quality, durability, a systems perspective in design, as well as new concepts for living and working is part of their concept.

One of the pioneers (N5AE) thinks that it is important to achieve a balance in involved ingredients in the project: energy use, embodied energy, material use, waste, healthy indoor climate, etc., even if CO_2 reduction remains the main issue. There should be an overall investment not just single high points. Several respondents find that the global issues are not present in Dutch publications on sustainable building, as expressed by respondent N7E:

> When you talk about sustainable building then it's, I think, it's focus is on the levels where designers are involved, from city planning to details of buildings, but not in a more world-wide frame.

Several Dutch respondents (N1A, N4A, N6AE, N9E) bring up the above mentioned controversy between energy efficient buildings and a healthy indoor climate as commented by architect N4A:

> Housing are so closed, it's awful! There should be much more energy spent on. /…/ …the housing gets very closed, very insulated and everything is done properly on paper but I think it is awful to live that

[54] The quotation was corrected from the original by the respondent in April 2004.

> way. And that's the difficult part. So that's why I think it's nice if you have a windmill somewhere, then you can use more energy…/…/ I think well, is it that smart to have a zero-energy house when you fly for example? How does it [fit] in the bigger picture? And then sometimes you should spend a little more energy and provide a better indoor climate.

Another respondent agrees (N1A):

> You can build environmental friendly but such a building is not necessarily healthy to live in.

One client (N12C) brings up what she finds to be a controversy between the established idea of sustainable building and durable quality in building. She finds that in sustainable building, wood is supposed to be a good choice (for example, in facades) but according to her the material is not durable.

Pioneer N10E presents two models for sustainable building. The first, the PPPP model shows a tetraeder with the four dimensions: People, Planet, Profit/Prosperity and Project (Figure 7.3). The second model emphasises three qualities that should be equally regarded in sustainable building: the environmental quality, the process quality and the design quality (Figure 7.4). Sustainable building should be 'build-able'; you have to arrange it in such a way that everybody is happy. *"In a chain if one link is weak, then the whole chain is weak. But if you integrate it like this, one link may be weak but together we're strong"*.

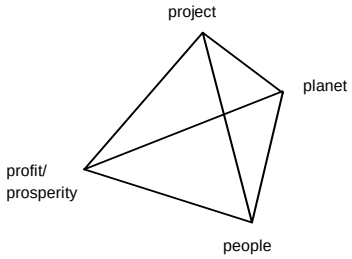

Figure 7.3 The PPPPmodel for sustainable buidling presented by the Dutch pioneer N10E.

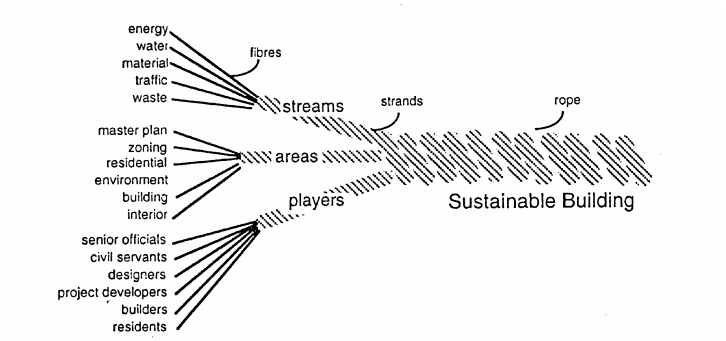

Figure 7.4 Three qualities of sustainable building. Model by Dutch pioneer N10E.

7.5 The personal or organisational approaches to sustainable building in practice

Swedish respondents

The approach to work with sustainable building differs among the respondents. Some of them (S4A, S5A, S10E, S11C, S14C) have a vocation and only work with projects that have a sustainable building profile. Others (S1A, S2A, S7A, S9A, S12C, S13C) also work with other kinds of projects mainly because there is too little demand for sustainable building. Three respondents (S7A, S12C, S13C) say that they work with different levels of sustainable building, a basic level in all projects and higher levels when this is asked for. The clients (S12C, S13C) have progressive ambitions to reach higher levels of sustainable building. This is also due to increasing customer demand, as the customers become more aware of energy costs, for example. A third category of actors thinks that sustainable building is embedded in their practice and does not have to be emphasised (S6A, S8A). One of them (S6A) says that they always incorporate environmental considerations into their projects, they think in 'ecological terms', even if this is not pronounced or expressed:

> As far as we're concerned this is a part of all projects.[55]

His statement is supported by another architect who thinks that in general architects have higher ambitions than their clients (S8A):

> We don't *not* advertise it but it is there in the programming.[56]

Among those who have a vocation working with sustainable building, we find aspects in their approach that can be educational for others. One of the clients (S14C), works for a small firm that has, through many years of development and research in renewable energy, reached a level at which they have sufficient knowledge and techniques that work and that can be implemented. The respondent says that they use the technique that they find efficient and good working, and do do not invest

[55] "För *vår* del finns det med i alla projekt." S6A
[56] "Vi skyltar inte med det, det finns med programmatiskt". S8A

further in innovations. Their ambition is to provide reasonably inexpensive housing for rent.

One of the pioneers (S1A) expresses a rather relaxed approach to sustainable building still driven by deep insight and lust for the issue:

> It is kind of a point of departure. It is important that you do as well as possible with what you're working on; take responsibility, try to accomplish it to at as high a standard as possible. Another side of it, I think, is the lust to experiment, the dream to build houses that can manage this and that. It could be about ventilation, how it [the house] is heated, and things like that. Darn, it is so much fun! /…/ I don't believe it is good to say to yourself that now I am going to save the world... /…/ You have to think it is fun in some other way as well. Try to build good things. And then, in the projects we do, try expand the boundaries a little. /…/ Of course you use your knowledge and experiences in all projects, of course you try to convince the client to make good and smart choices. Usually we succeed with that. If there are extremely bad finances in one place and you have to use plastic handles or whatever.. then you have to think it over and you have to look at it as a whole. But if they [the clients] for financial reasons want to bring in sealing with PCB then I would pull out of the deal...[57]

Another pioneer (S4A) expresses a scientific approach to sustainable building:

> People come to me. I want to investigate these things in a scientific way. That was *our* way to understand this, *my* way to approach this. But not in some general terms of building bio-climatically or something. A lot of people say that you should build with clay because that is 'healthy'. I want to know *how* healthy it really is. [58]

[57] "Det är väl ett slags utgångsläge då. Det ju viktigt att man gör så gott man kan med det man håller på. Tar ansvar försöker göra det så bra som möjligt. Nästa sida av det tycker jag, det är den här experimentlustan som finns, en dröm att göra hus som klarar det ena och det andra. Det kan vara hur det ventileras, hur det klarar att värma upp sig själv, eller nåt sånt där. Jävlar, det är så kul!/.../ Jag tror inte att det går att tänka sig att nu skall jag rädda världen.../.../ Man måste tycka att det är kul på nåt annat sätt också. Försöka se till att det blir bra grejor. Och sedan försöka att i de projekt vi gör sticka fram en fot va. /.../ Men det är ju klart att man tillämpar väl sin kunskap och erfarenhet i alla projekt klart att man försöker ju övertyga kunden att göra så bra och smarta val. Det brukar vi lyckas med. Jag menar: Är det nu så att det är vansinnigt dåligt med pengar på nåt ställe och man måste ta några dörrhandtag av plast eller, så får man ju fundera på det och titta i det stora hela. Men är det som så att man, av kostnadsskäl vill ha in, täta med PCB fogar då skulle jag liksom vända på klacken och gå därifrån..." S1A

[58] "Folk kommer till mig. Jag vill undersöka dom här sakerna på ett vetenskapligt sätt. Det var *vårt* sätt att angripa det på, *mitt* sätt att angripa det på. Men inte i några allmänna termer om att bygga bioklimatiskt eller någonting sånt. Det är många som går ut och säger, man skall bygga med lera t.ex. för det är *sunt*. Jag vill *veta* hur det verkligen förhåller sig. S4A

Two of the pioneers (S4A, S5A) say that an important approach in a sustainable building project is to educate the client and if possible the whole project organisation as well as the constructing labour. Pioneer S5A says that in a recent project he started by giving lectures and showing good examples. As he says:

> When I'm out talking about this way of building, I try to explain that if you can't describe *why* you should do it this way, then you can't explain *how* you should do it either. Nor *what* you can learn from it.[59]

Pioneer S5A is an example of an actor who lives as he teaches. He thinks that otherwise you are not trustworthy. He finds that most people working with environmental issues do not live as they teach. He only engages in projects where he can work with these issues.

> I don't want to say that I know this, but I am committed to this holistic thought and this includes both how you approach the project.../…/ And how to establish what the social mission with the project is. What kind of life should be lived in the building? /…/ And you have to have an ecological vision, an ideal vision. If you didn't have the economic constraint then you could achieve the ideal ecological vision. /…/ Then you have to follow [the project] through without compromising till the end. You should not back down in such a process. The environmental aspect has to be there from the beginning.[60]

He has built his own sustainable house to use as a demonstration and in marketing his work. As he says:

> Well, if I hadn't built that house then I wouldn't have had a single job. /…/ If we can't show good examples of what we can do then we're not trustworthy. [61]

However, he admits that even if he can show low investment and running costs for his house, few have showed interest in making such

[59] "När jag är ute och pratar om det här byggandet så brukar jag förklara att om man inte kan beskriva varför man skall göra det här, så kan man inte heller förklara hur man skall göra det. Och inte heller vad man kan lära sig utav det här." S5A

[60] "Jag vill inte påstå att jag kan det men jag har i alla fall engagerat mig i den här helhetstanken och det är både hur man nalkas projektet.../.../ Och det är att klara ut då att man måste ha en social mission med projektet. Vad är det för liv som skall levas i byggnaden. /.../ Och man måste ha en ekologisk vision en ideal vision. Om man inte hade den ekonomiska begränsningen så är den idealiskt ekologiska.../.../ Sen kör du kompromisslöst till det är färdigt, man får inte backa i en sån process. Miljön måste vara där från början."

[61] "Ja men alltså hade jag *inte* gjort det huset så hade jag inte haft ett enda jobb. /.../ Om inte vi kan visa upp goda exempel på vad vi kan göra så är vi inte trovärdiga." S5A

choice. The same pioneer estimates that he commit about about 50% of his time to research and development, which he finances himself.

Dutch respondents

The situation in the Netherlands is different than in Sweden; it has a niche market for sustainable building. Several of the respondents work exclusively or almost exclusively with sustainable building (N2A, N5AE, N6AE, N7E, N8E, N10E). Still it might be necessary to persuade a client as expressed by N5AE:

> [When] they don't ask us to do that [sustainable building] then we ask them, or we tell them that we can do it [sustainable building]. Sometimes we have a rather tough discussion.

Several environmental consultants (N8E, N9E, N10E) say that it is important to set the ambition level from the beginning of the project so that all involved have the same vision. One environmental consultant (N8E) says that they give a workshop at the beginning of a project to show good examples. Usually they do not show whole building but parts of it, some solutions. Otherwise there is the risk that people will be rejected by a certain design

> … well I don't like this architecture so I don't like sustainable building. We always say, well sustainable building can look just like every other building if you want.

Another environmental consultant (N9E) says that he was surprised how great an influence they could have on the outcome of a project. In his firm they always try to persuade the client.

> We try to persuade the client to think with us about strategies to arrive at a concept of sustainable building and not just a list of measures. In this way, we can achieve a sustainable plan.[62]

Several environmental consultants (N7E, N8E, N9E) find that they are the only actor in the building project that defends the sustainable building concept. Environmental consultant N9E finds that clients are often interested in sustainable building only due to the subsidies provided.

[62] The quotation was corrected from the original by the respondent in April 2004.

One of the architects (N1A) who does not work exclusively with sustainable building says that it is possible to achieve sustainable building even if the client is not aware of it:

> Yes because sometimes the client doesn't even know what you are doing. You are designing and detailing the thing as you think best. If there is no extra cost, he [the client] doesn't need to know. You choose the right materials in a natural manner. And of course there are many things that cost money and then you have to try to impart the concept.

The clients in the interview who were exclusively developers, committed to sustainable building when asked to. They followed the rules. If there is a market for it then they will provide sustainable building.

Several of the Dutch respondents do their own research and experiments (N3A, N4A, N5AE, N6AE). Some of the environmental consultants also become involved in and initiate full-scale building experiments and innovation projects (N8E, N9E, N10E). One of the pioneers (N3A) is an inventor and in the past 20 years has worked with innovation technique and experiments. One the architects (N4A) engages students to conduct experiments that are evaluated. The results are kept in a 'knowledge bank' to be used in future projects. He thinks that it is important that there is lust for a project. If you are obligated to sustainable building then the process becomes painful and will be reflected in the result:

> So we do the research ourselves. But it takes a lot of effort. That's true but it's nice to do it. /…/ For me, it is fun because we have so much fun, because we like to have fun, that is one of the criteria. /…/ Because if it is such a painful process, if one doesn't have much fun during the process then…/…/ I don't want to get trapped in a corner.

One respondent (N7E) works as an environmental consultant, at a 'change agency' to give information and inspiration:

> I usually work with organisational things and knowledge sharing, how you can inspire people to start experiments in this field. I translate information for the people that need it. Not by giving technical information, but explaining how to work together and evaluate things, use information.

Support in daily practice

Several respondents in both countries think that it is important to use arguments other than environmental ones when selling sustainable building to customers. As one Swedish architect says:

> I thought there would be more idealism at least when it's not more expensive. But the delay is much greater then that.[63]

Mainly economic arguments are used to convince people and the use of life-cycle costs is welcomed. As a pioneer says:

> We have to speak the language they understand. And that is the language of the wallet.[64]

Another argument used is that sustainable solutions have higher quality. In the Netherlands, the argument for better health and indoor climate is convincing. In Sweden, this does not work and as argued by a Swedish architect (S9A) people in Sweden seem to have trust in what is sold on the market as being 'controlled'. To convince the private consumer, one Swedish pioneer thinks that it is important that the inhabitants in sustainable housing get feedback for their commitment. One Dutch environmental consultant set her confidence in trends:

> So when PV-cells [Photo Voltaïsch, solar cells] become a trend that is a good thing. Then, people, don't want to use the technology because of the energy, but it is sophisticated to have solar cells on your roof. That should be the best way.

Obstacles to daily practice

Among obstacles mentioned in daily practice we find costs, time-pressure and the ignorance and lack of knowledge among builders, clients, private customers and consultants, as expressed by a Swedish architect (S9A):

> Public awareness is microscopic[65]

[63] "Jag trodde att det fanns en större idealism åtminstone om det inte var dyrare. Men trögheten är mycket mycket större än så." S9A
[64] " Vi måste prata det språk som dom förstår och det är plånbokens språk. S5A
[65] "Medvetenheten hos allmänheten är mikroskopisk" S9A

A Swedish environmental consultant (S10E) thinks that most clients make empty promises about sustainable building. They do not have the knowledge to implement their objectives and often mix objectives with means. She finds that here is a lack of follow-up of objectives in the process. Several respondents also point to discrepancies between objectives set up by managment in different organisations and the agreement among the labour in the 'floor'. There is a confusion of objectives and means. Mainly Swedish respondents point to structural problems, cartels and conservative forces in the building sector as being opposed to sustainable development. Some larger contractors have a strong position in Sweden today. One Swedish architect (S9A) that often works with small-sized constructors finds obstacles in economic advances provided by 'non-sustainable' material producers.

One obstacle mentioned by architects in both countries is that the market values of dwellings have become important, resulting in other more remunerative investments being prioritised. Several respondents in both countries find that the ruling economic system that focuses on short-term gains works in opposition to sustainable building and building for longer lifetimes.

7.6 The actors and the building process

The respondents had differing opinions about which actors that play the key role in realising sustainable building. A majority of respondents from both countries (N2A, N3A, N5AE, N6AE, N8E, N9E, S1A, S2A, S5A, S8A, S14C, S13C) ascribe the strongest role to the client/developer. The client/developer is the one that orders sustainable building and pays for it. He then has to demand that particular competence among the consultants and constructors he engages. A client who orders sustainable building gives imperatives for the sector to achieve such competence.

According to a Dutch client (N13C) the local authorities and/or the regulation system play the strongest role in realising sustainable building. Two Swedish and one Dutch respondent (S4A, S9A, N7E) think that it depends on who initiates the project. This committed person or 'fiery spirit' can be the architect, the client, the local authorities, an environmental consultant, or the users. Two Swedish pioneers (S4A,

S5A) emphasise that the architect's task inspire and educate the client (S5A makes a metaphor of the Mediaeval patron).

A few respondents ascribe the key role to client and architect together while others (N1A, N4A, S3A, S6A, S9A, S10E) ascribe the architect the strongest role. One Swedish architect (S6A) says:

> The architect always has the determining role in designing buildings. So nobody plays a more important role. /…/ The relation can be 49-51 but I will always claim that the architect has the strongest position.[66]

He thinks that the client does not play a more important role because he does not execute the task. Other respondents who attribute the architect the largest role defend their position claiming that if the architect does not take responsibility for sustainable building, nobody else will (S10E) or if the architect does not want to achieve sustainable building then it won't be achieved (N1A, N4A). The client/developer has seldom the knowledge to realise sustainable building, as pointed out by a Swedish pioneer (S3A):

> I must say that, if he is allowed to, the architect can have the *strongest* influence.[67]

Several respondents advocate an early involvement of all disciplines in the building process. Many architects think that the architect should be involved from the beginning to the end for best results. Teamwork, transdiciplinary work, integrated design are terms mentioned. It is also important that all actors are committed to achieving sustainable building. There is more time needed in the process to simulate different solutions, for information and knowledge retrieval, for education and for discussions, and this is to be budgeted for. Some time-consuming phases of the design process can be an isolated phenomenon as the results can directly be replicated in new projects.

The respondents mention that the level of ambition has to be settled and agreed upon among all parties involved. The level of ambition also has to be achievable. You cannot be a 'fundamentalist' say some respondents though they agree on the urge to change contemporary

[66] "Arkitekterna har alltid en avgörande roll i hur byggnader utformas. Så ingen annan har en viktigare roll." "Relationen kan vara 49-51 men jag vill alltid häva att arkitekten har den starkaste rollen." S6A

[67] "Arkitekten kan ju påverka *mest* får jag säga, om han får lov." S3A.

building practices. Several Swedish architects find it important to educate involved actors, from the client to the construction workers, from the beginning of the process. The program should not be strict according to a Dutch architect, it should allow for changes in the process.

The involvement of a project champion[68] is by many respondents seen as supportive. This can be the architect or somebody else, for example, an environmental consultant/expert. This project champion has the task of defending the ambitions for sustainable building as pointed out by a Swedish pioneer (S5A):

> There must be somebody who takes responsibility for carrying the idea throughout all the phases. Because knowledge is lost in every delivery phase.[69]

A Swedish respondent (S10E) finds it supportive to establish long-term relations with actors for a series of productions instead of always confronting new situations and new actors.

Some pioneers in both countries (S1A, S2A, S3A, N2A) find that contact with the user is one of the most important ingredients in achieving sustainable building. The contact should be initiated early in the process so that the users can participate in setting the ambition and the programme for the project. A Dutch pioneer points out the importance of 'selling' the idea to future tenants or users. This is also convincing for the client as it assures that the houses will be sold.

Respondents in both countries do not see the contractors as a problem as long as they are provided with correct information. It is, however, supportive if the contractor has some knowledge in the field.

The role of the architect

Most architects in the study find that a consolidation of the architect's position in the building process would be supportive for sustainable building, as well as for other qualities in architecture. Several of the respondents have themselves had a strong position in successful sustainable building projects.

[68] In Swedish: Projektlots

[69] "Någon måste vara med och ta ansvaret från idén och föra den idén genom alla dom här leden. För man tappar kunskap i varje överlämnande skede." S5A

All respondents consider the architects as a professional group to play an important role in a sustainable development (for sustainable building, but also in a wider societal perspective) but several think that architects have not taken this task seriously. They are not found to be interested, except for a small number of dedicated architects. Instead, architects follow the trends and at the moment sustainable building is experiencing a backlash. Furthermore, sustainable building has for a long time been associated with an unpopular form of aesthetics, especially among architects. One of the Swedish architects (S8A) thinks that the larger architect offices in Sweden have a strong position and should be able to make a stronger commitment to sustainable building.

Some respondents think that attitude is slowly changing when more prominent architects, such as Sir Norman Foster commits to sustainable building. Besides such opinion builders, we need inspiring and beautiful examples of sustainable building and the commitment of architectural periodicals, as pointed out by a Swedish pioneer (S1A):

> That it [an example of sustainable building] is brought forward as a piece of architecture to discuss. That I think is important.[70]

To bring about a change, a majority of the respondents point to the education of architects. Many respondents in both countries find that sustainable building has a low priority in the education of architects, which instead focuses on form and aesthetics. Sustainable building should be integrated and not taught in separate courses and should also be introduced at an early stage in the education. Pioneers in each respective country (N3A, S5A, S4A) also see an obvious lack of knowledge of building physics among both students and teachers. A few Swedish respondents (S5A, S8A) think that the education and the teachers at the architectural schools are far from practical reality and thus lack credibility. The schools are found to lag behind the real world where the demand for environmental consideration today is a fact.

Several respondents claim a new role for the architect. A Swedish pioneer (S2A) thinks that the architect should be more out on the field:

> …then you have the largest possibilities to influence[71].

[70] ”Att det lyfts fram som ett stycke arkitektur att diskutera. Det tror jag gör nytta.” S1A
[71] ”då har man störst chans att påverka” S2A

The rapprochement between user and architect is pointed out also by other respondents. Other respondents think that the architect should take a more comprehensive approach to the task and consider the long-term perspective. Several respondents think that the architect should take part in public debates, both in the profession and in society. The architects should also commit as a profession to pro-sustainable sector organisations, take larger interest in visionary work, in making expositions, organising debates, etc.

What is special about the sustainable design process?

As mentioned above several architects say that they are attracted to working with sustainable building due to the complexity of the task that renders the work more interesting. The design process is not different but it includes more ingredients, more factors to consider and therefore it becomes a challenge. As expressed by a Swedish architect (S6A):

> I think it is a splendid possibility for design as well, it is something to use to give buildings expression, a dimension in fact. An opportunity to play. /…/ Then I design a lot of 'ecologically' correct things without intending to, but rather from instinct. [72]

Making a sustainable building is definitely a matter of design, according to several respondents. The architect has an influence through the placement, the orientation, the form, the layout, etc. However, the design itself is not enough to achieve sustainable building. You also have to run through the objectives in the building process. You should have both substantial knowledge about sustainable building as well as knowledge of finance and subventions, according to a Dutch pioneer (N5AE).

The complexity of sustainable building often calls for the involvement of an environmental expert. The architect is a generalist and cannot always have the specific knowledge to implement sustainable building. Environmental expertise in the Netherlands is usually employed by municipalities (in planning matters and new developments), clients/developers and in more rare cases architects (for example, in competitions). The environmental expert or consultant can

[72] "Sen tycker jag att det är en utmärkt gestaltningsmöjlighet också, det är något att ge byggnader uttryck med, så det är en dimension helt enkelt. En spelmöjlighet. /.../ Så då gör jag en massa saker ekologiskt korrekt utan att det var någon avsikt. Snarare ur ryggmärgen då." S6A

also play the role of a project champion for sustainable issues. Respondents in both countries mention that engaging an environmental consultant is however often done for marketing reasons or to make a good impression for example in competitions. Employment of environmental experts seems less common in Sweden. A few larger actors in the field (architects, clients and constructors) have special departments dedicated to these issues.

The interview study includes six Dutch and two Swedish environmental consultants. The majority have a background as architects, which they find useful. They find it necessary to have knowledge about the design process. Two of the Dutch respondents work as architects and sometimes as environmental consultants for other architects. They find that the integration of sustainable issues easier when they both do the design and the consultancy.

The environmental consultant cannot entirely fill the lack of knowledge on the architects' side. As a Swedish pioneer (S2A) says, the architects need to have an *understanding* of the problem. According to the environmental consultants in the study, the architect has to have the *will* to create a sustainable building and to be open for co-operation. The architect needs some basic knowledge, also in order to judge the advice given, say some respondents (S6A, N4A). Out of personal experience they say that the quality of the advice is not always the best. Furthermore, the architect has to defend the aesthetic issues. A kind of rivalry between architects and environmental consultants can be discerned, as expressed by this Dutch respondent (N10E):

> If you're an architect and you have to advise other architects, then they feel that competing if you draw something for an architect, if you draw it too nicely then they think that you're designing, and of course they are the architect. It is better to draw the idea more primitively so the architect can accept the idea and make it his/her own design. We developed a design method to integrate environmental aspects into the urban design process, the method was used in an interdisciplinary team. Everybody was happy with it and with the results, but the designers didn't want it to be called a design method, for them it was a method of analysis. It looked as if architects don't want to design by method.[73]

[73] The quotation was corrected form the original by the respondent in April 2004.

Aesthetics vs. sustainability

In several cases the interviews have circled around the controversy between beautiful and sustainable and whether sustainable architecture should have a special design. Two respondents (S11E and N2A) think that sustainable building should be given a special expression in order to be distinguishable form other building. The rest of the respondents are against a special look for sustainable building that has characterised earlier examples of sustainable building. A Swedish pioneer (S1A) exclaims:

> 'Ecological' architecture is dead, fortunately![74]

All respondents think that good quality architecture is an important part of the sustainable building concept but many express difficulties in combining both. According to some respondents (S3A, N8E), either environmental aspects *or* architectural qualities will be put first and the other will be neglected. A Dutch architect (N4A) thinks that it is possible to combine both but this demands even more of the architect in the design and decision processes. A Swedish pioneer (S4A) thinks that there should be no trouble in combining both; it is a question of will:

> If only there had been equally strong forces behind creating an energy saving house as there are behind making a striking kitchen.[75]

One Swedish (S3A) and one Dutch respondent (S8E) regret becoming so deeply involved in environmental issues that they for years have neglected aesthetics. As expressed by the Swedish pioneer (S3A):

> I sometimes miss that I don't work with beautiful things. I haven't been able to put those other engagements aside. Then you could draw beautiful buildings but that comes second, I am not chosen for that. /…/ That would also be a shortcoming, if I couldn't unite these two things in a better way. But you can see in 'eco' projects all over the world that there are no beautiful buildings.[76]

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[74] "Den ekologiska arkitekturen är död och tur är väl det" S1A

[75] "Om det funnits lika stora drivkrafter att göra ett energisnålt hus som att göra ett fräckt kök." S4A

[76] "Jag kan ju idag sakna det att jag inte håller på med vackra saker. Ja, jag har inte förmått mig att skjuta bort dom här andra engagemangen. Och sen kan man rita snygga hus men då är ju det i andra hand, jag är ju inte vald för det. /.../ Det kan ju också vara en brist att jag inte kan förena dom här två bättre. Men det kan du ju se på eko-projekt överallt i världen att det är ju inte snygga hus." S3A

Another Swedish pioneer (S2A) also points to the opposite, that aesthetics are not everything:

> I absolutely want to protect beautiful housing, beautiful buildings, but that is not enough. There must also be another dimension. And then we have to convince people of what is beautiful. Because we are knowledgeable in that field. And that knowledge is nothing to be ashamed of...[77]

Some architects in the Netherlands known for their design, for example Mecanoo, have been involved in sustainable building in recent years. The difference between Mecanoo and an 'eco' architect according to a Dutch respondent (N4A) is that Mecanoo will always set 'beautiful' before 'environmental' when forced to make a choice. The conflict between environmental consideration and aesthetics falls back to the lack of reliable information, according to a Swedish architect (S6A):

> I am convinced that situations might occur when ecology or the sustainable perspective comes in conflict with architectural values. But that is very, very rare. Perhaps only in 1% of all tasks. /…/ I would imagine that it could be interesting to make a visitors centre facing a very beautiful view as an absolutely glazed building that would demand strong cooling down to become supportable. Which I mean is a crystal-clear wrong in 'ecological terms' so to speak, but still, maybe right. I might think that in this particular function it is the right thing to do, but in 99% of the cases it is subcounsciously that one chooses non-ecological or non-sustainable solutions when there is no conflict. You make a bad choice because you have the wrong information.[78]

Several other respondents (S1A, S3A, S8A) discuss the situation about being faced with making a choice between environmental performance and aesthetics. They conclude that when you make a choice that is not the best environmental choice it is important that the choice is taken *consciously*, as expressed by one pioneer (S1A):

[77] "Jag vill *absolut* värna om vackra bostäder, vackra hus men det är inte tillräckligt. Det måste till en dimension till. Och så måste man övertyga människor om vad som är vackert. För vi är trots allt kunniga på det området. Det behöver man inte skämmas för..." S2A

[78] "Ja, jag är övertygad om att det kan komma in tillfällen när ekologi eller hållbarhetsperspektiv kommer i strid med arkitektoniska intressen. Men det är väldigt väldigt sällan…det kunde vara 1% utav frågeställningarna. /.../ Jag skulle kunna tänka mig att det kunde vara intressant att göra ett besökscentrum mot en väldigt vacker utsikt som en absolut helt glasad byggnad som skulle kanske kräva väldigt stark kylning för att bli dräglig. Som jag menar är kristallklart ekologiskt helfel så att säga. Men kanske ändå rätt. Jag kan tycka att just i denna funktionen, att det är rätt att göra det, men i 99% av fallen så är det omedvetenhet som gör att man väljer oekologiska och ohållbara lösningar där det inte alls är någon konflikt. Att man väljer fel för att man har fel information." S6A

> I think it is very important to be able to say that I can afford this and that[79]

Two Swedish pioneers (S3A, S2A) point out participatory design as a cause for not achieving the aesthetic results that they wanted even if both are convinced of the utter importance of participatory design and democratic processes in order to achieve sustainable development. Both pioneers tell about projects in which they were able to make the design without the participation of the users: One pioneer says (S3A):

> ...I didn't have to take the wishes of others into consideration, but I have been able to produce both 'ecological' and good…[80]

The other pioneers (S2A) say:

> And in this last [x] project, the inhabitants were not involved and directing the architecture, so I could do it myself.[81]

Developers in both countries give architectural quality a high priority in their projects. Architectural quality is a form of marketing as it can be spread for example in architectural periodicals. Customers also ask for architectural quality, as expressed by a Swedish client (S13C):

> Evidently, architecture is an incredibly important part in the future.[82]

7.7 Information retrieval, knowledge-build up and tools

Information retrieval

As sources for news and information retrieval in the field of sustainable building, the respondents in both countries mention: personal contacts, mail, networks, periodicals (mainly trade press, architectural periodicals, etc.), newsletters (building research organisations/business partnerships/trade organisations, etc.), conferences/seminaries, fares, books, study trips, and the Internet. Personal contacts and networks are

[79] "Jag anser att det är så viktigt att uttrycka just detta att jag kan kosta på mig detta och detta." S1A
[80] "... där har jag inte behövt ta hänsyn till andra utan där har jag kunnat göra både ekologiskt och bra..." S3A
[81] "Och just det här senaste [x] projektet det är ju ett sådant projekt som, där inte dom boende var med och styrde arkitekturen utan jag fick ju göra själv." S2A
[82] "Självklart är arkitekturen en otroligt viktig del i framtiden." S13C

the main source according to the majority of the respondents. Trade press has also played a significant role, whereas few respondents read research reports. Research is found to be too theoretical to be of interest in practice, too difficult to access or even non-existent. As expressed by a Swedish pioneer (S2A):

> You talk to people and read a bit. I suppose that is the industry in a nutshell, the way I am. There isn't much and there should be more such scientific material about this [sustainable building] but there isn't. Not that I know of.[83]

Those who read research reports are often involved in, or have previously been involved in or carried out research. Some respondents say that they look for research results when needed in a specific situation, but they do not read research as a routine. One Swedish architect (S6A) relies on information found in the press:

> We continually read a lot of trade press and our expectation is that research results are reflected in that trade press.[84]

Several other respondents find that trade press and architectural periodicals, with badly informed journalists, do not transmit adequate information about sustainable building. In the Netherlands, there are two journals specialised in sustainable building. Most Dutch respondents know of and read these journals. Architects in general cannot maintain total control of the development, i.e., they search for information when they need it. Several Swedish actors would welcome more easily accessibly research results.

Several respondents find that working in European networks and inter-disciplinary projects and constellations is a good platform for mutual learning and knowledge and information exchange. Another way of retrieving information is through colleagues and students when engaged in education. Some respondents who work at larger companies have the potential to pay for information retrieval or have special departments that provide such services.

[83] "Man pratar med folk och läser lite. Det är väl branschen i ett nötskal sån som jag är. Det finns inte mycket, det borde finnas mer sånt här vetenskapligt material kring det här, men det finns inte. Inte vad jag känner till." S2A.
[84] "Vi läser fortlöpande ganska mycket fackpress och vi har ju förhoppningen att forskningsresultat speglas i den fackpressen" S6A

Knowledge build-up and internal evaluations

Some respondents work in organisation where courses on sustainable building are provided for employees. Two respondents (S6A, N9E) consider that the level of the courses on the market is low which does not motivate participation. A Swedish environmental consultant (S10E) working at an architect office find it important to have education for the rest of the employees as her department alone cannot take responsibility for these issues.

Several respondents think that each project they participate in is a way of learning more. However, the internal evaluations are very scarce among the respondents in both countries. As expressed by a Swedish respondent (S7A):

> So we can only confirm that feedback is very scarce. And I am a little comforted by everyone else saying the same thing; irrespective of sector [there is the problem with feedback]. Everyone wants it but nobody does it.[85]

The same respondent gives three explanations for the scarcity of evaluations, which are confirmed by other respondents:

> Time pressure and stress. To be thrown into the next project. Plus the fact that at the same time nobody wants to fail, doesn't want to expose failures. Even if we learn most from those. /…/ …then it is always fun to start with something new…[86]

A Dutch respondent also points out the fact that building is very slow. It is a matter of years before you have results. Many of the respondents follow their own projects out of curiosity in a 'non-scientific' way. The knowledge is seldom written down and thus remains personal. Experiences are transmitted in informal ways in the organisation from person to person, in mentor-adept situations, in formal meetings on a regular basis or in follow-up meetings after a project (especially if something went wrong, according to the Swedish respondent S7A).

[85] "Så det är ju liksom bara att konstatera att det här med erfarenhetsåterföring det är väldigt dåligt med det. Och det är jag lite tröstad av att alla säger samma sak nästan. Oavsett bransch är det samma problem med erfarenhetsåterföring. Alla vill göra det och ingen gör det." S7A

[86] "Tidspress och stress. Man kastas in i nästa projekt. Plus det att man samtidigt inte vill misslyckas, man vill inte skylta med missarna. Fast det är dom man lär sig mest av. /.../ ...sen är det ju alltid kul att börja med nåt nytt..." S7A

A Swedish respondent (S7A) from a large architectural firm says that they are, at the moment, experimenting with different types of internal evaluation models, for example, in the form of role plays. A Swedish developer (S13C) says that they are conducting interviews with experienced personal in an attempt to externalise personal knowledge.

Also evaluations of the building project itself are scarce. Several respondents in both countries say that it is very convincing and thus good marketing to have an evaluation with results to show future clients. The respondents explain the scarcity of evaluations with little research and development money in the sector and the fact that clients do not want to pay for the evaluations. An exception to this is governmental clients, according to a Dutch respondent. One Swedish architect (S8A) thinks that this is a problem that should be dealt with on a higher level in society. Several respondents however have had the opportunity to work on projects that have received national or European money for evaluations. One Swedish pioneer (S4A) points out how important it is that an evaluation be carried out by an objective actor. If the client or owner carries out the evaluation there is a risk that the results will not be spread or trusted. Several respondents also point to the fact that a technical evaluation has to be planned for from the beginning, to install measuring equipment, for example.

The clients that own and manage their own property have an ongoing evaluation in management. Inspections, environmental revision and environmental quality systems are instruments for evaluating the projects mentioned by some respondents.

Dissemination

The majority of the respondents take active part in the discourse of sustainable building. Besides working in building projects many are active as lecturers, instructors and they write articles and books. Many architects also take an active part in promoting their building projects through media and trade press, especially architectural periodicals. Not all, but a majority of the respondents are willing to share their knowledge and find that this is rewarding.

Tools

All respondents agree on the necessity of tools, as sustainable building grows more complex. As a Swedish pioneer (S11E) says:

> …it is no longer enough to use artistic intuition to bring about good and trustworthy results.[87]

Many respondents find that they are drowned in information and that they lack reliable sources. The question is how to produce reliable and useful tools. According to the respondents, a good tool should be easy to use, transparent and at the same time not too simplistic, in order to be reliable. A complex list of chemicals and Life Cycle Analysis are useless without an expert evaluation. Swedish respondents point to the lack of data on building materials. A Swedish environmental consultant (S10E) says that it is difficult to produce the ultimate tool, whereas several tools together can approach the true picture

Tools can be: books, material lists, building material declarations, information on the Internet, good examples (to convince clients for example), etc. Political support and regulations are tools, as well as education and knowledge. One Swedish architect (S8A) sees the design process in itself as a tool where different ideas are tried out and discussed. Among Dutch respondents, the National Package is used as a tool even if several prefer their own 'lists' with higher ambitions.

Among many of the architects and pioneers the most used tool is their own experience. In the absence of scientific evidence, many respondents draw from personal preferences. A Swedish client (S14C) refers some of his choices to 'common sense'. The respondents seem to use a mixture of scientific evidence and personal preferences. A Swedish pioneer (S4A) chooses polystyrene plastic for it's good thermal characteristics despite the bad 'eco' image of the material. A Dutch pioneer (N5AE) declares that he would not use PVC even if they would come up with some Life Cycle Analysis proving that PVC is a better choice.

Most respondents prefer and use simple tools and checklists even if they find it important to develop complete environmental assessment

[87] "...det inte längre räcker med en konstnärlig intuition att åstadkomma bra och trovärdiga resultat." S11E

tools. In the Netherlands, such tools already exists[88] but not in Sweden. One Swedish architect (S9A) thinks that there is a risk that these tools can be used manipulatively and lead to increased bureaucratisation. A Swedish pioneer (S3A) points out the fact that the very basis for such tools is concensus on environmental problems and environmental impact caused by building activities. He finds that this is still a controversial issue.

Half of the Dutch respondents have experience of environmental assessment tools. One respondent is positive, as he finds these tools objective. Several respondents point out the problem that these tools are time-consuming, demand specialist knowledge and thus are expensive to use. One respondent (N9E) belongs to an organisation that develops such tools. Even there are they are not used as a standard, only in special investigations. Those respondents that have experience of environmental assessment tools see some weaknesses, for example, in the data and reference objects used. Some respondents think that you have to understand how the programme is built up to be able to evaluate and rely on the results. One Dutch respondent (N6AE) is very critical. His judgement is based on his experience of delivering data to a tool and how this data has been used. Some Dutch respondents have experience of using environmental assessment tools in educational situations and find them to be good pedagogical instruments.

Only two of the respondents (S7A, S10E from the same organisation) work with the official ISO systems for environmental quality. One explanation for the low use of ISO certifications is that the majority of the respondents work for smaller organisations where the ISO systems imply a heavy workload and high costs. Another reason is that confidence in ISO is not high. As one Swedish pioneer (S11E) puts it:

> For instance, you could have quality control on life jackets made of concrete...[89]

Instead, almost half of the Swedish respondents, as well as a few of the Dutch, say that they have their own quality systems that work *in compliance with* ISO.

[88] For example Greencalc and EcoQuantum.
[89] "Man kan t.ex. ha kvalitetssäkrade flytvästar i betong..." S11E

7.8 Built examples and demonstration projects

All respondents find that built examples are one of the most important instruments to support sustainable building. As expressed by a Swedish architect (S7A):

> In the context of buildings and the environment, built examples are unbeatable, there is no better way.[90]

A Dutch architect (N6AE) explains the reason for their importance as:

> Because it was *built* and that's also a reason why people can learn from it, because it functions.

A Swedish respondent (S7A) fills in:

> It's there, and that shows that you have coped with the economic, technical and all the other [problems] …[91]

The built example has various functions. A Swedish architect (S6A) gives them the attribute of reference objects, as otherwise the concept of sustainable building would be too vague. A Dutch pioneer (N10E) says that the good example is to inspire the 'front-runners' in the building sector while building regulations are necessary for the 'laggards'. The example as 'tool' is a way to concretise the vision of sustainable building and stimulate positive creativity. A Dutch respondent (N9E) points out the use of tools in programming new projects:

> …a lot of projects start by searching for ambitions and what you need at that moment is examples.

A Dutch respondent (N8E) thinks that a demonstration project is a project where the actors involved openly declare that they are building a demonstration which adds a competition effect.

> …you know that other people are watching what you are doing.

Built examples are especially important for architects, however, several respondents point out the risk of superficial studies of examples. The

[90] "Alltså exemplet, i såna här sammanhang när det gäller byggande och miljö. Det är oslagbart, det finns inget bättre" S7A
[91] "Det sitter där, och det vill säga då har man klarat av alla ekonomiska, tekniska, och alla andra [problem] som finns där." S7A

example has to be related to the context. One Swedish respondent (S3A) brings up the example of the urine-separating toilet systems that might not be a good solution in a residence for elderly people.

Many respondents find it important that the demonstration projects are evaluated and that results are spread. A Swedish respondent says:

> ...evaluation and dissemination are two important parts [of the demonstration projects].[92]

Several respondents think that it is important that even negative results are spread, as expressed by a Swedish pioneer (S11E):

> I think that every eco-village should have at least one or two mistakes. Then they have fulfilled their function so to speak.[93]

A Dutch pioneer (N10E) finds a problem in that evaluations from different projects are not compared and that the evaluations are seldom used:

> …architects want to create a new thing and don't look back.

The same respondent says that when asking for money to conduct an evaluation of a demonstration project that was a few years old, the proposition was refused because the project was not 'new' any longer.

A Swedish architect (S9A) thinks that it is important that demonstration projects are spread over the country. He thinks that examples of sustainable building should be exposed in detached home showplaces like the Swedish 'Husknuten'. He also points out the fact that it can be tiresome for inhabitants in demonstration projects to often receive visits and be expected to show the visitors around.

One risk with demonstration projects, according to a Swedish pioneer:

> They can easily become a kind of pedagogical lecturing from a governmental authority.[94]

Another risk pointed out by two of the Swedish clients (S12C, S13C) is that demonstration projects get too experimental and risky. Clients

[92] "...utvärdering och spridning är två viktiga delar av det [demonstrations projektet]." S1A
[93] "Jag tycker att varje ekoby skall ha åtminstone ett eller två misstag i sig. Då har de så att säga fyllt sin funktion." S11E
[94] "Det kan ju lätt bli en sorts pedagogiska pekpinnar från en statlig myndighet." S11E

prefer to take development stepwise in small steps as expressed by respondent, S12C, even though she is aware that time is short:

> Good examples are important but we get further if we can raise the level a little in all projects. /…/ Then, I know that we have to hurry up.[95]

Should sustainable building be distinguished from conventional building?

The answer given by one of the Dutch respondent (N8E) reflects what most respondents think:

> Yes and no. I think for the special pilot projects you have to distinguish between the two. And so you can concentrate on sustainability and radical solutions, but for building in general it isn't good to consider the environment as something special. It is just another demand, it should be normal and common sense. And only when you talk about very special solutions, then it might be useful to distinguish between the two.

A majority of the Swedish respondents (10 out of 14) reply 'no' spontaneously to this question. However, most respondents think that front-line innovative demonstration projects still have an important function. According to some respondents the 'distinguishing' is part of the past. As expressed by a pioneer (S2A):

> That time has passed. It was in the beginning that we had to show something. Today we have to integrate this into normal buildings.[96]

Some other respondents think that all buildings should be sustainable, as expressed by this architect (S6A):

> I don't see the purpose of having any 'normal' building so to speak, all building activities should be sustainable building.[97]

Furthermore, others do not find it necessary to make a fuss about sustainable building but just do it, as expressed by pioneer (S5A):

[95] "Det är viktigt med goda exempel men man kommer längre om man höjer ribban lite i alla projekt. /.../ "Sen vet jag att vi har bråttom." S12C
[96] "Den tiden är förbi. Det var i början som vi var tvungna att visa någonting. Men idag så gäller det att få in det i det vanliga byggandet." S2A
[97] "Jag förstår inte meningen med att ha något vanligt byggande om jag uttrycker mig så, utan allt byggande borde väl vara hållbart byggande." S6A

> It is the traditional that is the alternative. For me this is the normal way of building.[98]

A higher number of Dutch respondents[99] than Swedish think that it is still important to distinguish sustainable building, as expressed by a Dutch respondent (N7E):

> The issue has to be set on the agenda as long as we have unreached objectives.

However, one of the Swedish pioneers (S3A) thinks that we have to bring forward what needs to be altered, otherwise issues might be neglected:

> [But] the risk is rather that the contemporary building that is not good will be called sustainable if we don't distinguish between these concepts.[100]

The same respondent finds the 'marketing jungle' with new terms like 'the silent house', 'the recycled house' a bit tiring, while a Dutch respondent (N1A) brings forward the supportive marketing values of these labels. Another Dutch (N5AE) respondent points out the value of the influence of the public at large:

> …if you carry out a project that looks very nice and it is a good sustainable project, that the 'man on the street' understands that is just an ordinary good looking project and it is sustainable…

The difference between demonstration projects and experiments

The respondents in both countries show agreement on the characteristics that distinguishe a demonstration project from an experiment. A demonstration project makes use of existing and tried techniques, whereas an experiment develops new techniques. The experiment is the inventive phase that precedes the demonstration, which is the implementation. The experiment is for the research world and the demonstration project for the market, says one Dutch respondent. The experiment can and even should be more daring/risky than the

[98] "Det är det traditionella som är det alternativa. För mig är detta det *normala* sättet att bygga. S5A

[99] The question was posed to all Swedish but not all Dutch respondents.

[100] "Men risken är väl snarare att det byggande vi har idag som inte är bra blir kallat för hållbart om vi inte skiljer dom åt." S3A

demonstration, say several respondents, and you are not sure of the outcome. The demonstration projects have to function, to be operable; people are going to live there. And the technique has to be marketable. An experiment should be allowed to fail. An experiment should be conducted on a small scale, to minimise the damage of eventual failures but also to facilitate evaluation. A demonstration project ought to be full scale. A Swedish pioneer (S1A) wants to define demonstration projects as:

> ...you demonstrate the uses of new techniques and new methods in full scale.[101]

A Dutch pioneer (N10E) does not agree that the technology has to be new:

> A demonstration project can show a very old measure dating from the Romans that can still work.

Compared to a 'normal' project, a demonstration project is more expensive, says a Dutch respondent (N5AE). A Swedish pioneer is a bit opposed to the focus on demonstration values in a demonstration project:

> In a real project you have removed a lot of the spectacular and chosen technology that is needed instead of demonstrated.[102]

One Swedish respondent (S8A) thinks that experiments should be innovative:

> Every demonstration project should be an experiment. /…/ [There] is no reason to make a demonstration of a mainstream project.[103]

A Dutch respondent (N6AE) has a different view:

> A building should never be an experiment. Experiments should be done in advance…

[101] "...man demonstrerar användandet av ny teknik och nya metoder, i full skala." S1A
[102] "I ett riktigt projekt har man skalat bort mycket av det spektakulära och valt en sån teknik som behövs istället för att visa. " S11E.
[103] "Varje demonstrations projekt bör vara ett experiment. /.../ [Det] finns ingen anledning att göra demonstration av det som är mainstream." S8A

Two respondents (N2A, S2A) think that the building sector conducts 'experiments' in ordinary projects. The sector uses untried technologies and concepts.

A majority of the architects and pioneers would like to see and work with more building experiments and demonstration projects. However, this type of work is not supported by society at the moment and the market is not innovative but focused on profit.

About recent demonstration projects in each country

Several Swedish (S2A, S3A, S4A, S8A, S10E) respondents express a critical opinion about two larger demonstration projects for sustainable building in Sweden in recent years: Bo01 in Malmö (Photo 7.5) and Hammarby Sjöstad in Stockholm. According to these respondents, focus in these projects has been on showy design and luxury living far from down-to-earth realistic objectives. Some respondents are even prepared to call these projects a 'disaster' or as expressed by the pioneers (S3A followed by S2A):

> That this is the best that can be done... it can't really be true. There is so much more that could be done. [104]
>
> They talk about ecology but a few grass-roofs are maybe not enough.[105]

Photo 7.5 Bo01, Sweden. National demonstration project for sustainable building. Wingårdh Architects. Built 2001. (Photo Wingårdh Architects http://www.wingardhs.se)

About half of the Dutch respondents are satisfied with the Dutch National Demonstration Projects Programme carried out in the late 1990s (see section 2.7). Those respondents who are critical point out the lack of evaluation and feedback and, what they find to be, the low architectural quality of many of the demonstration projects (Photo 7.6).

7.9 The personal driving force

The majority of the respondents tell about an early interest in environmental and/or social issues outside their professional career. Some have acquired their interest from their parents during childhood. Many of the pioneers were active in societal changes at the end of the

[104] " Att detta är det bästa man kan göra... och det kan det ju faktiskt inte vara." "Det kan göras *oerhört* mycket mera" S3A
[105] "De pratar om ekologi men lite grästak räcker kanske inte." S2A

Photo 7.6 Solarproject in Nieuwland, Amersfoort, the Netherlands. Demonstration project for sustainable building from 1997. Artès Architecten.

1960s and early 1970s. For many of the younger generation, the architect schools have introduced them to sustainable building where an earlier interest in environmental issues was fused with architecture. The respondents' focus on sustainable building varies from technical problems and energy saving, to alternative life styles and social commitment. A Swedish respondent (S10E) says that her engagement goes back to a desire to preserve and maintain in opposition to our waste producing society.

For several of the more experienced respondents in both countries the first inspiration for sustainable building came from United States in the early 80s where passive solar houses and wild experiments flourished during the President Carter era. Early inspiration also came from England, the AA school, as well as Germany and France.

A Dutch client (N13C) says that he engages in sustainable building because:

> It gives a good feeling. [It makes me feel good.]

A Swedish architect (S6A) thinks that it is a reliable way to work with buildings and also a good sales argument:

> ...a durable building that consumes little energy, I mean who doesn't want that?[106]

Several architects emphasise the challenge of working with a more complex design, as expressed by this Swedish architect (S7A):

> That's what really fascinates me about these things: Making a unity of the building. Maybe even more than the environmental issues to be honest, actually. Architecture, function and technology as a unit.[107]

A Swedish respondent (S12C) finds herself, despite great success in her work, making only 'piecemeal' contributions. She would like to do more projects with a comprehensive approach that have 'Permaculture' in Australia as a source of inspiration. Her point of departure for commitment to sustainable building is to contribute to creating something positive, such as an eco-village, instead of her earlier experiences of always being against everything: nuclear power, cutting down forests, etc.

Inspiring examples mentioned by the Swedish respondents

Some Swedish respondents think that Sweden is a forerunner for sustainable building while others do not agree with this and find no good example in their own country. One pioneer (S5A) points at one source of inspiration in Sweden:

> Erskine is clearly the shining star.[108]

He is supported by several colleagues (S1A, S3A, S4A) and his early sub-arctic buildings are mentioned (Photo 7.7). Architect Ralph Erskine is said to create beautiful architecture that at the same time is for ordinary people. Another Swedish architect mentioned as a source of inspiration is Bengt Waerne. He inspires others through his beautiful building the 'Nature house' and his environmental commitment (Photo 7.8). The Nature house is also mentioned by several Dutch respondents as an inspiring example. But he is also an example of the difficulties in combining both according several respondents (S5A, S3A, S8A). And

Photo 7.7 Sub artic houses, Svappavara, Kiruna, Sweden. The project has social and climatic ambitions. Architect Ralph Erskine, built 1963. (Photo Richard Einzig, In Egelius, Mats (1988) *Ralph Erskine, arkitekt*. Stockholm: Byggförlaget p. 98)

[106] "…en varaktig byggnad som använder lite energi, jag menar för vem vill inte ha det?" S6A
[107] "Det är ju det som fascinerar mig egentligen med dom här sakerna: Att få en helhet i byggnaden. Kanske mer än miljöfrågorna om jag får vara ärlig egentligen." S7A
[108] "Erskine är den klart lysande stjärnan." S5A

they point out the fact that he has not produced much lately. Some respondents (S3A, S4A, S11E) mention the Swedish architect Gert Wingårdh as an example of an architect able to combine sustainable, technically advanced and beautiful architecture at the same time (See section 9.3). One Swedish architect (S9A) finds the Swedish architect Anders Nyquist to be a strong example. Anders Nyquist considers of architectural quality and is innovative in combining new smart technology, good materials, low energy use, low costs and the end-user.

Photo 7.8 The 'Nature house', Sweden. Architect Bengt Waerne. (Photo Karl-Dietrich Bühler, In Fredriksson, Marianne and Bengt Warne (1993) *På Akacians villkor: Att bygga och bo i samklang med naturen* Göteborg: Warne förlag).

Some Swedish respondents (S8A, S10E, S12C) think that a source of inspiration can simply be an example of good housing, for example Swedish housing from the 1950s. These buildings are characterised by a human scale, natural materials, contact with the garden, good details in architecture, etc. This is architecture with basic every-day qualities that should be reconquered, says one Swedish client (S12C).

Some respondents also find inspiring examples from even earlier eras, for example the traditional houses in the Swedish countryside. A good measure is that these houses have lasted, says one respondent

(S10E). One pioneer (S5A) finds housing from the Bronze Age inspiring:

> …sun dried clay, local material. A stone basement and sun dried clay and this function for a couple of centuries. Then this housing environment was abandoned, the houses fell apart and today one cultivates on the building material that was this house. This I think is the archetype for sustainable building.[109]

Photo 7.9 Abandoned 'decomposable' houses of stone and clay. Alpujarras, Spain.

The same respondent (S5A) is also inspired by vernacular architecture. He gives a vivid description of sustainable traditional houses in Sweden:

> The farmer in Norrland built his house of local materials; a stone basement, timber, birch bark, clay and stone … There was very little material from other places. /.../ And the farmer also knew how to care for his surroundings. He had to have clean water both for himself and for his livestock to survive. He took care of waste products. That's where we get the expression that 'the meadow is the mother of the field'. The cattle graze in the meadow, walk home, shit in the barn, and then the dung, after having been treated, is spread on the fields. And from there the farmer gets his food. /…/ This is the archetype for sustainable eco-cycle adaptation. /…/ And the remarkable is that these houses are still present. We still like them. And of course there was a lot of crap built at that time as well. But those houses have rotted away.[110]

Some of the architects (S6A, S7A) are impressed by technically advanced projects, for example, architecture by for example Foster and Hopkins. As expressed by one architect (S7A):

> Fascinating solutions that hang together, where you don't see where the work of the ventilation engineer ends and the architect's begin...[111]

[109] "...soltorkat lera - lokalt material. Stenfot soltorkad lera, och sen så fungerar det där i ett antal hundra år. Så övergav man den här bebyggelsen, sen föll husen samman och idag odlar man på det byggnadsmaterial som var huset. Jag tycker det är urtypen för hållbart byggande." S5A

[110] "Bonden i Norrland byggde sitt hus av lokala material. Det var alltså en stenfot, det var timmer, det var näver, det var lera, det var sten... Det var väldigt lite material utifrån. /.../ Och han förstod ju också att han måste vårda sin omgivning. Han måste ju ha rent vatten för att överleva till sig och sina djur. Han tog hand om restprodukterna. Det här uttrycket att ängen är åkerns moder. Att kossorna betar på ängen, går hem och skiter i ladugården, och sen tar man gödseln och efter att man har behandlat den skickar man ut den på åkern. Och därifrån får bonden sin mat. /.../ Det är alltså urtypen av hållbart kretsloppsanpassat. /.../ Och det märkliga är att dom här husen dom står dessutom kvar. Dom tycker vi fortfarande om. Och det byggdes ju naturligtvis en väldig massa skit på den tiden likasom det byggs nu. Men dom husen är bortruttnade. " S5A

[111] "Fascinerande lösningar som hänger ihop, där man inte ser var ventialationsteknikerns arbete slutar och arkitektens börjar…" S7A

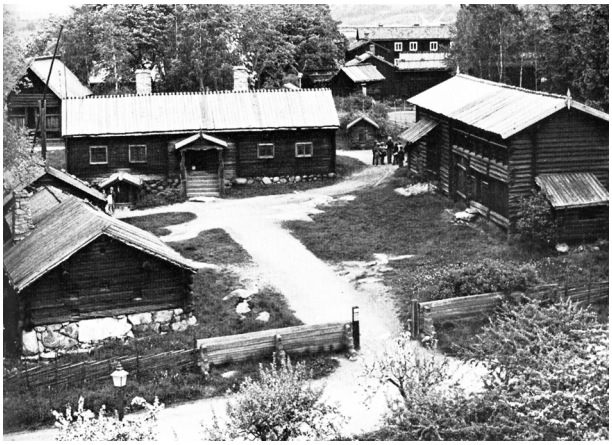


Photo 7.10 Swedish farmhouse of north-Swedish type, 'Älvrosgården' at Skansen museum, Stockholm, Sweden. Inhibited 1600-1700. (Photo The Nordic Museum. In Arnö-Berg, Inga and Arne Biörnstad eds (1980) *Skansens hus och gårdar. Nordiska Museet*. Skansen. Stockholm.)

The other architect finds this approach interesting (S6A):

> ...[Foster and Hopkins] work so to speak very concretely with this issue.[112]

Some Swedish respondents (S3A, S4A) mention philosophers as sources of inspiration for sustainable building[113].

Photo 7.11 Amsterdam**,** the Netherlands. 17th century canal houses in at Prinsen Gracht.

Inspiring examples mentioned by the Dutch respondents

One of the Dutch respondents (N8E) thinks that sustainable building is still a utopia:

> I am not sure if those buildings exist yet.

The 17th century canal houses in Amsterdam seem to be a strong example of sustainable building as mentioned by five Dutch respondents (N3A, N4A, N9E, N10E[114], N11C) (Photo 7.11).

(N10E) points out two inspiring examples of different characters: a 'zero-energy' 'high-tech' 'two under one roof' villa in Nieuwland, Amersfoort and a 'low-tech' adobe (lime and straw) villa in central Delft (Photos 7.12 and 7.13). He finds the 'low-tech' example in this case more 'environmental' as it is 'decomposable'.

[112] "[de] jobbar ju väldigt vad skall man säga sakligt med de här frågorna."
[113] For example, Georg Henrik von Wright, Georg Borgström, Sigmund Säteräng, and Arne Naess
[114] Later respondent N10E explains that the canal houses can be seen as durable but not sustainable as they were amongst others financed by money from slave-trade.

Photos 7.12 and 7.13 'Low-tech' house in Delft, the Netherlands, architect Israels, and 'high-tech' 'zero-energy' 'two under one roof' house in Nieuwland, Amersfoort, the Netherlands, architect Van Stralen.

One architect (N1A) finds an inspiring example in the library building by Mecanoo in Delft even though he doubts its 'sustainable' advantages:

> They say it is ecological, but it isn't at all. It has a nice roof, a green roof. But I mean that is not really sustainable. It has double walls but it had to be cheaper, so I don't know. It is a beautiful building really. Beautiful concept. But I wouldn't call it really sustainable, but then what is sustainable?

Photo 7.14 Library in Delft, the Netherlands, built 1998. Architect Mecanoo.

Another respondent (N4A) gives a similar comment about Mont-Cenis in Germany:

> Mont-Cenis, you could be critical about the building and say that it is, well, it's so big and can you call it sustainable, when you use so much material… But I like the building and I also like the idea, for this function, Buildings like that are an example.

Photo 7.15 Mont-Cenis, Herne-Sodingen, Germany. Architect Jourda & Perraudin.

7.10 The role of media

The majority of the respondents find that the media play an important role in influencing public opinion about sustainable building. However, media in general is not considered as using this power in a positive way. Too often media focus on negative sensational events or it reduces sustainable building to a matter of trivial things, such as composting. If results from a sustainable building project are positive, the likeliness that it will gain attention by mass-media is seen as reduced. As a Swedish architect (S9A) expresses it:

> If there is anything positive on the news, then it's presented as the last thing after the weather report. You throw in 30 seconds about some weirdo that has built his house of straw or something, to which the reporter smiles discreetly.[115]

[115] "Och skulle det vara nåt som är positivt, så blir det det sista efter det att man sänt vädret. Man slänger in 30 sekunder om en galning som byggt hus av halm eller sådär, som nyhetsuppläsaren ler lite försiktigt åt." S9A

Media are seen as not trustworthy by many respondents and incapable of reflecting complex situations. It can be too easy to get an eco label through the media. A Swedish respondent (S8A) thinks that when you do something a bit off the record you are more vulnerable to negative critics. Other respondents emphasise that the media also has the habit of adapting the story to suit their purposes with the news. A Swedish respondent (S2A) does not think that the journalists deliberately put sustainable building in a negative light but they are part of the ongoing debate in society that asserts, for example, that when there is an economic boom you should not complicate things.

One Swedish respondent (S11E) does not think that people in general take that which is spread through the media seriously. Another Swedish respondent (S9A) says that even so, when there are articles, for example, about a kind of paint that is a commonly considered to be 'environmental friendly' but that causes moisture problems in facades, then it can be difficult to use that particular product afterwards:

> So even if you shouldn't be influenced by the daily press, you are…[116]

The same respondent has the experience of negative influence from a trade press article that wrongly accused cellulose insulation of causing moisture problems. Several Dutch respondents mention a journalist in a Dutch building newspaper that deliberately and consequently wrote negative articles on sustainable building, as one of them (N7E)says:

> And that had a lot of influence because lots of people read the newspaper.

Architectural press is not seen as pro-sustainable building by a majority of the respondents in both countries.

7.11 Discussion and conclusions

The interview study shows that sustainable building is slowly gaining acceptance in the building sectors in both countries. Awareness of the issue is growing even if the respondents describe a general backlash for these issues in 2001 – 2002. This does not worry those pioneers who

[116] "Så även om man inte borde bli påverkad av dagstidningar, så blir man..." S9A.

have observed a coming and going wave-like flow of interest in these issues over the past decades. Other respondents are pessimistic and would prefer more radical changes. The clients in the study are mostly satisfied with the development of sustainable building and find that we have taken enormous steps the past decade. Dutch clients find that sustainable building is a natural part of the Dutch building sector.

Obstacles to sustainable building are found mainly on the political level but also on the sector level and on the level of the individual and organisations. Respondents in both countries find that the political will for sustainable building is missing and many Dutch respondents are disappointed, as political investments made in the Netherlands in the 1990s are not actually continued. Mainly Swedish respondents point out structural problems in the building sector. The commitment in the sector is often found to be more on paper and the knowledge for implementing sustainable building objectives is often missing. Several Swedish architects think that a larger responsibility for the development should be taken by the sector, especially by the major actors, while, for example, many clients feel that there is a lack of incentives for the actors to react.

Interpretations of sustainable building

The interview study further shows that the understanding of sustainable building is mainly based on personal interpretations. The interpretations of sustainable building seem to expand and diverge over time. On the one hand, there is the risk that a definition that is too narrow will lead to an exclusion of the subject from the broader agenda. On the other hand, there is the far larger risk that a definition that is too broad will lead to watering down the concept. As pointed out by several of the respondents, sustainable building still needs to be clearly distinguished from conventional building in order to put the issue on the agenda.

Basically, interpretations of sustainable building put forth by the respondents are in consensus with political and sector objectives in both countries. The Dutch interviews reflect a rather unified image of sustainable building in which official guidelines are present. The Swedish interviews reflect a more diverse range of interpretations. Several Swedish respondents emphasise the importance of social issues that they find exceed technical issues. Social issues are less reflected in

the Dutch interviews and, instead, building issues are addressed. In the Netherlands, there are indications that an already established idea of sustainable building can come into conflict with personal ideals of sustainable building, such as health and comfort.

About half of the Dutch respondents find other qualities, such as a long lifetime and architectural quality more important than merely environmental issues. A few Swedish architects in the study also defend the idea that good quality architecture 'naturally' has the qualities of sustainable building. Dalman (2001) has come to similar results in an interview study of the 22 architect offices involved in the national Swedish demonstration project Bo01. Dalman concludes that there are no larger differences between what has been the basis for the sustainable building at Bo01 and normal architectural qualities. One explanation found in Dalman's study is that the interviewed architects find sustainable building to be a term in vogue that no longer stands for any specific qualities. This probably has its basis in diffuse programmes and objectives for the demonstration project.

The approach in daily practice

A large number of the respondents in the study have a personal calling to work with sustainable building and a few respondents, mainly in the Netherlands, only work with projects of this character. Most respondents have to accept work with projects without this special direction, as the demand for sustainable building is not great at the moment. However, most of these actors try to convince the client or user to ask for sustainable building.

Another category of respondents is more pragmatic to the issue and delivers sustainable building only when asked for. They are more dependent on external influences, such as demand, trends, regulations or maybe subventionsin order to act. In this category, we find a few Swedish architects and all the Dutch clients. There is also a third category of actor, which can be called the experts. These are the environmental consultants that have a special position as environmental experts in building projects.

The commitment to sustainable building is among a majority of the respondents based on environmental and social commitments. Many

architects also have the desire to experiment and find sustainable building to be a challenge for the designer to cope with.

Respondents with a calling to work with these issues point out several ingredients in a successful sustainable building project: teamwork; interdisciplinary work; most actors should be involved from the start of the building project; there should be more time in the decision-making phase and design processes; the value of a shared vision of objectives among all actors involved; the involvement of a project champion (a fiery spirit), etc. (see Section 2.5). Some Swedish pioneers say that they always start with educating the client, the project team and if possible also all the labour. The majority of the respondents find the client to be the most important actor in attaining sustainable building. Some architects attribute the architect this role with the motivation that it is the architect who delivers the design for sustainable building. A large number of respondents in both countries think that consolidation of the architects' position in the building process would be a gain for sustainable building, as well as other qualities.

Knowledge and tools

The main source mentioned for information retrieval in these issues is informal contacts and networks. This is confirmed by a study conducted by The Swedish Environmental Protection Agency among Swedish organisations and municipalities (2003). In the study, the respondents did not actively search for information, but were supplied with knowledge through newsletters, via networks and informal contacts. Seminars and conferences were also singled out as important and the Internet also plays a certain role. The respondents in the present study mention, in addition, field trips, books and trade press as information sources. The respondents seldom use or read scientific results, which they do not find useful or difficult to access. Scientific results are sometimes consulted in a specific decision-making or design situation but not on a regular basis. Edén and Jönsson (2002, p. 121) confirm that actors in the building sector have little training in reading scientific reports or articles (see also Swedish Government, 2002:115).

The main tool used by the respondents is personal experience. In general, simple checklists and tools are preferred to more advanced ones, such as environmental assessment. Advanced tools take time,

special knowledge and are thus expensive. Many respondents do not trust the results they give while others welcome advanced tools as tools of the future. In a decision-making or design situation the respondents show mixed use of scientific-based facts and personal preferences.

Demonstration projects

All respondents in the study agree on the importance of built examples of sustainable building. The built example is a positive feature and it is concrete, a practical implication that fuses theory with reality. The built example is also used as a tool in order to convince clients or users and to find common frames of references in building programme phases. That which is considered as a good example of sustainable building does not always depend on how successful the project has been in meeting environmental objectives. Other qualities, such as good living qualities and an interesting design or concept are just as important for many respondents.

Most respondents find it important to have innovative demonstration projects and experiments that show the trend. However, the greatest effect will be achieved if sustainable building is implemented on a broad scale. Respondents in both countries agree on the characteristics of a demonstration project versus an experiment. An experiment should be more innovative, should be limited in scale due to the risk and could fail, while a demonstration project uses technology that is tested, should be full scale and should not fail.

Several respondents in both countries are disappointed with national demonstration projects in their own country, which they do not find sufficiently innovative. On the whole, respondents in both countries find there is a lack of research and development money at the moment. An investment in new demonstration projects would be supportive for sustainable development, according to several respondents in both countries.

Chapter 8 Demonstration Projects for Sustainable Building as Conveyed by the Swedish Trade Press

This chapter presents a study conducted during 2001 – 2002 in collaboration with doctoral candidate Pernilla Gluch[117]. The aim is to explore the media's conveyed image of sustainable building and to reflect on how this image may affect decision-making and attitudes. The answers to two questions are sought: *How are demonstration projects for sustainable building presented and debated in Swedish trade press?* and *What role does the Swedish trade press play as an information carrier for demonstration projects of sustainable building?* For a description of the method of analysis see Section 5.6.

8.1 Introduction

The point of departure for this study are findings in the previous studies which indicate that the trade press is one important source of information about demonstration projects for sustainable building (see the case studies in Chapter 6, Section 6.5, and the interview study in Chapter 7, Section 7.6). The respondents in the interview study, presented in Chapter 7, declare that they seldom read research results. The small relevance of research reports and articles as sources of information in the building sector is confirmed by other studies (MiljöRapporten, 2000; Swedish Government, 2002:115). Instead, the trade press must be seen as an easily accessible source with a presumably greater impact. In addition, research results, such as evaluations from demonstration projects, as seen in this study are often reflected in the trade press. The importance of the trade press as a source

[117] Results have been published in Gluch & Femenías (2002a, 2002b, 2002c, 2002d) and Gluch, Femenias and Stenberg (in prep).

of information in the building sector has been confirmed by Larsson (1992 p. 105).

Real life decision-making is characterised by uncertainty at all stages of the decision-making process, from problem definition to assessing probabilities of possible outcomes (Gough and Ward, 1996). This means that all actors in the building process are confronted with more or less uncertainty in their decisions. However, environmental decisions can be even more uncertain since changes in ecological systems, as well as social systems, need to be considered in the decisions (Wade-Benzoni et al., 1996, Wolff, 1998). Hence, issues that are not considered as environmental problems today may well be so in the future, in the same way as today's environmental problems were not anticipated yesterday. In many cases, it is therefore impossible for the practitioner to weigh different decision alternatives against each other correctly. Several respondents in the interview study point out problems of finding correct information in the large flow of information. This is confirmed by SOU 2002:115 and illustrated by the following words, expressed by an actor in a study conducted by Stenberg (Stenberg, 2000):

> There is always correct information. Things are done right and good prognoses are made. The problem is to hear them through the cacophony.

The influence of the trade press

Earlier studies have shown that decision-makers do not believe that they are unduly influenced by information conveyed by the media (Strannegård et al, 1998; Baumann et al., 2003). The respondents in the interview study (see Chapter 7) have different opinions of the influence of media on their attitudes. Some respondents find media to have little relevance while other respondents, in both countries, have concrete examples of situations in which their or other's behaviour and attitudes have been influenced by articles in the trade press. Eagly and Kulesa (1997) argue that media's impact on public attitudes increases when the public is repeatedly exposed to messages advocating a particular view. It can, as confirmed by one Swedish respondent, be difficult to completely dismiss statements in the media. The media can be seen as exerting influence through 'agenda setting' (Anderson, 1997). Accordingly, the

media do not necessarily tell us *what* to think, but set the agenda of which issues to think *about*.

The uncertainty in environmental decisions nourishes ambiguity as to what behaviour is most important when solving environmental problems (Wade-Benzoni et al, 1996). Instead, practitioners will rely on 'norms' that are established within their community (Sellerberg, 1994, see also discussion on praxis, Section 3.4). How decision-makers perceive the media's image of sustainable building depends on factors, such as accessibility and tangibility of the information, and also on their cognitive ability, psychological predisposition and experience (Jarlbro, 2001). DiMaggio and Powell (1983) have found that the greater the extent to which technologies are uncertain or goals are ambiguous within a field, the greater the rate of isomorphic change (see Section, 3.5). That is, organisations model themselves on similar organisations in their field that they perceive as legitimate or successful. This results in different organisations striving towards similar goals and using the same means to reach them. It can be argued that demonstration projects that receive the media's attention are likely to become normative for sustainable building.

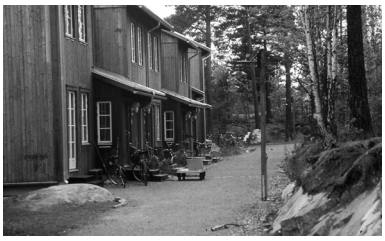


Photo 8.1 Understenhöjden, Stockholm, Sweden. Architect Bengt Bilén (Photo Michael Edén)

Photo 8.2 Ekoporten, Norrköping, Sweden. Architect FFNS. Photo from brochure *"Ekoporten – framtidens boende i kretsloppshus"* Hyresbostäder Norrköping

Photo 8.3 'Solar multi-family blocks', Gårdsten, Göteborg, Sweden. Architect Christer Nordström Arkitektkontor.

8.2 The corpus

A database search in Byggdok[118] of Swedish building projects built during 1990 – 2001 and which in some respect include environmental consideration shows that a handful projects attracted a majority of trade press interest (Gluch and Femenías, 2002a). The ten most frequently represented 'environmentally adjusted' or sustainable building projects represented over 60% of the total number of found articles.

From this search three widely known Swedish demonstration projects that were carried out during the period 1990-2001 and were in a position of setting the agenda for sustainable building in Sweden, were chosen: Ekoporten, Understenshöjden and the 'Solar multi-family blocks' in

[118] The database Byggdok covers areas, such as architecture, building design and construction, building technology, energy, and environmental technology.

Gårdsten[119] (Photos 8.1, 8.2, 8.3 and table 8.4). The criteria in common for these projects that qualified them for selection were that they were completed, client-driven, and evaluated by researchers (Botta et al., 1999; Dalenbäck, 1999; Levin et al., 2000). It was important that learning experiences from these projects were intended to be transmitted to forthcoming building

Table 8.4 Features of three cases studied[120]

	Understenshöjden	**Ekoporten**	**Solar multi-family blocks /Gårdsten**
Type of project	New development with row houses. Located in Stockholm.	Reconstruction of a multi-family block from the 1960s. Located in the suburbs of Norrköping.	Reconstruction of a multi-family block from the 1970s. Located in the suburbs of Göteborg.
Size of project	44 private owned (co-operative) single-family row houses.	18 rental apartments	255 rental apartments.
Initiative (year)	1990	Not indicated	1997
Built (year)	1993-1995	1995-1996	1999-2000
Evaluated/documented	1998-2000	1995-1998	2000-2001
Project organisation	Bottom-up project	Top-down project	Top-down project
Client	Co-operative building society	Municipal housing company	Municipal housing company
Contractual relationship	Design-build contract	Design-build contract	Design-build contract
Total costs	48,2 MSEK (4,8 M €)	31 MSEK (3,1 M €)	100 MSEK (10 M €)
Extraordinary investments	No data	18 MSEK (1,8 M €)	20 MSEK (2 M €)
Subsidies	No	4 MSEK (0,4 M €) (Swedish Gov.)	5 MSEK (0,5 M €) (EU/Swedish Gov.)

In identifying articles to be used in the analysis, we attempted to be as inclusive as possible. Four Swedish databases[121] containing a majority of current influential Swedish trade press journals were reviewed for

[119] A large amount of articles were found about Bo01 in Malmö. However, as most articles focused on issues other than the sustainable building profile this demonstration project was not chosen for the study. A study conducted by the LIP office in Malmö shows that 25% of the articles published on the project mention environmental issues. The main part of articles focused on organisational and economic problems of the project (Zinkernagel and Åberg, not published).
[120] Data collected from articles, brochures and reports.
[121] Presstext, Mediaarkivet, Byggdok and Artikelsök.

articles about the selected demonstration projects. The result was a corpus of 93 articles.

The analysis

A first level analysis was made using an analytical schema with a set of questions to be posed to the material. Thus, the articles in the corpus were reviewed according to: date of publication, author, text type, source, tone and purpose of the article.

A second level of analysis was conducted on a core corpus of 25 articles. This core corpus consisted of articles containing some kind of argument in which the building project at hand served as the predominant theme. The articles in the core corpus were further analysed according to key subjects, key terminology, environmental aspects and knowledge content, as well as involved actors. Pictures, figures, tables and captions were taken into consideration as part of the overall picture given by the articles.

In order to identify which part of the construction process is described in the articles, a simplified process scheme based on the different phases in a building project (planning, design, construction, operation/use and end-use) was drawn up. According to this scheme even actors mentioned in the articles could be identified.

To determine the key subjects in the sustainable building discourse, key words were picked out in an iterative review of the core corpus. These key words were categorised in eight groups. The subjects of the groups were: involved actors, general environmental terminology, described environmental measures, described environmental effects, technical solutions, social issues, indoor-climate and economic and managerial issues. In order to figuratively illustrate the relation between the subjects, word-count analysis was used where, instead of counting all words, only sentence-bearing words found in the core corpus were counted and arranged according to the subject of the categories.

8.3 Characteristics of the corpus

A cluster of articles was found to be written around start of construction of the demonstration projects and conveyed information about turning the first sod for the project. Only a few articles covered the construction

and the planning phases of the building process. Instead, the majority of the articles were written after the demonstration projects were completed and reflected the usage and operating phases of the building process, as well as presented results from evaluations. Most articles had a positive or neutral tone. Articles written before or in the beginning of the project were always positive while the few that were critical were those written after the construction projects were completed or evaluated.

Table 8.5 Authors, text type and number of sources of the 92 articles in the corpus, C, respectively the 24 articles in the core corpus, CC.

		C	CC
Author	Number of articles written by journalists	78[122]	15[123]
	Number of articles written by news agencies	4	0
	Number of articles written by involved actors	5	4
	Number of articles written by involved researchers	5	5
	Total	**92**	**24**
Text type	Report	49	15
	Exposition	16	8
	Blurred (mixed exposition and report)	19	0
	News item (indirect report)	8	0
	Total	**92**	**24**
Sources	Source not mentioned[124]	25	10
	1 source mentioned	35	7
	2 sources mentioned	18	6
	3 sources mentioned	8	1
	4 or more sources mentioned[125]	6	0
	Total	**92**	**24**

As shown in Table 8.5, the number of articles written by in-house journalists outnumbered other types of authors. A few articles were written by researchers or actors involved in the building process. Most articles in the corpus were reporting in character and few provided argumentative or analytical information to the reader.

Short interviews were the most frequently occurring direct source. More than 40% of the articles did not mention any source. Articles

[122] Five authors are identified as practicing architects. However they were not involved in the specific projecs that figure in the articles.
[123] Two of the authors have been identified as practicing architects.
[124] This category also includes articles where actors write out of their own experience.
[125] Even though several sources are used, mostly they are of similar kinds (for example actors from the same organization) and seldom provide views from different perspectives.

written by persons involved in the building process often rested upon their experience. In other cases, where no explicit source was mentioned, it was possible through examining the phrasing and use of vocabulary to reveal that much of the material conveyed in the articles was collected from a limited number of original sources (other trade press articles and brochures from the project owners), for example through identical phrases and mistakes. The authors seemed to strongly rely on their source and did not reflect on nor question the veracity of the information. This probably explains why a majority of the articles had a positive tone and were seldom provocative towards the topic. More critical articles were found when negative results from evaluations were reported after the project had been completed.

The articles could be divided in two main groups: promotional articles and informative articles. The promotional articles "sold" the demonstration project as a good example, or the environmental concepts used in the demonstration project, or even an actor, often a project champion or a 'mover and shaker', involved in the project. The informative articles mostly describe technical systems, give background information on the demonstration project's accomplishment or provide information from evaluations.

8.4 The conveyed image of the demonstration projects

This section is based on the analysis of the core corpus of 25 articles. Figure 8.6 shows that a large number of different actors figured in the articles. Nevertheless, only a limited number of persons are cited or in another way active in the articles. These *solitary* spokespersons usually represent the client or were engaged by the client as researchers or consultants. Often these persons are champions for the project. The articles focus on design and briefing and later on the operational phase (with an evaluation). People involved in and responsible for the construction phase are seldom quoted.

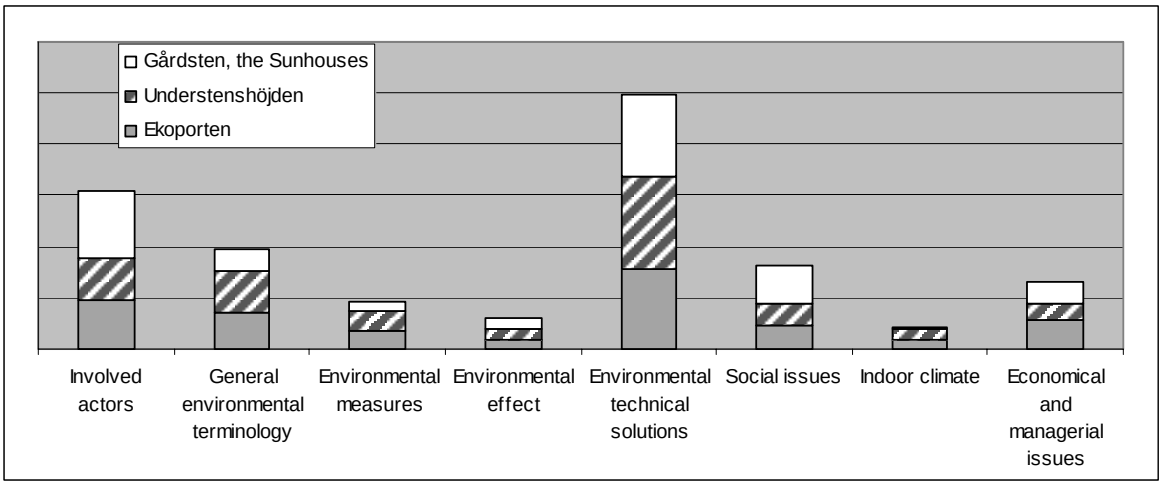


Figure 8.6 Key subjects involved in the discourse of sustainable building (number of key words, the figure illustrates the proportions)

Sustainable building

The study clearly indicates that the core corpus describes sustainable building first and foremost as a technical issue with an emphasis on technical solutions. These technical solutions and systems are often related to, and sometimes even interwoven with, environmental issues. Except for technical solutions environmental issues are most often presented in general terms using a nomenclature characterised by indistinct and fuzzy terminology. Terminology, such as environmental, green, ecological, eco, natural, environmentally friendly and sustainable were compounded with terms, such as building, construction, living, adjustment, behaviour, habits, perspective and attitude to form new words and concepts.

In line with the common perception of sustainable development (see Section 2.4), social issues concerning the human sphere and the living environment are well represented. It is worth noticing that both Ekoporten and the Solar multi-family blocks in Gårdsten are refurbishment projects of buildings located in socially and technically degraded suburban areas from the 1960s and 1970s, a factor which contributed to the emphasis on the social in the corpus. Since the mid-1990s it has often been pointed out that social and ecological upgrading

of these suburban areas should be done when addressing technical refurbishment (cf. Eriksson, 1996)

Issues regarding economics are mentioned in terms of: increased investment costs, received subsidies, or residents' decreased costs due to individual control of electricity, heating and water use. Managerial issues are discussed through problems in a variety of ways, such as non-profitability, poor coordination, conservative management, non-reliable environmental information and poor quality control. While social and technical issues are used as arguments for advocating sustainable building, economic and foremost managerial aspects of the building process are perceived as the main cause of failure.

The articles have been found to present the demonstration projects in terms of the objectives set up for the specific project regarding sustainable building measures. None of the articles include a problem definition concerning the environmental load from building activities and buildings and thus an explanation to why these measures and solutions have been chosen. The articles do not bring up any discussion about the measures and solutions used.

A few articles have a critical attitude to the demonstration projects due to their high energy consumption (Snis, 1998; Botta, 1999; Bengtsson, 2000b; Lundholm, 2000). A discrepancy can be found between how demonstration projects are judged and the objectives for the project set a few years earlier when the project was planned. For example, projects planned in the early and the mid 1990s, emphasise eco-cycles but are judged on the basis of their energy consumption, which in the late 1990s was seen as the important aspect to consider.

Measures for sustainable building

A list of five environmental areas considered as the most important objectives for the building sector (Ecocycle Council of the Building Sector, 2001), was used to distinguish environmental aspects highlighted in the articles. These areas are:

- Energy use during the usage phase including use of renewable energy sources.
- Material use during the construction and usage phase.
- Use of hazardous substances during the construction and usage phase.

- Indoor climate, including air quality, electric and magnetic fields, disturbances caused by noise and other unhealthy conditions caused by design, construction and operation of housings and facilities.
- Transportation of building material.

As illustrated in Figure 8.7, the reduction of *energy use* during the usage phase, and the use of renewable energy resources are the main environmental topic in the articles for all three projects studied. Negative results regarding energy use are debated lively. Actors involved in the building or evaluation process are quoted as explaining that the reduction of energy use has not been the highest priority on the agenda in the programming of the project (cf. Snis, 1998). Regarding *material use* during the construction phase and the usage phase, the intention to reduce the amount of materials used is not explicitly mentioned as a measure in any of the cases. Sorting building waste is only briefly mentioned in two articles. Some building material used is vaguely said to be “eco-cycle adapted'. The focus is often on choosing environmentally “correct” materials, also called environmentally friendly, reliably tested, “natural” or healthy materials, implicitly understood as either *material without hazardous substances* or materials developed with environmentally adapted technology. The criteria for choosing materials are not well accounted for and the specific quality attributed to the materials remains vague. In articles about Understenhöjden, aesthetic values are mentioned as criteria for material choice. Only one article mentions *transports* of any kind. This seems to imply that transports of building material is not regarded as an important issue in the articles and probably not in the projects either. *Indoor climate* is mentioned as an important issue in several articles. Some articles point out more specific considerations, such as creating an indoor climate free from emissions and allergenic substances, as well as reducing the influence of electromagnetic fields and noise, while other articles approach this issue in more vague terms as “a good indoor climate”, buildings that “breathe”.

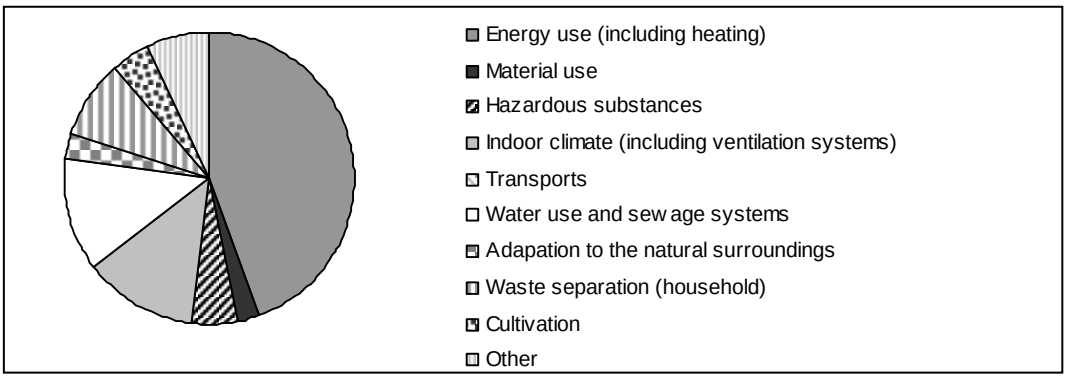


Figure 8.7 Environmental aspects considered in the core corpus, based on counting of sentence bearing words.

Some environmental measures in the demonstration projects mentioned in the articles are not covered by the list made by The Ecocycle Commission for the Building Sector (2001). This counts, for instance, for the objective of local eco-cycle systems, such as sewage systems that recycle nutrition and infiltrate rainwater. Furthermore, waste separation/compost and cultivation are other issues mentioned as sustainable building measures. Articles about Understenshöjden also emphasise the project's ambitions to adapt the building to its natural surroundings.

The knowledge content

Our estimation is that only approximately one third of the articles in the core corpus provide the building industry with valuable information that can contribute to increased knowledge about sustainable building among practitioners. The valuable knowledge content mostly involves examples of technical measures and solutions used or to be used in the demonstration project. Other articles provide information concerning: evaluations, examples of solutions to social problems, causes of problems that appear throughout the process, and issues regarding communication and cooperation. Articles with less valuable information are either too general (for example in Bengtsson, 2000a; Jerström, 1997), or focus on more daily matters rather than on building or building-process related issues (e.g., Karlsson, 2001; Lindgren, 1998). Others provide information that is too biased. For example, in trade

press articles about the Solar multi-family blocks in Gårdsten, two promoters figure as the main spokespersons in 6 out of 8 articles and thus had a major influence on the information released to the public. Few, or almost no, articles give a comprehensive understanding and discussion of specific problems connected to sustainable building and sustainable building's relation to the global situation.

In addition, comparing the knowledge content in the articles with the original source, several misleading errors have been found. Idleness perhaps but also ignorance and misinterpretations can be identified as causes of these errors. For example, some technical solutions, such as sun-panels, are described out of context and considered as energy reducing elements just by being technical solutions. Also researchers and research reports are falsely quoted. Articles most critical of sustainable building in the corpus are, for example, based on a falsely quoted researcher (Nordling, 2000). It is stated that the demonstration project 'Understenshöjden' was subjected to moist and mould problems caused by poor design. This was rendered in headlines as: "Understenshöjden, rich in moist and draught" (Bengtsson, 2000b), "Environmental ideal questioned" (Lundholm, 2000). That this one false quotation in one article (Bengtsson, 2000b) is repeated in several articles by different authors proves how uncritically data is published and how unreflecting the authors are towards their source, in this case *Byggindustrin* one of the largest Swedish building trade press periodicals generally distributed throughout the sector.

8.5 The role as carrier of environmental information

The present study has shown that the media's conveyed image of demonstration projects of sustainable building is based on a very limited number of persons' opinions rather than on unbiased sources. The choice of demonstration projects seems to be limited to a few targeted examples. Moreover, only parts of the building process are described. The articles that were not produced by journalists were found to be written by spokespersons involved in the projects or in an evaluation of the results. These spokespersons use the trade press to inform about 'their' project and can be biased. Articles written by journalists are often uncritical, unreflective and sometimes even reproduce

misunderstandings, and consequently, do not contribute to a varied debate about the demonstration projects in question. The use of rather fuzzy terms and the absence of a critical journalism can indicate that journalists have insufficient knowledge of the field.

The articles that have a positive tone, often published during the planning and early use of the demonstration projects, have the character of charming little stories while those negative in tone provide hard criticism. It has often been discussed that media have their main interest in risky events and scoops (for example Jarlsbro, 2001). As discussed above, environmental problems are diffuse and non-tangible (Beck, 1992) and thus generally difficult for people to relate to. The media handle this by personalising the problem by either focusing on something familiar and tangible (Djerf-Pierre, 1996), or by visualising a social dilemma involving heroes, crooks and victims (Aanes, 2000). In doing so, the environmental information conveyed by the media does not concern environmental problems as such but rather 'stories' about Mr X, Mrs M and Cow C. This 'personalisation' of the problem, in this case sustainable building, is confirmed by the present study in which many articles present demonstration projects through the voice of highly involved spokespersons and fiery spirits.

The knowledge content has been found to be rather poor, too general, often biased and does not contribute to a good understanding of either the problems or solutions for sustainable building. The focus in most articles is on specific solutions without motivation for the choice. Subsequently, the link between local demonstration projects and everyday practice is not related to global issues and risks of an environmental nature. Furthermore, there is a gap in the coherence between what is presented and the contemporary objective for sustainable building as drawn up by the sector. The lack of an adequate problem description and motivations for sustainable building can set focus on already defined 'sustainable solutions' without respect for contextual and local circumstances (cf. Jensen et al., 1998). This can lead to undermined understanding of and trust in sustainable building through emphasising visual sustainable attributes instead of real environmental effect. Furthermore, the focus on mainly technical solutions as the solution to sustainable building disregards other areas of concern, such as managerial and behavioural changes.

8.6 Discussion and conclusions

The image of sustainable building conveyed in the articles is largely dependent on the ambition and focus of a few building projects that are communicated through only a small number of involved actors and written sources. This implies that only a few persons' opinions, to a large extent, influence the view of demonstration projects and sustainable building. The use of undefined terminology may reveal that the authors' lack of knowledge in the field and/or reliance on already established images and (mis)apprehensions of sustainable building.

Furthermore, the image conveyed by the media seems to be incomplete, un-reflected and not very trustworthy, which does not help to reduce uncertainty about how to handle sustainable building in practice. This problem may also contribute to the underestimation of the importance of sustainable building and thus result in setting sustainable building outside the main agenda of the building industry. What is in focus in the articles reviewed seems to depend on current trends and the uncertainty of future outcomes from decisions that could give rise to an isomorphic development in the building industry, i.e. creating a norm (DiMggio and Powell, 1983). If this norm is based on incorrect and false perceptions of sustainable building, the development may, in the worst case, stagnate. Additionally, as sustainable building is treated as a special kind of building project, there is a risk that the subject will be set outside the main agenda for the building sector.

It can be questioned whether or not the trade press can serve as an appropriate information carrier for sustainable building. Either the industry must rely on additional, less biased information sources or the trade press must improve its reports. Regardless, it is important that researchers, when communicating research results, are over-explicit in order to avoid misinterpretation. Researchers would also be well advised to reflect over their channels of communication, for example, if more researchers published articles in the popular press, it would raise the standard of the medium and more researchers would follow. Moreover, researchers need to communicate their findings in a discourse that decision-makers can relate to and understand.

Chapter 9 A Study of Arkitektur, The Swedish Architectural Review

This chapter presents a study of the *Swedish Architectural Review*, in the following called by the Swedish name *Arkitektur*. The study points out aspects of the sustainable building discourse where the strive for architectural and sustainable qualities meet. This study is distinguished from the former, as the focus is not on the value of the information. Instead the focus is on the content in the discourse presented in *Arkitektur* concerning sustainable building and examples and demonstrations of this. The choice for a study of *Arkitektur* as a complement to the general study of the trade press presented in the previous chapter is further motivated as this research is carried out at a school of architecture. This fact indicates that architects, practising, teaching and those involved in research, are one key target group for the findings. Another motivation for the study is found in Government proposition 1997/98:117 on architectural quality. In the proposition several bodies, in a review of the proposition, point out the risk that a focus on sustainable development can miss aesthetic values. It is thus concluded that measures for sustainable development should be designed in an aesthetically attractive way (Swedish Government, 1997/98:117). For example, municipalities that apply for subsidies within the program for local investments in ecological reshaping (LIP, see Section 2.6) should account for how the architectural qualities are taken into consideration.

9.1 Introduction

Architectural reviews occupy a place apart as information carriers and agenda setters for architects. This has been confirmed through

interviews with architects in both case studies (Chapter 6) and architects in the interview study (Chapter 7). *Arkitektur* is the dominant architectural review in Sweden with an edition of 6,900 in 2001 (Hultin, 2002)[126]. A reader survey shows that almost all of Sweden's 6,000 architects read *Arkitektur*[127]. The review presents itself as:

> … a forum for debate on the art of building and a showcase for new architecture in Sweden since 1901. It has also become the foremost source of inspiration and information in Scandinavia for everyone with a professional interest in architecture and building. [128]

Recently the review has extended its scope to cover landscape architecture, interior architecture, design and other art forms:

> Arkitektur is, as a result, the largest architectural periodical in the Nordic region. [129]

Apart from *Arkitektur*, also *The Nordic Journal for Architectural Research* and the trade periodical *Arkitekten* published by the Swedish Association of Architects, have their main audience among architects. *The Nordic Journal for Architectural Research* probably has a limited relevance for the majority of practicing architects in Sweden, which has been debated in the journal (se for example Caldenby, 2000). The trade and union periodical *Arkitekten* is probably Swedish architects' main forum for news and debate distributed to all members and read by a high proportion of the Swedish architects. However, the prestigious status of the review *Arkitektur* and its position as main reference source for Swedish architects (see the quote above) defends the choice of the review for this study. Furthermore, the editors of *Arkitektur* declare that they represent 'architecture' and not the architects and can thus be seen as neutral, not representing a particular group's interest in society (Hultin, 2002)[130].

The aim

The study was conducted from February to May, 2003, and includes all articles on sustainable building in the volumes 1973 to 2002 (see Section

[126] Editorial column, No. 1, Vol. 2002.
[127] Information on *Arkitektur's* web site www.arkitektur.se
[128] Information on *Arkitektur's* web site www.arkitektur.se, original text in English.
[129] Information on *Arkitektur's* web site www.arkitektur.se, original text in English.
[130] Editorial column, No. 1, Vol. 2002.

5.6 for description of method of analysis). The aim has not been to discuss whether or not *Arkitektur* fulfils the task of being an information carrier for sustainable building. The aim has been to clarify how *Arkitektur* discusses the relation between architectural and aesthetic values and the concern for sustainable building. Klarqvist (1994) has in a study of 1993 year's volume of *Arkitektur* found that social and ecological aspects are seldom part of the architectural critics in *Arkitektur*, in favour of aesthetics. Klarqvist points out that the global and long-term perspectives formulated at the United Nations Earth Summit in Rio 1992 are not reflected.

The Norwegian researcher Ryghaug (2002) confirms the focus on aesthetic values in her study of the Norwegian architectural press. Ryghaug has found that the focus on aesthetics results in disregard for environmental and sustainable building related issues. Ryghaug has complemented her study with interviews of Norwegian architect that focus on the acceptance of energy efficiency laws. Ryghaug states that Norwegian architects have not assimilated national Norwegian guidelines for energy efficiency and do not show interest in that field. One major reason for this is, according to Ryghaug, that economic and technological arguments are not sufficient to make architects interested in energy efficiency. Ryghaug proposes that the government energy efficiency policy be translated into criteria for good architecture and aesthetics.

The analysis of the material is conducted in two steps. In a first step, the corpus of articles is revised according to: number of articles found, terminology and other general aspects, article type, text type, author and tone. In addition, reflection is made on the subjects and kinds of building projects that are presented.

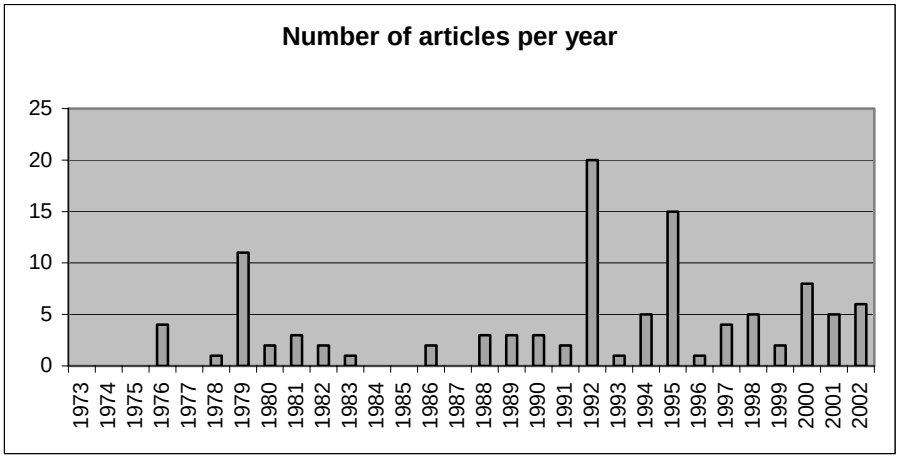
In a second level, the content of the articles is studied, focusing on discussions of examples of sustainable building[131]. As the term 'ecological' building is consequently used in the corpus this term is also used when referring to the discussions in the articles.

[131] The author has contributed with two articles, which are commentaries to architectural projects that are presented in *Arkitektur* (Femenías, 1998b; Femenías, 2000b). I have chosen not to refer to these articles in the second level of analysis.

9.2 A first indication of the corpus of articles

Two Swedish databases132 have been searched for articles in Arkitektur using the keywords: ecology, sustainable, energy133 and solar energy. In order to be as inclusive as possible, an additional search been made of the yearly registers of the. Some articles, which the review did not classify as dealing with 'ecology', have been included despite the fact that the ecological profile has not been the main theme when presented and discussed in Arkitektur. This concerns three recent projects with the ambition of being demonstration projects for sustainable building: Hammarby Sjöstad, Bo01 and Universeum. Table 1 gives a quantitative indication of the amount of attention given to ecological, sustainable and energy-efficient building during the period 1973 – 2002. A total of 110 articles have been found. The far greatest number of articles was found using the keyword 'ecology'.

Table 9.1 Timeline showing number of articles per year relating to 'ecological'/sustainable architecture or energy efficiency.



[132] The databases are: 1) The periodical *Arkitektur's* database on the Internet, and 2) Artikelsök, that covers articles found in *Arkitektur*. The Swedish keywords used are: ekologisk*, hållbar*, bärkraftig*, uthållig* (there are three different Swedish translations of the term sustainable), energi* and solenergi*.

[133] Energy use is a main indicator for sustainable building which after the 1973 oil-crises was set on the agenda preceding the more all-compassing concept of sustainable building.

Terminology and other general aspects

The word ecology appears for the first time 1991 as a headline in the yearly registers for the review. Up to 1991, most articles in the field are found under the title 'energy' or 'energy efficiency'. However, Ralph Erskine uses the term ecology in an article from 1979 (Erskine, 1979). Swedish translations for 'sustainable' have so far had little diffusion in *Arkitektur*. In the database search, only 5 hits were found using the Swedish terms for sustainable[134]. Three of these were found in articles published in 2002. The term 'ecological' architecture is used by all authors but only discussed by one (Edén, 2000). Edén opposes the 'misuse' of the term 'ecological'. Architecture is a cultural phenomenon and ecology does not deal with cultural phenomenon only with processes in nature. According to Edén the correct expression is "building for sustainable development". It can further be said that the articles in *Arkitektur* present a lot of buzzwords, such as: 'natural' material, 'natural' ventilation, materials 'that breath', etc. (cf. results from study 8, Section 8.4).

The first articles that relate to energy use in building activities are found in number 4, 1976 three years after the 1973 oil crises. Then there is a gap until number 5, 1979 where the entire issue is dedicated to discussions on the new loans for upgrading energy efficiency in the existing building stock[135]. For a period of ten years, only sporadic articles are found on energy and ecology until the thematic number 10, volume 1989 on resource-efficiency and ecology. This is the first time the review examines the phenomenon of ecological architecture in detail. After that one thematic number, 'ecology' is found every second or third year in the following volumes: 1992, 1994, 1995, 1998, 2000 and the most recent 2002. A search through all articles published during 2002 indicates a certain assimilation of the discussion on sustainable development and sustainable building also in articles without a special 'ecology' headline.

As often in architectural periodicals photographs, drawings and other illustrations play a prominent role. A rough estimation is that about 25%

[134] 'ekologisk', 'hållbar', 'bärkraftig' and 'uthållig'

[135] The main part of the articles discuss how these loans, given too freely, result in operations that do not necessarily give better energy efficiency but degrade aesthetic values in existing facades.

of the articles in corpus are illustrations. Klarqvist (1994) declares that project descriptions in 1993 year's edition of *Arkitektur* consist of 80-90% illustrations. The importance of aesthetics in *Arkitektur* can be exemplified by the following statement in the editorial column of number 8/1992 (Hultin, 1992):

> The material for this issue largely comes from this year's UIA conference in Stockholm. There it was presented in a not too available form – the architects who work with ecology issues do not always have beautiful photographs and drawings as the highest priority.
>
> Gunilla Lundahl covered the conference for Arkitektur, and also made a major contribution in transforming the material into pages in the periodical.[136]

Article types and text types

Editorial columns	4
Architectural debate	25
Project presentations	37
Critics	11
Interviews	2
Reports from seminars etc.	11
Book reviews	7
Other	13
Total	110

Table 9.2 Articles in corpus arranged by category.

Seven kinds of articles are found in the corpus: editorial columns; longer articles with mainly architectural debate or theory of architecture; project presentations, architectural critics/comments of presented projects; interviews with architects; reports from seminaries, etc.; reviews of books; and others (mainly letters to the editor or news items). As shown in Table 9.2, the largest number of articles is project presentations, 37 out of 110 (34%), followed by longer debate articles, 25 out of 110 (23%).

Most articles in the corpus present personal opinions and ideas, i.e. are of the text type 'exposition'[137]. Two articles refer to interviews and can be seen as reports. Report as text type is also found in articles reporting a seminar, meeting or conference, in book reviews and in project descriptions. Many articles mix report with exposition and personal opinions (blurred text type). *Arkitektur* has a routine that a rather neutral and informative project presentation made by the

[136] "Materialet till det här numret kommer till största delen från årets UIA-konferens I Stockholm. Där presenterades det i en inte alldeles lätttillgänlig form – de arkitekter som arbetar med ekologifrågor har inte vackra fotografier och ritningar som högsta prioritet. Gunilla Lundahl följde konferensen åt Arkitektur, och hon har också svarat för den stora insatsen att omvandla materialet till tidskriftsidor" (Hultin, 1992)

[137] Usually can be distinguished from the text forms: narrative (stories), procedure (how something is done like manuals), description (how and what a group of things are like), report (describe without trying to explain what a group of things are, how and what not why), explanation (justifies why a judgement have been made), exposition (arguments, why a thesis has been proposed, more developed explanation), blurred (mixed text types). From discussions with Dr. Christine Räisänen November 2001.

architect/architects is followed by a 'commentary' of an invited critic who gives his or her personal opinion of the project.

The authors

Regarding the main authors of the articles, 59 are found in the corpus. Out of these, 19 are female (29%). The majority of the authors have their main professional activities in practice: architectural production or planning activities[138]. The second main category of authors has their main activity in academia. Only two authors are journalists. One of these journalists alone accounts for 19 articles[139]. Otherwise, a majority of authors appear with only one article and a small number of authors have written 2-4 articles. 'The editors' have signed 4 articles. The present editor-in-chief and another member of the editorial staff are the authors of 9, respective, 8 articles.

Tone

All articles in the corpus express a positive tone towards the challenge of sustainable building. Some authors emphasise the necessity for changes in contemporary architectural practice (Erskine, 1979; Bjur, 1995; Persson, 1997; Edén, 2000). Gert Wingårdh, a Swedish contemporary architect who has attracted much attention in Arkitektur and elsewhere, declares in an interview (Caldenby and Hultin, 1995):

> There is today a large demand for ecologically correct architecture and I think that it is impossible to work in any another way in the future[140]

Although positive to the challenge, several authors use a critical tone when describing many attempts at dealing with sustainable building. Of these, two have written articles with a predominantly negative tone (Simonsen, 1995; Asklund, 1997). Lars Asklund (1997) describes in his review of *SAR's 'eco' guide* (Thurell, 1996)[141], some examples of

[138] In recent years, the name of the author as well as her or his position is mentioned in connection to the article. This conclusion is drawn on personal knowledge about the authors.
[139] Of these, 14 are brief project descriptions.
[140] "Det finns idag en efterfrågan på ekologiskt riktig arkitektur, och jag tror att det är omöjligt att arbeta på något annat sätt i framtiden." (Caldenby and Hultin, 1995)
[141] A guidebook of 'ecological' buildings published in 1997 by The Swedish Architect Association.

'ecological' building as being ugly, fundamentalist, superficial (using mainly tangible attributes), and for using poor technology and expensive and complicated systems. Another author, Simonsen (1995) focuses on negative practical experiences in her report presented at a seminar on ecological building.

Subjects and kinds of building projects presented

A large number of the articles focus on presenting projects with a limited general discussion on sustainable building. The programme regarding sustainable considerations is seldom accounted for neither are performance and results. A smaller number of articles primarily discuss the problem situation and agendas for sustainable building and sustainable urban development (Jacobsson, 1976; Friberg, 1976; Lundahl, 1989; Lundahl, 1991; Eble, 1992; Kennedy, 1992; Hackzell, 1994; Bjur, 1995; Caldenby, 1995; Persson, 1995; Heijl, 1997; Edén, 2000; Butters 2002). A few of these authors emphasise the necessity of radical changes to achieve 'ecological' architecture (Lundahl, 1991; Kennedy, 1992; Eble, 1992). The imbalance in contemporary ecological crises cannot be readjusted through merely suitable 'eco-techniques' says Eble (1992).

The discussions in the longer debate articles are mainly focused on new buildings and limited to the building level. A few articles have the urban level in focus (Friberg, 1976; Lundahl, 1989; Lundahl, 1991; Bjur, 1995). However, urban 'ecological' planning is said to be one of the important themes for the future. None of the articles gives a deeper discussion of sustainable refurbishment. One article discusses the reuse and recycling of materials (Persson, 1995). Thematic number 8/2002 focuses on landscape architecture and several articles point out sustainable development as one main issue for future landscape architecture.

Among the *realized* projects presented in the 37 project presentations[142] we find a majority of housing (Table 9.3). Among the housing we find 7 detached homes and 2 eco-villages. Several detached homes are designed and inhibited by an architect. The choice of projects to be presented can be seen as reflecting the few projects of sustainable building that have been realised. The majority of the examples that have been presented are Swedish, new building projects with few urban designs and refurbishments.

Housing	18
Schools	6
Office space/industry	5
Urban planning	4
Holiday houses	2
Refurbishment of housing	3
Sports centre	1
Science centre	1
Total	40

Table 9.3 Kind projects that are presented in the article category project presentation.

9.3 On the hunt for the good example

The presentation of good examples must be seen as one of the main tasks for architectural reviews also in the domain of sustainable building. It is also through the built example that the architect can contribute to sustainable development, as expressed by Hultin (1992):

> So what contributions can architects make? Well, if you are the least pessimistic you only see the limitations. In the western world so much is already built, so much ruined. A few ecological new building in this mass of buildings do not change much. From a more hopeful perspective these contributions are important; they are sources of inspiration, the drops that will hollow the stone. They can contribute to the necessary changes of our view upon the earth's limited resources. They can contribute to clearing the path so that these insights shall also become rooted in the decision-making institutions. They will mark the point of no return – this far but not further.[143]

Many authors point to the importance of *good* examples of 'ecological' architecture but also to the lack of the same. In thematic number 10/1989 Lundahl (1989) states the lack of practical experiences of sustainable

[142] Some project presentations include two or more projects. A few projects are presented twice, as projects and later after completion. This explains why the figure for the total number of the article type 'project presentation' is not the same as the number of projects presented. Other projects are presented in brief often as illustrations to the longer debate articles and are not included here.

[143] "Så vad betyder de insatser som arkitekterna kan bidra med? Ja, är man det minsta pessimistisk ser man bara begränsningarna. I västvärlden är så mycket redan byggt, så mycket redan förött. Enstaka ekologiska nytillskott i denna byggnadsmassa betyder i sak inte mycket. Från en mer hoppfull synvinkel är insatserna ock viktiga; de är inspirationskällor, dropparna som skall urholka stenen. De kan bidra till den nödvändiga förändringen av synsättet på jordens ändliga resurser. De kan hjälpa till att bereda vägen för att insikterna också skall få fäste i beslutsfattande institutioner. De blir markeringen av en vändpunkt – hit men inte längre." (Hultin, 1992 p. 2)

building in general in Sweden. Lundahl says that so far, 'ecological' efforts have mainly been supported by the 'grassroots'. However, the necessary knowledge exists and we should proceed and implement 'ecological' architecture on a larger scale. When the next thematic number on 'ecology' appears, 10/1992, the editor-in-chief is resigned to the fact that there is still no change (Hultin, 1992):

> When we once again return to the subject we have unfortunately to make the same statement as last time; knowledge has increased but there is no action.[144]

The editorial column in the thematic issue 6/1995 argues that consciousness about 'ecological' questions has grown and that committed architects 'are fully occupied carrying out questions and demands from clients'. Even so the editors find that the good examples are still 'marginal' (Editors, 1995). In 1996 Edén (1996) further points out the lack of practical experiences (due to low building activity in general at the time) and of good examples that can establish sustainable architecture. From volume 1994, there are more examples of 'ecological' architecture presented in *Arkitektur* (mainly detached homes) with discussions on whether or not these examples are good.

What is a good example of 'ecological' architecture?

That which is considered as being a good example of 'ecological' architecture can be understood through a study of the commentaries about the cases presented in *Arkitektur*. Several authors are critical to many 'ecological' examples. Asklund (1997) points out four problems with 'ecological' building in his review of SAR's 'eco-guide'. First of all, most 'ecological' housing is not only something for the very faithful but also dependent on complicated technical solutions:

> Ecological living does not seldom mean than people with admirably equanimity endure stinking toilets, blocked up infiltration systems and

[144] "När vi nu åter tar upp ämnet tvingas vi dessvärre att göra samma konstaterande som förra gången; kunskapen har ökat men handlandet står stilla." (Hultin, 1992)

> expensive and complicated heating systems requiring competence in engineering in order to master.[145]

Furthermore Asklund points out several cases in which 'ecology' is attributes of a more or less conventional building and the principles in themselves are more important than what it cost to achieve them. Last but not least, 'ecological' buildings are ugly. Asklund finds, for example, the 'ecological' architecture designed by the recognised architect Wingårdh encouraging. These buildings are made of 'natural and healthy' materials and without 'ecological trendy stuff'. Asklund says that he would like to see the same qualities as in normally good architecture in 'ecological' buildings:

> Ecological thinking should have more to do with the visual environment, just as much as with earth closets and purification plants. Then we will have the same requirements like for all other building: The houses should be beautiful and functional, people should be happy and feel good in them and they should not unnecessarily consume our resources.[146]

The same reasoning is shared by Brunnberg (1995) in his criticism of the Riseberga School, which he finds gives an answer to the constant issue of ecology and design. The terms he uses to describe these good 'ecological' qualities are: unobtrusive, obvious, silent, 'built according to a real eco-cycle and healthy', 'high quality and careful detail work do not need to be loud to be clear', concordance with the place, 'readable but still moderate symbols'.[147] Brunnberg concludes:

> It does not have to be the ecology that is the given carrier of the architectural expression. On the other hand, the ecological view is a given part of good architecture.[148]

[145] "Ekologiskt boende innebär inte sällan att man uthärdar osande toaletter, igengrodda infiltrationsanläggningar och dyrbara, komplicerade uppvärmningssystem som det krävs ingenjörskompetens att bemästra." (Asklund, 1997 p 61-62)

[146] "Ekologiskt tänkande borde ha lika mycket med den visuella miljön att göra, lika mycket som med mulltoa och reningsanläggningar. Då får vi plötsligt samma krav på ekologiskt byggande som på allt annat byggande: Husen skall vara vackra och funktionella, man skall trivas och må bra i dem och de ska inte i onödan tära på våra resurser." (Asklund, 1997 p 61)

[147] lågmäld, självklar, stillsam, 'byggt med hänsyn till ett riktigt kretslopp och vara hälsosamt', hög kvalitet och omsorgsfullt detaljarbete inte kräver högljuddhet för att bli tydlig', samstämmigheten med platsen. 'läsbara men ändå återhållsamma symboler'.

[148] "Det behöver inte vara ekologin som är given bärare av det arkitektoniska uttrycket. Däremot är den ekologiska synen en given del av god arkitektur." (Brunnberg, 1995 p. 29)

Tägil (1998, 2000) confirms the idea that the basis for 'ecological' architecture is found in planning good architecture without what he calls the usual attributes of 'ecologism' (green house, green roofs , etc.):

> The winning concept is apparently that the architect has tried to create good architecture that is also ecological, mentioned in that order. /…/ Despite that he [the architect Anders Svensson] has created an architecture that is not designed to look ecological, the ecology is still discretely visible everywhere. The eco-cycle is made visible, a resource economy and a healthy building are the corner stones that the planning is based upon.[149]

Some authors searche for 'ecological' ideals in earlier architectural traditions (Caldenby, 1995; Borelius Brodd, 1995). Treib (1995) says in an article that the fall of the world economy in the late 1980s has put an end to architectural extravagance and indicates a future for architecture on small budgets without abandoning social and ecological principles. As emphasised by Butters (2002), until the 1950s resource efficiency was also something natural and necessary for all except a few.

Edén (2000) gives four possible explanations to why 'ecological' architecture is often distinguished with a special look. The first explanation is that ecological technology gives this special aesthetic. The second is that 'ecology' is used as an excuse for a pent-up urge to create form and design. The third explanation is that a special category of architects work with these questions and the fourth that users' participation in the design and planning processes is the reason for these special designs.

The issue of modernistic 'ecological' architecture

Some authors also point out the necessity of drastic changes in the architectural profession and the need to create a new architecture (e.g., Erskine, 1979; Lundahl, 1991; Eble, 1992; Kennedy, 1992; Heijl, 1997). Both Erskine (1979) and Lundahl (1991) find that new knowledge about relationships in nature and resource efficiency should inspire new

[149] "Det vinnande konceptet är uppenbarligen att arkitekten försökt att skapa en god arkitektur som också är ekologisk, nämnt i den ordningen. /.../ Trots att han skapat en arkitektur som inte avsetts att se ekologisk ut, är ekologin ändå diskret synlig överallt. Synliggörandet av kretsloppen, hushållandet med resurser och ett hälsosamt byggeri är de hörnstenar som planeringen grundat sig på." (Tägil, 1998 p. 51)

architecture. Lundahl (1991) rejects the 'the anonymous boxes in an international style' and Eble (1992) thinks that the present monotony and dearth of ideas will find inspiration in'ecology'.

The question whether or not modernistic ideals and ecology are compatible is brought forward by several authors. Erskine (1979) finds it futile to search among contemporary eclectic cultures for 'ecological' design ideals:

> There are still too few examples of really good architecture, where these new values are expressed. Modernistic models seem irrelevant and are rejected, but new convincing models are not found. /…/ We would need a poetic architecture very different from the one created by contemporary elitist architects or what is found in the 'star' buildings in the world. An architecture that will satisfy and express other's and our best insights – and that contains something of the dreams behind philosophies and manifests about human rights, dreams about a future better world. When and where will it appear?[150]

Caldenby (1995) does not find that modernism is completely alien to 'ecological' issues. Caldenby brings forward the light and mobile structures of the 1960s as examples of this as well as work by Foster even if the 'ecological correctness' of his attempts can be discussed.

Adams (2001) in his comments on Universeum, the Science Centre (Photo 9.4) by architect Wingårdh, celebrates the building as a happy marriage between modernism and 'ecology':

> For Wingårdh, the building's ecology is an integral part of the design. /…/ Wingårdh's Universeum makes plain that the values of modernity and ecology need not be in conflict.

Butters (2002), in contrast, points out a range of bad experiences with 'ecological' front-line projects that have been celebrated as a happy marriage between modern architecture and 'ecology'. Focus has been more on finding interesting architectural expressions than on real

Photo 9.4 Universeum Sceince Centre, Göteborg, Sweden. Architect Wingårdhs Arkitekter. (Photo Bengt Wallin)

[150] "Det finns ännu få exempel på verkligt god arkitektur, där alla dessa nya värden fått sitt utryck. Modernismens modeller tycks irrelevanta och har förkastats, men man har ännu inte funnit övertygande nya modeller. /.../ Det skulle behövas en poetisk arkitektur av mycket annorlunda typ än den som skapats av dagens elitarkitekter eller som man finner i världens 'stjärnbyggnader'. En arkitektur som tillfredställer och uttrycker våra och andras bästa insikter – och som innehåller något av de drömmar som ligger bakom filosofier och manifest om mänskliga rättigheter, drömmar om en framtida bättre värld. När och var kommer den att uppstå?" (Erskine, 1979 p. 9)

environmental impact. He suggests that we study critically the 'ecological' front-line projects as architects have a tendency to shut their ears for critics. Butters finds that modern architectural ideals are not possible to join with 'ecological' consideration.

> Modernistic and 'ecological' views of the world and their respective design processes are, in some cases, diametrically opposed[151].

The experiment and the mainstream

In his article in number 6/2000 Edén (200) finds that even if environmental consideration is no longer a question of *if* but *how*, 'ecological building' is still a sub-stream in contemporary building practices. However, the author gives no indication of why this might be so. Some explanations are given by Tägil (2000) who refers to two schools designed by the same architect. Tägil finds a weakened interest in ecological experiments and instead a focus on pragmatic unobtrusive ecology:

> The Viking School is not even introduced as an ecological project. /…/ One can speculate over why the ecological experiment was not continued after the Östratorn School. The ecological issues are perhaps not as 'hot' any longer in this stock market fixated era. The ecological as a progressive carrier of ideas has been weakened. /…/ Then reports have appeared about defective technology even in the ecological building experiments.
>
> In addition, the Östratorn School was an experiment that was intended to be evaluated. Despite the symbolic and educational values that an ecological project has, from a practical view it almost requires that all persons involved have to be enthusiasts in order to make it work. The experimental building usually gets more pragmatic followers. That for which time is not ready disappears, but one nevertheless continues on another level than before. The Viking school is an example of this. Here the ecological aspects have become a natural matter of course, without being forced to go 'the whole hog'. 'The healthy-house concept' in this case has also come to mean to build with common sense."[152]

[151] Den modernistiska och ekologiska synen på världen, och deras respektive designprocesser, är i vissa stycken diametralt motsatta (Butters, 2002 p. 29).

[152] "Vikingaskolan lanseras inte ens som ett ekologiskt project. /.../ Varför man inte fortsatte det ekologiska experimentet efter Östratornskolan kan man spekulera över. De ekologiska frågorna är kanske inte lika 'heta' längre i denna börsfixerade tid. Ekologin som progressiv idébärare har också försvagats. /.../ Därtill har det börjat dyka upp rapporter om tekniska brister även i det ekologiska experimentbyggandet

Several other authors agree with Tägil in that they do not think that single 'ecological' experiments are the best strategy to change mainstream building. More will be achieved if the 'ecological' level is raised in all buildings (Lundahl, 1991; Simonsen, 1992; Brunnberg, 1995; Asklund, 1997). For example Asklund (1997) finds it more important to:

> ...build with common sense and use electricity at peak periods instead of throwing away money on costly and complicated systems.[153]

Lundahl (1991) points out the fact that 'eco-villages' are exclusive as they demand good economy for the involved as well as the physical possibility to become actively involved in the daily care of the living area. Brunnberg (1995) turns his back on earlier 'technical experiments' and welcomes simple solutions in the hand of the users:

> …building with the support of eco-cycle principles should not be a special category for self-sacrificing enthusiasts in their own colonies. Experimental building-certainly- but this is primarily about raising quality in general.[154]

Caldenby (1995) gives a warning against ecological fundamentalism and totalitarian visions. He finds that 'ecological' architecture is lost between organic formalism and the fundamentalism in the technological, biological and natural sciences. Caldenby further points out that the visual ecological attributes, such as green roofs, glass-rooms, and grotesque roof constructions, are hindrances for development:

Dessutom var Östratornskolan ett experiment, avsett att utvärderas. Oavsett det symboliska och pedagogiska värde som ett ekologiskt projekt har, krävs det ur praktisk synpunkt nästan att alla inblandade är 'eldsjälar' för att det ska fungera. Experimentbyggandet brukar få en mer pragmatsik efterföljd. Det som tiden inte är mogen för försvinner, men man fortsätter ändå på en annan nivå än tidigare. Vikingaskolan är ett exempel på detta. Här har ekologiska aspekter blivit en naturlig självklarhet, men utan tvång att 'löpa linan ut'. 'Sunda-hus-konceptet har i detta fall också blivit ett byggande med sunt förnuft." (Tägil, 2000, p 11).

[153] "...bygga förnuftigt och toppa med el än att kasta ut pengarna på kostsamma och komplicerade system." (Asklund, 1997 p. 62)

[154] "...byggande med stöd av kretsloppsprinciper ska inte vara någon egen kategori för självuppoffrande entusiaster i egna kolonier. Experimenterande byggande, visst, men det handlar ju i första hand om att höja kvaliteten i allmänhet." (Brunnberg, 1995 p. 29).

> What those signals say is that ecology is still a utopia, an ecological niche on the periphery of society with a need to manifest its particularity.[155]

Several authors would like to play down the seriousness in sustainable development and bring forward beauty, creativity, sensuousness, and poesy as important ingredients (for example Lundahl, 1989; Tiberg, 1989; Caldenby, 1990; Lundahl, 1991, Eble, 1992). As Danish architect Jens Arnfred cited in Caldenby (1990) says:

> Perhaps it is already too late but we should allow time to relax and not only worry, he says. The ecological derives out of the artistic, imagination, and madness can never be exploited.[156]

9.4 Discussion and conclusions

This study of *Arkitektur* between 1973 and 2002 shows that sustainable building or architecture, in the review systematically called 'ecological' architecture, is still separated as a special theme for discussion and not integrated into the general debate. 'Ecology' is mainly brought up in a thematic number every second year. Discussions are held by a rather limited and select number of authors, who mainly reflect personal ideas. Political objectives and the agendas for sustainable building that have reached consensus in the building sector are seldom brought up (see Chapter 2 and compare with results from the study of trade press, Chapter 8). The question remains whether or not this is a reflection of the interest of the editorial board or a reflection of the architectural profession in Sweden.

Even if 'ecological' considerations are discussed as a separate theme for architectural design, most authors agree that 'ecological' considerations should be a part of all good architecture. The often-referred statement that 'all good architecture is ecological' is refuted by Butters (2002) and exemplified with several modern celebrated 'ecological' front line-projects. The statement that 'all ecological

[155] "Vad sådana signaler säger är att ekologi fortfarande är ett utopiskt projekt, en ekologisk nisch vid sidan om samhället med behov att markera sin särskildhet." (Caldenby, 1995 p. 4)

[156] "Kankse är det för sent men vi borde ge oss tid att inte bara bekymra oss utan också slappna av menade han. Det ekologiska kommer ur det konstnärliga, fantasin och galenskapen kan aldrig exploateras." (Caldenby, 1990 p. 58)

architecture is not good' is discussed by a large number of authors (e.g., Caldenby, 1995; Brunnberg, 1995; Asklund, 1997).

The impact of the statement that 'all good architecture is ecological' or maybe the very source for the expression is revealed in the reasoning in several articles. The discussion can be understood as if efforts are made to achieve good architecture, with natural, healthy and durable materials. This would be enough to also achieve 'ecological' building. Similar reasoning has been found among architects in the interview study (Chapter 7) and also confirmed by Dalman (2001) in her interview study with architects involved in the Swedish demonstration project Bo01. There seems to be a kind of 'architectural view' of sustainable building with strong faith in aesthetics and good architecture. Furthermore, 'ecological' experiments are not largely supported by the authors. Instead an unobtrusive 'ecological' architecture is set forth, based on simple guidelines for good architecture.

It is interesting that discussions of 'ecological' architecture in *Arkitektur* often emphasise poetics and beauty as part of a human approach (see for example Tiberg, 1989; Caldenby, 1992). These terms are unfortunately often missing in the discussion of sustainable development and sustainable building both in the form of political objectives, as agendas in the sector and among researchers.

Chapter 10 Demonstrations Projects as a Strategy for Making Mainstream Building more Sustainable

The point of departure for this thesis is the current endeavour being made to support sustainable development in the building sector. Both at a national level and at a building sector level, during the past decade investments have been made in Sweden and the Netherlands towards achieving sustainable development with regard to building practices and the built environment. The main aim of this thesis has been to discuss the relevance and significance of demonstration projects as a strategy for supporting processes to make mainstream building more sustainable.

The research problem has been addressed through four different empirical studies in which demonstration projects for sustainable building have been studied as part of the everyday practice of the building sector for supporting the processes of change to conform to sustainable development, as well as being studied as products of the same practice. The demonstration project has also been studied as part of the contemporary discourse, among actors in the Swedish and the Dutch building sectors and in the Swedish trade press, in the respect of that in a continuous process aim at defining the concept of sustainable building and discuss relevant measures to be taken in order to attain sustainable building. A framework presented in Chapters 2 – 4 has been the basis for discussions around the findings from the empirical studies. This framework presents the notions of sustainable development and sustainable building, together with the conditions for learning and development in the building sector as well as findings from earlier studies in the field.

In this concluding chapter the discussion will be focused on the three research questions posed in Chapter 1. Firstly, the importance of the demonstration projects for arriving at more sustainable mainstream building will be discussed. Secondly, the question of how to study and present demonstration projects will be discussed as well as the way to

disseminate information from demonstration projects. Thirdly, conditions for the diffusion and reproduction of experience and findings from demonstration projects in mainstream building practices will be discussed.

10.1 The relevance of the demonstration project

A first conclusion that can be drawn, based on the empirical studies presented in this thesis as well as earlier research in the field, is that demonstration projects have an important role in the process towards more sustainable building. The demonstration projects make the complex problem of sustainable building both a tangible and a visible concept, and as such the idea of sustainable building will be physically present and represented in everyday situations as well as in discourses at a building sector level, at a national programme level and the general public level.

For the building sector, the demonstration projects provide real-world data, and can be attributed the function of reference objects for sustainable building both concerning the product, that is to say what sustainable building is and the process, how this can be implemented. The demonstration projects provide arenas for developing learning through doing in which actors in the building sector can try out new or more established sustainability concepts, environmental technologies etc. in practice. The practical experience performed in the demonstration project arena can also be observed by actors in the rest of building sector. The demonstration project is theoretically a potential strategy that provides good possibilities for supporting learning and development processes towards sustainable development in the building sector as well as a knowledge build-up relating to sustainable building. However, the empirical studies show that demonstration projects have deficiencies regarding a strategy for making mainstream building more sustainable and as a basis for a knowledge build-up. Such a strategy has to be improved in order to become effective and influential.

Learning from experience

In Chapter 3, the learning, development and innovation processes of the building sector were described as being slow and usually taken in small

steps. One reason for the slow pace of the building sector's processes of change is that it is a large sector. Moreover, both the products, the buildings and the building process, are complex systems involving many actors, different technologies etc. The change towards sustainable development will involve changes among the actors in technological systems as well as in social and cultural systems, and probably also in adjoining systems such as the prevailing economic systems, legal systems etc. There are reasons to believe that the changes towards sustainable development in this large complex system that comprises the building sector will take time (cf. discussion in Section 3.7). Many changes initiated today will have effect in the future. Another reason for the slow and incremental development processes in the building sector is that knowledge-building is dependent on experience gained in practice. A building project is a long process and there will be several years between the initiation of a building project and the built result and feedback.

Theoretically, the building sector has many favourable conditions for innovation and development (see Section 3.7). The building project offers multiple networks of actors and every new building project can be seen as an 'experimental workshop' (Dubois and Gadde, 2002). In practice, several studies point out the lack of incentives and interest in the building sector for innovation, knowledge build-up and for learning from experience (Bröchner et al., 1991; Ericson and Johansson, 1994; Dubois and Gadde, 2002; Lutz and Gabrielsson, 2002; Swedish Government, 2002:115; Rethinking Construction, 2002; Dulaimi et al., 2003; Josephson et al., 2003; Andersen et al., 2004). Among other reasons, barriers for learning in the building sector are found in the structure and organisation of work. Furthermore, actors in the building sector often focus on the unique and temporary character of the building project, which does not give incentives for feedback and learning (Dubois and Gadde, 2002; Lutz and Gabrielsson, 2002; Josephson et al., 2003).

Deficiencies concerning learning in contemporary demonstration projects

One of the main ideas with the demonstration project is to provide learning experience for the actors involved and to become educational

cases for the rest of the building sector. Even so, the empirical studies in this thesis show that the opportunities for learning offered by the demonstration projects are not made use of. There is often a lack of systematic evaluation, feedback and dissemination of results from demonstration projects venturing the internal as well as the external learning processes. This is also confirmed by earlier studies in the field (Sections 4.5 and 4.6).

Individuals and organizations in the building sector learn either from gaining their own experience or by taking advantage of experience gained by other actors. The empirical studies show that little time and money is set aside for internal evaluations, feedback and reflection about experience among the actors involved. The conclusion that can be drawn from this is that individual as well as organizational learning is undervalued in the building sector. The lack of interest for learning is considered as a general problem in the building sector (Bröchner et al., 1991; Swedish Government, 2002:115; Josephson et al., 2003). Another aspect of this, pointed out by one of the respondents in the interview study (see Section 7.7), is that architects for example have the tendency not to want to look back on old experiences. Instead they focus on new projects. A few other statements by architects in the interview study (see Section 7.7) confirm the lack of interest in feedback and post-occupancy evaluations of building projects in general among architects, but also in the rest of the building sector (cf. Brand, 1994; *Building Research and Information*, 2001). The empirical studies confirm the general dialectic between the learning and the action perspectives in building projects taken up by Lundin and Midler (1998). Earlier studies of building experiments and demonstration projects also show that the learning perspective is often neglected in favour of action (production) and the diffusion of innovations (see Section 4.5).

The lack of systematic evaluations and dissemination of results also venture the reliability and usability of experiences from demonstration projects. In the case of successful demonstration projects, this sets up barriers for the reproduction of the concepts and solutions used. It is important that results from demonstration projects are reliable (scientifically defensible). Furthermore, the demonstration project should be carried out in an open manner so that observing parties can recognize the demonstration project as ‘a fair test’ (cf. Keating and

Peach, 1989). The existence of consistent and reliable information should also work against negative demonstrations, for example, that negative rumours and images are spread from demonstration projects due to the lack of reliable information.

Findings from the case studies (Section 6.5) show that a reliable and useful evaluation should be planned and budgeted for from the initiation of the demonstration project. A Swedish respondent in the interview study (Section 7.7) finds it important that an independent and objective partner evaluates demonstration projects. The argument is to assure that the evaluation is spread and not (for example, in case of negative results) kept only for internal use. However, it can be argued that such an external evaluation cannot completely replace any internal evaluation and reflection about experience that will be of importance for the internal learning processes among the actors involved. Moreover, several authors in the literature (Section 4.7) and also respondents in the interview study (Section 7.8) point out that evaluations should be made in a way that their findings are comparable with other demonstration projects, if possible also internationally.

10.2 Dissemination and the use of information and experience

An earlier study of demonstration projects in the Netherlands emphasises the reproduction of successful results when a team of more or less the same actors is involved in a chain of successive demonstration projects (Buijs and Silvester 1996). In order to influence mainstream building outside the team of the actors involved, experiences from the demonstration project have to be externalised and disseminated. The temporary organisations of the demonstration projects can be characterised as ‘hosts for knowledge’ (Lundin and Midler, 1998), and the experience, not least the collective experience among the actors involved, has to be externalised and disseminated as far as possible. The issue of the dissemination of information also concerns the question of how to present demonstration projects of sustainable building in order to provide information to be used in new design and decision-making situations.

As described in Section 3.3, learning is a matter of transforming experience generated by others, and transferred through a source of information into living and useful knowledge. This process involves three steps: the production of information based on experience, the transmission of information and the transformation of information into useful knowledge to be used in new design and decision-making situations. It can be argued that consistent background information should be provided in order to make it possible to understand the contextual, specific and local constraints for the reproduction of the results. Furthermore, the presentation of information from demonstration projects should make it possible to recognize what the example is, for instance if it is the product, the technologies and methods used, or if the example is found in the process of implementing sustainable building, (cf. Birgersson, 1996). In this thesis the distinction between the product information (the tangible), the process information (the non-tangible) as well as the distinction of the information that is spread in written sources (the image) has been pointed out (see Sections 5.2 and 6.5). The thesis indicates that a considerable part of the information about demonstration projects that reaches actors in the building sector is not first-hand information, but is in some way filtered through an information source, for example, the trade press or information material spread by the project owners (see Sections 7.7 and 8.1).

The need for functioning and reliable change agencies

The case studies (Chapter 6) and the interview study (Chapter 7) in this thesis point out the lack of formal institutions and organisations for the dissemination of experience; both internally, from the temporary organisations involved in the demonstration projects to the home organisations, as well as externally, from the demonstration projects to the rest of the building sector. The general lack of structures for the formal dissemination of experience in the building sector is confirmed by the literature (see Chapter 3 and 4). Using the term of Rogers (1962), it can be argued that the sector is in need of *change agencies;* both inside organisations for the internal dissemination of results, and reliable change agencies that are common for actors in the building sector for the external dissemination of results.

The thesis indicates that neither research reports nor the trade press function satisfactorily as change agencies regarding experience and information from demonstration projects. Respondents in the interview study (see Section 7.7) complain about the lack of reliable and also easily accessible information about sustainable building. The respondents seldom use research as source of information, which they find difficult to access, irrelevant for their practice or even non- existent. The fact that the actors do not use existing research is a general problem in the building sector (cf. Strannegård et al., 1998; Swedish Government, 2002:115). The most commonly used sources are personal contacts and informal and formal networks (See Section 7.7)

In Chapters 8 and 9, the Swedish trade press has been studied as one easily accessible and often referred to source of information about demonstration projects and sustainable building in general (see Section 7.7). These studies show that the trade press can function as an eye opener during the early stages of an adoption process for new concepts and technologies (cf. Rogers, 1962). However, the Swedish trade press fails to provide consistent information applicable in design or decision-making situations.

The power of example

A demonstration project is not automatically a 'good example' of sustainable building. This depends, on the one hand, on the level of success of the demonstration projects in reaching their ambitions for sustainability and their applicability. On the other hand, this will also depend on whether the ideals represented by the demonstration project correspond to the ideals among the actors within the building sector.

The studies of the Swedish trade press show that the information provided about the demonstration project is scanty and lacks background information. Consequently, the trade press fails to create an understanding of the problem complex of sustainable building and the background to the decisions and measures taken in the demonstration projects presented. For example, the tangible aspects are often overemphasized leaving aside the important experience of the non-tangible dimension, the process of fruition. The lack of information about the background to decisions taken in the specific demonstration project implies a risk that already defined solutions and rather closed

images or ideals of sustainable building can become normative[157]. When these normative and closed solutions or ideals fail to address the interest of the building sector they may instead have a negative impact on the development of sustainable building (cf. Edén et al., 2004). This applies for example if the demonstration projects are understood as not being able to be reproduced on a larger scale, or when the introduction of sustainable concepts or technologies are beyond the feasibility of present building practices or if the architectural design of the examples are not regarded as being aesthetically attractive. When ideals for sustainable building are beyond the reach of the individual actor or the organisation in everyday practice, sustainable building risks being set outside the main agenda of the building sector.

The empirical studies show that aesthetics are important issues for architects when searching for 'good examples' of sustainable building. The empirical material also indicates that the image of the typical sustainable building project is a project in which aesthetics (according to for example the view of architects) have been neglected in favour of focusing on alternative materials, technical solutions etc. This has lead to an aversion to this kind of project among for example architects (see Chapter 9). The contemporary discourse on sustainable building often overlooks architectural quality and aesthetics as being criteria of importance. As a result, visions and objectives for sustainable building have often failed to address the interest of architects (cf. Ryghaug, 2002, Femenías, 2004).

Another side of this problem is that architects have the tendency to set architectural aesthetics in focus and architectural aesthetics are often valued higher than other important factors in building design, such as the function and use of the project (cf. Brawne, 1992; Brand, 1994). The interview study shows that when pointing out what they find to be 'good examples' of sustainable building several respondents place architectural design before function (Section 7.8). The fact that a demonstration project for sustainable building was left without proven effect, or even with negative results within some parts of the projects, did not hinder some Dutch architects from having these projects as inspiring examples.

[157] This is not only a problem with the discourse in the trade press, but also in other parts of the discourse on sustainable building, for example, in the literature. See discussion in Edén et al., 2004.

10.3 Sustainable building – still a place apart

The absence of influence from demonstration projects for sustainable building on mainstream building practice in Sweden was stated already in Chapter 1 (Figure 1.1). In this chapter several reasons for this lack of influence have been discussed. Firstly, it can be seen as being the lack of incentive and interest in the building sector to learn from experience. Secondly, that there is a lack of compilation and dissemination of reliable and useful findings from demonstration projects. Thirdly, many demonstration projects fail to appeal to actors in the building sector, as the ideals of the demonstration projects do not correspond with the ideals of the actors. A fourth reason is that demonstration projects are considered as being special projects and sidetracks from mainstream building. In the demonstration project, the actors involved make a commitment before the observing building sector and public to achieve a more sustainable building. The empirical studies show that when involved in such commitments, the building sector also approaches towards more sustainable building. However, successful demonstration projects often demand extra time in the process due to a more thorough planning: interdisciplinary tasks, the education of those involved, the involvement of expert knowledge etc. After the completion of the demonstration project, the majority of the actors involved return to their normal procedures and projects where there are less resources for continuing the development of sustainable building. The demonstration project then becomes a sidetrack or a one-off monument over initiatives taken at a certain moment. Consequently, demonstration projects fail to become part of a continuous development process towards more sustainable building. The special project or the 'research event' according to several authors has little chance of surviving in the real world where extra resources concerning time and money for fulfilling explicit objectives are missing or less present (Granath, 1991; Ericson and Johansson, 1994; Bröchner and Månsson, 1997). It can be seen as being a contradiction in that the ambition of many demonstration projects is to attain sustainable building under the rather 'normal' conditions of the building sector, which are characterised by short-term thinking and a focus on the quick yield from investments (see Chapters 4 and 6).

The contradiction of distinction or acceptability

This thesis indicates that there is a contradiction between the acceptance of the necessary changes to accomplish sustainable building, and the idea that this should be within reach without greater changes in contemporary building practices. In order to become influential and to become normative on a broad level, sustainable building has to become the mainstream building practice. A large part of the building sector, both in Sweden and in the Netherlands (see Chapters 6 – 9), is against the idea of distinguishing sustainable building as being a special kind of building project – sustainable building should be mainstream building. The empirical studies show that actors within the building sector are opposed to the extraordinary or ideological experiment that fails to address the majority of the actors in the sector and that consequently falls outside the sector's main agenda. Instead, the empirical studies point out the advantage of an incremental and successive development through realistic (and economically justified) projects using technology and methods applicable on a broad scale. The interview study shows that actors in the building sector make clear distinctions between building experiment and demonstration projects, but also point out the similarities between these two categories, and a preference for the latter (Table 10.1).

Table 10.1 The building experiment and the demonstration project as perceived by the respondents in the interview study (see, Section 7.8).

Building experiments	**Demonstration projects**
'Laboratory environment'	'Ordinary real world projects'
For research	For the building sector
(Should be) Small-scale	(Always) Full-scale
Can fail	Should not fail
Untested technique	Tested technique
Highly innovative	Innovative
Documentation	
Evaluation	
Dissemination of results	
More time in design and decision processes	
Extra costs in process	

The study of *Arkitektur* reveals a preference for a pragmatic and unobtrusive 'ecological' architecture among the authors (see, Section

9.3). The study shows that the authors have an aversion against the special and sometimes even symbolic examples of sustainable building. However, the study of *Arkitektur* indicates that some architects idealise the merits of simply 'good' architecture and consider that good architecture in itself is sustainable. The same ideas are revealed among several respondents in the interview study, and are confirmed in an earlier study (Dalman, 2001). This view of sustainable building focuses on durability, and underestimates the importance of for example environmental issues.

The idea of mainstream sustainable building is in conflict with the fact that sustainable building has to point towards the future. The demonstration project has to be more sustainable than mainstream, and even much more sustainable considering the state of the world (see Chapter 2). This contradiction between the idea of mainstream sustainable building and urgent threats against sustainable development is also recognised by a few respondents in the interview study (see Section 7.8). These respondents find it advantageous to clearly distinguish sustainable building from the mainstream in order to place the subject on the agendas. These respondents also call for new experiments within sustainable building that will push the development further.

Accordingly, this discussion indicates the problem of using a special label for the distinction of sustainable building. On the one hand, by addressing sustainable building as something special there is a risk it will be set outside the main agenda of the building sector. This is what characterises the development of sustainable building at the beginning of the 21st Century in the Netherlands and also in Sweden. The building sector and also the public have lost interest in sustainable building. On the other hand, if sustainable building is not distinguished from mainstream building there is a risk that the concept will be watered down. There is a risk that the concept can mean anything, include anything, and in the most negative scenario even be 'business-as-usual'.

10.4 Concluding remarks and future work

This study indicates that the demonstration project for sustainable building has the potential for becoming a strategy for successive and

incremental development in order to achieve the long-term objectives for sustainable development through realistic advancements. Demonstration projects for sustainable building tend to become quickly dated as research and technology advances and as cultural, societal and sector systems and values develop. Accordingly, the one-off demonstration projects should be seen as part of a development process; as concrete and tangible steps on the path of the long-term process towards the abstract objectives of sustainable building[158].

In order to make the strategy more explicit a stepwise model is proposed in which the demonstration project represents one level of innovation (Figure 10.2). The model distinguishes four levels of practice (cf. Edén, et al., 2003): 1) 'basic' practice, which means 'business as usual', 2) 'best practice', which is the best that can be achieved with present technology and methods[159], 3) demonstration projects that are more innovative than best practice, but nevertheless less innovative and risky than the experiment, and 4) the experiment or front-line project that uses the technology and methods of tomorrow. Accordingly, the model acknowledges the need for, on the one hand, 'best' practice examples and demonstration projects showing the way on a broad level, and on the other hand, building experiments or 'front-line' projects that have a much higher innovation level than the former. The model proposes that tomorrow's 'best' practice and demonstration practice will become mainstream, while new higher levels of innovation towards sustainable development will be sought for in new demonstration projects and building experiments. Furthermore, the model makes a clear distinction between experiments and demonstration projects in order to avoid the negative demonstrations of untried concepts and technologies not ready for direct implementation (cf. The Swedish Energy Research Comission, 1987).

[158] For a discussion on projects and processes in sustainable development see Falkheden, 1999 p. 138-139.

[159] The 'best practice' concept estimates that contemporary building practices have potential to develop, and consequently that 'basic' building practices are charged with unnecessary waste of potential quality (Rethinking Construction, 2002; Edén et al., 2003).

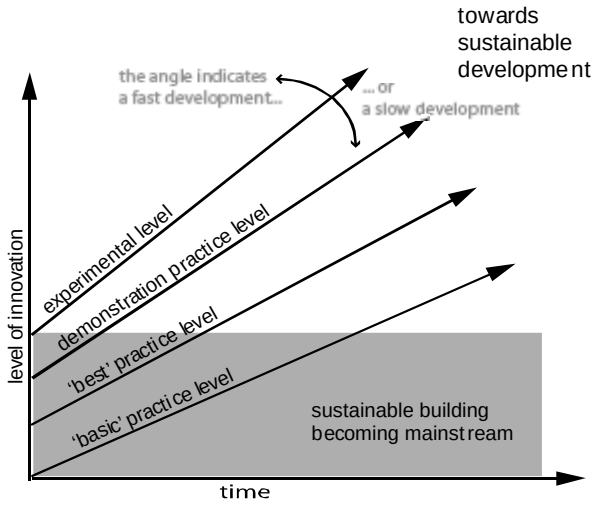


Figure 10.1 The successive process towards sustainable development in the building sector making mainstream building more sustainable (based on discussions in Edén et al., 2003).

The idea of the demonstration project as part of a successive development towards sustainable development could be helpful in encouraging actors in the building sector to initiate and commit themselves to such projects. Through the empirical studies it has been revealed that some of the hindrances for the implementation of sustainable building are the lack of consistent images of the problem and the lack of reliable information. This can also be a question of the actors in the building sector having difficulties in transforming existing information into useful and living knowledge able to be used in practice.

Sustainable building when addressed in its total complexity can be paralysing. Several respondents in the interview study have difficulties in describing the characteristics of sustainable building and some even find it impossible to imagine the ideal sustainable building in practice. Confronted with this huge and abstract task, and without any clear recipes on how to act, some actors will react by avoiding the task and persist with old routines (compare with the discussion in Section 3.5). The ideal situation would be if demonstration projects could be seen and

used as a strategy for incremental learning and development without the fear of making mistakes. All experience, good as bad, should be encouraged. The ideal would also be if the demonstration projects could function as arenas for mutual exchange between research and the world of practice in order to build up knowledge, based on real world data, able to be scientifically tested and spread outside the project team.

A strategy in a larger development process

The thesis shows that there is a need for the continued development and investment in demonstration projects for sustainable building, both in practice and in theory. However, these future demonstration projects should be carried out in a systematic way in order to ensure a collective knowledge build-up as well as the promotion of learning processes. There is a need for the development of evaluation methods for demonstration projects for sustainable building and further developed ideas regarding information communication in the building sector. Ultimately this concerns the development of the idea of change agencies for information communication about sustainable building in the building sector.

This thesis has had the aim of contributing to theoretical as well as practical advancements concerning the understanding and use of demonstrations projects for sustainable building. The demonstration project as a strategy for sustainable development in the building sector has also to be developed regarding its effective influence on mainstream building practices. In order to be ‘good examples’ of influence, what is needed are successful demonstration projects combining among other factors environmental issues with social and architectural values that will create confidence in sustainable building.

The findings show similar experience from demonstrations projects for sustainable building in Sweden and the Netherlands. Supported by the governmental authorities, the Netherlands made larger investments in demonstration projects in the late 1990s. However, both countries at the moment experience a backlash in interest for sustainable building as well as what concerns the development of demonstration projects. The demonstration project as a strategy for supporting the process towards sustainable development in the building sector should be seen as one important part of a larger investment. Investments for sustainable

building have to be made at a national and political level, at a building sector level and at the level of the organisations and individuals in the building sector, not least that which concerns education. Changes are needed in technological systems as well as in non-technical systems, such as the values and frames of reference among the actors and professional groups, and possibly also in systems outside the reach of the actors in the building sector, such as in economic systems, legislation etc. The thesis presents the building sector as a large and complex system and supports the idea that changes towards sustainable development in this sector are processes that will need time.

The contributions from all the individual actors in the building sector involved in this process are indispensable. There is a need for a better understanding of issues regarding sustainable development among the actors within the building sector. In order to support such development, there is also a need for a better understanding of the factors impeding the actors from becoming involved in this development. These factors can be the problem with lack of information or lack of good examples, or the fact that the building sector is stuck in old structures and routines that impede development and change. The empirical studies indicate that the actors in the building sector are willing to accept the challenge of sustainable building, but there is some kind of paralysis to overcome in order to advance. The interview study shows that the actors often think that there are other actors in the building sector that should take the first step for development, or that the responsibility is on the politicians, or the trade press. However, it could be argued that all individual actors in the building sector should take a larger responsibility for sustainable development. In order to attain a higher level of individual as well as organisational learning and development (see double loop learning, Section 3.5), this will also demand a critical view of the governing ideas and procedures in the daily practice of the building sector, both those of tacit and explicit character within organisations and professions.

The demonstration project as presented in this thesis is built up on the idea of a more mainstream sustainable building with broad applicability, a ‘way-winner’ strategy (see Section 2.3) in line with the ecological modernization of society in Sweden and the Netherlands. The thesis has also shown that actors in the building sector more easily accept the challenge of mainstream sustainable building, as well as the idea of the

successive development of the demonstration project, compared to more radical changes in contemporary building practices. However, it can be argued that there is a need for complementary demonstration projects or experiments that reach a higher level of innovation and that would demand more radical changes in building practices. It can be argued that there is a need for complementary 'path-finder' projects in the development. Some pioneers in the interview study (Chapter 7) have preferences for the 'path-finder' perspective with alternative and local solutions to sustainable building. The concept of sustainable building is still vague for many actors in the building sector, and accordingly open for personal interpretations. There is a risk that the concept will be watered down and become mainstream in order to be in compliance with other interests in the building sector. This thesis indicates that there is still a need for further developed analysis of what sustainable building is, as well as how this can be accomplished.

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Interviews:

IP1: **Project manager at the developer ECO-plan, Amsterdam.** (male) Also referred to as ‘project manager from ECO-plan’. Was involved in the project from app. 1993 – 1999. Interviewed 2/7 1998

IP2: **Architect from Christiaanse Architect & Planners, Rotterdam**. (male) Was involved in the project from 1993 – 1995. Interviewed 3/7 1998.

IP3: **Architect from Atelier Zeinstra, van der Pol Architect Office, Amsterdam**. (male) Was involved in the project during building design in 1995. Interviewed 3/7 1998

IP4: **Head of Neutelings Architecture, Rotterdam**. (male) Telephone interview 6/7 1998.

IP5: **Project manager at Westerpark district authorities, Amsterdam.** (female) Also referred to as ‘project manager at the local authorities’. Was involved until 1994. Interviewed 7/ 1998.

IP6: **Environmental consultant from BOOM, Delft, responsible for the urban design.** (female) Involved from 1993 – 1994. Interviewed 8/7 1998, and 10/6 1999.

IP7: **Two representatives from Building contractor Dura Bouw, Amsterdam.** (male) Involved. 1995 – 1998. Interviewed 10/7 1998.

IP8: **A couple (without children) living at GWL-terrain, Amsterdam**. (female and male) Interviewed 12/7 1998.

IP9: **Person living at GWL-terrain.** (female) Interviewed 8/4 1999.

IP10: **Employee at the neighbourhood office in Westerpark district, Amsterdam.** (male) Referred to as ‘the employee at the neighbourhood office’ or IP10. Followed more or less the whole project. Interviewed 8/4 1999.

IP11: **Environmental consultant at BOOM, Delft, responsible for the building design.** (female). Involved during building design 1995. Interviewed 10/5 1999.

IP12: **Person living in Block 5 at GWL-terrain**. (male) Interviewed 7/7 1999.

IP13: **Controller from developer ECO-plan, Amsterdam.** (male) Involved in the project from app. 1995 – 1998. Interviewed 9/7 1999.

IP14: **Local administrator GWL-terrain.** (male) Informal talk while walking around the area in July 1998.

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Interviews

1: **Project manager at the developer Bostadsbolaget, Göteborg. (**male) Interviewed 18/6 1998, and 7/3 200(Further a telephone interview was made the 23/2 2000.

2: **Head of Wingårdhs Architects, Göteborg.** (male) Telephone interview June 1998.

3: **Persons living in the building at Lindholmen.** (female and male) June 1998.

4: **Architects employeed at Wingårdh’s Architects, Göteborg.** (male) Interviewed 3/2 2000.

5: **The local administrator for Bostadsbolaget at Lindholmen, Göteborg**. (male) Informal talk while walking around the project, 7/3 2000.

6: **Environmental coordinator at the developer**. (female) *She was not involved in the project* but employed after the project’s completion. Telephone interview 23/2 2000.

7: **Former environmental coordinator at the developer**. (female) Interviewed 10/3 2000.

List of interviews for the interview study (Chapter 7)

Interviews with Swedish actors:

SA1: Male architect, pioneer. Interviewed Mai 30th 2001. 94 minutes.

S2A: Male architect, pioneer. Interviewed October 4th 2001. 96 minutes.

S3A: Male architect/professor, pioneer. Interviewed October 18th 2001. 104 minutes.

S4A: Male architect, pioneer. Interviewed November 23rd 2001. 140 minutes.

S5A: Male architect, pioneer. Interviewed February 21st 2002. 96 minutes.
S6A: Male architect, 'less experienced'. Interviewed February 2002. 33 minutes.
S7A: Male architect, 'less experienced'. Interviewed November 16th. 60 minutes.
S8A: Male architect, 'less experienced'. Interviewed December 1st. 70 minutes.
S9A: Male architect, 'less experienced'. Interviewed December 5th. 92 minutes.
S10E: Female environmental consultant, 'less experienced'. Interviewed Mai 31th 2001. 60 minutes.
S11E: Male environmental consultant, 'less experienced'. Interviewed February 20th 2002. 60 minutes.
S12E: Female environmental consultant, pioneer. Interviewed February 20th 2002. 80 minutes.
S13C: Male client, 'employee'. Interviewed October 26th 2001. 83 minutes.
S14C: Male client, 'less experienced'. Interviewed February 2002. 96 minutes.

Interviews with Dutch actors:

N1A: Male architect, pioneer. Interviewed June 26th 2001. 47 minutes.
N2A: Male architect, pioneer. Interviewed November 7th 2001. 57 minutes.
N3A: Male architect, pioneer. Interviewed November 9th 2001. 80 minutes.
N4A: Male architect 'less experienced'. Interviewed June 25th 2001. 90 minutes.
N5AE: Male architect/ environmental consultant, pioneer. Interviewed June 27th 2001. 57 minutes.
N6AE: Male architect/ environmental consultant, 'less experienced'. Interviewed November 8th 2001. 51 minutes.
N7E: Female environmental consultant, 'less experienced'. Interviewed June 25th 2001. 60 minutes.
N8E: Female environmental consultant, 'less experienced'. Interviewed June 27th 2001. 55 minutes.
N9E: Male environmental consultant, 'less experienced'. Interviewed June 27th 2001. 74 minutes.
N10E: Male environmental consultant, pioneer. Interviewed November 8th 2001. 87 minutes.
N11C: Male client, 'employee'. Interviewed November 7th 2001. 70 minutes.
N12C: Female client, 'employee'. Interviewed November 8th 2001. 60 minutes.
N13C: Male client, 'less experienced'. Interviewed November 6th 2001. 70 minutes.

Appendix A1 Environmental Measures for the GWL-terrein Case (Chapter 6)

Table A1.1 DCBA scheme over environmental ambitions for the urban design at GWL-terrein established in the SPvE (Gemeente Amsterdam, 1993). Ambition level for GWL-terrein marked in grey.

Theme	**D** **The normal situation**	**C** **Changed situation**	**B** **Minimum harm**	**A** **Autonomous**
1. Energy	4000 m^3 natural gas per household and year	3000 m^3 natural gas per household and year	2000 m^3 natural gas per household and year	Only renewable and sustainable energy
1.1 generation	Gas distribution	Combined heat and power	Solar and wind energy	Seasonal storage
1.2 construction	10.000 m^3 natural gas	7000 m^3 natural gas	4000 m^3 natural gas	Local construction materials
1.3 Usage:	Dispersed building	Greenhouses and storerooms	High, deep and wide buildings	Compact building
Heating	1300 m^3 natural gas	750 m^3 natural gas	450 m^3 natural gas (minimum concept)	No use of natural gas
Electricity	1000 m^3 natural gas, gives 3000 kWh	Energy saving installations Daylight use, 1500 kWh	No use of electric cookers, 1000 kWh	Limited use; 500 kWh
2. Water	Connected to municipal waste treatment system			
2.1 surface water	in- and outlet from surrounding water	purification with reed plants, storage/buffer and standard fluctuation	Seasonal storage, inlet in extreme cases	No inlet, complete purification
Channel banks	Concrete and tropical hardwood	natural materials	use of reed plant	Natural banks
2.2 waste water	Clean 7 times a year.	Separate sewer systems	Limited evacuation; green roofs and rain water barrels	Local waste water treatment
2.3 drinking-water	120 l per person and day	70 l per person and day, use of rain water barrel, water saving installations	30 l per person and day, reuse of rain water and	Drinking-water from the area

3. Greenery	Clean all			Keep existing landscape
3.1 preparing for building	If needed integral spade+	Partial raise, keep valuable landscape	Cunetten underneath housing and roads.	No raise
3.2 ecology/ nature	Mono-environment	Use functional zoning	Use fertile soil	Ecological infrastructure
Management	Cut grass 8 times per year and use pesticides	Grass cut two times a year and cut grass removed	Ecological management, sheep, cows, horses	Natural balance
3.3 recreation	Follow the normative	Green areas can be reached within walking distance	Recreation in the living area	Completely integrated
3.4 food production	Allotments as balancing item	Educational value, 20 m^2 per household	100m^2 per household, large and small cattle	>> 1000 m^2 per household
4. Live and work				
4.1 work opportunity	Bedroom town	All flats have a work space	”Nice” industry and offices in the area	Centre for IT- distance work
4.2 service	Concentrated in the area	At walking or biking distance	Small service shops in the area	Small service shops
4.3 occupant conduct	Slow conductive changes	Through information	Participation	Direct involvement
5. Site				
5.1 sun	Random orientation	Possible use of passive solar energy	Possible use of active solar energy, solar study of the site	Design suited to fit the orientation
5.2 wind	No attention, hinder coefficient 1.1	Some draught corners, coefficient 1.0	Study of model in wind tunnel, coefficient 0.8	Wind hindrance coefficient 0.5
5.3 noise	Good noise reduction with exceptions	Good noise reduction with no exceptions	One silent side of each house	Natural background noise
6. Waste				
6.2 organic	Burn or dump	Separate collection	Compost in garden or collection of organic waste	Compost in the area
6.3 glass	Recycle station	Recycle station at max. Distance of 60 m from dwelling	Collection at the house	Deposit
6.4 paper	Irregular collection	Recycle station in the area	Permanent dates for collection at the house	Recycle 100%
6.5 chemicals	Public chemical waste collection	Separate collection	Deposit in the area, open 60 hours/ week	Not used
6.6 heavy refuse	Burn or dump	”Show-days” for second hand shopping	Second hand shop in the area	Reparation in the area
6.7 dog’s dung	Not on our street	Doggy toilets	The owners responsibility	No dogs in the city

7. Traffic	The harder the better	Can you leave the car one day a week?		Home is best
7.1 slow traffic	Subordinated, longer distances	Structural differentiation	Priority	Only traffic permitted
7.2 carry transport	Op max 500 meters and 2/h	Max. 300 meters and 4/h	Max. 200 meters and 6/h	Optimally organised
7.3 private cars	Holy cow	Smaller lanes	Subordinated, no priority	Car-free area
7.4 parking	In front of the door, parking norm 1,5	At the end of the street, parking norm 1.0, distance work	Isolated parking, parking norm 0,5	Parking at entrance of living area, norm 0.25
8. Pipes				
8.1 system	Spread	Concentrated	Installed in foundation	Only the necessary
8.2 material	PVC/ copper	Cement/concrete/PE/ steel/fibre-cement	Limited dimension	
9. Building material	Choice on basis of investment			
9.1 paving	Asphalt	Concrete paving stones or brick tile	Semi-hard/permeable limited paved area	Crushed material for example wood chips?
9.2 furniture	Zinc coated metal, aluminium, tropical hard-wood	European hard-wood, recycled material, steel	Masonry, domestic spar	Clay, plants etc.

Table A1.2 DCBA scheme over environmental ambitions for the building design at GWL-terrein found in the SPvE (Gemeente Amsterdam, 1993). Ambition level for GWL-terrein marked in grey.

Theme	**D** **The normal situation**	**C** **Changed situation**	**B** **Minimum harm**	**A** **Autonomous**
1. Energy	*4000 m^3 natural gas per household and year*	*3000 m^3 natural gas per household and year*	*2000 m^3 natural gas per household and year*	*Only renewable and sustainable energy*
1.1 heat production	Gas-kettle	High efficiency gas-kettle with low NOx release	Radiant heating + solar collectors with heat storage	Top-load and cooking from with bio-gas
1.2 electricity production, consumption per year	Central electricity 1700 a.e.	Combined heat and power Max 1100 a.e	Individual solar cells and wind turbines 600 a.e.	Collective solar cells and wind turbines o a.e.
1.3 Construction			Low-energy construction techniques	Use of man power
1.4 heating	1300 m3 natural gas /household and year	750 m^3 natural gas/hh and year, Rc=3,0,	450 m^3 natural gas/hh and year	0 m^3 natural gas/hh and year

	Rc = 2,5	Extra insulation, energy efficient windows, minimum of windows to north, closed spaces (no open staircases nor kitchens),	Preheated in-air via green house, passive solar energy, transparent insulation, hot-filling washing machine	No need for heating due to extra insulation, passive solar energy, heat accumulation and use of rest-heat
1.5 hot-water	400 a.e.	Water saving 300 a.e.	Solar collectors + water saving installations 150 a.e.	Solar collectors + water saving installations, bio-gas
1.6 electricity		Energy saving installations Daylight use, 1500 kWh	Energy saving installations Daylight use, 1000 kWh	Energy saving installations Daylight, 500 kWh
2. Water	*Connected to municipal waste treatment system*	*Water saving*		*Self-sufficient*
2.1 drinking water	From the tap, 120 litre/ person/ day	70 litre/person/day, water saving installations on shower heads and taps, water saving toilet-6 litre	30 litre/person/day, Gustvaberg-toilet (4-6 litre), no bath-tube	Only for drinking, compost toilets
2.2 rain water	To the sewage system	Rain barrel in garden, permeable paving	Rain- water for toilet flushing, green roofing	Rain-water for shower, wash up and irrigation
3. Greenery	*Clean all*			*Keep existing landscape*
3.1 garden planning	Roses, heather, conifer, lawn, gravel/tile paths	No plants sensible for dryness, plants that attract butterflies, nesting boxes, limited paving	Plants for bio-diversity: birds, butterflies, bees Facade green, keep existing green	Nature like gardens, care for micro-environments, breeding places
3.2 food production	Allotments as balancing item	Educational value, 20 m^2 per household	100m^2 per household of kitchen garden	>> 1000 m^2 per household
4. Noise				
	Ilu + Ico = 0 dB (concrete)	Ilu + Ico = 3 dB (cavity walls without brace, floating floors)	Ilu + Ico = 6dB	Extra measures for noise-absorption
5. Waste	*Burn and deposit*	*Separate waste stream*	*Recycle*	*Closed eco-cycles*
5.1 during construction	Separation of chemicals	Waste separation	Complete waste separation, no packing, little waste production, construction possible to dismount, reuse	As little waste as possible, also rest for recycle, long life duration

			and recycle materials	
5.2 organic waste	Burn or dump	Separate collection	Compost in garden or collection of organic waste	Compost in the area
5.3 glass	Recycle station	Recycle station at max. Distance of 60 m from dwelling	Collection at the house	Only return bottles
5.4 paper	50% recycle	Recycle station in the area	Permanent dates for collection at the house, 90% recycle	Recycle 100%
5.5 chemicals	Public chemical waste collection	Separate collection	Deposit in the area, open 60 hours/ week	Not used
5.6 heavy refuse	Burn or dump	”Show-days” for second hand shopping	Second hand shop in the area	Reparation in the area
6. Traffic	*The harder the better*	*You can leave the car one day a week?*		*Home is best*
6.1 bicycles	Bad designed store room	Well designed store room	Store room/ bicycle stand close to entrance	Well supplied bicycle stands for visitors
7. Building materials	*Money as basis for choice*	*Minimal impact on nature*	*Consider indoor environment and waste situation*	*Local materials*
7.1 frame work	Concrete	Rest-materials as concrete gravel and FGD-gypsum	No metal, clean rest-materials, resource efficient	Wood, straw-bale, adobe, recycled bricks
7.2 envelope	Mostly synthetic materials, plaster of synthetic harts	No PUR, PVC, nor formaldehyde etc.; mineral plaster	Sustainable and possible to compost; brick with lime mortar	Unpainted wood, clay plaster
7.3 details	PUR, bitumen, lead	No PUR, PVC, bitumen, lead, zinc etc.	Draught safe, isofloc,	Reed, clay
- Windows	Tropical hardwood, PVC alkyd paint	European hardwood, high-solid or water based paint	Domestic wood (pine, larch, poplar), natural paint	Domestic wood
- Insulation	PS, PUR	Mineral wool	Cellulose fibre, cocoa nut, sea shells	Straw-bales, cellulose fibre, flax fibres, sea shells
7.4 Indoor	Gypsum, chipboard, melamine	No PUR, PVC, formaldehyde, radon etc.	Flexibility, wood	Wood, adobe, wax
8. Dwelling	*Towards the deluge*	*Information guidance*	*The good sake*	*Intentional*
8.1 furnishings	PVC, PUR, chipboard, tropical hardwood	Natural fibres, European wood, MDF	Built-in supplies	Chosen together with tenants
8.2 purchase of equipment	Money as basis for choice	Intentional choice	Hot-fill machines etc.	Collective

8.3 daily behaviour	Behaviour not reflecting possibilities	Information guidance	Optimal use according to possibilities	Make the living area more ecological
8.4 health and safety	Within alarm phase 3	No radon in cellar, attention for commune territory	Adapted for disabled, adaptable built, covered outdoor space	Central vacuum cleaner, dust free dwellings

Appendix A2 An Example of An Interview Guide used for the GWL–terrein Case Study (Chapter 6)

Here is an example of an interview guide used for interviewing actors involved in GWL–terrein case study presented in Chapter 6. The guide presented here was used for interviewing an architect in 1998.

Questions about x architect office:

1. Does the office have an environmental profile, what other projects have you done?
2. For how long did you work at x architect office? What was your position during the GWL–terrein project?
3. What is the architectural concept of the office? What kind of projects do you normally have?
4. Did working with this project make you and your office more interested in sustainable and environmental building or maybe the contrary?
5. Did some of the experiences you made make you and your office change the way you design buildings today?
6. Did the office do any more projects of this kind, or will do so?/ Do the office actively search sustainable building projects?
7. Do they have some education/ information for the architects at the office about environmentally sound building?

The building and design process of GWL—terrain:

8. Was there already a program written about the environmental issues when you started the design? For the urban design or the buildings?
9. From where / whom did you get the information needed about environmental design? Who decided?
10. What assessment / design tools for environmental design did you use for the GWL–terrein?
11. Why was this chosen? Where there other options? Did all actors use the same?
12. How is your experience working with the tool chosen?
13. What was good, what was bad, what was lacking?

14. Which tool would you chose today if you were to make a sustainable design?
15. Have you any experience working with the National Package? What do you think about it?
16. Is there a lack of good and reliable information about what environmental design is?
17. Are you satisfied with the result? What is good in GWL, what became less good?
18. What environmental aspects have been possible to achieve and which have not? What was the most difficult to achieve and why?
19. Is there something you would have done differently today?
20. Which is the largest obstacle in implementing sustainable design?
21. Which phase of the design and building process was the most *important* for to achieve an environmental friendly design? Which actors were the most important?
22. Which phase of the design and building process was connected with most *problems* to achieve an environmental friendly design?
23. Which other actors did you work most closely with during the design?

Questions on sustainable design:

24. What is the most important in making a sustainable design?
25. Which decisions are the most important in sustainable design?
26. Which decisions come first?
27. Did you have any examples on sustainable building that inspired your work with the GWL?
28. Is it important with demonstration projects/ inspiring examples?

Questions about your own vision of sustainable building?

29. Did you work with environmental questions before? Do you want to continue?
30. Where did you get your knowledge about environmental issues in general and concerning building?
31. What do you consider being sustainable building / duurzaam bouwen?
32. Do you consider it important to work with environmental design in building?
33. Do you think we can achieve any important environmental improvements by thinking about this when designing buildings?
34. Do you engage in reading/ finding news about new sustainable building, research and also new design tools for environmental design?
35. How do you work with sustainable design today? Which data do you relay on what design tools?
36. What advice would you give to somebody who would make a sustainable design today?
37. In The Netherlands the government support the sustainable building, did this effect your work? Do you think it is a good way to change the contemporary way of building?

38. Do you think there are other ways of encouraging sustainable design?
39. Do you think that the architect has an important role in developing and achieving sustainable design?
40. Do you think Dutch architects in general have a good understanding about environmental questions in building? Or is it merely a trend?
41. What is your vision about architecture in the future?
42. If you impose environmentally sound building, do you think that it should have a special look?
43. Would you do another GWL–terrein?

Appendix B An Example of An Interview Gudie used for the Interview Study (Chapter 7)

Here an interview guide used for the interview study in Chapter 7 is presented. The questions were not posed in the order set out, the interview instead following the 'story' told by the respondent. The guide acted as a support to ensure the coverage of all the themes interesting for the study. In interviews with clients/developers questions relating to the architect profession have been left out.

General:

1. What is your present opinion about sustainable development and environmental questions concerning the built environment., Is the question still relevant? Has it changed or developed during recent years? How has it changed?
2. Are these questions becoming a natural part of the current building practice in the Netherlands?
3. If there are still things to accomplish, where do you think the efforts should be made?
4. Who should take the responsibility for supporting further developments?
5. In what way, and by what means?
6. Do you think the built environment can support sustainable development in society?
7. Can we talk about sustainable building, or is it merely an issue of environmental building design?
8. Is it relevant for development to distinguish sustainable building from other kinds of building practice?
9. Could you describe some qualities that sustainable buildings should have? What do you consider to be sustainable building?
10. Could you give some examples?
11. What does your office have as a frame of reference when deciding what is and what is not sustainable?
12. Do all your employees have the same frame of reference or ideology?
13. How do you keep yourself informed about new research and other information?
14. Do you regularly have any kind of training for your employees?

The practice:

15. In what way do you work with these questions in your practice?
16. Do you only get involved in building projects with this aim and line of direction?
17. Since how long have you worked with these questions?
18. From where did you get your inspiration and motivation?
19. When do you usually enter a project?
20. Do you normally have the opportunity of influencing the outcome of the project with regard to environmental aspects?
21. Which is the most important actor for implementing sustainable building?
22. Could the building process be altered to better suit the aims of sustainable building?
23. From where do you get information about new findings or new examples of sustainable building?
24. Do you read research reports?
25. What magazines do you read?

The role of the architect versus environmental consults:

26. Is sustainable development a field where architects can contribute?
27. Is sustainable building a question of design (or can we solve these problems with rules and legislation etc, or the involvement of an environmental expert)?
28. Will sustainable building demand a different design process than other kinds of buildings?
29. Do architects need knowledge about these questions, or could the absence of this knowledge from the architects' side be provided by an environmental consultant?
30. What is the role of the environmental consultant in a building project?

About demonstration projects or built examples:

31. Are they important?
32. Could you mention some model projects or examples that have been sources of inspiration for your work/your office's work?
33. How are good examples created?
34. Is there any need for an expanded architectural criticism to evaluate examples?
35. In the Netherlands you have carried out many demonstration projects. What do you consider to be the criteria for a demonstration project?

36. Should they be evaluated, and in that case how? Is something missing in the evaluations carried out?
37. How are they distinguished from experiments?
38. Do we need demonstration projects?

Tools:

39. What kind of tools do you use to implement sustainable building?
40. Do these tools work well?
41. Are there any tools missing or needing further development?
42. Does the National Package have any relevance?

Feedback:

43. Do you have internal evaluations of your work?
44. What methods do you use for this?
45. Is the knowledge spread in your office or is it more related to individual persons?
46. How do you acquire and utilise knowledge from earlier projects carried out by other actors?

The role of media:

47. What do you think about the role of the media and reviews for presenting built examples and models?
48. Are these good means of spreading knowledge and information?
49. In what kind of media should they be published to have any impact?
50. Who in your opinion is the predominating person in the Netherlands regarding initiating the discourse on what sustainable building is about? Who are the spokesmen for the sustainable building movement?
51. Do you actively take part in these discourses?

If there is any time, and if the interview had not already provided answers to the following questions, we could discuss a project that you have been involved in and consider as being successful, or a good project to learn from:

52. What models or other built examples initially influenced the project?

53. Was there any idea providing a motivating force?
54. Who was motivating the project?
55. What concept of sustainable building provided the frame of reference?
56. Which tools did you use?
57. Was the project successful?
58. Has it been evaluated?
59. What did you learn?
60. In what way has this project been important for the continued work of your office?
61. In what way has this project been of importance for the rest of the building sector?