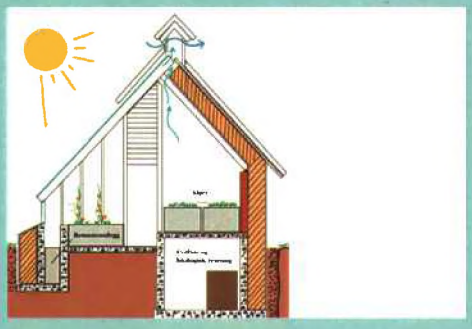
NO0505370

Marianne Ryghaug

Towards a Sustainable Aesthetics

Architects Constructing Energy Efficient Buildings



62 - 2003

Senter for teknologi og samfunn
Institutt for tverrfaglige kulturstudier
NTNU

TOWARDS A SUSTAINABLE AESTHETICS

ARCHITECTS CONSTRUCTING ENERGY EFFICIENT BUILDINGS

By

Marianne Ryghaug

Thesis for the Degree of
Doctor Rerum Politicarum

Department of Sociology and Political Science
Faculty of Social Sciences and Technology Management
Norwegian University of Science and Technology, NTNU

Trondheim 2002

ISBN 82-471-5205-3

For Ulrik and Pål

ACKNOWLEDGEMENTS[1]

First of all I want to thank Knut H. Sørensen for being an excellent supervisor through the whole process of writing this thesis. His constructive comments, insightful advice, inspiration and commitment have been of invaluable character for the realisation of this thesis. Moreover, I want to thank my second supervisor, Marit Reitan, for productive and sharp comments along the way.

I also want to thank all the persons who found time to be interviewed for sharing their thoughts and knowledge with me, in spite of their tight schedule.

The four years that I have been part of the Department of Interdisciplinary Studies of Culture, Centre for Technology and Society at NTNU have been very rewarding thanks to my dear colleagues and the stimulating environment they have been able to produce. Thanks to you, writing this thesis has been very different from the solitary process I have heard that it normally is! Especially I want to thank the participants of the Energy and Environment Group - Margrethe Aune, Thomas Berker, Robert Bye, Jørund Buen, Heidi Gjøen, Gry Kongsli, Helene Tronstad Moe, Robert Næss and Jøran Solli, who have read and commented on earlier drafts and parts of the thesis. A special thanks to Gry Kongsli who also joined me on one of the interview-trips to Oslo, and Thomas Berker and Finn Arne Jørgensen for technical assistance. I also want to thank Anne Martinussen, Torill Ryghaug and Even Martinussen for their tremendous efforts in proof-reading the manuscript. I also want to thank Line Melby for helping me with my list of references and for all the 'vague', but wonderful discussions we have had.

I also had the pleasure of staying with the Science Studies Department at the University of California, San Diego, during Summer/Fall 2001 and Winther 2002. Thanks to Chandra Mukerij for inviting me over, sponsoring me, and for making my stay a very enjoyable and stimulating one.

I will also thank my parents, Per and Torill Ryghaug and my parents-in-law Marit and Kjell Martinussen for their support, and for babysitting Ulrik when there was a need to work long hours or to socialise with friends.

[1] The research project was made possible by the Norwegian Research Council's research program (SAMRAM).

I finally want to thank Ulrik for being a constant reminder of what is really important in life and for making every day special, and Pål for his valuable concern and endorsement through the whole period. We stood the course together – thanks to your support and encouragement I beat you on the finishing line!

Trondheim, December 2002

Marianne Ryghaug

TABLE OF CONTENTS

1.

IMPLEMENTING ENERGY EFFICIENCY

California, January 18th, 2001:
"After weeks of threatened power outages, California was hit by rolling electricity blackouts Wednesday afternoon affecting 500,000 people in San Francisco, Sacramento and San Jose as well as other sections of Silicon Valley. Traffic lights, ATMs, classrooms and entire neighborhoods lost power for 60 to 90 minutes amid warnings electricity supplies would be dangerously low throughout the afternoon and into the evening. The rotating blackouts, the first ordered by California authorities since World War II, were expected to continue throughout the evening, affecting up to 2 million households".

This may seem like a frightening scenario unlikely to happen in Norway - an energy nation with vast resources of oil and hydroelectric power. The scenario is however more pertinent than one likes to think. According to researchers at SINTEF,[2] Norway is likely to be confronting an energy crisis within three or four years from now. This is due to the increasing energy gap between production and consumption and the fact that Norway is gradually getting more dependent on importing energy from other countries. In spite of large efforts directed towards energy efficiency measures, the total electricity consumption increases by 1,5 per cent each year. In 2000 the energy consumption in Norway was 124 TWh. In a dry year with little rainfall one will be able to produce 90 TWh. Thus, there is a shortage of 34 TWh. Theoretically, one may import 20 TWh from other countries'. The problem is what one should do with the remaining 14 TWh. Chief engineer at the Norwegian Water Resources and Energy Administration (NVE), Kjell Thorsen, confirms that one is concerned with the energy situation in a dry year in Norway.[3] As Norway all ready has an energy shortage even in a normal year, he thinks Norway will be extremely exposed for such a frightening scenario in the years to come.

According to the projections of the Norwegian Energy board[4] there will be a further growth in the energy consumption towards 2020, if no measures are taken.[5] The growing energy consumption is used as an

[2] "Energi - i akutt krise?" *Gemini* 2/2002, by Åse Dragland.
[3] "Strømkrise om få år", *Dagbladet*, Tuesday 19th of February 2002, by Kristian Sarastuen.
[4] NOU (Norges Offentlige Utredninger) [Norwegian Governmental White Papers] (1998): *Energi- og kraftbalansen mot 2020,* Oslo: Ministry for Petroleum and Energ, p. 11.
[5] St. meld. No 29, *Om energipolitikken.* 1988-99. Oslo: Ministry for Petroleum and Energy, p.5

argument for the need to engage in active political strategies to reduce the energy consumption, as well as increasing the energy production.

In particular, it has been stressed that the consumption of electricity is unreasonably high, and should be decreased. At the same time, the growing energy consumption has been used as an argument for increased energy production, mainly by building gas power plants. Hence, there are relatively large political disagreements about which measures that are most suitable for handling the growing and wasteful use of energy. Three alternatives have been emphasised, in addition to increasing the production of energy from oil and gas resources. First, to increase taxes on consumption of traditional forms of energy, secondly, to intensify the use of energy economising measures and thirdly, to use alternative energy sources, like for instance biomass or wind power.

The building and construction sector is responsible for a substantial part of the energy use in Norway. Buildings consume over 40 per cent of all energy. The industry can consequently make significant contributions to environmental improvement by better energy management, better utilisation of materials, and by using more energy efficient techniques. With today's technology it is possible to design buildings that only uses 20 to 30 per cent of what is considered normal use today (Butters and Østmo 2000).

The energy-consumption in buildings is not only decided by the technical standard of the building. The energy-culture of the end-users is also of great importance, and may be a source of great variations even between buildings that are technically similar (Aune 1998). On the other hand, there is no doubt that the technical standard is important, and it is likely to be more important in large public buildings, office buildings, factories and residential buildings than in small houses. An investigation by the Norwegian Building Research Institute shows that one can save 13 TWh of electric power a year, by designing energy optimal buildings.[6] This equals more than 10 per cent of Norway's total production of electricity. Therefore, improving the technical standard of new and renovated buildings as well as maintenance work would be an important energy efficiency measure. Here, I am mainly interested in how one may improve the energy standard in new buildings by designing energy optimal buildings.

Both political interest and research interests regarding the energy consumption of the households have concentrated on either the end-users or the development of renewable and more effective energy technologies (Hubak 1998). Energy decisions, for example what energy standard to choose, what energy system to use etc., are to a great extent made in other

[6] *Aftenposten* 02.06.99

arenas. The building industry is such an arena. Hubak's study shows that the decisions made in the building industry may be understood as a process of negotiation between different professions: The energy efficiency advisors play the role as specialists on energy design, but they have only limited influence in the building design process. This is partly due to tight economic limitations on investments in energy efficiency measures and partly due to the limited power of engineers working with heating, ventilation and sanitation compared to other professions in the building design process. The architect profession, on the other hand, is very interesting in this respect, due to their role as maintainers of totality and aesthetics, as well as their role as co-ordinators of the building process. The architect has by tradition had superior influence in the design of buildings. He or she often has the responsibility for co-ordinating the different professions that are involved in the building process (Hubak 1998), and has large influence in energy decisions that determine the energy standard of the building.

The role of the architect in the building design process has shifted somewhat during the years. Historically, the architect was like a master builder with responsibility for the totality.[7] During the years s/he has more and more taken on a role as a provider of services in a complex project organisation. Architects do both physical planning and projecting of buildings. Normally, it is the architect that is in charge of the main design that at an early stage determines the siting, the building concept, and how the main solution will be (Butters and Østmo 2000). There is no doubt that the architect has advantages compared to other consultants and actors in the building process, as he or she normally is involved in the early phases of the project. This is also the phase where the decisions that have the biggest consequences for the environmental profile of a building predominantly are taken. From an energy perspective, some of the most critical design decisions are made 'early on' in the process. It is in this phase that the placement and the orientation of the building are decided, as well as the shape of the building and the choice of the main materials.[8] The architect has in other words great possibilities to influence decisions that are of importance for the energy consumption of the building. Thus, it is important to explore how architects handle energy efficiency in building projects. *Challenges concerning energy economising in Norway related to the architect profession*

[7] Architects have traditionally also worked as public planners and as officials responsible for dealing with building questions and applications. However, I am here mainly interested in architects that are related to the building design process.

[8] Source: Miljøeffektivitet i bygg- og eiendomssektoren. Hva er miljøpotensialet, og hvordan utløse det? Oslo: Økobygg. November 2000.

and their role in affecting the energy standard in buildings is the main research problem of the thesis.

The main research question may be separated into two component research questions. The first is to analyse how the reality orientation of the architect profession is constituted and maintained, and how this in turn influences their values in connection to energy related decisions. How does the architects' professional role conception find expression in the educational system, the architect journals and how is it expressed among the "green outsiders" of the profession? The second component research question is related to decision-making processes regarding design processes, particularly concerning energy in buildings and the role that the architects play in these processes in interaction with other actors and within institutional frames.

Not all architects are working with building processes, and not all building processes involve an architect. Pre-cast building firms build approximately 2/3 of single family houses. Architects rarely design these houses, but may draw a prototype and contribute to modifications of it. However, the trend in this area goes towards more specially designed houses. Most large building projects include an architect, though.

Almost all qualified architects in Norway are members of the National Association of Norwegian Architects (NAL). Of the 3100 members, 1170 have their own practise, 930 are employed privately and 620 are employed in the public sector. Those that are employed in the private sector are spread over 700 architect firms. Most of the private architect firms are quite small – the average architect firm has approximately 4 employees.[9]

1.1 Energy economising measures in Norway

The concept of energy economising is a result of the wish to reduce the total energy consumption. Energy economising is a cluster of strategies and specifications with somewhat unclear definitions. However, the established political definition is the use of energy in an economically optimal way (Hubak 1998). The concept of energy economising was first introduced by a governmental report in Norway in 1975 as a political strategy to meet the concern for future shortages of electricity. The fear was a product of the ongoing shift from an oil-based energy system to an electrical energy system resulting from high oil prices due to the oil crisis (Næsje 2000). In the period from 1975 until today energy economising as a policy instrument has gone through different stages regarding motives and means. However, there are some features that have had a strong emphasis throughout the period. Norwegian energy economising policy has particularly been based on

[9] http://www.mnal.no/

controlling energy consumption by using relative prices, supporting and funding development of alternative energy technologies and producing information campaigns addressing households.

A common financial measure in Norwegian energy economising policy is consumer taxes, for example on electricity (the energy intensive industry is exempted). The rationale behind green taxes and relative prices is that spending power will impel energy economising technology. The market, i.e. the end-users, will then choose energy efficiency because it is profitable. Through adequate pricing policy the market mechanism will produce an optimal i.e. lower, energy consumption.

The government has also tried to stimulate the use of new renewable energy sources through exemption from investment taxes when investing in bio-energy installations, wind power installations, plants that use geo-thermal energy and solar energy, district heating plants and heat pumps. One has also used direct subsidies of investments in energy economising technology like heat pumps to try to increase energy efficiency in buildings (i.e. NVE's firm-specific introduction-arrangement).[10]

Another main measure is supporting energy-related R&D. Environmental energy research is mainly aimed at stimulating the development of new energy technologies and new solutions that may produce a more effective social economical and environmentally friendly energy system.[11] When energy efficient technology is developed it is expected that the technology will be used and thereby contribute to energy savings.

County energy economising centres have been created to take care of the information towards small end-users. The Governmental White Paper on energy policy from 1998-99 states that one will put special emphasis on the *energy use in buildings*, as households will stand for the largest part of energy consumption in the years to come. It states; "A reorganisation of the energy sector makes new demands on the information and training activity (...). It is important to give the users qualified and practical information. This will in particular refer to the building owner, architects and the consultant engineers. The Government must rely on that the different environments that are in contact with the user when concrete energy decisions are made, engage themselves in information activity".[12] Hence, information is not only thought to be passed directly on to the users through national campaigns, but also by the different professions in the building sector.

---

[10] *Miljøhandlingsplan for olje- og energisektoren* (1999). Oslo: Ministry for Petroleum and Energy.

[11] *Miljøhandlingsplan for olje- og energisektoren* (1999). Oslo: Ministry for Petroleum and Energy.

[12] St.melding no 29 *(1998-99):* [Governmental White Paper]. *Om energipolitikken.* p. 42, Oslo: Ministry for Petroleum and Energy.

To try to increase the industry's ability to reduce energy consumption, a so-called "branch network", an industrial/professional organisation for the industry has been established to provide professional and economic support as well as information. A network for building managers in private and public sector, as well as other central actors within the building trade, has also been established.[13]

Figure 1 illustrates a simplistic model of the Norwegian energy economising policy and the way it is supposed to work in relation to different actors.

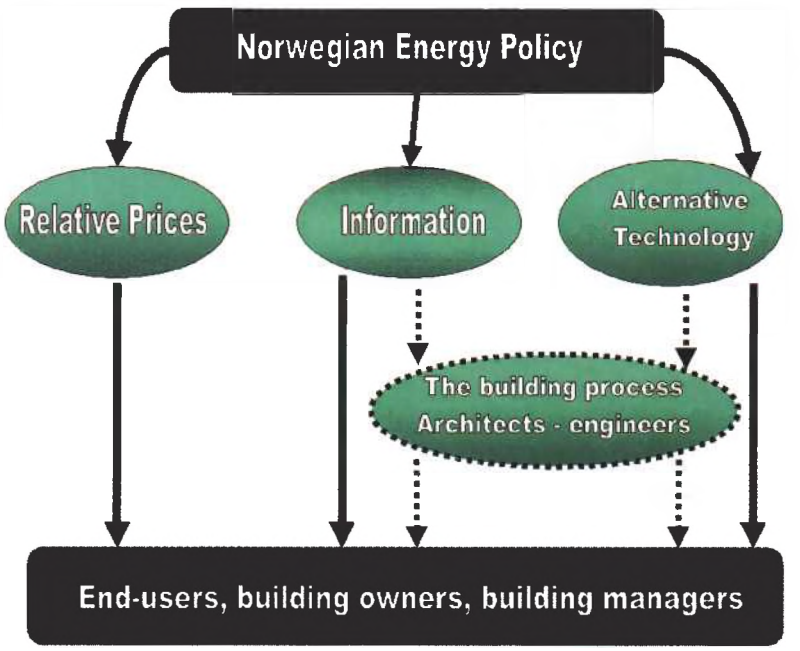


Figure 1. Energy economising in Norway. Measures and Actors.

Building codes and regulations are not included in this model. New demands due to energy economising has resulted in amendments in the building codes with consequences as to how buildings are being planned, built, and operated. However, this has only to a limited extent had consequences for the architecture (Hestnes 1996). The building codes do not act as a measure for promoting energy efficient and sustainable architecture the way they are produced today. The last Norwegian building codes, the Technical Regulation under the Planning and Building Act 1997, are functionally based,

[13] *Miljøhandlingsplan for olje- og energisektoren* (1999). Oslo: Ministry for Petroleum and Energy.

which means that they make demands concerning the result, but that the path towards the result is decided in each project.[14] This approach is chosen, as each building project is different, operating with different topographical, economical, and institutional conditions. What solutions that are the most appropriate will vary from project to project. Another reason for using this approach is that the technical development is faster than the production of regulations and that the actors in the building trade are the ones who have the greatest competence on technical solutions.

The new regulations of 1997 tightened the environmental requirements, compared to the former regulations. They demand that new buildings should be constructed with little energy consumption and pollution, that the building should be located, placed and/or designed with regard to energy efficiency, that one should chose materials and products that are produced energy efficiently and that have low emissions, and that the need for cooling should be as "little as possible". Regarding energy use the regulations say: " Construction works with installations shall be executed in such a manner as to promote a low demand for energy and power which does not exceed the overall limitations established in this Chapter. The demand for energy and power shall be such as to ensure a justifiable indoor environment. The construction works and its installations shall be executed in such a manner as to minimize the need for cooling and so as to avoid an unnecessary cooling demand."[15]

Most of the demands are qualitative and are expressing intentions more than demands. It is difficult for the building owner and those that design the building to know what standard or level they should lie on the basis of these instructions, and it is extremely difficult to evaluate the results. Further, the planning and building authorities seldom follow up these regulations. This is partly due to lack of traditions, partly due to lack of knowledge in the public sector.[16]

Another problem with the building codes, as energy efficiency measures, is that they regulate the energy demand for heating and ventilation, whereas the energy needed for hot water, cooling, lights and appliances are not regulated, even though this demand may be as large, or even larger than the energy needed for heating and ventilation. Nor do the regulations make a difference between energy that is bought and energy that comes from a local energy source. Another point that proves that the regulations of today are not

[14] Technical Regulation under the Planning and Building Act 1997.
[15] See Appendix B for an extract of the Technical Regulations under the Planning and Building Act 1997.
[16] Source: Miljøeffektivitet i bygg- og eiendomssektoren. Hva er miljøpotensialet, og hvordan utløse det? Oslo: Økobygg. November 2000.

used as an energy efficiency measure, is that there is a widespread wish for stronger regulations among actors in the building trade.[17]

In 1997 the "Regulation for approval of enterprises for liability rights" [Forskrift om godkjenning av foretak for ansvarsrett] also came into being. These regulations, among other things, make demands on documentation of competence among the responsible applicant (of enterprise), the responsible for the projecting, the responsible contractor, as well as the competence of the different control authorities. Failing to have routines of documenting environmental knowledge and competence, environmental demands have not been made an issue in this approbation procedure.

Summing up, there exist a wide range of strategies and energy efficiency measures in Norway; information campaigns for end-users, support and subsidies of energy efficient technologies, branch networks for building owners, green taxes and relative prices. None the less, as Figure 1 illustrates, few of these measures are directed towards the building sector and architects, in particular. The architects seem to have few incentives for designing in accordance with energy efficiency and sustainability, and there seem to be few institutional, economical and judicial conditions that are designed to favour these kinds of design developments.[18]

The study of Hubak (1998) demonstrated that the practitioners in the field flexibly interpret the concept of ENØK or energy economising. Even though different concepts may originally have different meanings, concepts like energy economising, sustainability, energy and environment, energy efficiency and ecology are often used interchangeably by different actors. As a result of this, the variation regarding use of concepts is retained in the dissertation, as all concepts allude to a better use of energy. However, it is not only in order to reflecting this conceptual variation that I have allowed myself to use different concepts for these phenomena. This is also related to the fact that there is not established a precise conceptualisation or usage concerning these ideas. Thus, the linguistic diversity employed as regards to these concepts that you find here is seen as tolerable, as the contents of meaning, broadly speaking, is the same.

To gather further insight into the research question it may be fruitful to look at what explanations different theories within political science may

[17] A survey done among actors in the building trade in 1998 shows that 71% of the respondents think we need tighter building regulations in order to solve the environmental problems (GRIP barometer). Miljøeffektivitet i bygg- og eiendomssektoren. Hva er miljøpotensialet, og hvordan utløse det? Oslo: Økobygg. November 2000.

[18] In 2001 ENOVA was established in order to strengthen the work on the environmental change of energy consumption and production in Norway. Thus, there has been a reorganisation of the energy efficiency measures after this analysis was conducted.

offer. The next section will give a brief overview of theories within political science that may be suitable for analysing the implementation of energy efficiency in relation to architects, the most obvious theories being different approaches within policy research, specifically Implementation Studies, Policy Analysis, Program Evaluation and New Institutionalism.

1.2 Relevant theories in political science

Policy research focuses on relationships between variables that reflect social problems and other variables that may be manipulated by public policy. According to Weimer and Vining, the desired product of policy research is a more-or-less verified hypothesis of the form: if the government does X, then Y will result. "For example, academic research into the causes of crime might identify moral education within the family as an important factor. Because our political system places much of family life outside the sphere of legitimate public intervention, however, there may be little that the government can do to foster moral education within the home. The policy researcher, therefore, may take moral education for given and focus instead on factors partially under government control, such as the certainty, swiftness, and severity of punishment for those who commit crimes", according to Weimer and Vining (1992: 5).

The policy process has traditionally been seen as consisting of "stages". One of the many authors that have provided such a list is Brewer (1974). His list consists of the following stages:

- Initiation
- Estimation
- Selection
- Implementation
- Evaluation
- Termination.

This list and other comparable alternatives have to a large extent formed the research agenda taken on by policy scientists since the mid-1970s, in both substantive and practical terms. The stages are seen as a way to reflect upon public policy both in concept and in function (Kjellberg og Reitan 1995). The different stages of the policy process may be intertwined, but none the less each stage has special characteristics, traits and procedures that make it unique and different from other stages. Thus, the process is seen as a sharply distinguished set of activities, a disjointed, episodic process rather than a more ongoing, continuous one. This way of portraying the policy process often implies a certain kind of linearity. Also, the policy phenomenon

is described as something that seemingly takes place in the relative short term (Sabatier 1999).

This idea of the differentiated, sequential policy process was quite popular among numerous authors during the 1970s and the 1980s and it was soon referred to as "conventional wisdom" or "the textbook policy process". According to Sabatier (1999), most agree that the linear stage framework of the policy process held centre stage for at least the better part of the 1970s and the 1980s. The linear stage model of the policy process directed an entire generation of research by noted policy scholars as they studied the stages, e.g., policy implementation, rather than specific issue areas (e.g., energy resources). Thus, in the beginning of the 70s, a new and fast-growing research tradition called *implementation studies* emerged. It tried to shed light on what happened after a public resolution is passed. Central publications are Pressman and Wildavsky's *Implementation. How great expectations in Washington are dashed in Oakland* (1973), Bardach's *The Implementation Game* (1977) and, Mazmanian and Sabatier's *Implementation and Public Policy* (1983).

1.2.1 Theories of Implementation

Soon after its emergence, different schools within Implementation Studies were formed based on different conceptions of the contents of implementation, as well as different models for analysis.[19] The conceptual debate about the contents of implementation is a result of the concept's intrinsic ambiguity. This stems from the fact that the execution of a policy does not necessarily lead to the realisation of its goals. While some have argued that implementation has a starting point, where some kind of activity is put into force, and a close, where one assesses the implementation due to the policy goals (Pressman and Wildavsky 1973). Others have argued that implementation is an ongoing process without a beginning or an end (Barett and Hill 1984). This cuts to the core of the discussion between the main traditions within implementation studies, the top-down approach and the bottom-up approach (Kjellberg and Reitan 1995).

Even if there is disagreement about where the implementation process begins or ends, it is still possible to see the implementation of a measure as a set of different stages, similar to the stages of Brewer (1974):

Phase 1 Policy formation – elucidation, public committees or work groups: development of proposition etc.

Phase 2 Resolution concerning the means –a law or similar means

[19] Today, the rivalry between the different models has decreased, as there is a greater common understanding of the problems within the field (Kjellberg og Reitan 1995)

Phase 3 Specification on the central level – directives
Phase 4 Specification on local level – directives and instructions
Phase 5 Realisation locally – activity in local agencies
Phase 6 Implementation practise – the result of the means
Phase 7 Reporting results back.

Pressmann and Wildavsky (1973) were the first to see successful implementation as a result of simplicity and clearness in the policy that was to be followed. One of their main assertions was that a small number of stages or so called "veto points" were prerequisites for successful implementation. The work of Van Meter and Van Horn (1975) followed in the same line. However, these two scholars made a stronger effort in systemising the insight drawn from the studies and using it in order to build models.

The starting point of their analytical framework is that a measure's political history affects its implementation. Two historical features were particularly important for the implementation process: The degree of change that the measure brings along compared to previous practice, and the degree of agreement on the measures in the decision phase.

However, the main focus of Van Meters and Van Horn is the structural variables that may affect the course of the implementation and consequently the degree of successful implementation. Four central circumstances are seen as crucial:

- the internal organisational conditions that feature the implementation of the measure
- the character of the units that are in charge of the implementation
- the economic, social and political conditions that encompass the process
- the attitudes of the actors that are in charge of the practical implementation of the measure

Van Meter and Van Horn try to create a causal model that specifies the relationships between these groups of factors or variables. As a result, the model that they have created is rather complex, which makes it unsuitable for testing all the suggested relevant factors. However, the core of their model is, more or less explicitly stated, the importance of clearness and consistency in the goal formulation, as well as hierarchic control. They are obviously in favour of strong central management, control within the organisation, and clear responsibility. Authority relations under the implementation itself are important conditions for a measure to be carried out in accordance with the conditions (Van Meter and Van Horn 1975).

Mazmanian and Sabatier's (1983) contribution to implementation studies aims at supplementing the earlier contributions of

Pressmann/Wildavsky and Van Meter/Van Horn. Their model also included so many factors that it was unsuitable for empirical use. As a consequence, they provided a "minimum list" of factors that they thought would facilitate implementing a resolution:

- clear and consistent goals
- an adequate causal theory
- judicial incentives that gives a high degree of approval from both civil servants and users, so that one avoids veto points
- engaged and competent "implementers", who employ their inevitable judgement in favour of the intentions of the measure
- support for the measure from organised interest groups and affected parts of public authorities
- stable socio-economic and political conditions that do not undermine the original political support of the measure, and who changes the basis for its underlying causal theory (Mazmanian and Sabatier 1983, Sabatier 1986).

Altogether, the three contributions outlined above give a fairly good picture of the conventional top-down approach to policy implementation: Policy is implemented on the basis of a law or some other kind of authoritative resolution. Stable structures and formal authority relations form the organisational frame, and the main steering mechanisms are control and direct influence of subordinate units.

There exist several perspectives on the implementation process that are critical towards the "top-down approach" to implementation. These perspectives often go under the name of "bottom-up" approaches and include perspectives like Richard Elmore's "backward mapping", Benny Hjern's "implementation structures" and Susan Barrett's "interaction perspective" (Barrett and Hill 1984).

In contrast to the top-down approaches' appetite for large numbers of variables, these approaches are characterised by small models and have a focus on the "lowest stage in the implementation process". The bottom-up approaches are in particular characterised by a user-oriented decentralising perspective, as they emphasise local judgement and de-emphasise hierarchic control. In their view, this makes it more likely that the measure will influence the behaviour it is meant to change (Kjellberg og Reitan 1995).

The bottom-up perspective emphasises informal structures, networks between equal actors, and disregard that there are evident control elements, as they emphasise adjustment through negotiation and compromise. Elmore's contribution (1980) is special, as it removes the distinction between implementation studies and evaluation of its practical results. The problem to be solved is the focal point, not the measure created to solve the problem.

Thus, the overall objective is to try to understand what factors determine practically adjusted results of public measures (Kjellberg og Reitan 1995).

According to Hjern and Porter (1981), each implementation process implies a conflict between two different rationales, the organisational relation and the measure's own logic, where the measures are implemented by a set of parts of public and private organisations, called implementation structures. The actors in the implementation structures come from different organisations and are tied together as a result of their special interest in the measure. Thus, the phenomenon is characterised by self-recruitment of the actors that are affected by a measure (Kjellberg og Reitan 1995). As a result of Hjern's empirical findings he concluded that local judgement had a large leeway, that there was an informal co-ordination of different roles between participants in an implementation process, and that implementation structures were diverse. Some structures stood out as regular and well-integrated units, while others were marked by more ad-hoc characteristics and were more loosely connected networks.

These viewpoints do not necessarily oppose the top-down approach, though they emphasise other aspects of the process that have had a tendency of being neglected in the top-down approach (Kjellberg and Reitan 1995). Both top-down and bottom-up approaches do, however, presuppose that the necessary channels for implementing the policy are in place, even though they disagree on the way policy should be implemented through these channels. Whether the measure is initiated from the top or from the bottom, both approaches presuppose that one has a functional political system with connections between measures and the relevant actors the measures are supposed to influence. As a consequence, none of the approaches are very good for analysing situations where relevant actors are placed outside of the political system, as is the case with architects and energy economising measures. As illustrated earlier (see figure 1), the architects that are a particularly important group in the building design process, fall outside of the measures' target area (and no one seems to care). Hence, it is necessary to turn to other approaches than the implementation studies when trying to explain the architects' role in energy economising policy.

Sabatier and Mazmanian's (1980) stress on the law enactment as essential in the implementation process is an attempt to create a distance to the most extreme behaviourist studies, which had a tendency to undermine the role of institutional variables. In this way, their contribution may be looked upon as one of the precursors of the neo-institutionalist approach that later appeared within political science. In the next section I will take a closer

look at this tradition, to see if this approach may offer some clues for studying my research question.

1.2.2. New Institutionalism

New institutionalism within political science may be viewed as a reaction to the behaviourist and rational choice emphasis that dominated the field in the mid-1900. New institutionalism is an analytical orientation within political science that tries to bridge the gap between political actions and institutions. The initial advocates, in particular James March and Johan P. Olsen who named the movement (1984), criticised the behaviourist and rational choice approaches for being characterised by contextualism, reductionism, utilitarianism, functionalism and instrumentalism. They also made positive statements about what they believed empirical political theory should be about, and they had a strong emphasis on norms of institutions as means of understanding how they function and how they shape individual behaviour (Peters 1999).[20]

New institutionalism embraces a variety of different approaches to institutional phenomena. While Peters (1999) names six different versions of the orientation in current use, Scott (1995) names two main versions present in today's political science; historical new institutional theory and rational choice theory.[21] Turn-of-the-century institutional scholars who devoted themselves to the detailed analysis of regimes and governance mechanisms inspire historical institutionalism. Within this tradition you find names like March and Olsen (1984, 1989), Hall (1986) and Skocpol (1985, 1992). Institutions are viewed as including formal structures and informal rules as well as procedures that structure conduct. Political institutions are not entirely seen as offshoots from other social structures, but as having independent effects on social events. These scholars further emphasise that social arrangements are not "the result of aggregating individual choices and actions, that many structures and outcomes are not those planned or intended, but the consequence of unanticipated and constrained choice" (Scott 1995). They also emphasise that history is not usually "efficient" – a process "that moves rapidly to a unique solution" (March and Olsen 1984: 737) – but one that is much more indeterminate and context dependent. The fundamental point of analytic departure is the choices that are made near the beginning in

[20] This direction within new institutionalism has been named "normative institutionalism" (Peters 1999).

[21] In addition to these, Peters (1999: p. 20) names Normative institutionalism (March and Olsen 1989; 1995), Empirical institutionalism (Weaver and Rockman 1993; Immergut 1992), International institutionalism (Krasner 1983; Rittberger 1993) and Societal Institutionalism (Schmitter 1974; Rokkan 1966, Knoke and Laumann 1987; March and Rhodes 1992a). There has also been some reviving interest in institutional analysis from other disciplines, like economics and sociology.

the history of a policy, often referred to as the initial policy choices. The institutionalised pledges that spring out of these initial policy choices are said to determine later decisions. In other words, policies are path dependent. Once a policy has been launched at a certain path it continues along it until some strong political force averts it from this path (Scott 1995).

Further, historically oriented new institutionalists represent a social-constructionist standpoint, which presupposes that abilities and preferences – that is, the very nature of the actors – cannot be comprehended except as part of some larger institutional framework (Krasner 1988). Individual preferences are not constant and are often resulting from choices rather than preceding or deciding them. Institutions construct actors and circumscribe their available forms of action. Institutions limit behaviour, as well as they give power to it. Thus, analysis conducted within this theoretical framework aims at giving detailed account of the specifics of institutional forms since they are anticipated to exercise strong effects on individual behaviour: structuring agendas, attention, preferences and modes of acting. In other words, one tries to show that "political systems are not neutral arenas within which "external" interests compete, but rather complex forms that generate independent interests and advantages and whose procedures exert important effects on whatever business is being transacted" (Scott 995: 26).

The historical direction within New Institutionalism gives useful insights when studying political systems and individual behaviour within institutions. The perspective could to some extent be useful in studying energy economising policy, although it is unlikely that the architect profession is a group with strong competing interests. As pointed out above, the core problem is that architects do not seem to be a part of the political system or institution, and that they remain unaffected by energy efficiency measures. This makes it natural to turn to the rational choice direction within new institutionalism. Maybe this direction within new institutionalism has more explanatory power in relation to architects' role in the energy efficiency measures.

Rational Choice is the second school within the new institutionalism according to Scott (1995). It includes scholars as Moe, Shepsle, and Weingast. These scholars view institutions as governance or rule systems, and argue that they represent rationally constructed edifices established by individuals seeking to promote or protect their interests. Thus, scholars promoting this approach argue that behaviour is a function of rules and incentives (Peters 1999). The approach represents an extension of the neo-institutional work in economics to the study of political systems. The general argument embraced by these scholars is that; "economic organisations and

institutions are explained in the same way. They are structures that emerge and take the specific form they do because they solve collective action problems and thereby facilitate gains from trade" (Moe 1990: p 217-218). Thus, these models are explicitly functionalist, as they claim that institutions emerge to meet social and economic requirements.

The shaping of Norwegian energy efficiency policy may partly be explained by historical and normative new institutionalist theory, as the obvious values of the institution (economic efficiency and utility) to a large extent may explain the contents of the public policy in this field. The policy mainly emphasises economic aspects and regards the user as a rational utility maximising actor. The fact that the policy has stayed this way over a long period of time, may be explained by historical new institutionalism, by the way the history of the institution (institutional commitments) has created a path for later policy-commitments that make the policy remain the same. Whether the new institutional theories are suited for giving insight into the question of why the energy economising policy does not affect the architects, is another issue. To understand the architect profession's strategies and non-strategies in relation to energy economising and their reasoning around this theme we will have to look further into the processes of a building project. In any case, it does not seem adequate to explain the architect profession's lack of attention towards energy economising as a result of utility maximisation. That is because the relationship is not that of a rejection, but rather one that is characterised by indifference or not being affected. Maybe the classical political science approach of policy analysis can offer more forceful tools for how to investigate this kind of relationship, than the new institutionalist?

1.2.3. Policy analysis

Policy analysis is a wide theoretical approach that contains many different scholars and directions. Weimer and Vining, two of the leading scholars within this field, define Policy analysis as "client-oriented advice relevant to public decisions and informed by social values" (Weimer and Vining 1992: 1). It is a fine line that separates policy analysis from policy research. The most important feature that distinguishes them is the client-orientation. Policy researchers are less closely tied to decision-makers and rather see themselves as members of an academic discipline. The major objective of policy analysis is analysing and presenting alternatives available to political actors for solving public problems. The common approach is to make a synthesis of existing research and theory to estimate consequences of alternative decisions. Policy analysts will often craft policy options for decision makers,

and the product of policy analysis is usually advice (Weimer and Vining 1992).

Teachers of policy analysis usually specify the components of the analytical process as a series of steps along the lines of the following: 1) define the problem 2) establish the evaluation criteria 3) identify alternative policies 4) display alternatives and select among them 5) monitor and evaluate the policy outcomes. Conversely, Weimer and Vining suggest that one cut this line of stages in two and start operating with a process consisting of two components, a problem analysis phase and a solution analysis phase.

The problem analysis phase consists of

- understanding the problem by assessing the conditions that concern the client, framing them as market or government failures, and modelling the relationships between the conditions of concern and variables that can be manipulated through public policy
- Choosing and explaining relevant goals and constraints, and
- Choosing solution methods.

There are five basic approaches for doing the problem analysis; a) standard cost-benefit analysis, b) qualitative cost-benefit analysis c) modified cost-benefit analysis, d) cost-effectiveness-analysis, and (e) multi-goal policy analysis.

The solution analysis phase consists of

- choosing evaluation criteria
- specifying policy alternatives
- evaluating: predicting impacts of alternatives and assessing them in terms of criteria, and
- recommending actions.

After the solution analysis phase, the recommended actions are communicated to clients as advice. It is also necessary to gather information throughout the problem and solution analysis. Both documents and people are seen as sources. According to Weimer and Vining (1992), the adoption and implementation of collective decisions innately involve co-operation. Collective decisions begin as proposals in political arenas and culminate in effects on people. As a consequence, they suggest dividing the process into two separate phases: adoption and implementation. The adoption phase starts with the articulation of policy proposals and ends, if ever, with its formal recognition as a law, regulation, administrative directive, or other decisions made in line with the rules of the appropriate political area. The implementation phase on the other hand, starts out with the adoption of the policy and continues as long as the policy remains in operation. Policy analysts typically make their contributions by formulating and evaluating

proposals during the adoption phase. However, they cannot do so effectively without anticipating the entire process from proposal to effect (Weimer and Vining 1992).

Classical planning is quite similar to policy analysis. Some planning programs have even become so similar to policy analysis that they in some universities, like Harvard, have merged together. Classical planning is a reaction to the apparent confusion and short-sightedness resulting from private market behaviour and pluralistic government. According to Weimer and Vining (1992), the general approach of planning is, first, to specify goals and objectives that will lead to a better society and second, to determine the most efficient way of achieving them. Centralisation of authority for the creation and execution of the plan are seen as necessary for effective planning.

In my opinion policy analysis does not offer the suitable theoretical insight that may enlighten the questions we are interested in here. What drives the research question is not a client who seeks advice on which alternative policy to choose in order to reduce energy consumption. Thus, a cost-benefit analysis of which alternative policy to follow is not adequate for my purpose. The policy alternatives are already staked out and the policy strategies are already there. Thus, the questions we seek to answer are in a different sphere, as the general energy efficiency measures are already staked out, even though they do not seem to function effectively. One of the reasons that they do not function is probably that the general measures described in the beginning of this chapter have not taken all relevant factors and actors into account. Some of the most relevant actors, the architects, do not seem to respond to the measures. Policy analysis does not offer suitable tools for such an analysis: it is operating on another level. In contrast to policy analysis, impact analysis for program evaluation is an approach that often is used for programs and policies that are already implemented.

The main question that this kind of study answers is what impacts a program has. Largely the program theory concept and the intent to test and explain empirical realisations of such theories generate the framework of the study of program evaluation. Most impact analysis tries to measure the impact of a program or a treatment. The crux of the analysis of the efficacy of a treatment or a program with respect to a particular outcome dimension, is a comparison of what did appear after implementing the program with what would have happened had the program not been implemented. Measuring the what-would-have-happened category, the *counterfactual*, is the pivotal point of all impact analysis design. The counterfactual will generally be the

quantitative score or level at which the outcome of interest would have been found had the program not been implemented (Mohr 1995).[22]

The question in my case is not a quantitative one. The goal is not the quantitative measurement of the efficiency of the energy economising policy in Norway. Earlier research has shown that measures regarding energy economising are not functioning effectively and that there is a great potential for improvement (Hubak 1998). Exactly to what extent it is functioning, is not what we seek to answer. The aim of this study is to gain greater understanding of why the energy efficiency policy is working or not working in the building trade, and how an important group, the architect profession is responding in regard to issues of energy efficiency. Thus, impact analysis will not be very helpful for answering the questions we are interested in here.

1.3. Perspectives: The role of sustainable values in architecture

As illustrated in this chapter, Norwegian energy efficiency policy seems to contain few general institutional and judicial conditions in order to make architects design energy efficient and sustainable buildings. None the less, as we will see in Chapter 7 there exists some specific situations where other, more specific institutional and judicial conditions are present in order to promote energy efficient and sustainable building projects. These situations are suited for analysing what types of economic and public regulations that have an impact on energy efficiency-decisions, and to what extent it is possible to further energy efficiency through this kind of measures. Thus, in order to answer the latter main component of the research problem, these situations will be studied thoroughly as cases. The implementation theories outlined above may seem fruitful when analysing these cases.

As already pointed out, the building process is not made a particular issue in the energy efficiency measures. The energy economising policy is framed in quite general terms, and it is supposed to reach a number of different actors. Thus, few if any of the measures are aimed directly towards architects. However, as figure 1 points out, many of the measures are based on information and knowledge passing through the realm of architects and the other professions in the building design process in order to reach the different users and finally be integrated in the design of a building. As a consequence, it is natural to expect that communication must be an important part of the process. As the policy measures are quite weak, as well as general

[22] There also exist some qualitative methods of program evaluation that have become widely accepted and practised (see: Goddard & Powell 1994; Greene 1994). Mohr (1995) argues that even though both quantitative and qualitative approaches may have something to contribute, it is not necessarily the same thing. Qualitative methods are not very good for impact analysis, but better for evaluative functions such as implementation analysis and process analysis. These approaches are covered in other sections of the chapter.

in scope, one can only hope for a random merging of the policy and the interests and values of the architect profession. The architect profession is generally portrayed as an inquisitive and progressive group in society, and it is therefore widely expected that they be committed to sustainability and green values. However, this is something that we do not know, and therefore it is important that we look further into this. As a consequence, one of the main issues that I want to address is the way architects deal with energy economising and sustainability.

As we have seen, the theories outlined above are not particularly suitable for analysing the first component of the research question concerning the architects' relation to energy economising. The bottom-up tradition within implementation studies is perhaps looking at the policy relevance of those who act in a situation. However, it presupposes that there exists a channel between the group that the measures are supposed to affect and the general policy measures that are designed to meet the claims of the initiating group at the bottom. In this case the situation is quite different, as it is not established a specific policy channel between the policy and the architects. Thus, to be able to explain the architects' relation to energy efficiency measures it is necessary to enter the building design process in an open way, exploring what is going on, and looking at what architects actually do. It is important to study how architects handle the energy efficiency in the building design process, the *actions* of the architect profession and to understand how this influence the realisation of energy economising in buildings. The goal is to understand the architects' domestication process (Silverstone et al. 1989, Sørensen 1996).

Thus, there exists an alternative reality within energy economising measures in relation to the architect profession that the approaches outlined above do not embrace. The focus of the thesis is an alternative segment of reality than most theories in political science usually do not deal with. To be able to analyse how architects domesticate (or do not domesticate) energy efficiency and to study the actions of the architects, it is necessary to use a constructivistic approach.

A similar aspect of the energy economising measures that is problematic to deal with if using one of the typical political scientist approaches to implementation, is the technology policy, inherent in the measures. Technology policy faces many of the same problems as with the architects, as the measures are broad and generally formulated. Technology policy is to a very low degree focused as a political problem and as an analytic object within political science. Thus, it is necessary to turn to other theories than those theories found within political science in order to

understand the problem of technology policy in relation to energy economising. Constructivistic approaches, like the work of Feenberg (1999b) emerge as alternative theories that may give new insight into the problem.

The dissertation will be organised in the following way: In the next Chapter I will give an account of suitable constructivistic approaches within technology studies that will be used in the study of the research question, as well as relevant constructivist theories within technology policy. Chapter 3 gives an overview of the data material, that is interviews with architects and other actors in the building design process, as well as architect journals and other written material sources. The chapter also portrays the method that I have used for analysing this data material which is based on a rather pragmatic qualitative approach. Chapters 4 to 7 constitute the analytic part of the thesis. Chapter 4 examines the practise of architects and their attitudes towards energy efficiency and sustainability based on interviews. The chapter maps out the status of energy efficiency among architects and how they deal with the question of energy efficiency in their practice. Chapter 5 explore how issues of energy efficiency, environment and sustainability are handled in three areas thought to constitute the dominant architect discourse, namely the educational system, the architect competitions and the architect journals. Chapter 6 looks at an alternative discourse that seems to compete with the dominating architect discourse, represented by groups within the architect profession that advocate issues of energy efficiency, ecology and sustainable building design. Chapter 7 analyses the realisation of three building projects in Norway that have intentions of being designed according to energy efficiency, ecology, and sustainability. The chapter attempts to answer how energy efficiency is translated into building design in these three cases, as well as pointing to some possible strategies and processes that seem to enhance energy efficient building design. Chapter 8 sums up the most important findings and discusses them in relation to the way that energy efficient technology and innovation is reflected in the Norwegian energy policy. The chapter also tries to suggest some possible strategies for making architects design more energy efficient buildings in the future. The chapter also suggest that by combining insights from political science and science and technology studies one may create arenas that may further the creation of a more viable energy policy.

2.

ANALYSING TECHNOLOGY

The architect profession is generally thought of as the group responsible for the aesthetic dimensions of a building. This makes it natural to expect them to be particularly concerned with aesthetics. Aesthetics is in turn connected to the experience of awe and wonder, sometimes referred to as 'The sublime'. In *American Technological Sublime* (1994), Nye describes sublimity as a unique and precious encounter with reality that underlies our enthusiasm for technology. He describes it as one of the most powerful human emotions, that when experienced by large groups can fuse society together: "In moments of sublimity, human beings temporarily disregard divisions among elements of the community. The sublime taps into fundamental hopes and fears. It is not a social residue, created by economic and political forces, though both can inflect its meaning. Rather, it is an essentially religious feeling, aroused by the confrontation with impressive objects, such as Niagara Falls, The Great Canyon, the New York skyline, the Golden Gate Bridge, or the earth-shaking launch of a space shuttle. The technological sublime is an integral part of contemporary consciousness, and its emergence and exfoliation into several distinct forms during the past two centuries is inscribed within public life" (Nye 1994: xiii).

In the American Technological Sublime, Nye explores different forms of the sublime historically as they have emerged between 1820 and the present: among others the Erie Canal, the first transcontinental railroad, the Brooklyn Bridge, the Empire State Building, Boulder (Hoover) Dam and the rededication of the Statue of Liberty. In this study, energy efficiency plays the role as a potential technological sublime in face of the architect profession. Technological sublimity is then interpreted as something that stands out, that seduces and make great impressions on those who are in contact with it. This is in many ways a more modest version of what Nye describes as "technological sublime". However, what seem sublime may diverge from one person to another and different interpretable communities maintain their right to establish its own aesthetic standards. What one person finds sublime, another person may dislike, as in the case when conservationists and ecologists disagree with civil engineers on the sublimity of dams (Nye 1994).

Whether, the energy efficiency technology is regarded as a technological sublime by the architect profession, is yet to be explored. This chapter demonstrates the variety of theoretical tools thought to become useful

when studying the construction of energy efficiency in buildings and the sublimity connected to this. Thus, the challenge for policy makers and advocates of energy efficiency may be interpreted as the project of making energy efficiency a technological sublime.

In the previous chapter it was demonstrated that political science offer few tools and theoretical approaches that will help understand how energy efficiency is handled in the building process as there is lack of a existing policy channel between the energy efficiency policy and the architects. To be able to explain the challenges concerning energy economising in Norway related to the architect profession and their role in affecting the energy standard in buildings, one will have to explore the actions and practice of the architect profession and the related domestication process (Silverstone et al. 1994, Sørensen 1996). As demonstrated in the previous chapter, political science offers few theories for dealing with such realities. The typical political scientist approaches also fail to provide a sufficiently nuanced view on technology policy. However, by using a constructivist approach one may solve these problems as it offers a range of alternative theories that is suitable for understanding technology, as well as the expertise and practise of the architect profession. Before going into this it is necessary to disclose a bit about the way the research problem is expected to be handled in light of these theories.

2.1 The research problem and the theoretical framework

The focal research problem, how architects handle energy efficiency in buildings, is presumed to consist of a number of dimensions, namely the problem of communication, the problem of professional practise, the problem of design and the problem of technological appropriation. The intention of this chapter is to discuss these dimensions within the theoretical framework. Thus, the chapter seeks to describe the theoretical tools anticipated as useful for explaining different aspects of the problem. However, before mapping out the more specific theoretical tools and concepts useful for enlighten different problem components, it is convenient to say something about the broad theoretical framework that these tools are developed within. That is the body of literature often referred to as Science and Technology Studies (STS), science studies or the social shaping of technology (SST)[23].

The reason for choosing this particular theoretical framework is that science studies provides a conceptual tool kit for thinking about technical expertise in more sophisticated ways. What science studies does best, is paying close attention to the details of scientific practise (Latour 1999b: 24),

[23] As I will come back to, these labels are not totally interchangeable and overlapping.

which is exactly what I am trying to do here. This theoretical approach tracks the history of disciplines, the dynamics of science as a social institution, and the philosophical basis for scientific knowledge. It demonstrates, for example, that there are manners of developing reliable criteria for assessing divergent theories and interpretations, but also that there are manners of discovering the agendas sometimes hidden behind a rhetoric of objectivity. In the process, science studies make it easier for lay-people to question the authority of experts and their claims. It teaches how to look for biases and holds out a vision of greater public participation in technical policy issues (Hess 1997). It relies on a constructivist approach, which seem to be the most fruitful way to enter the research question that I am interested in, as it focuses on the social alliances that lie behind technical choices. Constructivism also breaks with the typical conviction according to which society forms the speed of progress but not the nature of technology itself (Feenberg 1999a).

Another advantage of employing STS is that STS is convenient for understanding disjunctions and overlaps. The epistemology of STS, that is the denial of absolutism, forces it to explore the ways in which different kinds of knowledge butt up against each other and how it is decided locally (Law 1991). This will be very relevant when trying to understand how energy decisions are made in the building design process, as many different professional groups with different skills are involved in the decision making.

To portray these theoretical approaches as broad and overarching theories may seem precarious to some of the theorists within these traditions as there are many controversies and different directions related to these labels. The large body of research and theory which has become to be known as social shaping of technology (SST) is not a single well defined theory. Debate continues over which approaches should be incorporated in the term and its objects of study range widely across types of technology, parts of innovation processes or domains of use. Russell and Williams (2002) have none the less, made an attempt to select what they mean is the most important elements and have tried to develop a picture of how they might be integrated, providing some order to arguments. Their overview of the theoretical field is a great advantage, as drawing a broad picture of the theories and clarifying what they have in common seems to be very useful to for the purpose of this chapter. This will help elucidate the underlying perspective in which the research problem is being analysed.

There is no agreed definition of what make up or qualifies as a SST approach. The broadest definition has as its only decisive factor that it is in opposition to technological determinism and that it tries to lay bare social impact on the direction of technological change. Most directions share the

basic idea that technology is socially shaped and is accordingly fundamentally opposed to technological determinist accounts of the nature of technology that have dominated popular and most academic discourses on technology and society. This also opposes the most common perception of the relation between society and its technologies, as well as the bases of social organisation and the sources of social change.

Determinist models motivate prevalent thinking of economic and social development and have until quite recently been implicit in most policy frameworks for technology. According to Russell and Williams (2002) they "depict technology as an essentially autonomous entity, which develops according to an internal logic and in a direction of its own, and then has determinate impacts on society – in effect moulds society to suit its needs. The inevitable sequence of technological advance is determined in some accounts by progressive improvements on previous versions of a technology, and in others by scientific discoveries or the application of scientific methods to discover improvements" (Russell and Williams 2002: 39). In any case, technological change is portrayed as beyond social influence; even its implementation is often perceived to be determined by a 'technological imperative'. Embedded in these models is the denial of choice in the direction of technological and consequent social change. Consequently, the scope of public policy is limited to foreseeing and supervising the progress of technology along its preordained path, finding ways on speeding it up by providing the required resources and removing impediments, and endorsing the smooth adaptation of society to the changes it demands (Russell and Williams 2002).

SST refutes the idea that technology and society is separate but interacting spheres. It lays claim to terms that stress that technology and social arrangements develop together as part of the same process, and that technological entities always are a mixture of social and technical elements (Bijker and Law 1992a, Berg and Aune 1994, Williams 1997). Technology and organisation, cultural forms, values, identities are co-produced and are mutually dependent. Consequently, technological change is always part of a larger sociotechnical transformation. Many different labels have been used to characterise this hybrid features of technological developments and their contexts; a seamless web (Hughes 1986), sociotechnical ensembles (Bijker 1993), sociotechnologies (McLaughlin et al 1999) and sociotechnical landscapes (Russell and Williams 2002).

A recent trend within SST work is to exploring a relatively broad terrain from the start – a sector, system, arena or other part of the socio-technical landscape – and a multi-actor and often multi-level scope. This is

due to the complexity of the terrain, differences between domains and localities, and the effects on innovative activity of changes and politics elsewhere, which makes it crucial to look further than the immediate setting of a specific innovation. Thus, while earlier SST work often concentrated on design and development, there is today a trend towards more downstream analysis, as well as more 'outwards' incorporate analysis of infrastructure and of regulation or other instruments of political control more broadly pictured (Weber and Paul 1999 in Russell and Williams 2002: 78).

Jørgensen and Sørensen (2002) suggest the overarching concept of 'arenas of development', to capture key participants and features of particular contexts of innovation. By exploring the way the arena is formed, the restraints that operate on those processes, the inclusion or exclusion of groups, the favouring of some of the procedures or discourses, may be captured (Russell and Williams 2002). Energy efficiency in buildings may certainly be characterised as an arena of development, where it is crucial to look beyond the immediate context of a specific innovation and focus on the broader socio-technical terrain.

To the degree that results rely on intention, the elements deployed and the knowledge needed to do so are heterogeneous (Law 1987a and b). In order to minimise uncertainty and ensure acceptance and smooth implementation, developers may seek to fit an innovation into existing institutions, practices and expectations, like that of the architect profession. On the other hand, they may take on extensive reshaping of conditions by creating markets, configuring users, acquiring infrastructure, as to successfully introduce and operate a new technology. Thus, social effects depend on the way that particular impacts are sought or avoided by the actors involved (Russell and Williams 2002).

None the less, technological and social change within SST are subject to frequent impediments and failures and emerge in the course of local struggles to produce a working technology and accommodate it in its use setting. It can never be completely designed and calculated. "The extent to which a technology achieves a dominant group's objectives for it, or furthers its interests, is at least in part an achievement, possibly against the actions of users and others" (Russell and Williams 2002: 51). Here, this will be explored as regard to the architect profession, that is to say exploring to what extent energy efficient technology achieves the architects' objectives for it.

The reaction against technological determinism in studies of technology produced a range of arguments as to its insufficiency as explanation and emphasised the fact that technology is shaped in form and content by social forces. In stead of being "black boxed", the process and

content of technological activities and products should be open to social investigation. After the first period of theoretical arguments and empirical demonstrations that technologies are socially shaped, analyses focusing on how the shaping comes about and how it should be explained, occurred.

SST work has been largely based on case studies of individual artefacts and systems. That technology is socially shaped may however also be understood in the way that social processes shape not only the form and features of particular technologies but also patterns and general characteristics and directions of technologies across whole areas of development (Russell and Williams 2002). Technology studies have usually focused on technological development and use of technology by studying the political and social actors that are involved in the process (Jasanoff et al. 1995; MacKenzie og Wajcman 1999, Star and Griesemer 1989). Traditionally, one has particularly given priority to studies of technology development, and hereby the study of researchers and engineers that are involved in the process. Architects, however, have chiefly been neglected, but there is no reason to believe that they may not be analysed in a similar way.

Energy efficiency of the built environment has to a large part failed to attract sociological attention. The reason for this may be that "energy is invisible, building design is a technological process, there are no obvious theoretical footholds and perhaps most important of all, there are many other more amenable environmental issues on which to concentrate" (Guy and Shove 2000: 7). None the less, there are a few studies that have attempted to analyse energy efficient and sustainable buildings from a social constructivist perspective using insights from SST and related approaches. As already mentioned Marit Hubak (1998) has done a study of the role of the HVAC engineers concerning energy efficiency. This dissertation concluded that the architect profession seemed to have a much more important role in this respect, than the HVAC engineers, and that they accordingly should be given further attention. Kathryn B. Janda (1998) has done a study of two American energy efficiency projects that intervene in the market by addressing market failures and other barriers that seem to inhibit energy efficiency measures. She studies the role of professional culture and organisational context in relation to the success of these measures.

Kathryn Henderson (2002) examines a particular type of ecological building, the straw bale building movement. Her objective is to explore how the pursuit of new building codes for this technique reveals, not only struggle and compromise between the ecology-oriented values espoused by the straw bale building movement and the health and safety values which underlie

building codes in general, but also how the individual cultures of regional building regulation offices and of regional activist groups have influenced what kinds of building codes are sought and how they further influence subsequent codes in other locales modelled after them. The focus is on values and ethics articulated by professionals at the specific offices where approval of straw bale building has been sough. The research seeks to advance understanding of models of alternative technical knowledge and its transfer outside conventional design and development contexts.

In, *A sociology of Energy, Buildings and the Environment* (2000), Guy and Shove present a comprehensive study reflecting on the theories and models of change and action inscribed in energy-related building research and policy. Through three different case studies, they examine the production and application of building science, showing that energy-related practises are socially specific and localised in terms of time and context. Thus, the authors aim to take a few steps back from what is generally considered the role of social scientists in the field of technology and policy, namely the role of being 'people experts'. They refrain to give an understanding of the 'human dimension', individual choices and people's environmental values, attitudes and beliefs. On the contrary, they concentrate on the contexts of decision-making and the realities of building practise through three case studies. The first case study focuses on the insulation technology and what part the insulation industry plays in constructing demand. The second case explores how organisational contexts frame the opportunities for energy-efficient practise over time and space and space. The third case demonstrates how the changing social organisation of the property business frames the relative power of the different actors involved, and how this opens up for energy efficiency.

I take an alternative approach to the earlier works on the field of energy efficiency in building as I try to give a thick analysis and description of how one particular group of central actors within the building design process, handles energy efficiency. Thus, in some ways I try to get a grip on this 'human dimension', while at the same time extending the analysis, also including how policy of energy efficiency is embedded in practise.

In the following sections I will look at the different dimensions of the problem that this study tries to clarify in light of more specific theoretical tools produced within the SST and STS literature. These dimensions are related to the practise, communication, design and appropriation of technology. These dimensions are not to be considered exclusive categories that completely cover all possible angels from which the research question

may be studied. One should rather consider them as a mode of trying to point the research question and to divide it into different components.

2.2 The appropriation of technology

This dimension of the research problem focuses on the more specific task of implementing the technology in the building. Not in the sense that this is something separate from the social aspects thoroughly scrutinised by the other dimensions, but in the sense that one seeks an understanding of the more local and situated aspects, the organisational features etc. that embeds the technology in the building process. Thus, this component of the problem is not about asking whether actors are convinced of the idea of energy efficiency, but focuses more on situated problems that may arise once the technology has been implemented and the handling of the technology once the energy efficient buildings have been realised.

The process of embedding a technology in practice, making it work as it is supposed to, making it usable, sensible and evaluating it is called 'domestication' (Lie and Sørensen 1996). The appropriation takes place both at the local level when the technology is assimilated, practices are adjusted around it and it has been given value (practically, symbolically and cognitively) and as broader social processes of adapting the technology and considering its acceptability. How easily the technology is introduced and adopted varies a lot from one context to another. However, it is most often a quite lengthy struggle. It is reason to believe that it happens most easily when the changes are incremental and the new technology is quite discrete, whereas it is more complicated as regards major systems or configurations. The process is not a purely technical one, involving small adjustments in technology. Neither, is it a simple managerial process of reallocating resources and organising the work around it. On the contrary, it is a rather complex and political process that is influenced by the initial roles, commitments, identities, knowledge and expectations of a range of groups and individuals and that require change to those (Russell and Williams 2002).

This is also the case with energy efficient measures and the number of technologies that are introduced in order to make buildings more energy efficient. The whole range of individuals and groups that are involved in the process of deciding the energy design in the building will influence the outcome. Thus, the values and identities of the architect profession, which have a particularly important role in the process, are crucial regarding domestication and appropriation of the technology.

According to Russell and Williams (2002) appropriation is relying on interactions across different divides in work environments: management and

workforce, professional and occupational groups, gender divisions of labour, functional divisions in an organisation, and possibly different organisations. It is natural to expect that this is also relevant in the setting of the building process. According to Russell and Williams different user groups vary in the power to choose the technology, to acquire the skills and authority to use it in different ways and to fit into work routines or reshape them. The user groups also are different in their power to adapt or modify it, fix problems, override functions or by-pass its outputs, to influence its evaluation and interpretation, to resecure their identity and status – in gender and occupational or professional terms – and their sense of order and certainty around it. They are also likely to have different power as to subvert or reject the technology. The occupational groups that are involved in the building process may be regarded as this kind of user-groups, having varying degrees of power as regards the appropriation process. This is important to notice when studying the introduction of energy efficient building design (even though the groups that are studied here is not typical end-users).

Further on, McLaughlin et al. (1999) assert that users are influenced not only by explicit arguments about the value and benefits of the technology, but also by prevalent general discourses – especially those asserting the rationality, efficacy and neutrality of technology. These reflect particular assumptions about its properties and use, and thereby advantage particular groups and interpretations (Russell and Williams 2002).

Another important point for successful implementation is the articulation of supply and demand sides. That is, the ways a technology comes to be aligned with its required functions and its wider roles and significance. Successful introduction of a technology depends on some kind of communication and positioning activity. In most developments some kind of articulation of supply and demand happens. However, it is often quite jumbled and it is quite common that huge investments are made before demand and acceptability has been adequately assessed (Rip 1995). This insight of appropriation and use and of their articulation with design and development, are summarized in the notion of 'social learning' (Rip et al 1995, Wynne 1995, Sørensen 1996, Williams et al. 2000).

By expanding the innovation focus "downstream" to technology appropriation and use, SST increases authority to a long-standing message from evolutionary economics about the importance of coupling between technology supply and markets. The close coupling that was assumed to exist between scientific advances, technological innovation and economic growth was called into question at the end of the post-war boom in the late 1960s (Faulkner et al. 1998). By looking at the *detailed processes* involved; what is

learnt and how it is endorsed by specific conditions, SST focus on questions that have not been explored by broad brush evolutionary approaches. The appropriation focus draws attention to the *diversity* of users, with their specific and changing expectations, and their active role in developing practices, concepts of use and meaning around artefacts (Russell and Williams 2002). This also employs for the actors involved in the building process.

As much as it is needed to understand how developers tries to make favourable conditions for their technology to be spread, it is important to understand why some technologies stay marginalised. In order to do so it is important to analyse the socio-technological context into which they have to fit, and in which an appreciative niche would have to be opened up (Russell and Bunting 1998, cited in Russell and Williams 2002: 79). This will be attempted in the analysis of energy efficient technology in the building trade.

2.3 The design problem

One of the important dimensions of the focal problem has to do with the design of a building. To design a building is probably not a narrow and unambiguous process of optimisation. It is more like a matter of judgement between material possibilities on one side and social and cultural needs and assumptions on the other. It is a combination of nature and culture (Andersen and Sørensen 1992). In this way buildings are social constructions in a double meaning: they are the products of human efforts and a matter of judgement between different technological, social and cultural options. The symbolic content is also interesting in this respect, as it raises the questions of what a building should be, in the eyes of the architect profession. What should a building symbolise, and further does it symbolise the same for all architects? Should it be interpreted as modern or classical, as sober or as obtrusive, as luxurious or as good for the environment?

The social construction of technology approach (SCOT) is a theoretical approach that opens up for such questions, as it stresses that technological development or products, like buildings, may be interpreted differently by different groups of actors.

2.3.1 Social construction of technology (SCOT)

When studying technological development the concept of interpretive flexibility has shown to become particularly useful. The concept has its origin from an approach within SST known as the *social construction of technology* approach, or SCOT. This approach, initiated by Pinch and Bijker (1987), brought insight from sociology of scientific knowledge to bear on

technological development. The approach is an extension of Collin's (1983) empirical program of relativism (EPOR).

The EPOR has three stages: 1) demonstrating the "interpretive flexibility" of experimental results, which means their ability to be subject to more than one interpretation, 2) analysing the mechanism by which closure is attained; and 3) linking the mechanisms of closure to the wider social structure. In order to understand the mechanisms of closure in the second stage, Collins focused on the "core set" of experts and laboratories, consisting of a temporary network of conflicting individuals (Hess 1997: 95). As we will see, the SCOT program follows more or less the same stages as Collin's EPOR, but replaces some of the terms.

Taking up constructivist principles from SKK, SCOT deals with technological success and failure symmetrically, insisting on the same sort of explanation for both (Russell and Williams 2002). The approach is an attempt to understand how different social, political and economical conditions shape technological development. As the approach is to a great extent a sociological approach to technology, it analyses artefacts in context of society. The special way, in which society is related to artefacts, is through the conception of 'relevant social groups'. Relevant social groups are groups that are decisive as regard to the development of a technological product. The only criterion necessary for being defined as a relevant social group is that the group has a homogenous perception of the product. Thus, the main idea is that these groups have the same perception of the product and that this perception may be used for explaining different stages in the development of this technological product. Normally, there are many relevant social groups that are involved in the development of a technological product. This does not mean that one should fall into using well-worn and general labels as "producers" and "consumers". To be able to define the function of the product in a precise way, it is necessary to give a more detailed description of the relevant social groups (Pinch 1996).

As different social groups may have different perceptions or interpretations of a technology, the meaning ascribed to the fact is in other words 'interpretative flexible' (Pinch and Bijker 1987: 40). Interpretative flexibility means that the same product may be given a radically different content of meaning from one group to another. What one group experiences as a problem or as a non-aesthetic feature of the artefact, another group may see as a perfect problem solution. To demonstrate the interpretative flexibility of an artefact makes up the first step in the SCOT model (Pinch and Bijker 1987)[24].

[24] See Pinch and Bijker's findings regarding the development of the bicycle. (Pinch og Bijker 1987: 28-46).

According to Pinch and Bijker the flexibility will decline, in the sense that after some time there will happen a closure or stabilising of the technology. This is the second step in the SCOT model. Stabilising or closure happens when the dominating social group(s) accept the prevailing technological solution. The closure is mainly happening in two different ways; either rhetorically, or by redefining the product or the problem. By rhetorical closure they mean that the rhetorically founded choice of solution favours some characteristics or constructed features of the product. This implies closure of a technological controversy. The closure of a technological controversy does not mean that all the problems may be solved. The main point is whether the relevant social groups experience that the problem is solved. Redefining means turning the common perceptions of the product upside down. When a product or a problem is redefined, it is not through convincing the dominating relevant groups that a certain meaning contents is prevailing. On the contrary, it is through translating the perception of the product into a solution to another problem (Pinch and Bijker 1987).

The last stage in the research program of the SCOT model consists in relating the contents of a technological product to a wider socio-political environment. SCOT offers a solution to how this may be done in practice. The socio-cultural and political situation of the different social groups form the norms and values which in turn influence the meaning that a certain product is given. As the model show how different meanings may amount to different lines of development, the model offers an operationalisation of the relationship between the broader environment and the actual contents of the technology (Pinch and Bijker 1987). However, this last stage of the analysis – linking closure or stabilisation to the wider social structure – remains relatively undeveloped (Hess 1997). Thus, said in one sentence, the SCOT approach follows "the process by which closure is achieved among 'relevant social groups' between competing interpretations of the available technological options, so that a particular design becomes taken for granted as the essence of the technology (Pinch and Bijker 1984, Bijker 1987, 1993, 1995; Bijker and Law 1992, Bijker, Hughes and Pinch 1987 cf. Russell and Williams 2002: 41).

2.4 The communication problem

In order to be effective (i.e. to produce energy efficient buildings), energy efficiency policy has to be communicated to the architect profession. Architects must get the message that they should be more aware of energy efficiency when producing decisions that effect the energy standard of a building. One of the approaches within SST that seems fruitful for the

analysis of the communication aspect regarding how architects handle energy efficiency, is the translation approach coming out of the approach called Actor Network Theory (ANT).

2.4.1 Actor Network Theory (ANT)

Actor Network Theory is largely seen as the product of Michel Callon and Bruno Latour and colleagues at the École des Mines, sometimes referred to as the Paris school of STS. However, many others, and especially John Law has contributed to developing the theory. ANT may be understood as 'a semiotics of materiality'. This means that the theory takes the semiotic insight that entities are produced in relations and applies this to all materials, not only the linguistic ones. A consequence of the idea that entities achieve their form as a consequence of the relations in which they are located, is that entities are 'performed' in, by, and through those relations (Law 1999). The theory has spread and has translated itself into many new directions and different practises, drawing on other origins like cultural studies, social geography, organisational analysis, and feminist STS. According to Law (1999: 10) the theory is quite complex, even though much of its complexity has been lost in the process of labelling it as "a theory". According to Law the theory has been reduced to a few aphorisms that can quickly be passed on. Even though I agree with Law's point that we should go against the "grain of singularity, simplicity or centring", I cannot resist the temptation of focusing on some of the core concepts used within ANT that seems fruitful in light of my research question. Thus, making easy progress through the idea of "have theory, will travel" (cf. Law 1999: 11).

One of the advantages of ANT is that it has found a bypassing strategy concerning the double dissatisfaction that often characterises social sciences due to the alternation between actor and system, or agency and structure - either concentrating on the so called micro level or the macro level. By topicalising the social sciences' own controversies, (trying to explore the conditions which make the two opposite dissatifactions; searching for macro level explanations when having explored the micro level and vice versa) ANT might have found one of the characteristics of social order: The social does not consist of agency and structure, but is a circulating entity. Thus, ANT concentrates on movements.

This insight has consequences. First, by network one does not think of Society – "the Big Animal that makes sense of local interactions" – but rather the interactions that go through various kinds of devices, inscriptions, forms and formulae, into a local, practical tiny locus. This means that one is not directed further away from the local sites when exploring the structures of the

social (as typical for the dissatisfied social scientist), but rather closer to them (Latour 1999a: 16-18). Secondly, actantiality is not what the actor does, but rather what provides actants with their actions; subjectivity, intentionality and morality. Thirdly, the "actor" is not playing out the role as agency and the "network" as society, but designates two faces of the same phenomenon. Both micro and macro are local effects of hooking up to circulating entities. It is not possible for an observer to zoom from the global to the local and back. This leads us to a fourth consequence: That there is empty space in between the networks. These "terra incognita" are the most exciting aspects of ANT according to Latour (1999a: 19, and c). In line with this, it is natural to ask whether the architects are working in such a terra incognito.

In contradiction to the reading of many sociologists that believed that ANT was just another theory of what the social is made of - trying to explain the behaviour of social actors - the theory is really just another way of being true to the insights of ethnomethodology. ANT is a method to learn from the actors without imposing on them an a priori definition of their world-building capacities (Latour 1999a: 21). Thus, the slogan is to "follow the actors". It is however, important that this is a slogan and not something that should be taken literally. The slogan is good though, as it reminds us that we tend to reify, naturalise, or simply ignore what may be important distributions. The method is also good for generating surprises, of making oneself aware of the mysterious, as it tends to break down "natural" categories. None the less, it is important to sustain a kind of critical distance from those that are studied and not to take on their categories (Law 1991).

To be even more specific, this approach insists on following the actions and strategies of central actors as they try to assemble the resources needed for realising a project by "enrolling other actors – locking them into appropriate roles and appropriating the right to speak for them" (Russell and Williams 2002: 41). A technology is perceived as a mounting and increasingly stabilised network of material and non-material elements. Further on, the character of the project, as well as the interests and the identities of the actors involved are transformed as the network takes form. Advocates of the ANT approach assert that the analysis should steer clear of prior theorisations of the social setting and of the interests and powers of actors, disperse distinctions of scale and depict the constitution of entities in the processes and distinguish its concepts. The proponents of ANT have elaborated a whole terminology to describe these processes and to be able to distinguish its concepts. One of these central concepts is the concept of 'translation' (Russell and Williams 2002).

The general framework of the actor-network theory is called 'a sociology of translation'. Translation signifies the means by which one entity gives a role to others. The approach describes the process where a new artefact is invented and the fact builder/innovator needs to build a network of actors to get support for the invention. Building the network consists of developing different scenarios and enrolling the actors (Latour 1987). When a scenario is developed, the scenario is translated to appeal to what are believed to be the relevant actors' needs and wishes. Thus, translation means "the interpretation given by the fact-builders of their interests and that of the people they enrol" (Latour 1987). In other words, translations may be described as having four "components": problematisation, interessement, enrolment and mobilisation (Hess 1997).

Problematisation signifies the process of defining the issue in a way so that other actors accept one's definition of the problem. They gradually come to accept one's knowledge claims or technology as an obligatory point of passage, that is, as a necessary means to solving their problem. Interessement refers to imposing and stabilising the roles of the other actors defined by one's problematisation. In other words, the process of translating the images and concerns from one world into that of another, and then disciplining or maintaining that translation in order to stabilise a powerful network. The result of interessement, called 'enrolment', is the device by which actors/entities are attached to the network in interrelated roles. Finally, mobilisation is the accomplishment of desired representatives to act as spokesperson of other entities (Callon 1986). From Latour's work it is clear that enrolment does not only mean involving armies of people, but also of nature and technologies. The networks include people, the built environment, animals and plants, signs and symbols, inscriptions, and all manners of other things (Star 1991).

Consequently, translation may be described as the work of making two things that are not the same, equivalent (Law 1999). This way the meaning of the innovation may be changed in order to adapt to different wishes. Thus, it is reasonable to claim that translation is a rhetorical method that is used to make it look like interests coincide. One of the most famous cases for demonstrating how this process goes about, is Latour's study of Pasteur's discovery of the vaccine (Latour 1999c). In this study Latour demonstrates how Pasteur was able to translate other people's interests into his own language, and make them believe that they have common interests. Their interest is a *consequence*, and not a cause of Pasteur's efforts to translate what they want or what he makes them want. They had no a priori reason to

be interested at all, but Pasteur brought them more than one reason. Interest like anything else can be constructed (Latour 1999c: 259).

The translation approach also focuses on how persons or firms translate technological opportunities and economic, political and cultural conditions into socio-technical visions and strategies (Hubak 1998). Different strategies, like persuasion, seduction and motivation are being used to enrol central actors.

To transform energy economising from only being an assertion into being a fact is probably done the most easy way by finding persons that are willing to believe the assertion, invest in it or buy it. Presenting the energy efficiency argument in such a way that it will meet the interest of others may do this. Hubak's study (1998) indicates that energy economising to a large extent is translated by the HVAC and consultant engineers, who again translates energy economising to make it attractive for building owners and other professions working with the building construction (Hubak 1998: 252). As we will see the translation process seems however to be more complicated regarding the architect profession. This makes it even more interesting as I am like Fujimura (and in contrast to Latour) interested in understanding why some human perspectives win over others in the constructions of technologies and truths. Why and how some human actors will go along with the will of other actors, and why and how some human actors resist being enrolled - linking the non-user point of departure with the translation model (Fujimura 1991 cf. Star 1991: 29). According to Star (1991), the power of ANT is the move from the experience of building an empire like Mac Donald's and from the enormous amount of enrolment, translation and interessement involved in such ventures, towards the fact that it could have been otherwise. There is nothing inevitable about any science or technology as all constructions are historically contingent no matter how stabilised they are (Star 1991).

This is compatible with what could be one of the findings when studying energy efficiency in buildings. Before digging into the empirical findings, I am susceptible that by studying the realisation of energy efficient buildings, I am studying a successfully realised technology, like for example the famous case of the bicycle, or Pasteur's vaccine. It might just as well turn out that energy efficiency is unrealised in most building projects. Thus, my question will then be why the actors are reluctant towards enrolment. Why are they not enrolled? However, the social studies of science literature have identified a set of objects that make the translation process go easier, namely "boundary objects" (Jasanoff 1995; Star and Griesemer 1989).

2.4.2 Boundary objects

The concept of 'boundary objects' derives from STS researchers associated with the social worlds theory, such as Adele Clarke, Joan Fujimura, and Susan Leigh Star. A social world is a unit of discourse "not bounded by geography or formal membership 'but by the limits of effective communication'" (Clarke 1990: 19). Scientists and technologists move in communities of practise or social worlds, which have conventions of use about materials, goods, standards, measurements, and so forth. It is expensive to work within a world and practise outside this set of standards; for many disciplines, nearly impossible (Star 1991).

Boundary objects are entities at least ostensibly common to several actors' discourses, enabling them to discuss an issue and perceive a shared interest. The concept is useful for analysing how collective action is managed across social worlds to achieve enough agreement at various times to get work done and produce relatively (and temporarily) stable facts (Fujimura 1992).

A boundary object is an analytic concept of scientific objects that both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary objects are thus "both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across boundaries." They are weakly structured in common use and become strongly structured in individual-site use. These objects may be abstract or concrete. "Such objects have different meanings in different social worlds but their structure is common enough to more than one world to make them recognisable, a means of translation" (Star and Griesemer 1989: 393).

Boundary objects arise over time from durable co-operation among communities of practise. They are working arrangements that resolve anomalies of naturalisation without imposing a naturalisation of categories from one community or from an outside source of standardisation. They are therefore most useful investigating co-operative and relatively equal situations.

"Object" includes things, tools, artefacts and techniques, and ideas, stories and memories – objects that are treated as consequential by community members (Clarke and Fujimura 1992). The point is that the objects have different content in different communities of practice. What is interesting is not what this content is at all times, but that it is a media of communication between these communities (Bowker and Star 2000). Boundary objects act as bridges or anchors (however temporarily). They facilitate the multiple transactions needed to engineer agreements among

multiple social worlds. Creating and managing boundary objects are a key processes in developing and maintaining coherence across different communities of practise or social worlds (Star and Griesemer 1989: 393). Boundary objects (and standardised packages) are interfaces between multiple social worlds, which facilitate the flow of resources (concepts, skills, materials, techniques, and instruments), among multiple lines of work (Fujimura 1992).

The concept is developed in a study by Star and Griesemer (1989), in which they demonstrated that boundary objects made the co-ordination of efforts of members of multiple social worlds in building the Museum of Vertebrate Zoology at the University of California, Berkeley, more easy. The boundary objects made the groups intersect and work relatively successfully together. As the focal point of this concept is collective work across different communities of practise with different viewpoints and agendas, the theory should also be fruitful for studying the realisation of energy economising in the building sector.

In order to be able to design energy efficient buildings, it is essential that energy efficiency is communicated from the political community to the community of architects. The use of boundary objects would be one way to link the two societies together, and to create a way of communicating between them. The most obvious candidate to being a boundary object between these two separate worlds, is the concept of energy economising itself. Establishing the energy economising concept as a boundary object may serve as a meeting ground between actors on either side of the architect/policy maker boundary. This as a result of boundary objects usually playing "a critical role allowing different communities to work together around them and yet maintain disparate identities" (Guston 1999). Thus, the question here is to what degree does the concept of energy efficiency function as a boundary object that facilitates the translation from the realm of policy to the realm of architecture.

Fujimura has also introduced the idea of a *scientific bandwagon*, which occurs when "large numbers of people, laboratories, and organisations commit their resources to one approach to a problem" (1987: 261). The concept describes an increasing "returns phenomenon" in the selection of scientific problems such that researchers tend to flock to "hot" areas. The concept of the bandwagon communicates with network theories as a bandwagon might be viewed as particular type of rapid network growth (Hess 1997: 105).

In the recent literature another concept relating to the boundary literature has developed namely the concept of "boundary organisations".

Boundary organisations have three main characteristics. First, they exist on the frontier of two relatively different social worlds of politics and science, and have distinct lines of accountability to each. Second, they involve the participation of actors from both sides of the boundary, as well as professionals who serve the role as mediators. Third, they provide the opportunity and sometimes the incentives for the creation and use of boundary objects and standardised packages, which are common products used by actors on both sides of the border to meet their own purposes (Guston 1999, 2001). The concept of boundary organisations may also prove useful for this study.

2.5 The problem of practice

Hubak's (1998) study of the role of HVAC-engineers in the realisation of energy efficiency illustrated that there are many different actors in the design process, that often maintain different views of the building. Thus, it is not only within the architect profession that there may be different interpretations of what a building should be and how it should be designed. Building projects are arenas of multi-disciplinary work, in the sense that different forms of professional and vocational knowledge have to be co-ordinated and negotiated (Hubak 1998). The building is in a sense a different subject for the different professions that are involved, and the attention to energy efficiency has to be understood within this kind of multi-disciplinary dynamic.

It is natural to expect that architects' interpretation of buildings is different from other groups' perceptions of buildings - that architects perceive buildings differently than for example engineers, building owners, and consultants. This may be related to Bucciarelli's (1994) concept of object worlds.

2.5.1 Object worlds

A useful concept introduced by Bucciarelli is the concept of "object worlds". Object worlds are "hard in the sense that their base is 'objective', instrumental, often formal and abstract. And at the same time, object worlds are personal worlds. They derive from an individual's schooling in a discipline, are tempered and shaped further by an individual's work experience, that is, his or her professional history" (Bucciarelli 1994: 81). Object world deliberations may consist of personal rendering of scientific principles and technical possibilities and different styles of tacit knowledge. Within a single discipline, as for example within the world of an electrical engineer, the different individuals may have different styles or tacit knowledge, deriving from differences in education, national origins, or from

the firms that they work in. However, the most important distinction is that among different disciplines.

According to Bucciarelli (1994), designing is the process of attaining consensus among participants with different "interests" in the design, and that those different interests are not compatible in object-world terms. Designing and design decisions depend upon the values and interests of participants. By interest he refers to a situation where each participant has his/her own way of looking at "the problem" and accordingly is interested in having his/hers concerns given appropriate consideration. These concerns are thought to originate from his/hers technical expertise, experience and responsibilities, and are rooted in his/hers knowledge and belief about the nature of good design practice within their individual object worlds, concering what makes up the design task, or what comprises the problem (Bucciarelli 1994: 159-160).

Further, there is no overruling perspective, method, science, or technique that can control or manage the design process in object-world terms, as the process is social and necessitate the contributors to negotiate their difference and construct meaning through direct, and preferably face-to-face, dialogue. Thus, designing consist of making coherence to these perspectives and interests, fixing them in the artefact, as participants work to bring their efforts into harmony through negotiations. "This harmony, or lack of it, will be reflected in the artefact or in the 'built form'" - a phrase used by architects as Bucciarelli points out and which fits nicely in this context. "The quality of the final design and artifact, as evidenced by the harmony of the different underlying forms of different object worlds achieved, will then depend upon the social process engaged by participants, the competence of participants working within object worlds, and also the infrastructure and its vital, sustaining ecology" (Bucciarelli 1994: 187).

The implications of the concept of object worlds is that an object - like a building – is part of different object worlds. It is a junction of multiple object worlds and its design cannot be split apart into a collection of separate tasks independently pursued. It is the result of a continual engagement of and exchange among, individuals schooled and trained in a range of disciplines. This means that one should expect that the building is not the same thing to all participants in the building design process. Each individual's perspective and interests are embedded in her special *expertise* and responsibilities. Thus, one should expect that the building engineer sees one thing when looking at the building, the HVAC engineer sees another thing, and the architect sees something else.

Technological change influences the nature of skills and expertise, thus serving to differentiate groups of workers and experts. This is also the case when it comes to issues of energy efficiency. Thus, it is important to look at the role of the architect profession as an expertise in the building design process. The field of science and technology studies has made an important addition to our comprehension of expertise in general as much of the expertise that is relied on is associated with science and technology. Another reason for this is that technical knowledge (and especially scientific knowledge) is commonly believed to be value-free and therefore 'above' economic and political interests (Faulkner, Fleck and Williams 1998).

Because of the great importance of the topic, expertise has been treated in diverse and not always compatible ways. There is a confusing assortment of closely related terms, each of which targets broadly the same issues, but often with subtle differences. This plethora of terms makes it difficult to discuss expertise as a general category beyond its multifarious and particular manifestations; that is, beyond specific references to some application domain with respect to some particular body and knowledge about some particular technology (Fleck 1998).

Collins (1998) talks of four kinds of knowledge; facts and formal rules, heuristics, manual and perpetual skills, and cultural skills. The first two categories are expressible part of our knowledge while the two last categories are in-explicated abilities. Cultural skills are the skills that make us able to construct inductions in the same way as others in the world of concerted actions, thus the skills that enable us to make the world of concerted behaviour. Educational practises take account of the cultural aspects of knowledge. Consequently, scientists learn their trade by working through lots of examples under supervision and through guided laboratory experience.

Polyani's (1958) idea of tacit knowledge provides a link between manual skills and cultural skills. His well-known example of tacit knowledge is the skill associated with riding a bicycle. The rider has no comprehension of the formal dynamics of balance on a bicycle, but is still able to ride, whereas an expert bicycle engineer may know the rules, yet not be able to ride the bicycle. The rider, on the other hand know how to ride, but have problems explaining how he does it. Thus, tacit knowledge is not the same as 'mysterious' knowledge, or knowledge that is 'unsayable'. It is better deemed as *practical work* and something that is 'seen but unnoticed' (Collins 1998: 137).

Tacit knowledge is by nature fostered by experience or is obtained by example. It either cannot be or is not written down. This has consequences for how easily the technological knowledge may be transferred and traded,

since technological knowledge cannot be specified in patents and can only be transferred by personal interaction (Faulkner et. al 1998).

From our common knowledge about architects it is natural to expect that the architect is mainly trained into seeing the aesthetic elements of a building, and to evaluate whether its expression is good or bad. This is something that the architect has learned during the education and by experience (working as an architect). Thus, what makes the architect profession special as an expert group, is their knowledge of aesthetics. They are experts on aesthetics. Consequently, it is natural to ask, what it implies being "an expert on aesthetics". What underlies the concept of aesthetics? Using insight from the SSK, aesthetics may be regarded as a 'factish', that is one of many phenomena in the world that has a fiction-like character.

2.5.2 Factishes

Fetishism is an allegation made by a critic that implies that believers have simply projected onto a meaningless object their own beliefs and desires. Factishes, in contrast, are 'types of action that do not fall into the comminatory choice between facts and beliefs' (Latour 1999b: 306). The factish is a combination of the word "fact" and "fetish". The notion makes it obvious that both facts and fetishes have a common element of fabrication and that there is no need opposing facts to fetishes, nor to condemn facts and fetishes. Instead, it is intended to take seriously the role of actors in all types of activities and thus to do away with the notion of belief. The notion of factish is not an analytical category that can be added to others by means of a lucid discourse, as lucidity of discourse results from drawing upon the deepest obscurity, being forced to choose between constructivism and reality. The factish is real because it is constructed, so autonomous and so independent (Latour 1999b: 274-275, 306). Latour's analysis of the factish as a hybrid of fact and fetish explores the making, composition and presentation of reality. While at the same time as pointing to the fact that Latour says little about how factishes are produced, Undheim (2002) assesses the concept as being of great heuristic value. In his analysis of the visionary practise of globalisation, he tries to explore the production of different factishes and map out the social, cultural and geographical imaginaries that they rely on.

The concept of factish is also useful for exploring the production of the *aesthetics* within the architect profession. Aesthetics is a central concept within architecture and critical when trying to understand the thoughts and practices of the profession. This is linked to the fact that architecture often is defined as the 'aesthetic organisation of practical reality' (Cornell 1966) or 'built environment with an aesthetic-artistic content' (Cold 1991b: 41). The

concept is extremely difficult to grasp for non-architects. This is probably due to its factish characteristics – in one sense it is something real and a product of fact-like knowledge, yet it is endowed with beliefs, convictions and obsessions obscure for the outsider. The concept is closely connected to the concept of *architectural quality* which will be further explored in the analysis, and which have inherent features both related to knowledge of the theoretical kind, as well as the tacit knowledge that is gained through practice which also include "experiencing and feeling architecture".

According to Latour, the reason why one should always be aware of the factishes is that "their consequences are unforseen, the moral order fragile, the social one unstable. The role of the intellectual is not then to act as an iconoclast, to grab the hammer and break beliefs with facts, or to grab a sickle and undercut facts with beliefs, (...) but to be factishes and also a little bit facetious themselves, that is to protect the diversity of ontological status against the threat of its transformation into facts and fetishes, beliefs and things" (1999b, 306). Thus, according to Latour we seem to have missed something along the way.

In relation to the architect practise it may be a fruitful exercise to explore who are the iconoclasts in this setting. Is there any groups that want to destroy the icons, that want to grab the hammer and break the picture of the aesthetic phenomenon in architecture? Someone who wants to eliminate it and replace it with something else, like for example sustainability and energy efficiency? The concept of factish may prove useful for this kind of exercise.

2.6 Conclusion

As we have seen the Social Shaping of Technology (SST) consist of a myriad of different approaches, frameworks and concepts where many seem to be fruitful for the study of the way energy efficiency is handled by the architect profession. Many of the theories are complementary and overlapping, as there has been a change in SST during recent years towards less polarised positions, fundamentally new theoretical claims and programmatic declarations. SST seems also to be characterised by a pragmatic use of different theoretical assets in case studies. There is still much disagreement over forms of explanations and emphasis within SST. However, these differences and tensions may be positive as it reflects that different models and concepts can clarify different features of the same case (Russell and Williams 2002: 87).

The research problem may be approached from different directions. Four dimensions or aspects are thought to be particularly interesting components of the problem, namely

- appropriation,
- design,
- communication and
- practise.

In order to investigate these aspects further we have located several concepts that are anticipated as central in the analysis. These are in particular the concept of

- appropriation,
- interpretive flexibility,
- translation,
- boundary object,
- object worlds and
- factish.

The appropriation problem is the set of problems related to embedding the energy efficient and sustainable technology in the practice of architects, i.e. 'domesticating' the energy efficiency technology, at the local level and to adapting and introducing the technology in the broader context. Thus, we want to study how the architect profession perceives the energy efficient technology and the concept of energy efficiency practically, symbolically and cognitively. This is in some way related to the next concept, that is, how the building is interpreted.

The interpretive flexibility problem relates to how buildings are read by the architect profession and the other actors in the building design process, as there may be conflicts between competing interpretations of available technical options and different understandings of what a building should be. The symbolic content is also interesting in this respect. Should one interpret a building as modern, or classical, as sober or as obtrusive, as luxurious or environmentally sound? This is an important question, as it will have implications for implementation of energy efficiency in buildings.

The translation problem is, in brief, to transform the goals of the existing energy efficiency policy into the design of buildings. In other words, to translate energy efficiency in such a way that it communicates with the interests of the architect profession and accordingly persuades them into designing energy efficient and sustainable buildings. The question is whether central actors has managed to assemble the resources needed enrolling other actors – locking them into appropriate roles and appropriating the right to speak for them regarding energy efficiency in buildings.

The problems related to boundary objects are related to the problems of translation, as boundary objects may help the translation process go easier. The problem is to create objects, artefacts or analytical concepts that make it

possible for politicians and architects, to get work done, and produce energy efficient and sustainable buildings. In other words, the task is to identify crossing points between the world of the policy and the world of the architects, which facilitate the flow of resources and which maintain a common identity across borders, and to make them recognisable, as a means of translation.

The problem of object worlds is the problem of understanding how the architect profession and the other actors in the building design process have appropriated concerns and different interests deriving from the education and technical expertise, and how they accordingly have their own way of looking at "the design problem". In relation to this it is important to get further insight into the way consensus is obtained among participants with different "interests" in the design. It is also relevant to ask whether most architects seem to belong to the same object world, and how this object world is different from the object world of for example engineers.

The problem of buildings as factishes is to understand the consequences of energy efficient buildings being products of fact-like knowledge endowed with beliefs, convictions and obsessions. The fact that there exist a seamless relation between facts and values concerning buildings, make it impossible to only attract the value aspects. Both values and facts may be translated, and the challenge is not only to translate the factual aspects, but perhaps even more to translate the values.

This assembled toolkit of relevant ideas and concepts drawn from literature in the field of science and technology studies will be appropriated and adapted actively in the analysis. As the project of the dissertation is of an explorative character, the intention is not to test or to try out these concepts. The main research question is fixed in the relation between policy and practise. Thus, the project is to employ these concepts as analytical tools that may help unfolding the subject and the material.

Before embarking on the empirical analysis it is however necessary to say something about the methods by which these dimensions will be analysed and the data material itself.

3.

METHODOLOGY AND DATA MATERIAL

Two main data sources have been employed to answer the research questions in this dissertation. These are texts and interviews. Thus, it is important to take a closer look at the methodology used for studies of texts and analysing of interviews. It is also relevant to discuss methodology for observation, as observation was used in combination with interviews to get an overall impression of the way that architects work, in their natural environment and for further grounding the phenomena observed. I have also done case studies of three different building projects. This chapter discusses the methodology that has been used for analysing the different sources, before moving on to a more detailed overview of the data material and sampling procedures. However, it will first be necessary to reveal some of the implications of applying the theoretical framework that I am working within.

3.1 Methodological implications of applying a SST approach

The SST approach has typically been based on doing case studies, including detailed qualitative analysis. This approach reflects the conditions from which the technology studies came out from: the ignorance of technology in most social science, technological determinism, and the lack of already existing categories within sociology etc. to explain technological change, as well as the interdisciplinary character of the field. SST normally rests on "thick description", as a way of meeting the complexity and has gathered a great number of such cases (Russell and Williams 2002).

Case studies have negative connotations for many people, as they will assume that it is impossible to do valid generalisations from case studies. Russell and Williams (2002), however, argue that it is possible to gain robust and useful insight from SST work as the strong case study does not leave the work utterly descriptive. Unquestionably, there are dangers connected to taking one example to be paradigmatic without adequate justification, and of transmitting insights from one set of conditions to another, but this is not inherent in the form of theory development. The way to assess the significance of research findings within SST is obviously more complex and varied for SST compared to large-scale surveys, in the same way as other qualitative and historical analysis. Basically, to assess research findings requires more interactions between theory and the empirical material, as well as between SST and more general social theory.

Scholars within SST have approached this in different ways according to their framework, as different theoretical bases entail different views of what constitutes valid explanation, argument and evidence. However, typically, scholars identify and justify the prominent features of a case and its context, which form the basis of a class of cases, which can be treated similarly. General claims are then assessed in standard ways: against a range of empirical evidence, allowing for the theory-dependence of observation and other forms of data collection; and in terms of consistency of explanations at different levels of abstraction. As further areas of technology and appliance are scrutinised and weigh against each other, it will obviously be possible to judge the helpfulness of frameworks and the validity of concepts and claims across a wider range of sites than the ones on which their proponents have focused. Even a single study, if well analysed, can provide rich insights for intervention in that particular case and condition (Russell and Williams 2002).

Explaining the ways in which the choices were made or the conditions that produced a particular outcome, ought to permit the researcher plausibly to claim what would have been requisite for producing a different outcome. It should allow him or her to argue how close the development was to be going down a different path, what alterations or interventions would have shifted it, and how intricate those would have been. As an example, the comprehension of the stance of an actor and their degree of indifference to different possible results may make it possible to persuade them that their interests lie in a different direction. In this respect, the rich descriptions emerging from SST research may impart insights that are more useful for policy-makers and practitioners, as they rely directly on the available choices and constraints (Russell and Williams 2002).

Furthermore, quantitative approaches may be valid when technology artefacts and practices have become stabilised. They are, however, inadequate for opening up how the new world may turn out to function in a different way from what simple projecting of existing practices and expectations would indicate. SST on the other hand, offers guidelines and concepts to explore both continuity and change (Russell and Williams 2002).

3.2 Methodology for analysing texts and interviews

Texts may be interesting study objects in many ways. On one hand, one may be interested in the text itself, what the proper meaning is, and in what way the text is presented. On the other hand, one may be interested in the text as a witness of other social conditions (Sørensen 1984: 270). The latter approach is based on the assumption that texts relate to circumstances outside the text

and that they therefore could be an important source for understanding different forms of social phenomena like ideology, culture or politics. The reason for using texts as data material in this dissertation is founded on the very assumption that this may give an angle of incidence for understanding conditions outside the text, more precisely spoken, how energy efficiency and sustainability are handled by architects.

A text is often used as a data source to explain problems within social sciences. Earlier, social scientific text analysis has to a large extent been limited to the analysis of governmental white papers, public reports etc. in addition to historical sources that have had a strong tradition within political science compared to other social sciences (Hammersley and Atkinson 1996). In the last 20 years a text linguistic turn has occurred within social sciences, that has made the use of texts even more widespread. This has also lead to the fact that other types of texts than the most traditional types of published material (like books, journals, papers, documents and reports) have been perceived as data sources of interest. One has opened up for the use of unpublished sources like letters, manuscripts, internal company accounts etc. (Kjelstadli 1997). The linguistic turn is however more radical. It implies a stronger emphasis on the linguistic elements in the comprehension of society and an insisting on the usage of more advanced textual scientific methods for analysing texts in the social sciences.

Despite of this, there are few established methods for analysing texts within social sciences. This argument is substantiated if one look at the existing methodological literature. A rough examination shows that there is very little available methodology on text analysis among Norwegian authors in the 90ties. When the subject is mentioned, it is almost exclusively treated superficially and the literature discusses to a very small extent how on should deal with texts as data material, working as researchers and social scientists. The exceptions are Heradstveit and Bjørgo's book about political communication (1987) and Neumann's introductory book on discourse analysis (2001).

So how is textual analysis conducted within social sciences and political science in particular? The most common strategy is to divide the process into three parts. First one seeks to clarify what is actually written in the text, then one tries to explore the deeper meaning of the text, and finally, one presents the interpretation of the text regarding contents and meaning (Kjeldstadli 1997). When the source is from our own times an immediate surface interpretation may be unproblematic. However, as any literary scholar will be aware of, to find out what the text is really trying to tell may be more intricate. Some insight may obviously be gained by reading the text carefully

over and over again and sometimes this kind of spontaneous reading without any theoretical or methodological regard is convenient. In most cases, however, one will not get very far by using this kind of textual reading.

Text analysis in the social sciences, and particularly in political science, is often characterised by a naive pragmatism, where texts are read superficially and at face value, without use of any methodological tools. This, in spite of the large number of existing methods specifically designed for text analysis in other disciplines, like content analysis, hermeneutics, grounded theory, structuralism, semiotics and discourse analysis. Social sciences have so far adopted these methods to a very limited extent. There is much evidence that the increasing openness that quantitative and qualitative researchers have shown in relation to each other's methodological approaches during the last two decades, should also be extended to the including of other forms of acknowledgement than those traditionally regarded as "scientific" within the social sciences. One should be more aware of the deliberate usage of linguistic possibilities and escape the apprehension of language as "that of a neutral utensil that is used to say something else". And to a greater degree be aware of the fact that language "is never merely an instrument to convey a 'meaning' or a 'fact' or a 'thought' or a 'truth'", but see that language has "a density of its own" (Roland Barthes cf. Wadel 1991). According to Barthes, these two understandings of language are what differentiates literature from science, and make literature more scientific than science, as literature is aware of the fact that the language never is naive (Wadel 1991). Here, I will try to overcome this typically naive reading of texts by drawing upon insights from methods established for the analysis of texts.

The existing methodological literature found on the shelves of the social science methodology section has an emphasis on statistical methods. Among books on qualitative methods the centre of gravity is on qualitative interviews, and in particular on the interaction in the interview situation. The translation of oral conversations into written texts and the processing of this text are given relatively little attention (Kvale 1997: 161).[25] Accordingly, the process concerning how to systemise and interpret the data material has been called "the blank pages of the methodology chapters" (Solberg 1984). There is no standard model for text analysis that corresponds to the many techniques that are available for statistical analysis. Text analysis is first and foremost a qualitative method of analysis. The lack of a standard model for analysis of a text may be due to the lack of multidisciplinary communication on qualitative analysis (Kvale 1997).

[25] For more on problems related to the transcription of interviews see Kvale 1997: 101-110.

What method to choose, and the reason for choosing exactly this method, is not always obvious. However, it is important to be aware that all methods and content descriptions imply some kind of alteration of the data material. It is more than a mere reconstruction, as all methods imply a reduction process through which certain characteristics in the basic material are highlighted, while others are disappearing (Findahl and Höijer 1981). The way the reduction is done and the motivation for it is particular for each method.

When analysing textual sources like architect journals, the analysis is inspired by a hermeneutic approach (Gadamer 1976,1977,1984; Schleiermacher 1998; Mueller-Vollmer 1986). Hermeneutics has as a starting point that the reader has certain expectations and understandings of what the text is about already before having started analysing the text. This understanding is based on former experiences from earlier texts, and implies a reading of common traits and relationships into the concrete observations (Repstad 1992). In brief, the method is as follows. First, one reads the text and tries to form an overall impression. Then, the reader returns to the individual subjects and sections of statements, and tries to crystallise their meaning and signification. Further on, one goes back to doing a more reflected holistic interpretation, and continues this way (Repstad 1992; Alvesson and Sköldberg 1994). While doing this, it is important to be aware that the interpretative work may lead to potential distortions of the text due to the reading of one's own background and values into the material. None the less, not all obliquity in the hermeneutic process entail such results. There may also be a built-in harmonising wryness in the oscillation between the holistic and the partial comprehension of the texts, as one presupposes a certain consistency in the material that may lead to neglect of the intrinsic antagonisms and ambivalence in the text (Repstad 1992). Furthermore, when texts are outcome of social practices and have a social scientific objective, they must also be read as regards the external relations of the text (Sørensen 1984). These relations may be related to other texts, to the person that have written the text, to the historic conditions regarding the production of the text etc. When analysing architect journals I have tried to be aware of these methodological considerations.

Texts are not only used in contexts where they exist prior to the research project, as is the case when one uses public or private documents as data sources. Texts also have a common trait with qualitative methods in general, as the data that the researcher studies generally will be available in form of text. Some claim, however, that a text, which is generated on the basis of interviews, is not a text on the same level, as usual documents. This

because the transcription only is an artificial construction from oral to written form, and that it therefore will not be the same solid and unshakeable empirical data material as it often is regarded as in interview projects (Kvale 1997).

The methods for analysing interviews do not necessary differ radically from the analysis of texts. Mostly, the same methodological approaches may be used, as the interview material may be looked upon as another form of text. However, the transcription will turn out to be a mixture of text and oral speech. One of the most prevailing differences compared to texts that exist prior to research projects is that the researcher has fairly good knowledge of the production of the text.

When the text is produced by the researcher herself/himself through transcription of interviews the different rhetorical forms for oral or written speech are often neglected. Nevertheless, one possibility to avoid this, is to acknowledge that the transcription is a social construction, and then to present detailed procedures on how the credibility of the transcription may be increased (Kvale 1997). In an open, no-conductive interview the respondent gives the researcher one or several stories. Thus, the transcription may have the form of a narrative text (Kvale 1997). The researcher may fluctuate between being a story finder and a storyteller during the course of the analysis. An interview analysis lies somewhere between the original story that was told to the interviewer and the final story that the researcher presents to the public. To a large degree analysing is the equivalent to dividing into parts and elements. The transcription of the interview, as well as the perception of the interview as a collection of utterances, may further lead to a fragmentation of the story into separate units – as paragraphs, sentences and words (Kvale 1997).

The interviews with architects and related professions in the building design process are analysed drawing upon methodological insight from several disciplines and approaches in other fields, yet to be obvious within political science. Three different insights particularly inspired the analysis: Insight from recent semiotics, discourse analysis and stories.

One entry to analysing text has so far been little used within social sciences, the so-called *stories* or *urban tales* (Czarniawska 1997; Grant, Keenoy and Oswick 1998; Orr 1996). A story is a short incident that the respondent has either experienced or observed in his environment. Social scientific text analyses often presume that decisions are taken on the grounds of rational information. However, decisions are often taken on the basis of stories. Both the content and the form of a story contribute to giving an understanding of the informant and the social context in which the informant

operates (Thagaard 1998). A story includes a time dimension (a pattern of action), it has a social dimension (someone is telling something to someone else), and it has a meaning (a course of events that give a point and a unity to the story). One of the most important social functions of a story is to maintain social ties and to create group identity (Kvale 1997; Mishler 1986). The method is suitable for studying the way central actors substantiate their arguments on for example decisions related to energy efficiency.[26] The story often becomes an argument in itself, as well as an independent answer. Stories are, in other words, a narrative way in which one may talk oneself out of decisions. By looking at this kind of stories as a whole, the social sciences may get a more realistic approach to text analysis.

Discourse analysis is another part of the general linguistic turn within the social sciences; a turn away from positivism in direction of a more relational understanding of language where every linguistic expression have a past experience from prior relations with other linguistic expressions (Neumann 2001). The concept of discourse is used in many different ways (Holter 1996, Silverman 1993). Some scholars use the concept for all oral forms of text or talk (Gilbert and Mulkay 1984). Some are using it as a synonym for "text", while others draw a border between text and discourse (Halliday 1978). Linguists often avoid the discourse concept and prefer the concept of "text" for all recordings of the language in use. Some scholars maintain that discourse is language in context, while others claim that it is language in action, while text is the written account of this interaction (Nunan 1993). There are also discourse analytics that refer to "discourse" as a much broader linguistic practise under historic development (Foucault 1972).

Discourse analysis is as diverse as the discourse concept. It has been used as a common conception for practically all research that deal with language in its social and cognitive context (Brown and Yule 1983; Coulthard 1977; van Dijk 1985). Further, it has been used for research that focuses on linguistic units on a higher level than sentences (Stubbs 1983), and for research on relations and connections between sentences and sequences of speech (Tannen 1984; van Dijk and Kintch 1983). Discourse analysis has further regarded as a concept that covers the development from structuralism and semiotics (Foucault 1971; Pecheux 1982). As discourse analysis have developed simultaneously within a variety of disciplines and has drawn upon a broad spectrum of theories, it has become so abundant that two different books on discourse analysis may not have any overlap as regard to contents. Thus, discourse analysis is not one simple direction of analysis; it

[26] One example is the analysis of Næsje (2000), which show that central actors use stories about wrong use of heat pump technology to give proof of their point of view regarding the issue.

is a range of multidisciplinary approaches and can be used in many different ways. The analysis of the interviews does mainly draw upon insight from the social constructivist approaches within discourse analysis (e.g. Potter and Wetherell 1987). The reason for choosing not to go deeper into discourse theorists like Foucault, or Laclau and Mouffe, is that they do not deliver a sufficient range of practical tools for doing a textually close discourse analysis and a methodology to analyse specific texts.

The main point of discourse analysis is to analyse meaning where meaning is created, which is in the social sphere. Discourse analysis is first and foremost concerned with language, while other social practises like the mass media, schools and the family, produce meaning only as a by-product. Language, on the other side, has as its main function to create meaning (Neumann 2001). Further, discourse analysis draws heavily on structuralist and post-structuralist philosophy of language that maintains that access to reality always goes through the language. By using the language we create representations of reality. These representations are never a mere reflection of the already existing reality, but contribute to the creation of it. This is not the same as denying that the reality exists, but rather that it only has meaning through discourse. Thus, the language is not only a channel through which information and facts are communicated. The language takes part in the constitution of the social world (Jørgensen and Philips 1999). Put in another way, people perform constructions of the social reality through language. Firstly, this is done when one actively creates statements from existing linguistic resources and an infinite number of available words and constructions of meaning. Secondly, this is done by the active selection of these resources; from an infinite number of available words and constructions of meaning some are chosen while others are not excluded. Thirdly, the chosen construction has consequences. The mode of expression influences conceptions, generates consequences etc. (Alvesson and Sköldberg 1994)

The role of the discourse analytic is not to get "behind" the discourse, or to try to find out what people really mean when they say what they say. The point of departure is that one may never reach the reality outside of the discourses. Thus, it is the discourse itself that is the object of analysis. One is not trying to find out what utterances are right or wrong, but rather concentrate on what is actually being said or written. Further, one will investigate which patterns are possible to find in the different utterances, and what consequences the different discursive representations of reality result in. The discourse is not describing an external world "out there". The discourse is rather creating a world that seems to be true or real for the person speaking (Jørgensen and Philips 1999).

How should the overwhelming material that has been gathered to do a discourse analysis be treated? Different discourse analytic traditions encroach on the analysis in various ways, as the choice of analysis techniques depends on the theoretical framework and procedure. Jørgensen and Philips (1999) point out two different techniques to get the analysis started. One technique implies looking for points of crises as signs that something is wrong in the interaction, and may reflect on conflicts between different discourses. As I have interviewed architects that position themselves differently concerning energy economising and sustainability, the analysis also may be said to use controversies as a methodological tool.

Jørgensen and Philips (1999) claim that in the same way as in other qualitative methods for analysis, there are no existing clear procedures or recipes in discourse analysis. However, coding is usually the first step. Coding is usually performed in the following way. One starts with reading and rereading the transcription in order to identify themes or subjects - one codes the material by placing fragments of the text into categories. One tries to be open for new subjects, gained through carrying out and through reading the interviews, and tries not only to identify the subjects that derive from the theoretical framework. Extracts of interviews are copied into different fields of subjects, and as the comprehension of a certain topic develops, it is appropriate to return to the material and search for more examples. During the process some topics are rejected, while new ones are formulated (Jørgensen and Philips 1999).

The analysis of interviews with architects and the other relevant social actors in the building trade has been inspired by this procedure. As the interviews were made available in transcribed form, the various subjects that the interviews touched were grouped, and quotations that seemed to illustrate the various themes in the most suitable way were selected. Some of the subjects derived from the theoretical framework while others were new subjects gained through carrying out and reading through the interviews. As the subjects developed and became richer I returned to the interview material to search for more examples, and to look for perspectives that I might have overlooked in the first round.

Structuralism and semiotics have appeared as a condition of opportunity for discourse analysis. As the presentation above also bear witness to, it is tempting to claim that discourse analysis often is stuck in a structuralist approach. It partly employs a structuralist procedure, while at the same time it looses something on the way. In particular the text's motional aspects – the dynamics and the action orientation – are neglected. The discourse analysis often becomes a top-down analysis where the discourse

sets limit to the one who is talking, and where the macro structures determine the speech acts in the micro. Thus, to meet the limitations of discourse analysis I have tried to include some semiotic tools when analysing the way that architects handle energy efficiency in buildings.

Semiotics has structuralism as its origin. Structuralists have no common program, but are of common conceptual decent (Barthes 1972). Most concepts stem from the work of Saussure, and his theories are today considered as the point of departure for most of structuralistic and semiotic work (Madsen 1970; Maren-Grisebach 1974; Fages 1969; Sturrock 1989).[27]

The research object of structuralism is all human and social phenomena, irrespective of form. This is made possible by the fact that all societal activity is interpreted as language, whether it is the dress codes or the matrimony traditions in a society (Lane 1970). By regarding all forms of social activity as language, regularities may be reduced to abstract laws (grammar) in the same way as "ordinary" language. The main thought of structuralism is that one may find a relational system (a grammar) for the social that is hidden (latent) and which decide how actual (manifest) social patterns of co-operation will look.

Thus, structuralism does not seek the structures that are on the surface and which may be observed, but seeks the structures that lie under the empirical reality. It is this kind of invisible structure that the American linguist Noam Chomsky has called the "deep structure", in opposition to the surface structure, which is what we can see or hear. Structuralist analyses is further concentrated on synchronic, and not diachronic structures. The synchronic structure consists of a network of existing relations and of a non-historical process. Thus, one may regard the structuralism as anti-causal. If a structuralist compares to patterns of social relations that is separated in time and space, and he observes structural differences, he will not claim that it is induced by one or several factors like one traditionally will do. The structuralist will argue that the only thing one can say, is that a particular structure has been transformed into another structure, and that repeated observations make us capable of saying that a given structure always will be transformed in a certain way. One gets transformation laws and not causal laws (Lane 1970).

One objection to structuralist and semiotic methods is that they are far too enclosed to do justice to the specific contents of different texts, despite the fact that they often are said to be universal and suitable for all types of texts. Titcher et al. (2000) maintain that the analytical methods that are based

[27] The core is three lectures that he held at the University in Geneva between 1906 and 1911. *Cours de linguistique générale* (1962) edited by Bally, Séchenhaye and Riedlingers is a collection of his lectures.

on narrative semiotics, first and foremost are suitable for analysing stories and fairy tales, as the method focuses on revealing the narrative structure in a story. This can be contested. Semiotics are more than a proclamation, and it is possible to use the method for analysing non-narrative texts in light of social scientific research questions.

New insight may definitely be gained by looking at actants in the narrative structure. The fact that semiotics have only minutely been picked up by social scientists, is probably due to the complexity of the methods and the limited interest in theories of language that the social scientists traditionally have exibited. Nevertheless, there are many good examples of how to use semiotics for analysing a text as a witness of other social conditions.

Semiotic analyses with a social objective have been utilised in science and technology studies, for example in an analysis of the door closer by Latour (1988). This semiotic analysis is founded on the semiotic works of Greimas (1983) which deal with movement in texts and how meaning is constructed. It employs the concepts of projection and delegation to show how humans delegate or translate tasks and competence to artefacts. Another useful concept for doing a semiotic analysis on the status of energy efficiency in the architect profession, is the concept of "modalities" (see, Latour 1987; Sætnan 1995).

Further, the semiotic method of reading technology developed by Akrich and Latour (1992) focuses on the processes of inscription (done by engineers), prescription (what an artefact allows of forbids) and subscription (reactions by humans and non humans). This is a translation process going back and forth between words and things, intentions and materiality, technologies and readings, interpretations and reactions and actions (Gjøen and Hård 2002). This semiotic method of reading technology supplements the discursive method, and provides fruitful tools for analysing how energy efficient technology is translated by architects and other relevant actors in the building design process. These concepts were elaborated more thoroughly in the previous chapter.

3.3 Observation

Observation is a qualitative method that may either be used by its own or in combination with other methods. It is normally a part of what is labelled ethnographic research or fieldwork studies. Ethnographic studies are mainly carried out to gratify three simultaneous requirements associated with the study of human activities. Firstly, the need for an empirical approach. Secondly, the need to remain open to elements that cannot be codified at the

time of the study, and thirdly, a concern for grounding the phenomena observed in the field (Baszanger and Dodier 1997).

As in most methodological traditions there is great disagreement on how ethnographic studies should be conducted (Hope 2002). One distinction is between studies which are based in depth studies and participant observation and those which are using data that may be called ethnographic as they derive from observation, interviews and experiments, and is data that usually is collected periodically (Smith 2001). According to Emerson et al. (2001) participant observation is the most important activity in ethnographic field studies. Participant observation is characterised by being present in a natural field over a relatively long period of time to do research, experience and get an understanding of the social life and the natural processes that appear in the context that is being studied. Hammersley and Atkinson (1996) have a more liberal understanding of ethnography and also include other qualitative research methods like qualitative interviews. They regard interviews as social events where the interviewer is a participating observer. The latter understanding is the one that is most in common with the character of the observation method used in this dissertation.

The most traditional method for recording observation data in ethnographical studies is through field notes. In addition, the field worker or interviewer appropriates tacit knowledge that is invisible in written records. One is using "thought notes" or the memory to complete and redefine the recorded events and statements (Hammersley and Atkinson 1996).

A profound discussion of the different characteristics of ethnography and observation is not relevant here, as observation mainly has been carried out as a supplement to interviews. Thus, the method that has been used is a sub division of ethnographic methods that does not meet the ideal of long periods of observation. This is mostly due to practical concerns. However, the importance of observing for shorter periods while conducting interviews should not be undermined. The observation in different architect firms and building sites has been important as for the forming of new ideas, the understanding of the field and confirmation of ideas and interpretations. Here, I will only give some brief examples of some of the material based on observation.

One example is a discussion on the roof design of a new school building between two "ordinary" architects and a research-architect that I was allowed to follow. The observation of the discussion provided me with a more profound understanding of the practice of architects – the way they think and work. Another example is observation of the interior of the architect firms, their architectonic expression etc. which offered additional

insight into their aesthetic preferences and style. I also did valuable observations of building models, drawings and other materials on "the site" that supplemented the interviews with useful information about the different building projects.

Summing up, the analysis of the architect's handling of energy efficiency is conducted employing a qualitative pragmatic approach. The analysis draws upon insights from hermeneutics, discourse analysis, semiotics and narrative stories, but not in an orthodox way. The analysis does to a certain degree exist on the discursive level, while as this method alone often become too static, the analysis is also inspired by semiotics. In addition to this I have drawn insight from observation and fieldwork studies, in order to ground the observed phenomena more thoroughly. The next sections give a presentation of the two main sources of data that the dissertation is based upon, as well as an overview of the different sampling and interview techniques used while gathering data.

3.4 The data material

A common strategy to map the perception of a large group of actors in political science is through surveys. Surveys often provide some insights about the level of knowledge and general attitudes, but they do not say much about the kind of reasoning that is behind the measured attitudes. This dissertation aims at studying how architects handle energy efficiency and sustainability in building design. Analysing trends is one aspect of this. It is however more important to understand the way that architects reason in relation to energy efficiency and even more important how they relate it to their practise. If such knowledge is gained, it may serve as a base for developing more successful energy efficiency measures in the future. Thus, surveys have serious limitations as regards the end of this study.

An alternative strategy for studying the architect discourse on energy efficiency and sustainability in a way that provides a better understanding of how opinions are shaped and developed, is through looking at how these issues are dealt with in architect journals. This is an interesting angle as journals give a good impression on how energy efficiency is promoted and handled in the profession. The journals are used by architects and regarded as sources of information and inspiration. The presentations of different building projects in the journals represent an important cross-section of opinions that allows us to analyse what aspects of architecture are commented upon, and what kind of technological and aesthetic arguments that are made use of. The main object of analysis is to discover what kinds of concerns that appear, how they are projected into the public sphere of architects, and how

environmental reasoning is related (or not related) to architectonic expressions.

3.4.1 The written data material

Two Norwegian architect journals have been used as data material, namely "Byggekunst" [The Norwegian Review of Architecture] and "Arkitektnytt" [Architect News]. These are the two most important Norwegian architect journals. The Norwegian Review of Architecture has been a source of inspiration and information for architects and other actors within the building and planning industry for over 80 years. It is published 8 times a year and the readers often keep it and use it frequently as an information agency when working with new tasks[28]. Some have claimed that it is the most important source of reference for Norwegian architects (Helland 1988).

Architect News is the architects' main forum for news and debate. The journal is circulated to all members of The National Association of Norwegian Architects (NAL). As 85% of all qualified architects in Norway are members of NAL, the journal is subscribed by a high proportion of Norwegian architects and can thereby be seen as a central forum in which one might explore the status of energy efficiency in the profession.

The analysis covers the period from 1970 to 2000. In this period every third volume has been analysed, as well as all volumes between 1997-1999. All articles from the sampled volumes which comment upon the actual research question (i.e. which discuss energy efficiency, ecology, environmentalism, sustainable development etc.) are sampled and analysed. In addition to the architect journals, commonly used sources like Government White Papers and Proposals to Parliament have been analysed.

3.4.2 The interviews

Given the explorative nature of our study, it is natural to combine the analysis of relevant documents and texts with interviews. As the architect profession in Norway is a relatively unexplored domain and the field is relatively new to me, it was natural to use a technique similar to the detection process described as a 'rummaging process' in textbooks, as for tracking down relevant informants (see, McCracken 1988).

The rummaging process consist of tracking down some initial actors, and as more information is gathered, the universe of potential informants spread out as the interviewees are prompted for other relevant actors. This method for organising the sampling has also been labelled the 'snowball

[28] Before 1979 there were 6 issues published each year.

method' or 'snowball sampling' (Hammersley and Atkinson 1995; Bijker 1995). Typically snowball sampling starts by interviewing a limited number of actors involved in the controversy, asking them at the end of each interview who should be interviewed to get a complete picture. In this way, the number of new actors will increase rapidly in the beginning, then slow down, and finally, when no new names are mentioned, the complete set of actors involved will be mapped out.

The pitfalls of this method are that gatekeepers or other powerful persons in the field may effectively direct the data collection in a certain direction, so that the data collected may become misleading. Thus, the researcher may be guided towards existing territories and fields and "left unable to engage in the strategic search for data that is essential to a reflexive approach" (Hammersley and Atkinson 1995: 134).

The snowball sample method was a relatively efficient method of defining the architects who were involved with energy efficiency and sustainability, as this milieu turned out to be relatively small and clearly set out. The rummaging or the snowball method was also used to get information about energy efficient and sustainable building projects that were suitable as case studies. However, the aim was not only to map out the understanding of energy efficiency and sustainability among the architects that already were involved in these kinds of issues. The aim was also to study the architect profession in its entirety and to get to an impression of the varying attitudes and ways that architects handle these kinds of issues, including architects who supposedly were not particularly committed to these kind of issues. To sample architect firms that were not supposedly predominantly committed to issues of energy efficiency and sustainability, I used information from architect journals, the yellow pages and other informants.

The interviews were conducted during the winter 1999 and spring 2001. Altogether, 38 people were interviewed. The interview material consists of 22 interviews with architects working as practising architects in 11 different architect firms, as university professors, in research and as profiled spokespersons in central organisations related to design and architecture. The firms have been chosen to represent a broad sample of Norwegian architect firms in relation to size, reputation and expressed (or unexpressed) engagement in energy and environmental issues. The firms held office in either Oslo or Trondheim, while some have branches in both cities. I have refrained from interviewing architects working as planners and architects at the building authorities of municipalities as I have been mainly interested in the thoughts of practises of architects who influence the building design process more directly in some way or other.

The relevant architect organisations are the Norwegian Architect Association (NAL), Norwegian Architects for a Sustainable Development (NABU), The Norwegian foundation for design, architecture and built environment (Norsk Form), and ArchitectNews (Arkitektnytt). In addition, two persons have been interviewed about EcoBuild (Økobygg) and this organisation's work in trying to make the branch more energy efficient.

There have also been interviews with 14 other relevant actors in the building trade who are important in relation to a building's energy standard. Five engineers working in four different consultant engineering firms have been interviewed, as well as six representatives of building owners in both private and public sector, including large property firms. Three persons representing two different building contractors have been interviewed.

The non-architect actors were mainly selected on basis of their involvement in three different building projects that were chosen as *case study objects*, due to their pronounced efforts to create energy efficient and environmentally sound buildings. These three cases are Pilestredet Park, Kvernhuset Junior High and Telenor Fornebu office building. The three cases were picked as they represent three different types of building projects – a residential building, a school building and an office building – all claiming a commitment to issues of environmental friendliness and energy efficiency. Pilestredet Park is a large residence project in Oslo, where the goal of the project is to unite the best environmental solutions and appear as a leading example of sustainable city development.[29] Kvernhuset Junior High is a school project which has as a goal that the new school building should minimise the use of energy, materials and economic resources during the building's life, and to use renewable resources to the greatest possible extent. Its other main goal is to make the building itself a pedagogical instrument for sustainable development.[30] The third project, Telenor Fornebu, is the head quarter of Norway's largest Telecom company and the largest office building in Norway. Its goal is to be the leading workplace for innovative activity in Scandinavia and at the same time be showing high ambitions concerning sustainable development through the project.[31]

[29] http://www.statsbygg.no/prosjekter/pilestredet/

[30] "Skolen som pedagogisk tanke" by Terje Grøsseth. *Byggaktuelt* 12. 1999.

[31] http://www.telenor.no/fornebu/fakta.shtml, http://www.telenor.no/fornebu/miljo.shtml

Table 1. The interview material[32]

Relevant Actors	Number of interviewees
Architects	22
Building Owners/property firms	6
Consultant engineers	5
Contractors	3
Others	2*
Total	38

* Programme manager and employee of the EcoBuild Programme.

The reason why the interviews are not only limited to the architect profession is that the architects do not operate by themselves regarding the energy design of buildings. As mentioned earlier, Hubak's analysis (1998) of the HVAC industry indicates that the building's energy standard is a result of a multi-professional decision process also involving building owners, contractors and consultant engineers.

As the mapping out of the architect profession's handling of energy efficiency and sustainability is of an explorative character, it was natural to conduct the interviews in a relatively open way. Accordingly, the interviews were conducted as "conversation interviews", that is a floating conversation steered in direction of the topics that the interviewer introduce. To make sure that the interviews would cover all the topics that I wanted to cover, I used an interview guide during the interviews (see Appendix C for more details). The interview guide remained fairly identical through all the interviews, although some new topics were introduced as new insight from previous interviews was gained. Some changes were also made due to the fact that the interviews were about different building projects, that the informants had different background (e.g. practising architects versus proficiency politicians) etc.

The technique used during the interviews has similarities to "narrative interviews" (Czarniawska 1998), as much of the structuring and the main concept of the interviews were decided by the informant (e.g. the sequence of the questions). This technique also emphasises the strength in focusing on actual incidents and the way concrete decisions are taken, as this will produce data which are more similar to direct observation, and which make it possible to contrast standard stories about practice with actual practise. Accordingly, the interviews are, as far as possible, dealing with specific building projects and specific energy decisions taken in these projects, to avoid too much general information and idealised answers. Thus, the approach was open, while at the same time driven in a specific direction as many of the questions

[32] The practising architects working in private architect firms are made anonymous . See Appendix B for a more detailed overview of the informants.

touched upon concrete design situations and solutions. Most interviews lasted about one-and-a-half hour, and they were all taped and transcribed in full.

My role as an interviewer also somewhat shifted during the interviews as I sometimes used my status as a non-expert in the field to get the informant to explain issues that were important for understanding the functioning of a building or the building industry. This contributed to furthering the reflexivity of both the informant and my own understanding of the issue. As I gained more insight into different procedures, techniques and projects I had the opportunity to play the part of an insider-expert in order to confirm assumptions that I had got from earlier interviews, as well as to get more and sometimes more sensitive information.

3.5 Conclusion

As we have seen in this chapter I am using a rather pragmatic qualitative method when analysing the data material outlined above, using insights from a variety of different methodological directions. This has proven to be a quite widespread research strategy within science and technology studies. The approach used here also congregate with the typical SST approach in concentrating on the specificity of processes in different arenas of technology and different domains of application. As mentioned earlier, this emphasis on the particularities of historical and social settings is in some way a reaction to the over-generalisation typical of early diffusion studies and economic analysis of firms as sites of innovation. Gaining a general understanding of the research question is nevertheless fully obtainable. As the next chapters will demonstrate, using a thick description and writing in an open way using of citations, makes it possible for the reader to follow the arguments and consequently, to some degree validate the conclusions.

4.

CLOSE ENCOUNTER WITH THE ARCHITECT - STRATEGIES FOR DOING BOUNDARY WORK IN RELATION TO ENERGY EFFICIENCY

Chapter 1 stated that the energy efficiency policy measures are both quite weak and general, and that this means that one can only hope for a random merging of the policy and the interests and values of the architect profession. However, as the architect profession is generally portrayed as an inquisitive and progressive group in society, it is widely expected that they are committed to sustainability and green values, and hereby energy efficiency. In this chapter this hypothesis will be given further attention.

Most people have an idea of what an architect is and what he or she does for a living. Conversely, a survey conducted in 1961 to map out the architect's position in the eyes of the opinion revealed that two-thirds of the public never had had anything to do with an architect and saw it as unlikely that they would in the future. The survey concluded that "The role of the architect do not yet seem to be incorporated into the community" (Brochman 1986: 75). The public's relation to the architect may have shifted since, although there is no reason to expect that the situation has shifted dramatically. It is therefore natural to expect that most people still have had few "architect encounters". Thus, it is natural to take a deeper look into the life and habitat of the architect.[33]

The research problem of this chapter is twofold: first, it attempts to answer how architects give a reason to their profession and second, how does energy efficiency stand in relation to this reasoning. In other words, how does energy efficiency fit into the professional identity of the architects? To answer this question, it seems helpful to use the concept of 'boundary work'.

Boundary work is defined as "the discursive attribution of selected qualities to scientists, scientific methods and scientific claims for the purpose of drawing a rhetorical boundary between science and some less authoritative residual non-science" (Gieryn 1999: 4). Boundary work is the process by which groups try to inflict categories and distinctions with the intention of controlling participation in scientific and technological debates and activities

[33] In the thesis the architect occupation is seen as a profession. For a longer discussion on what is meant by a profession and how the practise of architects relates to this, see Duffy (1998), Torgersen (1972), Skogheim (1985).

(Gieryn 1995 Shackley and Wynne 1996; Jasanoff 1987, cf. Russell and Williams 2002). So, what is the relationship between designing buildings and science, – are architects really practising science when designing buildings? The answer is definitely yes. Designing buildings is a scientific practise, as science is nothing but a space that obtains authority precisely from and through sporadic negotiations of its flexible and contextually dependent borders and territories. Science is a kind of "spatial marker" for cognitive authority that is blank until its insides get filled and its borders drawn in the middle of context-bound negotiations over who and what is "scientific". Whatever ends up as inside or outside is a local and episodic accomplishment, a consequence of rhetorical games of inclusion and exclusion (Gieryn 1995).

Boundary work is the strategic practical action, which insider scientists (including architects) use to pursue or protect several different "professional" goals (Gieryn 1999). The boundaries are not fixed by logic or time, but are drawn by local actors. This way, boundary work may be characterised as a way of doing police-work – trying to maintain something that is recognisable for those involved. The concept was initially formulated to explain how scientists maintain boundaries of their community against threats to its cognitive authority from within (Guston 2001). However, there exist different ways of doing boundary-work. One type of boundary work occurs when insiders seek to push out the frontiers of their cultural authority into spaces already claimed by others. Another common kind of boundary work involves insiders' efforts to banish not-real members of the midst. These "outsiders" are often labelled as "deviant", pseudo-scientists, amateurs, fake etc. Thus, processes of social control cultivate homogeneity of belief and practise within a profession by threatening insiders with banishment for perceived departures from the norm. A third type of boundary work involves the creation of walls to defend the resources and privileges of those who are on the inside. Successful boundary work of this kind is assessed by the avoidance of the control of science by outside powers - or, said in another way, "protection of the autonomous control of science by scientist-insiders" (Gieryn 1995: 435).

Here, the question is how the borders and the territories of the architect profession are flexibly and discursively mapped out in pursuit of some observed or inferred ambition, and what consequences this will have for the question of energy efficiency? What are the professional goals of the architect profession? Which strategies do they have to do boundary work? How do they define the inside and outside of the profession? And how does energy efficiency relate to these goals and strategies? Thus, the chapter examines how architects do boundary-work – how do they define "science"

or rather what is good architecture/a good architect by attributing characteristics that spatially segregate their practise from other territories in the culturescape? Boundary-work is an important feature of profesionalising projects of architects, a rhetorical form well suited to the seizure, monopolisation, and protection of those goodies. Thus, for revealing how the architect profession handles energy efficiency when designing buildings, exploring how architects do boundary-work is crucial.

The chapter tries to answer these questions by looking at relevant literature regarding the architect practise and interviews with practising architects that have an important position in the profession. Altogether, these interviews and books should give a fairly good picture of the practise of architects, their strategies for doing boundary-work, and how energy efficiency-issues are related to this.

4.1 Architects and their practise

Architecture is according to Nordberg-Schultz (1986: 54) something that "comes into being when the building task is realised technically within the language of form"[34]. The order should be of such value that the form is identical in structure with the building task, and the technical solution with the form. The architectonic totality melts naturally disparate factors together by combining physical-practical, psychological, social and cultural needs with design and technical systems. Thus, architecture is regarded as artistic-synthetically and not scientific-analytical.

As we already discussed in Chapter 1, aesthetics is a central concept within architecture, a practise often defined as "the aesthetic organisation of the practical reality" (Cornell 1966). One may even claim that it is exactly the training in aesthetics that separated the work of the architect from the engineer – that aesthetics is the boundary object for architects in relation to engineers and the more technological professions. In *Aesthetics of Built Form* Holgate (1992) tries to give engineers a better understanding of what underlies the aesthetics of buildings. In this book he indicates that those with a technological background may have difficulties in approaching the subject of aesthetics as they may normally have other habits of perception, another value system and another language. Technologist do not normally "scan" the place in order to get a general opinion about it. Further, engineers are more occupied with details than architects. As a result of their training in statics, they also have a larger disposition to see beauty in the equilibrium of a bridge, than the drastic lines that architects often find attractive. Engineers often seem to think that it is difficult to share the architects' ideas concerning

[34] Translated from Norwegian.

"movement" and "rhythm" in buildings. Architects are more visually oriented and have a tendency to elongating the lines they perceive in their imagination and to develop, mathematically, lines that go into the surroundings.

Before moving over to what the architects are actually doing, it is interesting to look closer at how they describe their role in their own words. Most architects seem to have a notion of the architect profession being more idealistic than other professions. Many point to the fact that they often take the job home and make sketches in their spare time. They are also eager to draw a boundary between themselves and the engineers that supposedly do not inherit such idealistic qualities. One architect says that "I think that one chooses to be an architect for other reasons than to be an engineer (...) how many engineers sit on the edge of the bed making sketches? I think of the project, discuss it, blot on napkins etc. (...) The engineer tells me on a Friday afternoon that he needs some kind of solution. 'You can think about it during the weekend' he says laughing a little bit, and that is actually what I am doing. (...) It is not for certain that all architects are like this, but many architects are more idealistic."[35]

Apart from being idealistic, being a kind of free-spirited, distant artist also seems to be an alluring trait among many architects. According to the manager of the Norwegian foundation for design, architecture and built environment [Norsk Form], many architects pursue the role as the absent-minded architect hero like Sverre Fehn and such persons, that does not like to go to meetings, and who finds meetings a crime against humanity. The manager of the Norwegian foundation for design, architecture and built environment says: "If you mean this, and never sit in a committee, never bother to write a document and worship the artist myth, you set yourself on the sideline. That has happened to a certain extent when one has professionalised the project management instruments. The architects have not entered that arena because they have been afraid to loose their proficiency identity as artists."[36] Thus, the artistic aspects of the architect role seem to be an integral part of the architect's identity. This is something that is defined as a core characteristic of being on the inside of the profession and something that must be defended against other tasks, like administrative ones, that threaten to over-shadow the artistic ones. The artistic aspect is also a trait that upholds the boundary between being an architect and being a building engineer.

Architects are also doing boundary work when insisting on the understanding of the architect as "the last renaissance-man" and the last

[35] Interview with "Myrvang" and "Birkeland", 04.03.2001, p.10.
[36] Interview with manager, Norsk Form, 08.05.2001, p.7

"synthesis profession" that we have.[37] Further, it is also emphasised that being an architect is not something that you can learn from reading books. "It is something terribly practical, very crafty, very concrete and physical, combined with seeing opportunities all the time along the way. It is very non-academic and we experience a great need to be academic in our profession and making it a little bit more accepted within the university. On the other hand the profession is exceedingly non-academic. Thus, you get a schism between those who would like the profession to be more academic and those who do not".[38] In this way, the architects maintain a boundary between themselves and other academic disciplines, as most architects consider architecture less of an academic discipline and more of a practical craft.

There is also evidence that architects see themselves as more cultivated than "common" people. Architects are known to have a certain style, a style described as more "puritan" than what is usual among other people. According to a professor in architecture this may be noticed by the way they dress, as an incredibly large number of architects dress mainly in black and white and a little bit of grey, maybe with a red blouse and a yellow jacket. She compares this dress-code to the way engineers dress; "they have chequered shirts, perhaps a striped neckerchief and an anorak they got during the Olympics with three different colours, and brown-greyish trousers and multicoloured trainers. They look quite terrible!" she says.[39] According to the professor, the architect sees it as a job to make qualitative assessment about appearance, whether it is deciding what scarf to wear or what cushions to arrange in the sofa. This is another example of architects doing boundary work.

In sum, architects seem to define their professional practice and identity as being idealistic and free-spirited, at the same time practical and artistic. When describing their profession, they seem continuously to be doing boundary work. Even the way they dress, is an objective for their extensive boundary work. By emphasising the artistic aspects of their practise, they are doing boundary work to pursue this goal and to protect their domain from the engineers. The extensive use of relational comments, and in particular the numerous distinctions done in relation to engineers is very peculiar. This phenomenon may indicate the existence of an obvious need among architects not to be considered as engineers.

Similar thoughts about the profession are also found in the literature about the practise of architects. As regard to architecture as it unfolds in

[37] Interview with "Johnsen", 30.11.1999, p.2.
[38] Interview with "Johnsen", 30.11.1999, p.10.
[39] Interview with "Nordberg", 04.05.2001, p. 2.

practise, aesthetics is to a very little extent made a scientific subject. Many claim that there is an opposition between being creative and the logical thought process. Many architects believe that every single design solution is a unique creative experience where they have the role as artists and where the artist creates according to a kind of intuitive evaluation of the problem. The architects seem intuitively to be responding to a kind of system for recognition where what other architects bless and evaluates the most is the unique process of creation, as a piece of art. The majority of architectural works are appreciated on basis of being a creative product. Research and knowledge on the other hand, are seen as hampering the creative artist-architect (Newman 1974). The architect profession has been tied to different professional ways of thought or paradigms; one stemming from art, the other from science and technology. In what degree the architect profession – and not least the education – should be anchored to technology compared to art has been an ongoing conflict among architects (Skogheim 1985).

In Odd Brochmann's work - *These architects. A history of their life and work in Norway*[40] (1986: 1) the author starts out by giving a preliminary explanation of what the tasks of the architect consist of. The deed of the architect is defined as "to plan the design of buildings and assembled settlements in a way that unite technical and user-related concerns with a intellectually enriching attitude. It is self-evident that the more or less convincing result is dependent on the disposable material resources and the common prevailing view on what is intellectually valuable. (...) Since planning and designing first and foremost find expression in drawing, this last-mentioned, easier word is most often used about his activity." As the architect also became engaged in the planning of the reconstruction of Norway after the 2nd World War, taking a main role in the regional planning as co-ordination of different interests assumed to be the special issue of architects, the definition of architecture had to be revised. After this architecture was defined as the "organisation of the physical environment, embracing everything from things to buildings and design of the landscape. The intention of this organisation is the same as before" (Brochmann 1986: 62).[41]

In 1985, the first official program statement of The National Association of Norwegian Architects (NAL) beyond legal expressions is published. In the concluding section there is an enumeration of what the society will ask of the architect in the future.

---

[40] Translated from Norwegian: - *disse arkitektene. En historie om deres liv og virke i Norge.*
[41] Translated from Norwegian.

- Architects must be aware of the connection between the single commission and society as a totality. He must see and evaluate the task from a comprehensive view of society, so that he may arrange its real extent, set up the premises for his part, and work for a long-term planning.
- The architects must analyse all sides of each single commission, both the technical and the ideological, and use their experience to give it a content fit for human beings.
- The architect must, as an artist, use new impulses and ideas and protect existing values. He shall evaluate, form and make them fit into the totality.
- He must, as an administrator, lead and co-ordinate the physical planning, so that all the details eventually form a totality.
- He must have a psychological ability to give guidance and to co-operate. He must be able to pass on, procure his ideas and demonstrate the large connectedness in the tasks.
- He must have comprehension for the many financial problems and the ability to think socio-economically.
- He must as a citizen and architect be willing to do an effort on all levels that he thinks is correct, also the political one.
- The architect must not settle down with being a specialist on a tiny area as his speciality is the totality.
- He may not claim to have the responsibility as a manager, and at the same time want to be a consultant without economic responsibility.
- The professional qualifications of the architect must at all times follow the development.
- Few architects may solely meet these demands, but the working group that the public perceive as "the architect" must redeem the claims collectively.

The committee announces that it with this introduction wanted to give a picture of the responsibility of the architect and to point out the tasks that must be solved. The position of the profession is summarised as "The danger of becoming ineffective dreamers hangs over us. The same does the danger of becoming non-effective without dreaming" (Vaardal-Lunde, cf. Brochmann 1986: 71).

These proclamations tell us something about the designated role of the architect in society, as well as they give us some clues as to the tasks that the architects are supposed to fulfil. None the less, what kind of tasks he is supposed to accomplish, depends on what type of job he has. An architect may work in (public) planning, as a consultant, in research, as a writer, as a lecturer etc. Here, when talking about the practise of architects we are mainly interested in practising architects that work in private architect offices and

that are consequently involved in the design of buildings, as this is the major focus of the dissertation.

A building project is always a joint venture. The architect never designs a building alone and in the end it is often the building owner that has the final decision-making power, as he is the one that is left with the product.[42] There are also many different constituents and prerequisites that govern the process, in addition to the requirements of the future owner: For example the demands of the government and the interests and opinions of the different consultants (the ventilation consultants, the electro-consultants and the building technical consultants). All professions involved may be interested in optimising their own profession and a good solution within one profession may lead to a bad solution within another profession. Thus, the making of compromises is an important aspect of the building design process. Designing buildings involves deliberation of a potentially enormous number of features that are each weighted differently and craftily integrated into the project.

Whilst teamwork and combined efforts have been stressed, the architect still seems to be viewed as the leader of the building process according to Pressman (2001). The architect has by tradition had superior influence in the design of buildings. He or she often has the superior responsibility and is consequently, in charge of co-ordinating the different professions that are involved (Hubak 1998). Traditionally, the architect has had the role of organising the project and has often been the one to decide what to sacrifice on behalf of what. Further, architects play such an important part in this situation as they are involved in most problem-solving processes and finding solutions. Thus, the job of the architect is to attend to the totality of the building. As one of the architects interviewed explains, "the architect is the only person in the project with complete overview. The architect knows the building from a completely different angle than a consultant, because the design process is divided into small parts, so that we draw first and then send the drawings around, and then they do their endorsements, and we get the drawings back."[43] In order to safeguard the totality in this process, architects must be clever communicating and interacting with all the different actors involved. Thus, thinking of the totality is an important aspect of the architect's task - a totality that also involves people. According to one of the architects, this demonstrates the linkage between architecture and art, as the optimal matter for an artist, is also to seek the totality. Nonetheless, architecture is different from art, in the way that more people use it. It is also

[42] Interview with president, NAL, 09.05.2001, p.7.
[43] Interview with "Johnsen", 08.12.2000, p. 4.

different from engineering, as the engineer mainly is responsible for safeguarding something measurable.[44]

To get a better grip of what an architect really does, one may describe the workday of an architect. Here, the workday of three well-established architects working in three different Oslo-based firms will be described. The first is a partner in a large firm, the second is a partner in a middle range firm and the third is a self-employed person in a small firm. As is common in most architect firms, these firms have a broad spectrum of commissions and take on different types of projects like private buildings, schools, office buildings, restaurants, rehabilitation, etc. The workdays of these three persons may also be seen as close to the ideal architect workday, which is extremely varied and constituted by a great number of different tasks – not unlike the work of the renaissance -man.

The workday of the architect in the large well-known Oslo-based firm is described as "little typical, in the sense that it is very varied" and very hectic. He says, "like most architects I do every thing from planning, impact assessments at one end of the spectrum to detail-forms and kitchen equipment at the other end."[45] He uses about one third of his time related to the role as general manager. The rest is spent on managing and solving projects, which again is divided into internal and external meetings and telephone calls. There is also "a striking amount of writing" that is a consequence of his role, working with contracts, project descriptions, articles etc. He also does a lot of sketching and drawing, almost on all occasions together with other people. He rarely works alone. The sketching is done at all levels, both on primary elements and detail solutions, depending on where they find themselves in the project. The sketching is actually a solution phase, a loose problem-solving process, at a time where one does not have the answer yet. This is different from the production-oriented precise drawing done by lower rank employees and which is uniquely done on computers. He says, "in the early phases of the project there are things that I walk around thinking about. Maybe I do some sketching, either in the spare time, at home or in meetings, or I just go around thinking about the things and then sit down to work with the ideas that I have. Thus, there is preparatory work before one can actually sit down and do sketches. (...) As I already said, I make sketches predominantly together with other people, so that they almost directly can get what I am thinking of and working on in my head, with the intention that it

[44] Interview with "Smith", 26.06.2001, p. 7.
[45] Interview with "Robertsen", 06.03.2001, p. 1.

may be pursued as fast as possible, in stead of a process where I first draw and then have to explain to the others what I have imagined."[46]

This seems like a quite typical workday of an architect working as general manager, as similar tasks and practises is confirmed in other interviews. It also seems to be common that the managers emphasise the sketching compared to detailed drawing, as well as controlling and giving guidance about the drawings of others.[47] This firm also has a plan for developing the competence in the firm, as it is a dilemma for the architects that there are so many different professional domains that they ought to know about. As a result, they have to prioritise, dividing different areas between the employees, as everyone cannot be equally good at everything within the firm. Different persons are in charge of different competence areas, where they have the responsibility to inform the others. The plan also shows which of the areas that are supposed to be prioritised. According to the manager, the environment is one of the leading areas.[48]

The workday of the architect that is one of several partners in a middle size firm also seems to consist of many different tasks. He does a lot of designing and drawing related to all kinds of commissions like houses, larger residences, industry buildings and school buildings. He also does research, as well as administrative tasks. There is a division of different work tasks within different areas, and the informant has the responsibility for economy and tasks related to data and IT. However, most of his time he spends on planning and designing.

At the time being, four of the architects in the firm are working together on a large school project. The work tasks are divided between them so that one has responsibility for administration and filling out forms, one has the responsibility for the main concept and to see to it that things are done according to the plan. Three of the four persons involved are producing drawings. One has drawn parts of the building, segments and details and two have drawn the main part of the project. The work at the office is usually organised quite non-hierarchical. The employees do the same kind of work as the partners. The employees do the same kind of drawing, but have less contact with the earliest phases of the project. The partners try to get them involved in the projects to the same degree as themselves and after some time, they let them go alone to meetings etc. so that they get more experience and so that knowledge get diffused. The intention is that they should observe and learn about the totality and not only the parts of the projects.[49]

---

[46] Interview with "Martinsen", 08.12.2000, p. 1.
[47] Interview with, "Sundahl", 01.12.1999, p.1.
[48] Interview with "Martinsen", 08.12.2000, p. 14-15.
[49] Interview with "Johnsen", 08.12.1999, p.1.

The workday of a self-employed architect is told in a similar way. A typical workday starts with a meeting with a building owner and other collaborators where they discuss questions regarding a commission on a local plan. She makes a few telephone calls to check up some issues they were wondering about and then works on a sketching project for another building owner. In between, she makes a few phone calls, and sends faxes etc. about other projects. "It is about doing many different things at the same time", she says. "I always have several projects that I am working on at the same time. Now, I have maybe five projects. With the kind of projects I am doing this is quite normal. It is several small projects, an atelier, a large annex for a school, several houses, and consultant commissions, which is the rarest type of project".[50]

These three workday stories illustrate that the ideal workday of an architect is quite varied and is comprised of a melange of different administrative tasks, as well as sketching and drawing. Precise drawing on computers seems to be reserved for lower rank employees. Managers and partners have more responsibilities towards the overall concept. Apart from this, the organisation of the architect firm is ideally thought to be fairly non-hierarchic.

Most architects seem to emphasise that they work long hours. At the same time they emphasise that the work, in most cases, is seen as meaningful and interesting. The long hours does not always come out of necessity, it is just as often a result of their devotion to the work.[51] However, many stories in the interviews seem to indicate that the situation of the architect profession is getting tougher than it used to be.

In 1984 almost half of the architects associated with the National Association for Norwegian Architects (NAL) were self-employed or private practising architects. Of these firms, more than two thirds had one single employee on average, which means that most people were totally without assistance (Brochman 1986). This is an unfortunate trait of the profession, according to an architect who has worked most of his career in bigger architect firms. "One of the mistakes that one often does in our profession is to follow the dream of starting one's own architect practise. This is unfortunate if you are a young newly educated architect, as you will have to invent a lot of things and struggle alone. It is better to be part of a larger office with many different opinions and to be part of a critical mass".[52] Thus, the ideal of starting your own business may be discouraging. However, here

[50] Interview with "Dahl", 07.12.1999, p. 1.
[51] Interview with "Robertsen", 06.03.2001, p. 1.
[52] Interview with "Robertsen", 06.03.2001, p. 1.

the story of the self-employed architect, do not seem to differ much from the stories of the architect working in a middle range firm and the one working in a large firm.

It is often claimed that the situation of the profession has tightened during the recent years and that the freedom has been reduced, at least in the private sector. This is due to more strain on both time and economy and the fact that one is expected to produce more architecture for less money in a shorter time frame. The relationship to economy is getting increasingly stressful. One of the interviewees expresses that the reason for this is the emergence of young hustlers in the building trade – persons which market themselves as having cost control for anybody. As these actors are very persistent, both building erection time and economy are becoming more and more stressed.[53] Apart from being more pushed in relation to time and economy, there is also a tendency towards a stronger focus on risk-aversion in today's building industry, especially in the public sector. As one is afraid to take any risks, it is quite common to contact architects that have done similar projects before. The leader of "You only get assigned to draw a school as long as you have already drawn a school. (...) This is a problem as it decelerates the innovation pace and the will to experiment, which is problematic for architecture, as it tightens the space for creative and uncommon solutions."[54]

Another condition for producing architecture that has become more rigorous during the recent years, is the control from the building owner. The architect has to emphasise what the building owner asks for to a larger extent than before. Also, in ordinary building tasks subject to political control, the limits have become much stronger.[55] This is also related to the increasing use of property development firms, which normally implies that price become the governing principle while technical development, interplay between different systems and interdisciplinary work is pushed to the background. Consequently, there is a tendency that the development firm is controlling the building and that the contractor is fully responsible for the design.[56]

The notion of the architect as the last renaissance-man also seems to be fading. As the manager of the Norwegian foundation for design, architecture and built environment point out: the "architects were more generalist before than they are today, and have been pushed to the side line in project work, loosing much of their ability to control the project. (...) Architects are not seen as generalists any more. They are portrayed as specialists that safeguard

[53] Interview with "Sundahl", 01.12.1999, p.3.
[54] Interview with manager, Norsk Form, 08.05.2001, p.6.
[55] Interview with manager, Norsk Form, 08.05.2001, p.6.
[56] Interview with "Sand", 21.06.2001, p. 11.

a niche".[57] Thus, some conceptions and premises regarding the architect profession seem to be changing. This makes the boundary work of the profession even more crucial as a means to protect their position, in the building design process, claiming authority over certain areas.

The significant amount of boundary work that architects seem to be doing in relation to engineers may also have significant effects on how architects handle energy efficiency, as it can make it difficult to appropriate issues that engineers stand for. The boundary work done in relation to engineers can make it difficult for architects to take in worlds and techniques that have more connotations towards the engineering profession, than the architect profession. Thus, it might be the case that the boundary work done in relation to engineers result in a situation where the energy efficiency and sustainable energy technology are perceived as belonging to the wrong symbol world.

4.2 The design process and the problem of energy decisions

The core of the architect discipline is design. The design of buildings is an imaginative process. It is also extremely practical, involving an inventive grasp of user requirements so that they can be given – by the clever allocation of too scarce resources – popular and appropriate spatial expression (Duffy 1998). More concrete, the responsibility of the architect is to develop drawings and specifications that show exactly what is going to be built. The architect is usually a linkage point, giving advice during the building process. The point of departure of the architect is normally the program. The program specifies the goals and demands that one have in relation to the building. It gives a thorough description of the functional, aesthetic, social and cultural goals that the building should fulfil. Further it contains a room-program, as well as it demands specifications on technical solutions and devices (Lewis 1998).

The program is often rigid. In a large building the size of the building and what the rooms should contain are often described in detail down to the last square meter. However, there are usually many different ways to organise the buildings, and their access and to present possibilities for further development. In the first stages of the building process the architect is mainly preoccupied with assessing the imaginary design possibilities through exploring different architectonic solutions. As one architect says, "we take the first steps as idea-developers."[58] The architect often uses architect journals as a source of information and inspiration when working. At this

[57] Interview with manager, Norsk Form, 08.05.2001, p.6.
[58] Interview with "Martinsen", 08.12.2000, p. 14-15.

stage it is also important to emphasise that the building should be buildable and not too complicated. This is also often pointed out as an economical argument.[59]

After the first idea-concept period, one produces more and more precise drawings and explanations of what is going to be built. Finally the architect assist the accomplishment of the project (Lewis 1998). Thus, the architect may pass for technologist, administrator and artist – his or her job is to provide the building with a nice aesthetic expression, and at the same time ensuring that it is stable, useful and functional, and often also that it is cost-effectively constructed.

All architects regard collaboration as a crucial part of the design process; some see concept development as co-operative, at the same time as others see joint efforts as reducing the strength of a solution in some instances. The way in which consultants are worked into the design process is part of the architect's personal belief. However, the value and significance of consultants' participation during the design process is indisputable (Pressman 2001). The influence of the architect related to the other professions that are involved in the building process varies from one project to another. This is also a dynamic process that changes constantly.

One area where compromises often are made and collaboration is crucial is the heat, energy and ventilation area. One architect says, "I think our influence and power regarding the energy side of the question is rather limited. It is not really our profession (...) the architect profession is special, as it comprises so many other professions in a way. If one work consciously on energy solutions on the whole building it will effect the building design (...) so it is clearly our profession as well, but decisions regarding the choice of energy source etc. is not our domain (...). However, we have influence on putting things on the agenda and raising consciousness."[60]

Despite a few such claims that indicate that not all architects reflect upon their role in relation to energy efficiency, most architects seem to acknowledge that they may play a part in energy decisions related to the building design, when confronted with the question. Architects are often the ones to suggest the overall sketchy solutions and the concept. They are the ones who investigate the conditions, what exists on the site, what can be done in relation to daylight, orientation and all the architectonic approaches to the problem.

None the less, the architect's power to decide the energy design of building projects is limited by several factors. First and foremost they are

[59] Interview with "Sundahl", 01.12.1999, p.2.
[60] Interview with "Martinsen", 08.12.2000, p. 9-10.

limited by the building codes. The building codes state the maximum energy loss in a building and set standards concerning U-values, air change etc. HVAC consultants and consultant engineers normally provide these simulations and calculations.[61] More specifically, they produce calculations of each component's thermal heat transfer coefficient (U-value), as well as calculations regarding ventilation, pipes and technical works. The calculations are often produced by inputting simple information like the size of the building and the amount of windows etc. into a computer. The calculations must be within the minimum standards of the building codes.[62] Thus, after the calculations have been processed there is normally a discussion among different actors about how the result may be used in order to reach the demands of the building codes. As one building unit may compensate for another, thick walls may compensate for having a thin roof etc., there are many possible solutions and the calculations of different building segments must be put together so that it, seen as a totality, meet the required standards.[63]

Thus, the HVAC consultants also have a certain grip on the energy decisions in the building process. They are decisive in assessing the potential of different solutions as well as suggesting new solutions.[64] None the less, the fact that they are often included late in the project when the architect already has made the first sketches and perhaps also decided on a main concept (that will be difficult to alter afterwards), undermine their control in this situation. Hence, most of the time the architect has the upper hand. As one of them says "sometimes there are demands on energy solutions, heating solutions etc., but for the most we are quite free to chose solutions."[65]

The co-operation between the different professions and actors that are involved in the building design process is sometimes difficult. Some professional disagreement about what solutions to chose is quite normal. The participants in the project groups are always dependent on the actions of others. When conflicts arise, they are often resulting from the fact that a person has not done what someone else was expecting or has not followed the plan of progress. One architect says, "The architect is usually the connecting link for the whole matter, and if the HVAC consultant does not do his job, it may effect our progress and we may spend more time on something than we initially expected. Likewise, the ventilation engineer may say that he will put channels into the panelled ceiling at a moment when the architect has

[61] Interview with "Jacobsen", 08.05.2001. p.5.
[62] Interview with "Sundahl", 01.12.1999, p.5.
[63] Interview with "Sundahl", 01.12.1999, p.5.
[64] Interview with "Jacobsen", 08.05.2001. p.6
[65] Interview with "Johnsen", 08.12.2000, p. 4.

not yet decided how high the panelled ceiling should be. It is like this all the time. There are many things that must be put into place in a building. It is not done on the site anymore as everything is planned and targeted beforehand. To co-ordinate the different professions is a huge job in complicated buildings."[66] Different aspects related to the design of ventilation systems seem to be a recurring problem area.

Normally, there is a quite straightforward division between the architect and engineer concerning ventilation installations and other technical devices etc. According to a practising architect they usually ask the ventilation consultant how much space they need in order to install the system. Apart from that, most architects ignore how it comes out and what kind of couplings that is used inside, as long as it is invisible. However, if it is visible, they may express that they cannot have a flat channel there, that one should have a round channel instead and in this and that colour. "If it becomes a part of the visual environment it is our responsibility. All visible parts of the public environment are our responsibility", according to the architect.[67]

Even though this division may seem straightforward and most architects are, as we shall see, quite indifferent towards energy solutions, there seem to be a certain conflict between architects and HVAC engineers regarding ventilation principles. This conflict has to do with the use of ventilation systems based on natural ventilation principles. Many architects seem to be quite positive towards this building integrated way of designing ventilation systems. The reason for this seems to be connected to the fact that most architects loathe mechanical ventilation systems, perceived as "the enemy of architecture" that "destroy the whole project."[68] This attitude stems from the perception of ventilation aggregates as something that take up a lot of space, space-consuming channels and systems that have a tendency of becoming even bigger than planned. By using natural ventilation one may let go of the aggregate rooms. However, they experience that both HVAC consultants and the building codes act as barriers to implementing this kind of building integrated energy efficient design.

To sum up, architects seem to have a crucial role in regard to the energy standard of a building. They have a central role in energy decisions. Consequently, their assessments, evaluations, knowledge and attitudes regarding energy efficiency, environment and sustainability will have a crucial effect on the energy standard of the building. Hubak's (1998) study

[66] Interview with "Sundahl", 01.12.1999, p.5.
[67] Interview with "Sundahl", 01.12.1999, p.12.
[68] Interview with "Jacobsen", 08.05.2001. p.6.

supports this, as it reveals that the decisions taken in this branch can be understood as a process of negotiation between different professions, where the energy efficiency advisors play the role as specialists on energy design, but have only limited influence in the building design process, partly due to tight limitations on economic investments on energy efficiency measures, and partly due to the limited power of engineers (working with heating, ventilation and sanitation) compared to other professions in the building design process, like the architect profession. The study finds that architects are particularly important actors in this respect, due to their role as maintainers of totality and aesthetics, as well as their role as co-ordinators of the building project.

4.3 Interest in sustainable and energy efficient architecture

Different conditions are thought to affect the interest of sustainability among architects. One obvious condition is marked demand. The way the market works in this respect is somewhat unclear. However, it is obvious that the possibility of being innovative is limited when architect commissions are squeezed.

There are mainly two ways that an architect can get commissions, either through acquaintances or through competitions. Getting jobs through acquaintances usually results from the fact that the architect firm has built something for the employer before, with which he or she is satisfied. Consequently, he/she wants the same architects. However, after Norway became member of the EEA, architects have to compete on almost every commission of a certain size.

The situation of young and inexperienced architects has been a much-debated subject in the Norwegian architect profession lately. Since the middle of the 90ties an increasing group of young and non-established architects has expressed dissatisfaction and frustration over the lack of opportunity to participate in the professional development within the profession. This critique has increasingly been directed towards the situation in the competitive market for architect services. Young architects claim that they are practically being shut off from the "marketplace" that architect competitions constitute. The discussion has revealed that their qualifications are only good for the open architect competitions, that constitutes only a small fraction of the competitions announced each year in Norway.

This development is due to the insertion of the EU service directive in 1994 and the new Plan and Building Regulations from 1997. The basis for these changes was a clarification of the legal responsibility of the architects towards the employers and current fellow actors in the building process. The

amendments were seen as rational and necessary responses to the way the market had developed in Europe on to the beginning of the 90ies (Eggertsson 2002).

The core of the problem lies in the fact that the service directive presupposes that all building-projects with a cost framework stipulated over a certain threshold-value have to invite tenders. Thus, most official building projects have to be advertised, either as tender competitions or architect competitions. Time has shown that most projects that must undergo this selection process end up as tender competitions where the architect competes on the basis of the price of his services. On second place one finds the confined, or "closed" architect competitions, as they often are called, also named "parallel commissions".[69] On third place, is the open architect competition where buildings are designed on the basis of a program. Only between five or six of the 37 average competitions a year, have been open architect competitions where all architects may participate. This is not a sensational finding according to Eggertsson, as there have never been a tradition for using open competitions as an arena for professional development in Norway in the same way as in Finland and Denmark. However, the problem is that young and non-established architects only can participate in around 15 percent of the competitions that are arranged each year in Norway (Eggertsson 2002). This is due to the fact that the new Plan and Building Regulations classify all architects according to their competence and experience related to raising buildings defined by the National Office of Building Technology and Administration. Thus, the formal competence that most architects have after finishing education only qualify for the lowest stage in the formal approbation system that one operates, which is single family houses and buildings with a low degree of difficulty. The explanation of why this group of architects cannot participate in all competitions is simple: The competitions in the open or confined tender categories presuppose approval in a higher stage than class 1, to be participating, or to be chosen. Of the country's nearly 5000 working architects, only 720 are registered as owners or co-owners in firms accepted as enterprise class 2 or 3 (Eggertsson 2002).

The development towards more competitions seems also to be regarded as a traumatic change by the more established firms, as the competition has hardened. An architect firm that has participated in numerous open and closed competitions describes the experience as following:

[69] In parallel commissions four or five architect firms are invited "to do some analysis, draw some things" and all get paid to deliver something. They focus on which opportunities the project has, and the one that is picked get to do the job. Interview with "Johnsen", 08.12.2000, p. 2.

"Sometimes we win and then we become very happy. Sometimes we loose and then we are very bad-tempered, because we have done work in the region of two hundred thousand [NOK] from which we get nothing in return (...) The increased competition also leads to the fact that it costs more to get commissions than before. We are many competitors, we have to perform even better and have to take risks in form of efforts, to get assigned. So if we win, everything is joyful, but if we loose it is depressing".[70]

The competitions have certain requirements regarding the material that should be handed in to the competition. The documents that are made are only flat drawings. To avoid putting too heavy a load on the architects, facades are often done very small in scale. The material is very sketch-like facade drawings and a kind of suggested volume-structure of the building. This way it is possible to assess whether it is tall or low, the extension of the building etc., but rather difficult to read something else out of the drawings.[71]

The freedom of the architect also varies according to kind of competition, task and building owner. In an open competition the architect is given plenty of rope, as there is usually no employer there 'holding the architect by the ears." When working within a professional market and employers that builds rental properties, the architect is normally allowed little latitude and there are strict limitations. The more professional the builder, the sharper he is in defining the architect's freedom of action and deciding what factors that should be rigid. For instance, one of the architect firms experienced that the same builder always demanded that the windows should not be wider than 1,25 meters to be able to put up an office partition on crossbars every 1,25 meters to divide a landscape office.[72] An architect working with a large building contractor is supporting this view. He says, "[The contractor] has developed a good system where he summarises their aims, arranging them into directives. This is always perceived as a challenge by architects because one would like to be unbound and to work from a situation towards the centre, and not to start with a building modus for example".[73] The program also limits the architect's freedom of action. The next section will look deeper into the program and the design process in general.

The transition towards a more energy efficient and sustainable architecture seems to go at a snail's pace. Like most people, architects tend to get more conscious about the environment, although the development is

[70] Interview with "Sundahl", 01.12.1999, p.1-2.
[71] Interview with "Sundahl", 01.12.1999, p.6-7.
[72] Interview with president, NAL, 09.05.2001, p. 5.
[73] Interview with "Sand", 21.06.2001, p. 7.

going slowly.[74] The manager of the Norwegian foundation for design, architecture and built environment claims that architects are relatively aloof towards environmental dimensions of architecture. "They are always a little bit interested, because it is polite to be a part of it, but many things indicate that being particularly interested in environmental issues, does not touch the core of the professional understanding of Norwegian architects".[75] This lack of interest among architects for environmental, sustainable and energy efficient architecture is confirmed in most architect interviews. Many claim that "environmentally friendly" is a phrase that one only 'chucks in', while one never does anything serious about it.[76] It is something that one often pretend to be conscious about, to seem politically correct.

According to a professor of architecture, architect students are not very interested in the topic either. She says, "Whether the wall should be 30 or 35 centimetres thick for storing the heat, or whether you should use a stone wall for storage of solar heat, stone floors, or wooden floors, do not preoccupy the students. They are mostly preoccupied with the architectonic elements."[77]

There is also a stated lack of interest in the environment in relation to the sales segment. Academics and researchers are perceived much more interested, even though "these groups hold on to their knowledge and uses it internally, while one does not get anywhere before it reaches those that are engaged in sales and buying".[78] The architects does neither participate actively in the discussion around technological development, which is important for developing new energy efficient buildings.[79]

Being an architect that is interested in environmental issues appears to have low status within the profession. "To be an architect that is preoccupied with environmental questions is sort of ... it is an attitude that they are poor architects, not really good 'creme architects".[80] This view is supported by the President of the Norwegian Association of Architects who says that the issue is not very present and that it is not regarded as a central criteria for quality.[81] Sustainability and energy efficiency do not seem to be criteria for good architecture. "Architecture is a little bit disconnected from that", one architect

[74] Interview with "Carlsson", 01.09.1999, p. 2
[75] Interview with manager, Norsk Form, 08.05.2001, p. 1.
[76] Interview with, "Birkeland" and "Matisen", 04.03.2001. p. 3.
[77] It is interesting to note that this utterance also indicates that environment and energy efficiency is seen as something that is not a part of the "architectonic elements". Prof. " Nordberg", 04.05.2001, p. 9.
[78] Interview with "Birkeland" and "Matisen", 04.03.2001. p. 3.
[79] Interview with, "Sand", 21.06.2001, p. 12.
[80] Interview with "Birkeland" and "Matisen", 04.03.2001. p. 4.
[81] Interview with president, NAL, 09.05.2001, p.2

says, "but it is a parameter that has to be solved together with all the other aspects that an architect's commission is about".[82]

One architect expresses doubt when faced with the accusation that architects are not preoccupied with environmental issues and energy efficiency as he cannot really picture this as a problem. "Architects should be mostly preoccupied with architecture and design, and of course include all the other terms in relation to that, among them technical and energy economic solutions",[83] he says. To sum it up, it looks like environmental issues are only present to a very small degree in the rationale of architects. This may be connected to the way that buildings are perceived by the profession. Many architects do not seem to think of buildings as an important environmental problem. Other environmental problems are often regarded as far more serious. These are typically problems related to city planning, transportation etc. A quite common statement is that energy efficiency measures, like increased insulation etc., only makes a small contribution in the overall picture. One architect explains: "If you isolate with 20 centimetres mineral wool or not, or ventilates in this or that way, is only cosmetics in my eyes. The large technological decisions are really taken on the planning level where nobody is able to foresee the consequences. Then one introduces such [solutions] afterwards."[84] Thus, the really important energy decisions are perceived as being made on an even higher level than on the building level.

It is also a prevalent attitude that the importance of accomplishing a sustainable and environmentally friendly architecture depends on which part you believe concerning the issues of global warming. As one of the architects explains: "There is still some controversy around the global warming problem, and if you believe it to be related to seasonal variations due to sun spot periods etc., there is no need to take the problem seriously".[85] However, the president of the Norwegian Architect Association is inclined to say that until it is proved that the problem of global warming is overrated, one should take the problem seriously. He thinks it is rather embarrassing that the architects have not been "clever enough" to take it seriously. "Most of us don't care at all about the realities of this", he says.

One of Norway's most profiled architect-authors and the editor of the Norwegian architect newsmagazine, Arkitektnytt, also recognises that the architects lack involvement in environmental issues. He sees the lack of architect involvement in the social sphere as a prevalent phenomenon valid in many areas of the society: "Architects are not very good at placing their

[82] Interview with "Jacobsen", 08.05.2001, p. 2.
[83] Interview with "Jacobsen", 08.05.2001, p. 8.
[84] Interview with "Moe", 30.11.1999, p.5
[85] Interview with president, NAL, 09.05.2001, p.4.

profession in a social context", he says. The profession is "too passive as an occupational group in the social debate."[86] Lack of involvement in social questions, like the environmental one, is perceived as conditioned by the state of the market. "One is not very preoccupied with environmental issues during times of building boom conditions, as prosperity and environment does not fit well together. It is during recessions that one becomes interested in environmental issues, as it is related to saving resources". It is difficult to start debates as the market is very hot and the architects are busy. The architects are at the moment drawing around the clock and cannot find time for discussing their profession and seeing it in perspective.[87] He thinks that it is important that the architects profile themselves more than they do at the moment, and that they engage more in e.g. energy and ecological thinking, as an occupational group.

An architect that has been working with environmental issues for several decades supports this view. She claims that when teaching environmental courses to students from poor countries, they understand the problems immediately, while she it is like talking to a brick wall in Norway, as Norwegians are only interested in their own health. "Healthy houses and indoor climate are acceptable issues to talk about, but energy is not seen as an interesting topic".[88] Thus, it seems like it is a pervasive attitude that the conditions for thinking about environment, sustainability and energy efficiency in Norway today are poor.

Nonetheless, many architects seem to think of buildings as an environmental problem if one expands the concept, also including the more visual pollution of the environment. An architect representing a trendy architect firm in Oslo, says: "I think buildings represent a smaller environmental problem than roads and area plans. The negligence of the public space is a larger problem: little adjustment to locality and colossuses that uncritically are built in a hurry by contractors."[89] Thus, buildings are seen as important environmental problems visually. This argument is also founded on the basis that buildings are something that we will have to live with for 50-100 years. Architecture is seen as a form of cultural expression that is forced upon us, and that we cannot reject in the same way as other pieces of art that we do not like. Architecture is therefore regarded as "a public form of art", and consequently, "one should not allow architects to behave nonchalant or outwardly to the fact that this is something that will be used and perceived by many others. An artist may paint a picture exactly the

[86] Interview with editor, Arkitektnytt, 09.05.2001, p. 7.
[87] Interview with editor, Arkitektnytt, 09.05.2001, p. 3,5.
[88] Interview with "Dahl", 07.12.1999, p. 16.
[89] Interview with Prof. "Nordberg", 04.05.2001, p. 6

way he wants to because the market will decide whether it has any value, while architecture is an expression that 'hits people in the face'. Thus, it compels some kind of responsibility that is extraordinary for architecture compared to other expressions, and is very important as a public form of art."[90] In this way, the environmental aspects of architecture is perceived as a visual problem rather than a problem dealing with energy consumption and the use of resources.

Some architects seem to have a very simplistic approach to whether buildings are an environmental problem in relation to energy consumption. One answers that "well, we have to have houses to live in, and if you say that buildings in their origin are hostile to the environment you might as well put down everything (...) Buildings take into consideration, to a larger or smaller extent, the environment in which they will be built. There are good and bad buildings, which has to do with a lot of different aspects, and it may relate to how one interact with the environment and energy consumption. But visual pollution may be just as bad as other forms of pollution. The environment may be polluted on different levels."[91]

Some architects tend to minimise their role in relation to questions related to energy and environment, and point out other, more influential actors. It appears to be a widespread idea that if the employer or building owner is not interested in these issues, it is not easy for the architects to be interested either.[92] Many architects also give the impression that there is no obvious reason why architects should be particularly interested in sustainability, energy efficiency and the environment. They do not understand why the architect profession, as a group, should have more blame towards the environment than any other group in society. One practising architect says: "We live in a society that already is totally unbalanced, and you cannot expect that architecture is going to repair this."[93] When asked about energy use in buildings one architect responds quite frankly that he "does not know very much about it, as it is the domain of the engineers".[94] However, this stand in grim contrast to the findings of Hubak (1998) and the findings in most interviews that support the supposition that architects have a key role in energy decisions. It is quite obvious that architects have a powerful position when deciding the energy standard of a building. However, this position may not be considered as an important one, as these kinds of questions are regarded as tedious.

---

[90] Interview with manager, Norsk Form, 08.05.2001, p. 3-4.
[91] Interview with "Jacobsen", 08.05.2001, p. 2-3.
[92] Interview with leader, NABU, 08.05.2001, p.8
[93] Interview with architect "Moe", 30.11.1999, p.6.
[94] Interview with manager, Norsk Form, 08.05.2001, p. 4.

One of the respondents cut to the core of the matter when uttering: "I think environmental architecture is the wrong connection of concepts. Frankly, you may be environmentally sound in any context. Architecture as a discipline of its own ignores whether it is environmentally friendly or not. (...) Most architects are first of all architects, where environmental solutions obviously are one of the aspects of being an architect, but normally it is not something that overrule the form."[95]

In sum, the section demonstrates that energy efficiency and environmental problems are defined as being on the outside of the architect profession. Those on the inside have strategies for doing boundary work that defines those that are interested in these issues as the outside, excluding them from the midst of the profession by questioning their qualities as "pure and real architects".

4.4 Conclusion

The analysis reveals that the majority of architects are to a very limited extent concerned with energy efficiency. They do not regard energy efficiency and ecology or environmentalism in general, as aspects that they have to relate to and even less as something that they should integrate into their practice. Thus, energy efficiency is to a small extent domesticated by the profession.

The usual strategies for defining the boundaries of the architect profession, that is the linguistic actions on what is good for architects, demonstrate that architects struggle with defining energy efficiency on the inside of their professional boundary. Energy efficiency is something that remains on the outside of their boundary.

The boundary work done by the architects is characterised by its consistency. The boundary work takes place on a great number of different levels. The elements consisting of dress codes, engagement in the work, work method, work tasks, motivation, as well as the character of the work. Thus, the architect clearly feels that he is in a really special place, compared to other professions. It is natural, though, to ask whether this is symbolising the fact that architects feel a bit threatened.

There are also many indications that architects are lagging behind compared to other professions in the building trade when it comes to energy efficient projecting. They are also fairly invisible in the debate on these topics. Thus, it seems like some of the architect's 'competitors' in the building design process, the technologist, and maybe in particular the HVAC engineers, have taken energy efficiency to be a part of their practise to a larger extent than the architects have. This way energy efficiency is turned

[95] Interview with "Jacobsen", 08.05.2001, p. 7.

into a technological problem, which makes it even more difficult for the architects to make it something of their own.

The common lack of interest for energy efficient and sustainable architecture that seems to be predominant among the architect profession in Norway, may of course be a problem for the implementation of energy efficiency policy. The energy economising policy is framed in quite general terms. Many of the measures are based on information and knowledge passing through the realm of architects and the other professions in the building design process in order to reach the different users and finally be integrated in the design of a building.

The interviews suggest that the random merging of the policy and the interests and values of the architect profession that is necessary if the policy measures are to be successful, are not happening. Thus, the hypothesis that states that the architect profession is strongly committed to sustainability and green values looks as if it is being refuted at this point. Consequently, the next question is why the architect profession rejects issues of energy efficiency, sustainability and environment. Why are architects indifferent towards these issues, and why are they uninterested in incorporating it into their practice, despite the fact that other professions in the building process are becoming much more concerned with this issue?

The next chapter tries to map out the reasons that lies behind the architect professions unwillingness to think about energy efficiency and environment by looking deeper into the overall architect discourse. An analysis of the dominant architect discourse should give some clues concerning this question. The architect journals, the architect competitions and the educational domain presumably shape the architect discourse. Thus, the next chapter will explore these three areas and see how they handle issues of energy efficiency, environment and sustainability.

5.

SUSTAINABLE ENERGY AND THE PROBLEM OF THE ARCHITECT DISCOURSE

The previous chapter revealed that energy efficient and sustainable architecture does not seem to interest the architect profession to a great extent. Further, the hypothesis stating that the architect profession would be dedicated to sustainability and green values was dismissed. In this chapter I will analyse why the architect profession rejects issues of energy efficiency, sustainability and environment, by looking deeper into the dominant architect discourse, represented in the educational system, the architect competitions and the architect journals. Thus, the chapter explores how the dominant architect discourse deals with issues of energy efficiency, environment and sustainability. First, it is necessary to give some further explanation of what is meant by discourse and in particular, what characterises a dominant discourse.

A concept has many and different meanings in different contexts. Pecheux defines a discourse as "[A] particular area of language that may be identified by the institutions to which it relates and by the positions from which it comes and which it marks for the speaker. The position does not exist by itself, however. Indeed, it may be understood as a standpoint taken up by the discourse through its relation to another, ultimately an opposing discourse" (cf. Macdonell 1986: 3). Drawing upon Pecheux's definition, a discourse is defined as a system of production of a set of utterances and practices that, by inscribing themselves in institutions and standing out as more or less normal, are reality constituting for its carriers and have a certain degree of regularity in a set of social relations.

The discourse analysis itself may be done in three steps: choice and demarcation of the discourse, identification of the representations of the discourse, and stratification of the discourse. There is also a sin qua non to have general knowledge of the terrain or cultural capital before one starts the analysis (Neumann 2001.) When doing discourse analysis one reads texts, or one reads social processes *as* text. The amount of available material is often enormous. However, some texts, called monuments, often stand out as nodes and anchor points of the discourse. Some of the texts that are analysed here may in many ways be characterised as monuments, in the way that they are carrying the discourse. However, it is claimed that by concentrating on the texts that to the greatest degree cause hustle and bustle, there is a chance that one automatically gives privilege to the dominant representation that usually

is the loudest. On the other side, there is a chance that the publication of texts that only repeats or incrementally expands the dominating representation, will come about quite calmly and steadily. The hustle and bustle is a result of the fact that something new is happening, which is met with different attempts of restriction from those dominating the discourse (Neumann 2001). Thus, looking only for conflicts may be a dangerous path, as there is also a chance that there exist alternative positions that are difficult to detect because the attempts to limit the discourse are successful. The alternative discourse may not be published, as it may be silenced by the dominant discourse.

In this chapter I aim to map out the contents of the dominant architect discourse in relation to issues of sustainable energy. I have tried to cover as many contingencies as possible, in as many different genres as possible, striving to follow Foucault's advice to "read everything, study everything". This is of course impossible in practise and there is always the danger of having overlooked a relevant text. However, no matter the circumference of the discourse, there are always a limited number of texts that amount to the main reference points. Texts are also given centrality due to the media they are published in, and it is necessary to be aware of what media has what value.

Based on the cultural competence gathered by working with the field, the analysis focuses on three institutions where the dominant architect discourse seems to be inscribed: the system of education, the architect journals and the architect competitions. In each of these institutions, central texts, including interviews, are analysed in purpose of finding different representations or realities that exist in the discourse. When those that carry the same representation or have a version of reality that resembles each other, is institutionalised, one say that it constitutes 'a position' in the discourse. Normally, a discourse contains one dominant representation of the reality and several alternative representations. If there is only one representation, the discourse is non-political or politically closed. When a representation is relatively unchallenged in the discourse, so unchallenged that it appears as 'natural'; there exists a 'hegemonic condition' (Neumann 2001).

The next sections will look deeper into the dominant or hegemonic representation of the architect discourse in order to try to understand why architects tend to neglect the question of energy efficient building design. I am looking for the discursive work that is being done in order to maintain the hegemony, (that is the production of utterances and practises that confirms the representation), and to reveal how sustainable energy is related to this.

However, it is not sufficient to establish the contents of the dominant discourse in relation to sustainable energy. The chapter also aims at

explaining what the dominant discourse is *doing* with the topic of sustainable energy. There are mainly three things that the discourse can do to the issue of sustainable energy; it may dismiss it, accept it or it may transform it. The way sustainable energy is transformed by the discourse is particularly interesting, as this will give important clues to how energy efficiency and sustainable architecture is handled by the profession and why it is handled in that particular way.

In order to understand how such a transformation comes about, the concept of translation is likely to be useful. Translation, as already explained in Chapter 2, is the rhetorical process of making interests look like they converge. Translation refers to all the displacements through other actors whose mediation is indispensable for any action to occur. In stead of the rigid antagonism between context and content, chains of translations refer to the work through which actors modify, displace and translate their numerous and conflicting interests (Latour 1999b). Thus, the second task of this chapter is to explain what happens when architects are made to talk about energy efficiency, and to study the character of the translation that is taking place in this process.

5.1 Sustainable energy in the education

It is quite obvious that the years that architects spend in university or college studying to become an architect contributes to forming their perspectives of what architecture is and what it should be. Through the education the architect student acquire certain understandings, capacities and skills that are connected to what it means being an architect, and he/she gets a picture of the future job situation. He/she also learns certain norms related to design (Skogheim 1985). According to one of the practising architects, it is while studying that an opinion about design and architecture is formed, and that the definition of good architecture is developed.[96] It is reasonable to think that this "moulding process" partly is a result of what architects have been taught, as well as a reflection of the values of their lecturers.

The civil architect education at NTNU is based on learning by doing exercises or project work. In the more typical knowledge subjects, ordinary lectures are held. The first three years of the education is common to all students. In the last two years the students may chose among classes that offered by the Faculty of Architecture, Planning and Fine Arts or other faculties at NTNU that may be relevant to the education. The last semester the students work on their Master thesis. The education lasts five years. Department of Form and Colour, Department of Architectural History,

[96] Interview with "Dahl", 07.12.1999, p. 1.

Department of Building Technology, Department of Architectural Design and Department of Town and Regional Planning do the teaching[97].

Based on the course plan from the architect education at NTNU, "Architecture 1" and "Architecture 2" are the largest classes in the first and second semester of the first year of the architect education. "Architecture 1 – Space – structure and shape" gives an introduction to the theoretical and practical basis of architecture. It presents the basic elements in architecture with an emphasis on space, structure and design, and the interplay between these elements. The stated knowledge goal of the course is the understanding of building history, character, structure and design documented by architectonic drawings sketches and archive data. The course aims to create a dialogue with the students, focusing on basic concepts and manufacturing processes in architecture. Creativity, experience and insight are highlighted, as well as an understanding of the qualities of the room, room delimitation, character and use. Sketch-notes and free-hand drawing are emphasised, in addition to gathering of information, use of library and presentation methods, for both text and writing.[98]

In addition to "Architecture 1", the students have to take a course called "Form and Colour 1" where they are given an introduction in basic drawing-related questions, with an emphasis on experience of space, and the representation of space and form. There is an introduction to the use of colours, colour theories and the relationship between colours, as well as colour applied in drawings. There is also a small course in "Theory of Structures" that gives an introduction to load calculations, instructions on equilibrium, mechanics of materials and simple building technique. Further, some simple construction elements in wood, steal and concrete are treated in this course. The theories are used to calculate forces as well as ricers and cross-sections, and simple dimension tasks. There is also a course in "The Theory and History of Architecture", which is supposed to encourage the understanding of the history of our built environment through the analysis of building types and the shaping of single buildings and environments, seen in light of technical knowledge, theory and social conditions. The goal is to provide knowledge of the classic, Greek-Roman world of buildings, as well as the architecture and theory formations of the 20th Century.

The biggest class of the second semester in the first year, called "Architecture 2", is a direct continuation of the courses in the first semester. It gives a further introduction to the theoretical and practical basis of

[97] The faculty has since gone through a reorganisation (autumn 2002), which means that this structure has been altered.

[98] Source: Studiehåndbok 2001-2002. Sivilarkitektstudiet. [Course manual – the civil architect education], NTNU.

architecture, emphasising the interplay between materials, construction and design, and the human goals related to space and building components. Through close collaboration with the Department of Building Technology, one teaches and provides knowledge about constructions, joints and details with wood as building material, the interplay between buildings, surroundings and climate, and the interplay between design, function and space. Through the collaboration with Department of Form and Colour training in the understanding of form and spaces in landscapes is given, as well as training in building models and drawing used as a media for study and presentation.

The largest part of the third year is dedicated "Building in city, a simple built form in a city situation (Architecture 3)". Thus, this course is connecting the theoretical introduction and the practical exercises in the first year to a simple built form and function in a city situation, with space and interiors, constructions and details. The course is meant to develop the basic understanding of the most important of the complex factors that constitute a part of the shaping of integrated work of architecture in the living city situation. The goal is also to give insight into man's comprehension, understanding and evaluation of the built environment, and to develop certain skills in working with shape, space and light, constructions, materials and details, interiors, surfaces and colours in an architectonic holistic perspective. The students are taught architectural working methods using tools, like sketches, models, data modelling and creativity in teamwork.

In the fourth semester the students have their first encounter with something that relates to energy and considerations around sustainability. One of the main goals of the Architecture 4 course "Building and terrain – construction and design in the landscape context" is to give an introduction to resource- and environmental questions related to the design of the building. Otherwise, the course focuses on giving an introduction to the design of buildings and the relationship between built form and landscape. The second year also comprises courses in "Building physics", "Landscape and place", and a continuation of the courses in "Form and Colour", as well as "The Theory and History of Architecture" from first year. This latter course is also continued in the third year. In addition, the students are taught "Town planning", "Housing", and "Bigger buildings in a planning context."

In the 4th and 5th year each semester is given the following structure: one problem-oriented project subject, one knowledge-oriented subject closely connected to the problem-oriented subject, and one optional subject. The course plan in 4th and 5th year may be self programmed or pre-programmed by the faculty. The pre-programmed course plans are within the areas of

architecture and planning, architecture and design, and architecture and project management. Among a great variety of subjects to choose from, only one project-subject and one knowledge-subject is related to energy in buildings. These are voluntary courses that the students may choose if they are particularly interested in these topics. There are also some courses that are likely to be related to energy issues, like the courses on "Principles in Lightning", "Light in architecture", and "Wind as a Premise of Built Form".

All in all, the study plan at NTNU gives an impression that there is very little emphasis on energy efficient and sustainable architecture in the education, especially during the first years. These topics do not seem to be well integrated into the classes that are taught during the first years and are mainly operating as special topics that particularly interested students may choose during the last years.

The role of energy efficient, environmental and sustainable architecture at Oslo School of Architecture (AHO) does not differ much from the education plan at NTNU. The course plan of AHO seems to have many of the same features as the one at NTNU, even though there are some organisational differences.[99] The education is standardised towards five and a half years, where first and second year constitute the basic education, followed by three years of special courses and one semester of doing a Master thesis. The basic education is mandatory regarding contents and sequence. During the special courses students pick one project course and one thematic course according to their interest each semester.[100]

One of the sections under the Department of Form, Technology and History is an area called "building technology". This is obviously the area responsible for issues related to energy and environment. The goals and responsibilities within this area are " to conduct the teaching and research within the technological aspects of architecture and planning. Particularly, the relation between construction, materials and shape is handled thoroughly. The technological aspects also include topics as ecological building, building ventilation and energy saving, as well as organisation and administration of building affairs."[101] It is a fundamental idea that the technological subjects are treated in a way that ties them directly to architecture and architectural design. This subject area offers education on the relationship between architecture and construction forms, construction theory that includes statistics and mechanics of materials, building techniques and materials, building physics and house building technique, ventilation principles,

[99] Informants claiming little substantial difference between the two schools have supported this view in interviews.
[100] Source: Brochure. AHO. [Oslo Architect School].
[101] ECTS Catalogue, Architecture and Urbanism 2002/2003. p. 3. Oslo: Oslo School of Architecture.

ecology, building administration and building regulations and laws. The education is organised in basic courses that particularly deal with the relationship between construction and design in architecture, and special courses with topics that vary from one year to another. The special topics are project or design oriented courses that seek to go deeper into certain technological aspects considered crucial to architecture, such as "concrete constructions", "membrane constructions", "architecture and ecology" etc. There are also thematic courses with even more specific topics.

Despite the proclaimed effort concerning ecology and energy in the area of building technology, the study plan at AHO gives an overall impression that the emphasis on energy efficient and sustainable architecture in the education is negligible. Among the courses described as basic courses in the course catalogue, none of them mention energy efficiency and sustainability in buildings. Further, there is only one course among the design-oriented courses that mentions energy and sustainable architecture, a course that has as its goal to design houseboat-habitations wharf side in Oslo. The theme course in "Urbanism" seek to give education in sustainability and sustainable town and settlement ideals, but as the name reveals, this course is dealing with the town and regional level more than the building level. Thus, there seem to be little focus on energy efficiency and sustainability in the education at AHO. It is of course possible that sustainable energy issues are taught in some classes, even though it is not mentioned in the course description. However, the lack of emphasis on these topics in the course description gives a fairly strong indication that these topics do not have a high status in the education.[102] The main finding from studying the education plans from NTNU and AHO is that sustainable energy is dismissed from the discourse. It is however difficult to read the status of energy efficiency and sustainable architecture only on the basis of course plans. To get a thicker discursive description on how sustainable energy is treated in the architect discourse it is central to explore the opinions of the professors conducting the discourse. To get a deeper understanding of how these issues are handled in the education it is thus necessary to consult those that are involved with the teaching process. Through interviewing three persons teaching architecture at NTNU, two professors and one associate professor, I have tried to get a more profound understanding of this relationship.

One of the professors interviewed was involved in the teaching of energy efficiency and environmental issues at NTNU. She explains that

[102] Interview with "Carlsson", 01.09.1999, p.5

[102] Interview with "Carlsson", 01.09.1999, p.5The many practising architects educated at AHO that I have spoken to confirm this.

earlier on, there was nothing concerning energy in the education at all. It was almost totally absent from the education, which means that the architects that are practising today have learnt very little about it. Eventually, one has tried to integrate aspects of energy, environment and resources into the curriculum. One tries gradually to integrate it in the first year, where the issues have been handled very superficially and generally. According to the professor, it takes a long time before the students understand the point of energy-related themes, and that they distinguish the connection to other parts of the education. However, she explains that in the new educational plan, use of resources, energy, and environment will enter all stages as special topics in all chapters.[103]

As already mentioned above, there are a few short courses on these topics in the 4th and 5th years of the education, which are optional special classes. It is also characteristic that particularly foreign students are interested in these courses, as there is a long tradition for emphasising these aspects of architecture abroad.[104]

According to the professor teaching energy efficiency in buildings, people giving lectures at the architect schools have an enormous influencing power. Like in most professional disciplines, there is an ongoing struggle among different factions, as to what should be the focal point of the education. This antagonism is particularly found between those that teach at the Department of Architectural Design and those from Department of Building Technology. This is probably related to the different professional thought systems or paradigms that traditionally have existed within the architect profession, one stemming from science and technology, the other from fine arts (Skogheim 1985).[105]

Especially in the first and second year, a majority of the teachers come from the Department of Built Art, and these are mostly interested in "creativity". According the professor from Building Technology the first years there is a widespread apprehension that, "The students barely need to learn anything - they are only stimulated in thinking creatively".[106] She does, however, think that, "knowledge does no harm".[107] Here, the issue is portrayed as a struggle between knowledge and creativity.

The same professor illustrates this struggle between the different departments regarding what should be the heart of the education with a story. The incident she refers to happened when a student of hers was about to do a

[103] Interview with "Carlsson", 01.09.1999, p. 5
[104] Interview with "Carlsson", 01.09.1999, p. 5
[105] See, Fitch (1965) for a more elaborate discussion on the professional anchoring of the architect profession.
[106] Interview with "Carlsson", 01.09.1999, p. 5
[107] Interview with "Carlsson", 01.09.1999, p. 5.

master thesis on designing an ecological school. The teacher at Building Technology recommended the student to contact a second supervisor at the Architectural Design department, as she herself had no special knowledge about schools. When the student contacted the person with special competence on schools at the Architectural Design Department, she was told that he ought to be the main supervisor, as it is "the architectural aspects that are important". Ecology and energy issues were only to be seen as additions – something that one could include afterwards. According to the Building Technology lecturer, this is quite a common view among architects. It is the design of the building that is important, and energy efficient and sustainable energy design is a secondary consideration.

The professor at the Department of Architectural Design to a certain extent confirms this view on sustainable energy issues. She thinks that one should deal with all the aspects, also the ones related to energy efficiency and the environment. However, she thinks that this is not easy, as the understanding of what is the correct way of building according to sustainable or energy efficient standards shifts all the time, due to technological development. During one period designing compact buildings with small holes for windows is recommended, then suddenly a new type of glass, which makes large glass facades possible, is developed, and the definition of what is sustainable energy design changes. She says, "Energy efficiency is interpreted as building as compact as possible, so that the outer facades are as small as possible. At the same time, this way the sun never penetrates the inner areas and one may loose something. Thus, it is very difficult to adjust building patterns according to energy efficiency aspects – very difficult, precisely because one always develops new materials. I think it is something one should act seriously in accordance with. (...) And we never go beyond the sketching stage here at NTNU, and it is in the further work that one has to go into this energy efficiency business, whether you should have solar cells and windmills on the roof, thermal heating or any other solution. We never get this far in the process. But I think that it is interesting to explore these areas more thoroughly, aesthetically as well, as architects always are chasing new aesthetic expressions as statement of our time. In this respect energy efficiency may give some new impulses, and it has. You have these glass super-structures and semi-climatic zones that you meet everywhere, so I think it is something that one should take seriously, but one should not think that there is one simple solution to it."[108]

Thus, energy efficiency and sustainable energy solutions seem to be dismissed by some of the professors as something that should be integrated

[108] Interview with "Nordberg", 07.05.2001, p. 4.

into the education. One reason for this is that they translate energy efficiency as purely being a question of technology. Technology may be added after the building has been designed, and consequently after the sketching stage that one operates on at the architect school. As energy issues are not perceived as a question of design, but rather as 'gluing on' the appropriate technology, like solar cells and windmills, it is seen as something that belongs to the domain of the engineers and not the architects.

The controversy regarding the place of sustainable energy issues in the education is confirmed by one of the professors that claim that, "What is being taught on energy efficiency now, is portrayed as demands of what you have to do, in relation to what the law says. So, again you have this quite fragmented attitude, and then the Department of Building Technology enters. So when the students have drawn something that they think is nice, they get into the picture and students get to hear 'no, it has to be like this and like that'. And there is some teaching in the first year about indoor climate, and that is also kind of disconnected. So there is also this kind of information that already is a bit fragmented and which is not used actively in the design, or to develop ideas. [Students] do not attend an architect school to build what is being built now. You want to give the students an opportunity to believe in something and to develop ideas for the future, and I do not think that the education is good enough at doing that."[109] Thus, it seems like this other lecturer sees energy efficiency and sustainability in buildings as something fragmented that is not integrated into the design problems, and which therefore functions as a hindrance to the creativity of the students.

One of the professors teaching first and second year confirms my assumption that downgrading issues of energy efficiency and sustainability in the first years of the education is a deliberate strategy from the point of those teaching architectural design. He says, "I am very sceptical towards including energy efficiency[110] directly in the first year. I think it is more important to make people conscious of why they like sitting in a sunny wall and why they always sit on the sunny side of a street cafe. And that there are certain patterns in the way that we relate to the climate that is much more interesting than energy efficiency. I think it is the totality, to understand where you are building, in relation to the type of building body you should have, that is to be in accordance with energy efficiency (...). I do not think that it should be a part of the basic architect education, because, if one tried to *feel* a little bit more, one would understand that a great deal of this is energy efficient".[111] In

[109] Interview with "Smith", 26.06.2001, p. 5.
[110] The informant uses the Norwegian term energy economising. Here, it is translated into energy efficiency, as this is the most common term in the international literature.
[111] Interview with "Smith", 26.06.2001, p. 2.

other words, he does not think that taking account of the environment when designing buildings is very interesting as long as there is no account of the totality. Teaching the students to think of the experience and feeling what one should require from a building is more important, and may also be a way of approaching energy efficiency demands. He also thinks that the energy efficiency performance of a building often is narrowly measured with quantitative measures.[112]

The same lecturer thinks that energy efficiency and environmental concern are issues that the students are interested in. He claims that they often demand greater engagement and information. However, he does not think that they experience the school as being a vanguard in relation to energy efficiency and environmental issues. He thinks many of the students begin at NTNU because they think that this is an architect school which is first-class on technology, but that they learn rather quickly that aspects that have to do with technology are boring. He tells that this is a common criticism of the education, and something that produces frustration among the students, as the reason for why they chose this particular university was that they expected it to be outstanding on technology issues. Further, he claims that according to the students there is passed on an attitude, saying that technology is boring. It is the classes that they work the least with (at least the first year) and the ones they sacrifice for the design classes where it is possible to make the students work day and night. The energy efficiency classes are thought of as subsidiary classes that are not really important, because technology, energy efficiency and the environmental issues have become something that are on the sideline as compared to the rest of the study.[113]

It is not those who teach other topics that communicate that technology is boring, on the contrary, he thinks that it is the technology classes that are bad. He says they are "fragmented and badly integrated. When we evaluate, it is [these classes] that have the poorest results. (...) It is something that is forced upon them [the students]".[114] Somehow, the students come to regard the energy and technology classes as less important than other classes. The professor from the Architectural Design department thinks that the poor status of the energy efficiency teaching is a result of the teaching itself, first and foremost because the teaching is badly integrated with other aspects of the education and in the totality.

All in all, it seems like some teachers at the department of Building Technology try to translate energy efficiency into something interesting.

[112] Interview with "Smith", 26.06.2001, p. 2.
[113] Interview with "Smith", 26.06.2001, p. 5.
[114] Interview with "Smith", 26.06.2001, p. 5.

Nonetheless, there is a widespread attitude that these issues are unsuccessfully translated among other actors, as they do not manage to translate them into something that most architects find interesting. The teachers of architectural design seem to translate energy efficiency as knowledge of technology - something that stands in contrast to what they perceive as the focal points of the architect education, namely creativity and design.

The lack of integration of the different topics is also emphasised by the professor from Architectural Design teaching more advanced classes. She says she would welcome closer co-operation between the different departments, so that the students understand that you do not work with town and regional planning in one project, and building technology in another, but rather that an architect works with all these aspects at the same time. It is important to stress that it is a difficult and complex task to make all these things harmonise and to make everybody pull in the same direction. All aspects are important, but they are only important in relation to each other. They are not important separately."[115] Again, it is the totality that is emphasised.

Further, she says that the architect has to learn about sustainable energy, as one of many issues that is important in the education. However, it is not something that they can be experts on. "You should have kind of an optimal attitude in relation to the things you work with, and there are so many things in the course of five years. You must create the technological, the aesthetic, the human and the functional basis. All the other things that architects have to deal with – building descriptions, quantity calculations, administration, project management and for example deciding glass types and insulation multitude, even though it is a part of our task, I think you may easily learn these things by post-experience courses and by working with experts on the topics. We can't be experts. (...) but the basic attitude must be obtained."[116] In this way, technology related to energy efficiency is portrayed as something an architect should know about, but only to a very limited extent, as it is the creativity that is the most important thing to adopt. Energy efficiency does not seem to be considered very interesting in this respect. It is not perceived as an aspect that is crucial concerning architectural design. On the contrary, it is translated into being a technical feature of the building, that to a small degree is related to the quality of the building. Nonetheless, it is portrayed as something that has to be part of the basic understanding that the students are given.

[115] Interview with "Nordberg", 04.05.2001, p. 7.
[116] Interview with "Nordberg", 04.05.201, p. 8.

Among the teachers giving lectures at NTNU, not everybody seems to think of buildings as an important environmental problem: One lecturer says, "I think that buildings represent a smaller problem than roads and plants. Most buildings are appalling, are in the wrong place, are not built by architects, but are 'smacked up' by contractors or others. It is aesthetically and culturally a horrifying problem. (...) It is a bigger problem that the public space is totally neglected in our culture."[117] Thus, the idea that exists among practising architects, namely that buildings can be environmental problems because of their aesthetic features, also seem to be present among those teaching architecture.

Low-energy buildings are perceived as buildings that are built "more experimental, as research vanguards, often involving a lot of engineers so that the technological parts has given the expression, making it very tedious." While ecological building strives at a more holistic way of thinking, involving the users in the design and emphasising that it is part of a cycle that varies etc., low-energy building is very often focused on the energy use, and therefore have a more technological look.[118] So, what is important for the students to learn?

One of the architects teaching first and second year students, thinks that the most important thing is to always have a constant wonder. "If they all the time search to understand what is sensed as good architecture with a holistic approach to that, they have come a long way, because then they escape the chase for isms and showing off, and become more inclined to making reasonable architecture. But the most important thing that they should learn during the education is to design both indoor and outdoor comfortable rooms, regardless of status and devices. It is more important that the architect student becomes sincerely and wonderingly interested in what architecture is, rather than graduating with the sensation that 'I am an architect'. Being an architect is something that has to be learnt continuously, as the problems are changing all the time and we always have to protect the totality. (...) The building owner has not the experience (...) [and] the knowledge. The engineer has his parts and areas and is trained to think in terms of components. The bank provides the money. But it is always the architect that is supposed to take care of the totality. The preconditions for this change all the time, so I think the sincere inquisitiveness of what is best there and then is the most important feature that an architect should have. And of course you go out and get information about energy efficiency. You understand that you have to use it and that an engineer will have to help you. (...) But it is

[117] Interview with "Nordberg", 04.05.2001, p. 6.
[118] Interview with "Smith", 26.06.2001, p. 6.

important that the architect does not think that he knows everything. If one enters such quasi-information about energy efficiency into the architect education, then it is very important that young graduate architects understand that 'I am not a specialist in that, but I am a specialist in the totality'. (...) That there is no one else that can take care of the totality, because the aesthetic must be an element".[119] Thus, it looks like it is the traditional view of the architect as a curious and creative person and the co-ordinator and the caretaker of the totality that is prevalent.

On the question of what are the most important things that architect students should learn during the education, one of the professors answers: "We have five years to create architects. When they come here, they are young, ordinary people. Many have never drawn before, and have never acted aesthetically in accordance with their surroundings, but are curious and think this is exciting. Thus, we have simply the job of giving them an understanding of architecture (...) – what you, as a cultivated architect and as a human being, may render to the society that you live in. This is about starting with the beginning: What spaces do you create? What materials do you use? What experiences do you give those that will be present inside and outside the houses? What kind of public spaces are you creating? How do you relate to them? And how do you relate to the places that you work in? It is a complex program the architect students have to go through, about completely basic aspects. The rooms, the constructions, the materials, daylight, and then there is all the sensuous experiences, the place, climate, and when I say materials, energy efficiency is implied in this area, likewise constructions. That there are several filters with semi-climatic zones and how they are experienced, so it is the whole complex. It is difficult to say that one thing is more important than another (...) and there is the consciousness that the building will stand for 100 years, and that it has to have adaptive capacity".[120] As follows, creating good experiences and spaces seem to be emphasised by those teaching architecture as one of the main features. Energy efficiency may be a part of this, but there seems to be a prevailing attitude that such issues are something that the architect cannot be bothered too much with during the education. These issues are seen as the domain of others (engineers) and a consideration that may be incorporated after the building is designed, and as a consequence have little to do in the courses taught at NTNU. This is another example of the boundary work that architects do, in relation to their profession. As we saw in the previous

[119] Interview with "Smith", 26.06.2001, p. 4.
[120] Interview with "Nordberg", 04.05.2001, p. 7.

chapter architects do an extensive amount of boundary work in a great number of areas and especially in relation to engineers.

The status of energy efficiency questions may be summarised by the following statement: "There may be some architects that are interested in energy efficiency, but I do not think that architects necessarily should have any reason for being more interested in it than anyone else, really, beyond using common sense and thinking of the totality."[121] In this way, energy efficiency is carefully parked outside the sphere that architects should be occupied with. It is to a very small extent domesticated and is not seen as belonging to their object world by central actors in the educational system.

Concerning the energy efficient technology, one of the professors claims there is something close to superstition regarding the belief in technological solutions. She sees air-conditioning in building design as an example of this 'unsuccessful strategy': "All heated air is deposited and sucked into a system that extracts the heat, the heat is used for hot tap water etc. and you cannot open a window, and barely go in and out a door. Ten years ago you were not allowed to open windows in schools because it disturbed the air-conditioning that were tuned to save energy, so I think that air conditioning systems are an evil. I cannot stand them. I cannot stand the air-conditioning systems that we have here, or other places. I think it is better to put on a quilted anorak when it is cold and to open the windows and go out to breath in fresh air."[122]

She also reveals a strong distrust in technical systems like smart-technologies. She says, " I am so old I have the largest possible lack of confidence in all kinds of knobs and systems, as I can't understand and deal with these things (...)". This is because she finds it very irritating when systems break down and she finds herself dependent on getting help from specialists. As a consequence, she has chosen to have as few machines as possible in her home, and living without a car. "What was so annoying about the car, was that I could open the lid and peek into it, but I didn't understand anything, so I couldn't do anything. I was helpless", she says, and continues, "I don't want my life to be dependent on others all the time. There is enough dependence on other people in the world. My daily existence has to be so simple that I can use my head for sensible things. (...) I have even got rid of the bicycle because it became too complicated with all the gears and when I had a flat tyre I could not get it off and repair the tube, and everything was so unbearable. Can you imagine what it would be like if I was supposed to deal

[121] Interview with "Smith", 26.06.2001, p. 10.
[122] Interview with "Nordberg", 04.05.2001, p. 6.

with such a system, where only specialists may be able to help me?"[123] Along these lines, not all those teaching architecture are equally optimistic on behalf of technological solutions. Energy efficient technology is translated into something that makes our lives more complicated. This seems however to be related, not only to the understanding of technology – it is also a question of design and formal expression.

Apart from the education given by architect schools, architects also have the possibility to follow courses and seminars given by the Architect Academy. According to one of the teachers at NTNU, the Architect Academy has received financial support from NAL to start post-experience courses on energy saving etc., but there have been little interest. She thinks this is probably due to the fact that the campaigns have been too idealistic and moralising, such as 'this will save the world', and that the architects are not interested in hearing more of that. They want facts – to know how one should do things in practise."[124]

It should also be interesting to see what former architect students have to say about the role of energy efficient, sustainable and environmentally sound architecture in the education. This may further enrich the information drawn from course plans and interviews with lecturers. As one could expect from the information about the education, most architects claim that they learned almost nothing concerning these kinds of topics while at architect school. Two architects working in a 'young' architect firm in Trondheim confirms this understanding. They think that one has to start learning during the education how to be able to design energy efficient and sustainable buildings. One has to be "brought up" to understand that one has a responsibility towards designing in accordance with these aspects. Further, they think that one should learn as early as possible to work more inter-disciplinary, as a good ecological project requires that one starts co-operating from the beginning of a project. They claim that they learned nothing concerning these issues while they were studying - perhaps a total of two hours a year all together. They got some information about a few eco-projects, but these were "hippie projects from around the world (...) Nothing serious".[125] Such statements are quite typical among former architect students.

The discourse among actors in the educational institutions reflect a conflict concerning what should be emphasised in the education: should the students first and foremost learn how to be creative creatures as regards

[123] Interview with "Nordberg", 04.05.2001, p. 6.
[124] Interview with, "Carlsson", 01.09.1999, p. 2
[125] Interview with Winther and Davidsen, 28.03.2001, p. 9.

design, or is it equally important that they learn how to design sustainable architecture. The dominating view is that one should concentrate on creativity and design, and that it is not important to focus on energy efficiency issues, as this kind of knowledge may easily be appropriated later from other specialists. As one practising architect explained, "the definition concerning good architecture that one learns while studying does not contain anything at all concerning environment and ecology. These aspects are completely removed from the definition".[126] The skills and anticipations obtained through the Norwegian architect education are likely to be related to the practise of architecture as a creative activity connected to designing buildings.

5.2. Sustainable energy in Norwegian architect journals[127]

The architects often use architect journals as a source of inspiration and information. Thus, architect journals are a crucial source of information on what is setting the tone in today's architecture, what is seen as good architecture and what is dominating the architect discourse. The two most central journals in Norway are The Norwegian Review of Architecture [Byggekunst] and Architect News [Arkitektnytt]. In this section I will explore how energy efficiency and sustainable architecture is portrayed in these journals. The journals are analysed during a 30-year period, from 1970 until 2000. In this period every third volume is analysed, as well as all the volumes from 1997 to 1999.

[126] Interview with "Dahl", 07.12.1999, p. 7.

[127] The analysis of the architect journals is partly based on an article (Ryghaug 2000), published in *Tidsskrift for Samfunnsforskning* 41, 324-352.

The Norwegian Review of Architecture, 6/2002.[128]

The Norwegian Review of Architecture has been a source of information and inspiration for Norwegian architects and other professions within building and planning for about 80 years. The Norwegian Review of Architecture is published eight times a year[129] and the readers often collect the magazine and use it frequently as a source of information when working with new tasks. Some have claimed that it is the most important reference source of Norwegian architects (Helland 1988). The journal mainly presents building projects and constructions designed by Norwegian architects, as well as projects designed by landscape architects and interior architects. The magazine also brings information from abroad on corresponding areas. In addition, it contains some features on architectonic history, theory,[130] book reviews, coverage of expositions, promotions and product information for windows, floors, doors, interiors, lightning, building materials, software etc. All issues contain an editorial. Some of these are thematic issues with an editorial philosophising about the theme, as for example in the number on "Landscape/Spitzbergen" where the editorial is about "New nature".[131] However, the principal content aims at presenting buildings and projects.

Many different types of projects are presented in the magazine, from private houses, cultural buildings and museums, urban business premises and office buildings, to schools and traffic projects. Large prestigious projects are

[128] http://www.mnal.no/Forlaget/Byggekunst/BK.html
[129] Before 1979 the magazine was published 6 times a year.
[130] Some articles are related to one particular style, for example the article on the "The language of the Swiss style" in Byggekunst 5/1998 or "Art and lightning".
[131] See, *Byggekunst* 6/98.

often described, like Oslo airport Gardemoen and Trøndelag Theatre. However, smaller projects and single-family homes are also represented. All in all, the journal has little room for debate and reflection, as it is more descriptive in its form.

The typical The Norwegian Review of Architecture article is a voluminous presentation of a project focusing on illustrations of the building presented through refined colour pictures and drawings. The text or the depiction of the building has a subordinate place and occupies only a fraction of the length of the article. The portrayal of the building usually includes a description of the site; the landscape and the situation stressing the aesthetic qualities. It often contains a description of the view, the surrounding buildings, vegetation on the site, slopes, light conditions and how the building ought to be placed in order to take advantage of the aesthetic qualities of the site. Further, it usually encloses a description of the different functions that the building should incorporate, a description of the building design, the extension, the layout (area, space program) and material choices. The choice of building materials is normally described as motivated by aesthetic considerations. The depiction finally describes the architectonic expression that the building is seen to communicate, and sometimes also artistic decorations.

This description of a family house in Asker, Norway, illustrates the usual contents and style of a typical article in The Norwegian Review of Architecture:

"A scanty budget and beautiful pine trees with the Oslo fjord sparkling far-off has determined the design of the house. The house is simple, with the entire ground floor as one large living room. The room opens in full length towards the forest with an eleven-meter long window. Towards the northwest the building has its only outgrowth; a small niche with elevated floor of tatamy mats and skylight of channel plastics. First floor has a bathroom and bedroom for three kids and two adults.

The scanty budget, together with open and trustful building owners have inspired the development of new solutions for prefabricated furnishing, moveable sliding doors etc.

The outside wall is crafted in 'Leca isoblokk' externally, and float-finished. Outwardly body-tinted, inwardly limed. Inwardly constructions and wooden floors are in pine, interior walls and fittings of birchen veneer. Floors in the entrance and the bathroom are steel smoothed and polished concrete. The roof has band thatch in zinc."[132]

---

[132] *Byggekunst* 1/1998, p. 27.

As we see the description is quite taciturn, dominated by aesthetic and architectonic criteria. The description covers a few columns, and colourful pictures and drawings to illustrate the project cover more than five pages.

Having minutely examined The Norwegian Review of Architecture in the period from 1970 until 1999 the conclusion must be that the journal is almost solely focused on the aesthetic aspects of a building. Detailed statements concerning energy - and environment seem to be subordinate and an under-prioritised part of the journal. Material on environment, ecology or energy is almost completely absent, with the exception of a small period during the 70ies where one may find some articles regarding nature conservation and the use of resources. In this period, The Norwegian Review of Architecture seems to be more focused on such problems, and a more versatile professional body where professional groups other than architects publish articles that deal with subjects related to architecture and social planning. During this time, the journal did not present as many building projects as today, and used less space on illustrating the projects. However, the journal was also at this point dedicated to presenting the aesthetic aspects of a building, as well as describing the functional demands that the building should meet. To the degree that material on nature conservation, environmental protection and energy exists, it is found in written articles and not as parts of the description of building projects. Also in the 70ies, the projects were described based on their aesthetic qualities. Even in the cases where environmental issues are debated, it is often the aesthetic aspects of environmental problems that are emphasised. This is particularly the case in the beginning of the 70ies. From the mid-70ies and on, the articles also focus more on ecology, energy shortage and nature resources. Thus, environmental concerns were clearly on the agenda, but it was normally no more than a word of praise that to a small degree was reflected in the projects that were presented.

All in all, during the period from 1970 until 1999, there are few examples of buildings where energy and environmental criteria have been decisive in forming the building design. This in spite of the fact that the editor of The Norwegian Review of Architecture, already in 1976 (4) claimed that they from time to time would give information on solutions related to energy- and resource use in the form of commentaries and articles, as well as presentations of projects that display how it may be done in practise. Exemptions are the thematic issues on "The Ecobuilding" in 1994 (7) and "Green building technology in architecture" in 1997 (6) that illustrate several projects where energy-, ecology- and environmental criteria are taken seriously. Except from these two special editions, it is the aesthetic aspects

that are accentuated. One example to illustrate this is an article about windmills, where on should expect that energy and environmental issues were discussed to a certain degree. Nonetheless, also in this article the focus is on the aesthetic elements. One discusses how windmills should be placed in the landscape to create the best possible aesthetic expression.[133] Another example that illustrates how the aesthetic aspects push on and overrule the energy decisions, is the portrait of the new main office building of Kredittkassen (a Norwegian bank): "The heating of the building is mainly done by electric heaters. The solution is partly chosen as it demands small technical rooms and because the cross section on shafts and horizontal guidings may be reduced" (Lund and Slaatto 1988: 443).

The lacking presentation of energy-, ecology- and environmental buildings is also evident in an article in The Norwegian Review of Architecture 1994 (1) that presents the development of The Norwegian Review of Architecture from 1919 to 1994, where this type of architecture basically goes unmentioned. This is called to attention in a letter from Røstvik published in The Norwegian Review of Architecture (4) that assert that " practically, the ecological architecture (solar energy, salutary materials and building processes, ecology) is not presented. Despite the fact that a part of this period was very environmentally focused, The Norwegian Review of Architecture is chemically completely devoid of this kind of thoughts. (...) The Norwegian Review of Architecture has in this way contributed to, and still contributes to kill by silence, discard, immaterialise and conceal information on one of the most central themes of our times."[134] This also demonstrates how a dominant discourse may succeed in silencing alternative discourses.

In The Norwegian Review of Architecture 1972 (2) it is debated whether the journal should concern mere aesthetics. It is maintained, "the way architecture is presented forms norms of quality and schools among colleagues."[135] One is warned against a visually beautiful and hollow formalism, on the verge of forcing itself into the international architect press. The international journals are depicted as ingenious and expensive – a press where the value of architecture often is evaluated on the basis of their "picture postcard value" and where one worships photogenic facades and banal advertising graphics, in stead of useful and meaningful and beautiful surroundings. However, during the 80ies and until today, it seems that The Norwegian Review of Architecture show signs of this "visually beautiful"

---

[133] See, *Byggekunst* 1998/6.
[134] *Byggekunst* 1994, p. 207 (by Røstvik).
[135] *Byggekunst* 1979/72 (9): 100 (by Butenschøn).

and "hollow formalism". Elaborate illustrations and presentations of buildings based on aesthetic qualities seem to increasingly set the tone, at the same time as the role of The Norwegian Review of Architecture as a critical voice and a debating organ is de-emphasised. It is the aesthetic and to a certain extent the functional qualities of the buildings that are highlighted and expressed.

Thus, The Norwegian Review of Architecture is in a way closed, in the sense that it does not give any room for flexible interpretations concerning how a building should be understood (see Pinch and Bijker 1987). There are no controversies regarding how the building should be read. The building is almost uniquely understood on the basis of its aesthetic qualities and characteristic. There is a relatively homogenic interpretation of the building – one specific meaning is prevailing. Energy efficient, sustainable and environmental considerations have no place in this interpretation. The Norwegian Review of Architecture stands out as an excellent example of a media, that only gives voice to the dominant representation of architecture, and which thereby contributes to maintaining the dominant discourse as a discourse about aesthetics. The dominant representations come calmly and steadily about. That the most central architect journal in Norway seems to be closed concerning these issues is an important finding in itself. It also says quite a lot about the status of the energy- and environmental demands within the architect profession in Norway today.

The other central Norwegian architect journal, analysed here, is Architect News [Arkitektnytt] – the Norwegian architects' main forum for news and debates. The journal is published every fortnight and is read by people working with regulation and design. The journal debates plans on different levels and the design of all kinds of buildings, exterior plants, and interiors. The journal is an essential organ for debates where different actors in the building industry meet in order to exchange experiences and opinions.

Architect News 18/2002.[136]

The typical theme in Architect News is debate contributions on topics of current interest that relate to the world of architects. Further, Architect News publishes short letters, announces available positions and architect competitions and prices. The journal also contains coverage and reports from meetings, expositions, conferences and fairs in Norway and abroad, as well as information about courses, excursions and seminars. It is also a magazine for the members of The National Association of Norwegian Architects (NAL), The National Association of Norwegian Interior Architects (NIL) and The Association of Norwegian Landscape Architects (NLA). AFAG (The Federation of Architects) has also a column of their own, where questions regarding wage, working conditions etc. are raised. Architect News is distributed to all members of NAL. As over 85 per cent of all qualified architects in Norway are members of NAL, the journal may be seen as a central forum appropriate for exploring to what degree and in what way energy efficiency and environmental considerations are integral parts of the architect consciousness. As Architect News is an organ for debates and discussions, it is probably more open to giving voice to other opinions besides the dominant ones, and thereby more likely to contain alternative discourses, than The Norwegian Review of Architecture.

It is not easy to characterise a typical Architect News article. The debate articles are quite varied both when it comes to length, style and contents. The article is often connected to concrete projects like for example the development of Bakklandet, an old part of Trondheim City, or the

[136] http://www.mnal.no/Forlaget/Arkitektnytt/default.htm

development of a new opera house in Oslo. Some overarching subjects do seem to repeat themselves, though. Many articles are about architect competitions, contracting of architect services, and wage and price questions. Other overarching recurring subjects are tendencies in the architecture (modernism, post-modernism, classicism etc.), strategies for physical planning and social questions. There are also some articles that deal with sustainable architecture, ecology and environmental problems.

One should expect that the energy and environmental debate was most visible during the 1970ies. However, an examination of Architect News from 1970 to 1999 shows that this is not the case. In the volumes between 1970 and 1979 there is relatively little material on energy and environment, even though social house building and the housing environment is a popular subject. The same is the case during the 1980ies. In the course of these years Architect News presents some matter-of-factly information and research based material on different techniques that are amiable for reducing the energy use, as well as environmentally sound correct material selection. There are also some inquiries for more initiative concerning these issues on behalf of the architects. Time after time, it is pointed out that the architect profession lacks interest and knowledge about sustainable and ecological design. Nonetheless, in the wake of these calls for action, there is no evidence of an arising debate around these questions, as objections and counterpleas remain absent. This is also the situation in the beginning of the nineties. However, from the mid-nineties there is a small increase in the number of articles that contain material on energy- and environmental concerns. Most of these articles concern the progress on the development side; that is the technological development of heat pump solutions, solar energy solutions and practical ecological design.

In 1994 there is a formation of a group called NABU[137] (Norwegian Architects for Sustainable Buildings), and Architect News gets a special column called "Eco-News" (later NABU-news). At first, it does not seem to have directed the contents of Architect News in a more environmentally friendly direction and the debate about these questions is long in its coming. The small group of architects that works actively with these issues becomes more visible. Nonetheless, it does not contribute to creating a broad debate around these questions. However, in 1998 and 1999 there is an increased discussion around these issues, and there is a certain debate concerning

[137] Many of the participants come from a small assembly of architects that has been situated in the basement of Oslo Architect School in the period from 1988-1993 under the name of "Ecological Forum".

energy, ecology and environmentally sound building. Still, there seem to be only a few architects advocating these issues.

The debate mostly consists of advocates for sustainable architecture calling attention to the architect profession's lack of interest in these issues. The leader of NABU, claims in Architect News number 4, 1999, that there is a development towards environmentally sound buildings among public authorities and the building industry. Nonetheless, it has been pointed out over and over again that the architect profession lags behind when it comes to environmental and sustainable design, compared to other professions in the building trade (Butters 1999a). The architects are accused of not participating in the debate on these issues. The leader of NABU assesses that great attitude changes are occurring among the entrepreneurs, the engineers, internationally and in the public authorities. Architects, on the other hand, do not participate nor contribute to the development towards more energy efficient and environmentally sound building projects, or in the debate regarding these problems. He also accuses those who have shown some interest in the subject of having a superficial understanding of it, thinking that it only is about adding some new "green technical gimmicks". For him, this is rather a question of creating a completely new and ecological view of the world. Further, he advertise for more knowledge and comprehension for the fact that cycles, energy and the use of materials are something completely different than some patching up with water saving douches, rough panel and natural paint. Asle Strøm, the leader of the Architect Academy claims that if the architect profession does not take this seriously, they will become "parked" as a profession, and other groups will take over these areas as "environmental consultants" (Ødegården 1999a: 7).

Butters claims that there are two important factors for succeeding in promoting ecological architecture: ecological architecture does not only presuppose a new approach, but also requires a corresponding and different knowledge basis and education. The educational system is to be blamed for some of the architect profession's defensiveness in environmental issues. According to Butters, they were actually more active during the 60ies. Today, there is only a small group of architects that has appropriated a thorough knowledge in this kind of issues and which has leading-edge competence (Ødegården1999b: 5).

In sum, the discussion around sustainable architecture reflects an antagonism between two different traditions on how to comprehend today's architecture. An antagonism between the large portion of architects who endeavour the 'architecture as art'-view and a small group of architects emphasising the architect's social responsibility including a concern for the

environment. As we have seen in this chapter the former group of architects constitutes the powerful force within the architect profession. Architects mainly perceive architecture as a form of art, and according to the architect that puts forward these arguments, there are too many architects who regard their profession this way and who thereby neglect other aspects of building projects. This is the reason why architects often are accused of "self-sufficiency, biased interests and professional vanity". [138]

Conclusively, the analysis of every third volume of The Norwegian Review of Architecture and Architect News from 1970 until 2000 suggests that there is not a broad interest in energy- and environmental design among architects. This is an issue that to a very little extent is presented and that is almost absent in portraits given of buildings in the two journals. As one of the respondents points out: "good architecture is today defined in design-terminology, that is the appearance, how it looks visually, and it is very dependent on trends. It is what is setting the tone in the large journals."[139] This view is further corroborated in an interview with the manager of The Norwegian foundation for design, architecture and built environment, where he talks about adjustment to place. He says, "The problem that we constantly struggle with is the weak-willed and unreflected, and where architects have a tendency to be fashion victims that design the latest from the international journals, ergo an alienating uniform. But fashions change, and it is difficult for the Norwegian architect world to transgress the prevailing taste."[140] He has not got the impression that the architects have disengaged themselves from the international journals, and thinks there is little to do if the architect schools are not able to make the architects relate to the contemporary idols and glossy architects in a critical way.

Architect News contributes to nuancing the gloomy reports on sustainable architecture in the journals a little bit by giving voice to the small group of architects interested in these aspects and by letting them express their concern regarding the lack of interest by the rest of the profession. This indicates that the architect profession is not a totally homogenous group after all. Most architects seem not to be bothered by issues concerning energy efficiency. Nonetheless, there exists a small anti-group that strongly advocates the importance of these aspects in architecture, and which attempts to translate energy efficiency into architect practise. Still, this alternative representation of the reality that exists in Architect News is dominated by the representation of architecture as an aesthetic endeavour. The architect

[138] Wenche Terjesen, *Arkitektnytt* 4/99, p. 2.
[139] Interview with "Dahl", 07.12.1999, p. 7.
[140] "Norge – et rikt, konvensjonelt og ekkelt lite land?". *Arkitektnytt* 19/2002, p. 4.

competitions constitute the third arena where this dominant discourse may be studied.

5.3. The Architect Competitions

Most architect firms participate in architect competitions. Architect competitions are very important as they generate a lot of attention, publicity and prestige, and are often seen as trend-setters within the profession. According to the manager of the Norwegian foundation for design, architecture and built environment, architect competitions are basically created with other architects in mind. The jury mainly consists of architects, and the competition therefore is about architects trying to convince architects. Thus, the competitions are carried out within the tribal language of architects, and are accordingly difficult for outsiders to comprehend.[141]

The president of the Norwegian Architect Association maintains that shape or design is the exclusive criteria in architect competitions. One should however distinguish between different types of competitions. Shape or design is the most important feature in most competitions, while concept, originality and functionality also are important, especially in large open idea contests. One architect claims; "The most important thing is perhaps that you are hungry, really hungry. If starting to be satisfied, you do things that you have done before.[142]

Some contests have a less ambitious scope as they only try to find the architect best suited to do a certain job. In these contests the emphasis is on the economic aspects, keeping to the room program, and solving practical tasks in the program. In the last couple of years there have also been a handful of official competitions where ecological and environmental criteria have been included in the program. There is however no guarantee that these criteria are taken seriously by the jury, as several architect competitions with high environmental profiles have played down these aspects when it came to the crunch. An example that generated some debate was an office building, supposedly meant to be the pilot project of the large ecological building project in Oslo, called Pilestredet Park.[143]

Statsbygg arranged a competition about Pilestredet Park in 1998 as a limited project competition and invited five architect firms to participate after a pre-qualifying round. The task was to rebuild the Pathology Building at the old National Hospital for re-use by the National Insurance Administration. A central part of the program stated that the proposals should be energy- and

[141] Interview with manager, Norsk Form, 08.05.2001, p. 3.
[142] Interview with "Sundahl", 01.12.1999, p. 2.
[143] *Arkitektnytt* 7/199, p. 11, *Arkitektnytt* 5/99, p. 2.

environmentally sound, and that the building should be a role model for subsequent developments and stand out as the engine in the city's ecological program that was developed for the area.

After announcing the winner, the competition has been greatly criticised, as the winning project was "the one that to a greatest degree sovereignly overlooked all attempts on city ecological adjustment and design solutions, despite of the clear intentions in the competition program"[144]. Many pointed out another project as the rightful winner of the competition – a project by GASA, that to a large degree had implemented the ecological intentions in their proposal. According to the critics, the winning project lacked any kind of ecological measures, and won as a result of its aesthetics solutions. This has been seen as a typical example of former contests where sustainable energy and ecological demands have been included in the competition program. Despite the intentions, design is seen as winning criteria. A successful architect claiming to have beaten other contestants on "pure design-appeal", supports this view.

He claims that design has become the most important criteria in architecture, in the same way as it has become the dominant decision criteria for purchasing all kinds of goods in the late nineties. He compares this to the triumph of the Audi TT, where the only success criterion is the design, and not the technical performance or the longevity of the car. He thinks the same will happen in the building trade as has happened in the car trade. Eventually, all architects will know how to build an efficient and flexible office building, which means that those features will no longer be objects of competition, in the same way as when all cars are excellent machines the personal design criteria becomes more important. However, not all architects make equally well adjusted and efficient buildings yet, which make flexibility and area effectiveness basic criteria as well.[145] The prominence of the design criteria also is more important when one has a private building owner, than in official competitions where a jury is in search of a kind of objectiveness and criteria like the logistic solution and the room program, are more important.[146]

Architect competitions seem to substantiate a definition of architecture solely related to design/formal criteria, as well as functionality, adjustment to situation etc. Thus, good architecture is architecture that *looks* and *feels* good. One architect says that, he thinks environmentally friendly architecture is a wrong mix of concepts. "You can be environmentally friendly in many situations and architecture, as a discipline of it's own, disregards whether it is

---

[144] *Arkitektnytt* 5/99, p. 2. Architect Arne Sunde, by Spor Architects.
[145] Interview with "Martinsen", 08.12.1999, p. 3.
[146] Interview with "Martinsen", 08.12.1999, p. 3.

environmentally friendly or not." Further on he says that, "most architects are primarily architects. Environmental solutions are of course one aspect of this, but it isn't what overrules the shape. (...) The dominant belief is that "architects should be mostly preoccupied with architecture and design, but also incorporate all other premises in relation to that, including technical and energy economising solutions".[147]

One of the most prominent advocates for sustainable buildings in Norway, the leader of NABU, asserts that whether he travels around with a group of ecological architects or conventional architects, they do not see the same world: "They do not look at the same things. One person says 'that's great!' when he sees some rough Siberian larch tree that is ecological, even though the shape of the building may not be very refined. The ordinary architect will on the other side say that this is a horrible house solely on the basis of the shape".[148] One architect sums it up quite well. He says, "the motives for designing ecological architecture are not very strong, as it gives no prestige among other architects. You will not be rewarded by anyone for being clever with ecology. It will not be given much attention if someone makes a building that only uses half of the energy as other buildings. One will not hoist the flag for you. It will not be noticed in the architect journals, or in the architect association, and you don't even get particularly many assignments. There is absolutely no reason for being good at it, as it is not related to the pride of the profession. What is related to the professional pride is to be a mini Sverre Fehn or being published in Wallpaper or one of the great international architect journals. That is what gives status. If so, it doesn't matter how much ventilation you use".[149]

Thus, sustainable energy is to a large degree neglected in architect competitions. In cases where it has been included in the competition program it seems to be translated as an aspect subordinate to design. This is the dominant representation of the reality in competitions.

5.4. Conclusion

The chapter demonstrates that buildings may be thought of as factishes. As we remember from Chapter 2 factishes are phenomenon that do not fall into the daunting choice between fact and belief (Latour 1999b). Buildings are factishes in the respect that they inherit certain intrinsic tensions. They are both aesthetic and technological - they are combinations of values and

[147] Interview with "Jacobsen", 08.05.2001, p. 2, 7-8.
[148] Interview with leader, NABU, 08.05.2001, p. 2.
[149] Interview with manager, Norsk Form, 08.05.2001, p. 7.

knowledge. The aesthetics is in itself a factish, but is enrolled in an even larger factish – the building.

Further, the chapter demonstrates that the educational system has few courses that relate to energy efficiency, sustainability and environmental issues, even though the number seems to increase. These kinds of issues do not seem to be well integrated into the overall philosophy of the education and in the basic courses. The education emphasises the creation of architects that are aware of their responsibilities of taking care of the totality of a building project, while using their creativity to create good experiences in outside and indoor spaces. Topics concerning energy efficiency and sustainable building design seem to be perceived as additional aspects, not strongly related to architectural design.

There have also been relatively few competitions that include aspects of energy efficiency and sustainability. Where such demands have been stated, they are not always followed up. Competitions are normally guided by aesthetic considerations concerning the overall design and functional criteria. The winning criteria are of course varying according to type of project etc., but design seems to be the dominant criterion.

The two largest Norwegian Architect Journals are not very concerned with aspects related to energy efficiency and sustainability. The Norwegian Review of Architecture, the most typical architect magazine of the two, mostly illustrates building projects that converge with the dominating view of architectonic quality - projects that are considered aesthetically prominent. First and foremost, the journal portrays visual aspects of buildings. The design is the crucial factor together with functional aspects. Architect news has historically been almost devoid of articles on energy efficiency and sustainability. However, recently there have been tendencies towards focusing more on these issues and there is influx of a controversy. Most articles touching upon these issues are characterised by a cry for engagement on behalf of the profession, as the advocates seem to be a small group within the profession struggling to be heard by the majority. The quite high temperature in these articles also demonstrates the difficulties that these groups face in relation to the dominant discourse, and the difficulties they meet in trying to express their attitudes in a way comprehensible to the rest of the profession. Their problem is in other words a translation problem – A problem of translating energy efficient and sustainable architecture into something that interests most architects. That the dominant discourse allows only certain ways to talk about architecture makes this translation a difficult one.

In sum, there seem to exist a rather hegemonic condition regarding the "do's and don'ts" of the architect profession, as the main representation institutionalised in the educational system, the architect journals and the architect competitions seem relatively unchallenged - so unchallenged that it appears almost "natural". All in all, the dominant representation of the architect discourse is that of the aesthetising discourse. The aesthetics is the object of the boundary work – the concept that draws the boundaries of the profession. The dominant discourse makes it difficult to talk about sustainable energy. It does not seem to communicate well with energy efficiency, sustainable and ecological architecture, as these issues do not appear to be an integral part of the professional discourse. The character of the boundary work and the dominant architect discourse has two consequences. First, it makes it difficult to transform sustainable energy and energy efficiency into the dominant discourse. Second, it is difficult to translate energy efficiency and sustainable energy towards technological aspects. In other words, the translation problem is a problem that goes both ways, and may consequently be seen as a serious translation problem.

However, when architects are made to speak about sustainable energy, the topic is not totally dismissed. There is also a translation going on, which indicates that it is not impossible to create energy efficient and sustainable architecture within the dominant paradigm. None the less, the dominant discourse does not give anything for free in this respect, as it does not contain concepts that communicate with environmental friendliness.

Despite the lack of engagement from the majority of architects, the analysis of Architect News reveals that there exists an alternative discourse within the profession, a group of architects that fervently tries to translate sustainable energy as an important issue of the architect practise. This group offers an alternative representation of the discourse. In other words, the discourse is not completely closed.

The next chapter tries to explore what these outsiders do, in order to get around the problem of translation. The chapter attempts to produce an answer to why they have not succeeded in enrolling the rest of the architect profession. Why have they not managed to translate sustainable energy into something that interests most architects? As we have seen here, the dominant architect discourse has to a large extent dismissed sustainable energy as an interesting issue. In stead it focuses on the aesthetic aspects of architecture. Thus, the question is whether it is possible to translate energy efficiency and sustainable energy into something aesthetic.

6.

TOWARDS A SUSTAINABLE AESTHETICS? STRATEGIES AND CONTROVERSIES IN ECOLOGICAL ARCHITECTURE

The previous chapter demonstrated that energy efficiency and sustainable architecture are marginalized by the dominant architect discourse. Nonetheless, the analysis of Architect News showed that there exists an opposition to the hegemonic point of view with its singular emphasis on aesthetic design criteria. These adversary architects are ardent advocates of energy efficiency, ecology and sustainable building design. Despite the general scope and relative weakness of the sustainable energy policy measures, they have picked up these issues. However, it is not clear to what extent they have been affected by policy or whether they express the impact of the environmental movement upon the architect profession. This needs to be examined.

Utilising basic insights from the Social Construction of Technology approach (SCOT), it is rather obvious that the same building may be perceived quite differently. This flexibility of interpretation is frequently embedded in what Pinch and Bijker (1987) calls relevant social groups, groups of actors that somehow may be perceived to influence further developments of the technology (here: buildings) under scrutiny. Moreover, the flexible interpretation also produces different assessments and ideas of what kind of development is needed.

The previous chapter revealed the potential existence of two conflict lines that are interesting for further study: an aesthetic conflict line (beautiful – not beautiful) and one environmental conflict line (sustainable – not sustainable). A building considered a product of good architecture within the dominant discourse could be viewed as unsustainable by oppositional architects, while examples of sustainable buildings were considered to be bad architecture from the point of view of the dominant discourse. Clearly, aesthetics as well as sustainability may be object for controversy.

Given the fact that there is a dominant discourse among architects, this means that the issue of what is to be considered good architecture has reached closure, to use another concept from SCOT. The opposition face the challenge of re-opening this closure to produce a controversy, which in turn may provide the basis for a different kind of closure. This is not an easy task.

To understand the dynamics of this situation, we need to study the shaping of the efforts to conduct this controversy. On one hand, there is the question of how the dominant position tries to reproduce and reinforce its hegemony. On the other hand, there are the challenges facing the opposition in providing an alternative and a strategy to push forward this alternative. Given the interpretative flexibility of concepts like sustainability and energy efficiency, we should in fact expect that there would be several alternatives. This has also been proven in earlier research (Guy and Farmer 2001).

In this chapter I will explore the alternative discourse by trying to get a better understanding of how environmentally concerned architects construct their alternatives. Given the importance of aesthetics in the dominant discourse, it is particularly important to look at how these actors approach this issue and their ability to use such arguments to promote their ideas. Along this line, it is central to ask why ecological architects do not manage to convince the rest of the profession that they should adopt their ideas and thus be more in line with current Norwegian environmental policy. Why is green architecture in general overlooked in the journals, the education and the competitions? Why does energy efficient, sustainable and ecological architecture seem to be so controversial?

To answer these questions I will make use of interviews with architects, both practising architects and architects with important positions in various architect organisations. The interviews will be supplied with information from the journal Architect News where a debate around these issues has emerged during the last years. The interviews, which were conducted at a later point in time, revealed that there also exist opposing traditions *within* the group of "green" architects. This antagonism and their view on what environmentally friendly architecture should be about will be developed further in this chapter.

In order to understand the challenges facing green architects in terms of criteria for good architectural design, I will develop further some of the findings from the previous chapter. The hegemonic ideas about good architecture do not just provide a set of values, but also the concepts that are used to describe and evaluate architecture.

6.1 Constructing "good architecture": What is architectonic quality?

In chapter 5 we revealed that the dominant representation of the architect discourse is that of the aestheticising discourse, where the concept of aesthetics draws the boundaries of the profession. In view of this it is relevant

to ask how the architectural science solve the problem of aesthetics and how it decides what is good and what is bad architecture.

Aesthetics is a part of philosophy that seeks to analyse concepts and produce theories about the experience of objects. What it is that characterises "aesthetic objects" and experiences, and the foundation of this experience is one of the aesthetics' main concerns. It is common to distinguish between normative aesthetics and descriptive aesthetics. The descriptive aesthetics is mainly focused on classifying and arranging work of art in types, periods or styles and to assign common traits to them. Much of today's writing and thinking in relation to architecture, deal with changes in styles, the discovery of new trends and retracing their origins. Normative aesthetics, on the other hand, focuses on alleging requisite characteristics or criteria for what is beautiful or not beautiful and consequently making visible what properties an artefact should have in order to be an aesthetic, valuable object.

There is no widespread philosophical doctrine concerning what is good and what is bad art that is completely unrelated to how art evolve. Thus, it is problematic to put forward a set of normative rules and universal criteria for good aesthetic quality. However, when architectural science is practised it is nevertheless possible to identify a number of criteria that is repeated when evaluating the architectural quality of buildings. We all have an opinion of what quality is. None the less, architectural quality is not simply a question of individual taste, but also concerns cultural and professional knowledge. This knowledge is not only of theoretical kind, but is very much tied to the "tacit" knowledge that is gained through practise, and which is necessary in order to create architectural quality. According to Cold (1995), many people are likely to think that architecture is about securing, technically and functionally a good and proper building that is thought-through as regards space and the different functions that it is supposed to accommodate. This is off course an important fundament in architecture, but architecture is also something else. It is also about experiences. It is about spaces, light, totality, coherence, identity, character, poetry and "meaning", as well as interpreting the material, constructional and design possibilities of its own time.

According to Norsk Form, aesthetic norms often demand that things fit together. Architecture is the art of coherence. What goes together is, from way back in time, the decision of aesthetic quality – beauty. The question asked is how parts fit together within the totality and how the units form a part of a pattern (Cold 1995). Thus, inherent the aesthetics, there is a duality without answers; one should attend to the cultural tradition that may be interpreted into a context and one should be open to innovations that cross frontiers and that often mean a rupture with traditions.

Hesselgren (1977) has developed a kind of catechism with ten good advice for creating good surroundings. In order to be able to do this the architect should be good at experiencing, observing, interpreting, explaining and transforming. This means that senses, reason, empathy and intuition have to be used. The "Ten Commandments of the architect" is

- avoid monotony
- aim at totality, delimitation
- seek to achieve beauty, balance, harmony and variation
- readability. Using architecture as a signal language for actions, expectations, orientation and bearer of culture (symbol)
- room experience is created deliberately by open – closed, large – small
- aspire to friendliness
- see users as co-creators
- see and experience others in activity
- see and experiencing nature, animals and plants
- see and experiencing the dead nature with mountains, earth, water and heaven.

Little scientific work has been done on concrete criteria for evaluating architectural or/and architectonic quality in buildings.[150] However, Cold (1991a) has done an examination of jury statements in relation to the 25-year old history of awarding the Wood Price [Treprisen]. Her method was to register the qualitative statements used by the juries, gathering them into groups and indicating the belonging of the different price winners to different groups. As a result of this work, five groups of criteria were distinguished. The first was harmony, balance and totality, i.e. design that is "clear", well dimensioned and exquisite. The second was simplicity in construction and choice of materials. The former refers to conditions characterised as "limitation", "simplicity in expression", "cautious use of details", and the latter refers to natural and traditional materials. The third was originality and novelty value, i.e. buildings that are described as visionary, forceful, personal, artistic, imaginative, poetic, independent, future-oriented, etc. The fourth group was adjustment to physical surroundings and landscape, i.e. buildings that are assessed as being accommodating to the premises on the site or the surrounding buildings, landscape, nature, climate etc. And finally the fifth was systematising and development, i.e. work that is considered safe, reassuring, effective, rational or economical.

[150]Administrasjonsdepartementet (1996): *Estetikk i statlige bygg og anlegg: veileder*. Oslo: Adminstrasjons-departementet.

These different groups of criteria may be seen as a hypothesis about the contents of a building with expected architectonic quality. Harmony, balance and totality were decidedly the most used criterion. Harmony implies a holistic interplay between complimentary qualities, as for example order and variation, open and closed, and represents a core value in architecture, independent of styles. Originality and novelty value were the third most commonly mentioned qualities (Cold 1991a). The list indicates that even though it is difficult to define criteria for aesthetic value, it is to a certain extent possible to find, if not universal, then recurring criteria for aesthetic quality bound to place, history, time and culture.[151]

As mentioned in the previous chapter most architects make up their mind about design and architecture while they are studying, and most of them have some sort of definition of good architecture that they claim to think they safeguard through their practise. The following paragraphs are dedicated to explaining the most prevailing definitions among today's architects, revealed in the interviews and the analysis of architect journals.

The president of the Norwegian Architect Association (NAL), has called for a debate concerning the extent to which the attention to the sustainability-perspective shall overrule other criteria for architectonic quality.[152] As for the traditional aesthete architect, it is the architectural visual expression – to sense the creative spirit of the work, which is the unalterable characteristic hallmark of architectonic quality. This view has also been named "the architecture as art"-view.[153] The ecologists, on the other hand, regard architectonic quality as a "hybrid" composed of shape/design, function and technique. They are promoting a holistic view in which what is environmentally sound is combined with good design. Along these lines, the leader of the Architect Academy, Asle Strøm, calls the discussion about architectonic quality versus environmental considerations a derailment.

According to the president of the Norwegian architect association, the quality criteria of good architecture is solely related to design or shape. Many others who state that good architecture is defined using the terminology of design, appearance, and visual expression support this claim. Consequently, to be a successful architect you should be totally unwilling to compromise on the design aspects of a building. One architect explains designing buildings as "a way of working with musicality – harmonisation between materials,

---

[151] For more about the scientific basis of architecture and aesthetics, see Ryghaug (1999): Arkitekturens vitenskapelige grunnlag. Essay to doctoral course in philosophy of science/Working paper, Dept. of Interdisciplinary studies of culture 02/2002. NTNU.

[152] Kiran, K.: "Sexy arkitektur, ansvarlighet og misforståelser", *Arkitektnytt* 6/1999, p. 19.

[153] See Terjesen, W.: "Hva er sexy arkitektur hr. president?" *Arkitektnytt* 4/1999, p. 4.

between surfaces, between details of the shape".[154] "It is often an experience of the landscape and the design aspects that is the starting point as to how the buildings should be situated. It is not common to include climatic concerns when orienting the building on the site, and consequently there exist a lot of wrong-oriented buildings with problems of over-heating or too much cooling".[155]

There is also evidence that form and design have become even more important over the last years, as new generations of even more design oriented architects have sprung up. One architect ascribes the new generations of being, " more preoccupied with drawing for each other – more engaged in the visual and design expression, than they used to be". He says, "Honestly, I don't think they care a hang whether this goes together in a reasonable way in an ecological account, even though they now and then 'pay lip service' to the question for the sake of appearances. They don't get involved and are very little preoccupied with the operating of new buildings. There are still architect lecturers and professors that claim that architects should only be interested in a building until it has been photographed for the first time. What happens afterwards, if it gets messed up, if water is running down the walls, they don't have to care about. (...) At the exhibit that just opened, Norwegian Contemporary Architecture 1995-2000, there are very few architects that have a deliberate attitude towards ecological thinking. It is the scant details, roofs without gutters, where the water is running straight down the walls and where the owner of the house is in legal proceedings with the architect one month after the house was opened because it is impossible to live in it, that are exhibited as splendid statements of Norwegian contemporary architecture".[156]

Architectural quality is of course also dependent on trends, i.e. what tone that is set in the great architect journals and by the most popular architects. The previous chapter where the two most important architect journals in Norway were analysed, shows that buildings are read almost solely on the basis of their aesthetic qualities in the journals (also see, Ryghaug 2000). The journals often emphasise how the building is placed in order to make the most of the aesthetic qualities of the site, the choice of materials and the aesthetic criteria that the choice is based on. The architectonic expression of the building is highlighted. Sometimes the artistic decorations are underlined as well. One example of this tendency is the emphasis on employment of "smooth, newly cut stones, polished in

[154] Interview with "Martinsen", 08.12.1999, p. 7.
[155] Interview with "Dahl", 07.12.1999, p. 7.
[156] Interview with manager, Norsk Form, 08.05.2001, p. 3.

China."[157] According to the editor of Byggekunst, Bjørn Larsen, the actual trends within Norwegian architecture on short term basis is "functionalist nostalgia", meaning a building that imitates the shape of functionalism without including its substantial content.[158]

There is a trend towards a typical style or architectural tradition among today's architects, as most architects are advocating "modern architecture" and prefer shapes that are geometrical and features that are somewhat abstract.[159] Some common defining characteristics of modernism are: "open interior spaces, rectilinear shapes, light plane surfaces stripped of superficial ornamentation or decoration, and a visually light appearance often brought about by the use of cantilever construction" (Vickers 1999). As a main rule one may say that most architects follow today's dominant regime of architectural taste – a taste that equals modern, minimalist building style, with extensive use of glass and steel.

Good architecture is further on characterised by being new and original. As a consequence, many architects are quite arrogant and impetuous in their expressions, and are not very sensitive towards the context, as they are more preoccupied with designing buildings that will stand out in history, than buildings that will blend in with history.

Most architects seem however to include a notion of *functionality* into their definition of quality in architecture. A recurring definition seems to be that of architecture as "a beautiful frame surrounding a function" or "aesthetic organisation of the practical reality".[160] In many ways architecture is all about solving practical problems and creating frameworks so that particular functions can be carried out in the most adequate way. However, as this is something that an engineer could do, it is important for architects to emphasise that people sense their surroundings and that the surroundings affect us as human beings.[161] This is also reflected in the extensive amount of boundary work that architects do in relation to other professions, as pointed out in Chapter 4. Thus, good architecture may not *only* rely on functional criteria, but must also be able to produce exciting experiences. "The experience of the room" is a quality that most architects seem to share as a crucial value in good architecture.

There is evidence that aesthetic aspects sometimes are seen as more critical than functionality, to the extent that considerations of functionality are set aside. One example is Sandvika town hall, which by most architects, was

[157] Interview with "Myrvang", 04.03.2001, p. 6.
[158] Sekne, I.: "Byggekunst vil vise arkitekturen", *Arkitektnytt* 18/2002, p. 10.
[159] Interview with leader, NABU, 08.05.2001, p. 3.
[160] Interview with "Robertsen", 06.03.2001, p. 1.
[161] Interview with president, NAL, 09.05.2001, p. 2.

regarded as a good piece of architecture, even though the building was malfunctioning and produced conditions that made it impossible for people to work there.[162] (This also points to the fact that the user aspect of the building is not always given high priority when designing buildings). Another architect that has worked a lot with schools has similar experiences: "I have seen that many schools have achieved publicity, because they are beautiful, but many of them are uninteresting as they don't reflect one piece of modern pedagogy. For example, the plans may be totally conventional, but the interior make them well adapted to the terrain, or they may have employed some precious materials".[163]

Conclusively, as demonstrated in the analysis of the dominant architect discourse and in this section, good architecture is constructed mainly in relation to design criteria related to aesthetics. In the next section we will take a closer on look how environmentally conscious architects meet these criteria and how sustainable architecture is constructed.

6.2 Environmentally conscious architects

The group of ecologically interested and environmentally conscious architects seems to consist of a relatively small and clearly set out-group of people. In Architect News, they are portrayed as a small, eccentric, sect-like group of architects – not unlike a religious congregation. Norwegian Architects for Sustainable Development (NABU) is probably the most central actor within this group of architects, in addition to a small number of practising architects. NABU is a project under NAL, established in 1994. NABU is based on the 1992 Rio conference and Habitat agendas, and the ensuing declaration of 1993 by the International Union of Architects (UIA) concerning sustainability in the built environment. According to the leader of NABU, there exists a real environmental commitment within this very small group of the architect profession, but they have few commissions and very low earnings. Some have criticised them of working only for an inner circle, but the leader of NABU claims that their goal is to include as many as possible, even if the economic resources are scarce. NABU's aim is to integrate awareness and knowledge about sustainable planning and building into the everyday practise of architects, planners and others in the building sector. NABU plans and arranges conferences, courses, workshops, information activities, reports and other initiatives that have architects as their primary target group. Further on, they also entail interaction and cross-disciplinary co-operation with engineers, researchers, public bodies, the

[162] Interview with "Dahl", 07.12.1999, p. 7.
[163] Interview with "Opdahl", 20.04.2001, p. 1.

building industry and the public. Out of an approximate budget of NOK 4,0 million, more than 85% is market based, with projects commissioned by public and private sector clients.[164]

According to the leader of NABU, ecology and sustainability are key concepts in today's society, and as a consequence the architecture is facing a new and necessary shift of paradigm or a different world picture. The ecological architecture has until now lacked the philosophical aspect that may place it in the history of architecture and one has claimed that the ecological architects literally have been too "down to earth". They have worked at the grassroots level with earth, water and energy, with the end-users, but they have not devoted enough of their time to providing a philosophy that could place their endeavours within the overall history of architecture. According to the eco-architects this is an explanation of why energy efficiency, and in general ecological architecture, has had little impact among the majority of architects.

According to the leader of NABU, "ecology is not a question of style, but an approach, where contents – in the processes, in the materials, in the life cycle of architecture from the cradle to the grave – is as important as shape." He refers to the book *Økologien tager form* [Shaping ecology] by Bech-Danielsen (1998), where the author states that while modernism developed a new design language, it did not rebel against the 'existing hostile to nature worldview' that has been prevailing since the renaissance. He thinks that today, ecology gives us a new paradigm without clear aesthetic guidelines, which he questions whether we need. The ecological paradigm places us in a concrete world where not only the shape of the intellect, but also life processes and time lapses count. Thus, architects have to learn to perceive and understand buildings in a different way.[165] As follows, he does not think ecology will result in one clear design direction or style, and describes this new understanding of the world as a hybrid. He declares that, "the architect's focus on design, technique and surface must be supplemented (and not replaced) with a new understanding of the ecological contents."[166]

Most ecologists claim that there is no such thing as an "ecological style". Ecological architecture is about the things that exist under the "skin" of a building, and is not only about the curves. Beauty of form and shape must be combined with what is environmentally reasonable, and the visual expression both will and must vary, and should not become too unambiguous. They regard the ecological architecture as having an

[164] Source: http: //nabu.no/english/english.htm
[165] Butters, C.: "Fra hageby til high tech?" *Arkitektnytt* 4/99, p. 20-21.
[166] Butters, C.: "Økologien tar form", *Arkitektnytt* 8/99, p. 12

unrestricted design. It can both be traditional and very modern. Some ecologists argue that ecology may in some cases lead to new and peculiar visual design expressions, for example when one bases the design on principles of natural ventilation or solar energy. Still, much of the ecology lies in hidden elements of the building – partly inside walls, in the running of the building, in the user-participation and the building process, and cannot be noticed at all on the surface of a building.[167]

The debate in Architect News gives the contours of a movement within the architect profession strongly committed to energy efficiency, sustainability and environmental sound building design. Even though the ecologically oriented actors claim sternly that there is no specific style linked to this kind of reasoning, the interviews nuance this picture a great deal. They reveal that among most architects there seem to be a conception that there exists two opposing poles within ecological architecture, both which are linked to a certain design and building image.

There seems to be several different schools or directions of what is called "ecological architecture". I will in the following paragraphs try to map out the predominant characteristics of the two most dominant schools, the low-tech and the high-tech approach to energy efficient and sustainable architecture.

6.2.1 Low-tech ecological buildings

One ecological school is the romantic, nostalgic and low-tech architectural trend that came from the US in the end of the 60's and beginning of the 70's as part of the hippie movement. In the beginning the trend was an ideological anti-technological revolt, which in due course were inspired by different kinds of movements, like Rudolph Steiner's anthroposophical design, traditional tribes and ecological farming. Within the architect profession the group has been seen as a "small congregation", a "cult" and an "out group" of architects that have eccentric features, are very idealistic and that see ecology almost as a way of life. In Denmark, England and Wales such ecological groups have created their own village communities that neither consume energy from the outside world, nor produce any waste. The vision of independent eco-communities is almost fully realised in alternative communities such as the Findhorn Community in Scotland and Arcosanti in Arizona. Such communities function almost like exhibit societies, as they arrange seminars and are open and including towards the outside world. For the people living in these communities ecology is almost a religion.[168]

---

[167] Butters, C. : "Økologien tar form", *Arkitektnytt* 8/1999, p. 12.
[168] Interview with "Winther and Davidsen", 28.03.2001, p. 3.

Many claim that this movement also brought with it a stylistic trend – a design influence that became an icon for a rather particular way of constructing buildings. The revolt had to be visible: "Many architects associate ecological approaches with working with primitive technological solutions, stamped soil solutions. Ecological anthroposophical architecture is an undercurrent, a particular architectonic trend with a kind of philosophical and aesthetic movement that has lived quite long as a mainstream within ecological architecture."[169]

The most important advocates for this school within ecological architecture in Norway, is probably the Gaia-group. The Gaia-group started as a critical group of architects at the Architect School in Oslo. The school provided a course in alternative ecology that a group of students found interesting, so they continued self-programming the study and became the Gaia-group. Thus, the foundation was there from the start.[170]

According to this group of architects the main functions of the building should be able to work without using a lot of technology. They believe that one should not get too dependent on technology, and pushing it to the extremes they feel that "technology will soon take our lives". They are not convinced that smart-technology and extreme high-tech solutions will reduce the energy consumption, as one uses a lot of energy producing these systems. They also have bad associations regarding the use of technology to save energy, stemming from the period where extremely compact houses were built (with lots of insulation), only turning out to use twice as much energy because the dwellers opened the windows.[171] "What we are doing today is extremely unhealthy, we are about to dirty our own life environment, and if we wish to do something else, we have to think more simply about things, and it does not have to be technically complicated. That is a dead end", according to one of the Gaia architects.[172]

Instead of thinking that new technological solutions will produce a more sustainable future, they advocate the use of creativity to develop simple, natural systems that are safe and self-functioning. Ecology is about looking at different cycles; the energy flows, material flows, waste flows, food flows, the flows of water and sewer, and to make them take place *locally* to avoid unnecessary import and export.

Many of the houses have the recycling done locally within the confines of the house. One of the Gaia-architects that I spoke to described a new ecological innovation to separate different types of water and sewage so that

[169] Interview with "Sand", 21.06.2001, p. 10.
[170] Interview with Gaia-informant 1, 07.12.1999, p. 16.
[171] Interview with Gaia-informant 1, 07.12.1999, p. 12.
[172] Interview with Gaia-informant 1, 07.12.1999, p. 12.

one may take care of the resources, like for example using urine for fertilising.[173] Thus, in these houses "pee, pooh and wind are recycled, then coming out of the kitchen tap in the forth round" as the manager of the Norwegian foundation for design, architecture and built environment puts it rather bluntly.[174]

The Gaia architects have a very comprehensive way of thinking about the environment in relation to building design. As an example, they point to the fact that if a household grew one fifth of the food it consumes, e.g. by cultivating a fruit garden and some vegetables, it may easily save the same amount of energy as a low energy house (10 000 kWh). Thus, they think that every house should have the possibility to have a garden in the nearby surroundings.

According to Gaia, ecological design defers from ordinary design in the way that the starting point is the *local conditions* of the site; the climate, the soil, the access of local materials, and that it employs these local conditions in order to orient and design the building. As a consequence, the architecture becomes extremely subjective and does not have a certain style, according to the advocates of this tradition of ecological architecture.[175] Nonetheless, the Gaia architect thinks it is a problem when building owners want them to include ecological aspects, but still want the buildings to look exactly like traditional, ordinary architecture.[176] Thus, even though the low-tech ecologists do not think that their architecture must have a certain style, they acknowledge that it sometimes (or often) look differently from ordinary buildings. This is produced by the fact that the conditions that are used as a base for the design are different. "To work in relation to ecological principles implies that things are done differently, and things become different. One uses other materials and there are some design criteria that become different," she says.[177] Thus, even though they dismiss that ecological architecture has a specific style, they acknowledge that it may look differently. She also admits that there is sometimes use of clichés, as acting in accordance with the climate and daylight gives certain different perspectives on the design.[178]

Even though the low-tech architects themselves seem to ignore that their architecture represents a certain style, ecological low-tech architecture does seem to have some common stylistic features in the eyes of other architects, although these characteristics may have become less prominent

[173] Interview with Gaia-informant 1, 07.12.1999 p. 11.
[174] Interview with manager, Norsk Form, 08.05.2001, p. 2.
[175] Interview with Gaia-informant 1, 07.12.1999, p. 9.
[176] Interview with Gaia-informant 1, 07.12.1999, p. 2.
[177] Interview with Gaia-informant 1, 07.12.1999, p. 4.
[178] Interview with Gaia-informant 1, 07.12.1999, p. 9.

during the last years. According to most architects, the low-tech ecological buildings had quite definite characteristics in the beginning. Many mention the Gaia-projects on Lista, characterised by "unplaned and cracked wooden materials", no mineral fibre insulation in walls, no plastic in the house, etc. Another architect says: "In the beginning there was buildings that were half dug down and round balls with a small surface and little loss of heat."[179]

Photo: Chris Butters.[180]

Low-tech ecological buildings have traditionally been built in a small scale, and have most typically been private homes initiated by eco-enthusiasts. Many characterise them as having a rather personal and homemade carpenter style. Some of the houses are built out of dirt- and straw-bail materials, whereas others are built of wood, others even have dirt floors. The roofs on these houses are often covered with turf or grass and are traditionally pointed. Flat roofs are rarely found, as flat roof design often entails employment of toxic substances. Many claim that the shape and expression of these houses resemble that of the traditional mountain cabins. The houses have also been characterised as "blubbery", "hairy", "dishevelled", "organic", "knitted" and having a "barefoot–out- in- the- woods-shape."

[179] Interview with "Opdahl", 20.04.2001, p. 2.

[180] Brekkestranda Hotel. Sognefjorden. Environmental features: Large degree of 'closeness to nature' in design and use of materials. Good construction economy. Arkitekt MNAL Bjørn Simonnæs. Source: Butters and Østmo (2000).

According to a practising architect belonging to the younger segment of the profession, these buildings often have the shape of barns and are designed to look like old farms, built with logs (this of course may be a result of the owner's wishes and not the architect's).[181] There are also some that associate low-tech, ecological architecture with organic shapes. That is, no right angels in the buildings - typical of "Rudolf Steiner design" (Browning 1998), walls that are canted in various interesting directions, round windows and a fairly simple palette of materials. In other words, a design that strives at copying the shapes that one finds in nature.

6.2.2 High-tech energy efficient buildings

The second form of ecological architecture is the low energy building oriented towards high-tech solutions. The starting point of the low energy building is that one must attach a lot of technology, like ventilation systems, solar collectors, or large storage tanks, to the building to reduce the energy consumption in the building.[182] Some of these energy efficient buildings are quite large, and differ from the low-tech ecological buildings as they are often built with well-known and modern building materials, like steal and glass.

As one of the lecturers mentioned in the previous chapter, high-tech ecological buildings in Norway are traditionally built as experiments - as the cutting edge of research and are consequently heavily influenced by engineers.[183] The architects in this group are seen to function more as engineers and technologists, than as architects, thus, architecture as built art is not very pronounced in this direction. It is also common that the technology in these buildings often heavily affects the expression of the building.[184]

[181] Interview with "Birkeland and Myrvang", 04.03.2001, p. 5.
[182] Interview with "Johnsen", 08.12.2001, p. 7
[183] Interview with "Smith", 26.06.2001.
[184] Interview with manager, Norsk Form, 08.05.2001, p. 1.

Photo: Finn Østmo[185]

The most prominent examples of these kinds of buildings are not found in Norway but in other European countries. This approach is perhaps best epitomised by the high-tech school, led by British architects such as Norman Foster, Richard Rogerts, Nicholas Grimshaw, and Michael Hopklins, and include the work of Italian architect Renzo Piano, Thomas Herzog in Germany, and the bioclimatic skyscrapers of Ken Yeang in Malaysia. One famous example is the Commerzbank headquarter in Frankfurt, designed by Foster and Partners.[186] The solutions that they use are often related to a whole range of technological innovations in building fabric and servicing systems, such as photovoltaics, translucent insulation, new types of glass and solar shading, intelligent facades, double-skin walls and roofs that store heat. Passive solar design and daylight, energy efficient lightning, the use of natural and mixed-mode ventilation, more efficient air conditioning and comfort cooling, combined with sophisticated energy management systems are all part of the high-tech approach. The language of the high-tech approach is susceptible to being tremendously quantitative. Achievement is articulated in the numerical reduction of building energy consumption, material-embodied energy, waste and resource-use reduction and in concepts such as life-cycle flexibility and cost-benefit analysis.[187] This extreme kind of high-tech building design has yet to see the light in Norway.

An interview with one of the architect professors that may be said to belong within the high-tech end of the spectrum supports the finding that most architects are indifferent towards energy efficient and sustainable building design. Further, he acknowledges that there exists a high-tech and a

[185] Indre Østfold Meierier, Mysen, Environmental features: Active and passive solar heating. Sun collecting shading devices etc. Architect: GASA AS, Source: Butters and Østmo (2000).

[186] Sir Norman Foster was rewarded the prestigious Pritzker prize in 1999 as number 22 (succeeding Renzo Piano and Sverre Fehn).

[187] These features are also revealed in Guy and Farmer (2001).

low-tech group of architects that are interested in these questions. The low-tech group is portrayed as a small group of fairly marginal "green" architects that are very interested in these matters, with a reputation of being constituted extremists, and "long-haired radicals out of touch with reality".[188] The professor perceives this group more as a barrier, than as a factor that facilitates the promotion of energy efficient design in the building project, as they are thought to be moralising too much, without showing how energy efficient techniques may be integrated into the architecture. Most architects are reluctant to listen to a group of people who profess that architects should save the planet. They rather want good practical examples on how it could be implemented into modern architecture with a nice visual expression. Thus, this stands in direct opposition to the opinion of NABU, that the lack of placing ecology as an overall ideology is a reason for the neglect by most architects. According to the architect professor architects lack practical examples and not ideological or moral speeches.

The architect professor belonging to the high-tech tradition naturally thinks that many of the high tech buildings that have been realised are elegant buildings. He particularly refers to a group of architects that he believes has had great international success and has taken on many and prestigious commissions, namely the Gasa architect firm. According to the professor, this group has high competence in energy-efficiency techniques and knowledge about how to integrate them into a modern, exiting and aesthetic building design. The success of this group of architects may however be contested in view of the overall architect profession, nor does it seem to have had an effect on the dominant architect discourse, as these issues are given little attention in the debates in Arkitektnytt and in Byggekunst, compared to traditional building projects.[189]

To sum up, different relevant social groups exist within the ecological architecture, each advocating different ways of designing ecological architecture, fighting over which solutions to chose, the opposite poles being high-tech and low-tech solutions. Most architects seem however to agree to that *either* direction is controversial.

6.3 Ecological architecture = controversial architecture

None of the ecological traditions fosters positive sentiments and incentives that make the ordinary architect want to follow their path. Energy economising is not seen as very interesting, neither from the high-tech nor the

[188] Interview with "Carlsson", 01.09.1999, p. 3.

[189] However, compared to other ecological projects, it seems like they have got a fair share of publicity. A project by Gasa, namely "Klosterenga ecological recidences" is presented in *Byggekunst* 6/1997, 36-43.

low-tech end of the spectrum by most architects. Most architects regard the already existing ecological architecture as uninteresting, dull and, as the director of NAL puts it, not very "sexy". Ecological architecture is for the majority of architects associated with wooden houses, green grass, soils, straw, and turfed roofs: thus, with old-fashioned ecological buildings. He further says that sustainability has been associated with an ideology for an architectonic expression and emphasises that "some ecologists have themselves described it as 'knitted houses', a gained naturalness identified with greenery, earth and straw, to push it to the extremes".[190]

As revealed in the previous chapter, both architects working as practising architects and architect lecturers cannot really see the reason why architects should be more interested in energy efficiency than anybody else, beyond common sense. There also seem to be a common understanding that environmental soundness should not automatically be seen as a criteria for good architecture, as "it is obvious that one may point to many examples of good architecture with lousy insulation and so on."[191]

The high-tech energy efficient architecture is picked up by a small group of architects particularly into technology and often working within research. The buildings are often regarded as being of low architectonic value and are thereby relatively uninteresting for the common architect, who thinks that many of these houses look fairly foolish, rough and dull. As one architect says, "To most architects it doesn't matter if one recycles and stores the heat, if the building doesn't look good."[192] When talking about energy efficiency solutions, and double glass-walls another architect claim; "there is nothing that can happen between to glass walls" as an argument against these type of highly technical solutions.[193] However, the foreign high-tech architecture appears to have a somewhat higher status among architects, as it has a building image that lies closer to a modernist one. None the less, this extreme high-tech architecture has had little real impact on the design choices of Norwegian architects, so far. The low-tech ecological architecture is mostly embraced by those who are already seduced by this way of thinking, and is seen to be of little relevant to the rest. In this way, none of these traditions seem to converge with what most architects think is good architecture; that is architecture which persist within a modernist design expression. They think that many poor buildings have been designed by ecological architects, and that ecological buildings are a result of mediocre architects trying to make a

[190] Ødegården, O: "Må gjøres fristende", *Arkitektnytt* 19/1998, p. 7.
[191] Interview with "Martinsen", 08.12.1999, p. 6.
[192] Interview with manager, Norsk Form, 08.05.2001, p. 1-2.
[193] Interview with Professor "Nordberg", 04.05.2001, p. 2.

great fuss about themselves and their buildings because they are ecological, and not because it is good architecture.[194]

6.4 Translating energy efficiency and sustainability in line with aesthetic criteria

Neither high-tech energy efficiency nor low-tech ecology produce architecture that most architects find appealing. People involved with this are not the trendsetters of the profession, and those who are trendsetters do not design particularly energy efficient and ecological buildings. It is therefore appropriate to conclude that the energy efficiency policy to a large degree has failed to be translated into something that interest most architects.

One reason for this is that traditional low-tech ecological architecture has an aesthetic expression that most architects do not like, as it goes against their preferred aesthetic expressions of modernism. In other words, it is often made fun of because it breaks with modernist design expressions. One example of this is roof design. The acute angels and pointed roof design of these houses are some of the features that make this architecture unfashionable, as flat or arched roofs is the trend in architect circles. Ecological architecture is also in some ways in conflict with modernism and open form, as ecological architecture often strives to divide the building into zones to prevent that the whole house has to hold 22° C.[195]

In an interview with one of the advocates for sustainable architecture, I asked whether he preferred high-tech or low-tech ecological architecture. He corrected me and said that there is no such distinction anymore, as ecology is not about shape. However, he continued saying that he had occasionally been very fond of modernistic houses, but he thought it was more correct to say that he preferred the more low-tech side. This way, while claiming that there is no such distinction, he makes a distinction between modernism and low-tech himself.

An interesting explanation for the difficulty in translating energy efficiency into something beautiful is the lack of *boundary objects* that may facilitate the translation. The most evident candidate for being a boundary object between energy economising policy and architecture is the concept of energy economising or energy efficiency itself. The concept of energy efficiency is a politically constructed artefact that has yet to enter the community of architects. As demonstrated in the previous chapter, the concept is almost absent in the overall architect discourse and it is not something most architects feel comfortable talking about or have a great

[194] Interview with "Sand", 21.06.2001, p. 12.
[195] Interview with leader, NABU, 08.05.2001, p. 3.

interest in. When asked about energy efficiency, the issue is mostly brushed aside as something that has to do with amendments of old houses, mainly by increasing the use of insulation and installing water saving equipment, and energy saving light bulbs and douches. It is not perceived as a common goal and does not have conventional accept among architects.

Architects also seem to reject the potential boundary objects that the engineers offer in form of new technologies, as they are very sceptical towards using technology as expressions of design. Whenever a new topic or a new set of problems is introduced to architects it is typical for them to focus on finding a design oriented architectonic answer to the problem. Finding a new architectonic answer to a problem, like for example environmental problems, implies looking for something that may symbolise the environmental aspects. Creating such symbols may create a greater consciousness of the green aspects in buildings, but it could also become so eccentric that it has no transmission value. According to an architect working within research, it is all right to create interesting single objects, but they should not be so strange and so special that they cannot be employed in most buildings. This is however, what seems to have happened to many ecological and energy efficient buildings. They have become sort of interesting, but "queer research."[196]

Consequently, dislike of ecological and environmental architecture may be explained by the extensive use of symbols, like solar panels on the roof, discharge water running through reed etc. and the extreme expressions that many of these buildings have. One example is a Swedish school that is a favoured reference project for some of the ecological architects. The school uses pellets for heating, which is considered to be suitable. Though, the construction of a pellet-tower is considered superfluous, as she bursts out: "But, as a symbol of how clever they are they have built a pellets tower!" This is according to this architect an example of appropriate technology being used as design criteria, and as trademark, which they consider themselves very critical towards.[197]

Another recurring example of energy efficient technology and ecological techniques used in order to symbolise environmental concern, is the Swedish Eco-schools. These schools are often used as examples of how ugly a building can get when one let the ventilation system become the governing design principle. The schools, around twenty in number, look almost exactly the same; they have about fifty chimneys on the roof and look

[196] Interview with "Opdahl" 20.04.2001 p. 8-9.
[197] Interview with Winther and Davidsen, 29.03.2001, p. 5.

like "extremely long barns". Consequently, the architects have been accused of not taking the challenge of designing them seriously.[198]

The building code is a boundary object that could link the two different communities of practise together in regards to designing energy efficient buildings. They are however not strict enough to be seen as a real incentive towards creating an energy efficient architecture, as building codes mainly encourage using old, well-known technologies and building techniques. Thus, the building codes do not function as boundary objects in creating energy efficient buildings.

In recent literature another concept relating to the boundary literature has developed, namely, the concept of "boundary organisations". Boundary organisations have three main characteristics. First, they exist on the frontier of two relatively different social worlds of politics and science, and have distinct lines of accountability. Second, they involve the participation of actors from both sides of the boundary, as well as professionals who serve as mediators. Third, they provide the opportunity and sometimes the incentives for the creation and use of boundary objects and standardised packages, which are common products used by actors on both sides of the border to meet their own purposes (Guston 1999, 2001).

A program within the building sector in Norway, named the EcoBuild Programme [Øko Bygg], has at least some common features with a boundary organisation. The EcoBuild Programme is a readjustment program for the building and property trade to get more environmentally effective buildings. The program is supposed to invest 350 mill NOK (half of it coming from the trade and half from the government) in the adjustment process over a five year period. One of the sponsors of the program is NVE (Norwegian Water Resources and Energy Directorate) and the Ministry of Petroleum and Energy. There are participants from both sides of the table; both people from NVE and the Ministry of Local Government and Regional Development, and from the different professions in the building trade, for example architects.

The program uses many different measures to make the trade more environmentally effective, their most important measure being to provide financing for projects that may contribute to this goal. They also arrange courses and seminars, some of which are based on the results coming from the various projects they have funded. They also produce guidebooks for different professions in the business. Some of the large actors, (as some of Norway's largest companies like Telenor and Statsbygg) do also take part. EcoBuild has been involved in creating kick-off meetings for these firms when great building projects are being initiated to help them get started with

[198] Interview with Winther and Davidsen, 29.03.2001, p. 2; Sundahl, 01.12.1999, p. 14.

the process of getting more environmentally sound buildings. The organisation also has several groups that work on issues of energy and environment, in relation to the building code, the laws and regulations.

Thus, the EcoBuild Programme has some of the features of a boundary organisation. It exists on the frontier between two relatively different social worlds of politics and practise, and involves participating actors from both sides of the boundary – both policy makers (government) and architects. The programme also provides the opportunity, and sometimes the incentives, for the creation and use of boundary objects. It is however, not the purpose of this chapter to do an extensive analysis of the EcoBuild programme in order to establish whether the organisation acts as a boundary organisation, or not. It is more important to emphasise that the organisation strives to do boundary work.

The abandonment of ecology, energy efficiency and sustainability by most of the architect profession indicates that the EcoBuild Programme so far has not been totally successful in fulfilling its goal and doing boundary work. One of the employees admits that it has been particularly difficult to reach the realm of architects, as one only get the message to those who are already interested. "We have worked on gathering the trade and the trade has gathered quite strongly. But it is extremely difficult to find measures that architects support and which make them include themselves. The architects feel most comfortable alone. (...) We have coaxed, wormed and threatened, and we have tried to make the architect profession to understand that they have to do something, but they obviously haven't understood it well enough."[199]

Other organisations doing boundary work are for example NABU (Norwegian Architects for a sustainable development). This organisation clearly does not meet the criteria of being a boundary organisation, as it only consist of one side of the boundary, i.e. the architect side, and a relatively small group within this profession as well. This means that its members are not seen as typical representatives of any of the groups on each side of the boundary, which may also be one of the reasons why NABU has not been more successful in doing boundary work.

According to the president, the National Association of Norwegian Architects (NAL) tries to emphasise that when there are problems related to environment, the competence in NABU should be used. However, he knows that this is not always the case. Sometimes work is done in relation to these issues without conferring with NABU. He himself uses NABU, as a kind of "resource bank" to acquire ideas and viewpoints that he needs when giving

[199] Interview with EcoBuild-informant 1, 01.06.01, p. 1.

talks etc. and NABU uses NAL to market their viewpoints because their convincing powers are better than the ones of those that are lower in the system. So, according to the NAL president there is a reciprocal action.[200]

In many ways NABU tries to bridge the gap between the policy goals and the architects, by trying to make the architects become more interested in ecology. One way of doing this is to convince architects that their old prejudices against ecological buildings no longer hold, as they emphasise that ecology and sustainability is not about shape, but contents. The leader of NABU says: "One tends to think about one style after the other through history, now there is modernism and we wonder what will be the next style because we think linearly. I think ecology belongs to another paradigm and that we therefore should ask a different question that is not about design, and primarily, not about shape at all, – but about contents. This is important. I think that architects should try to be a little less preoccupied with shape." This observation supports the assumption that the aesthetics, and modernism in particular, is the ruling constituent for the architect profession of today. However, this makes the strategy of encouraging architects to be less preoccupied with design an unpromising one, as this seems to be a trickier task than trying to translate ecological and energy efficient architecture into remarkable architecture aesthetically speaking.

As the recent literature on boundary organisations suggests, the different features of the boundary organisation facilitate co-operation and the creation of boundary objects across boundaries, such as the architect – policy boundary. Perhaps the creation of more established and powerful boundary organisations as well as more awareness from the government's side, concerning how to present energy economising to architects, is a way of creating boundary objects and thereby making the policy goal of an energy efficient building industry more attainable.

6.5 Conclusion

The analysis demonstrates that there are ecological alternatives to the mainstream design oriented tradition that exists within the profession today. This alternative group of ecological architects denies a concept of architectonic quality solely related to design. They claim that buildings should be something more than beautiful facades, and that a building that does not take into consideration aspects of ecology and the environment cannot be interesting as an architectonic object. These groups insist on including environmental aspects as criteria for architectonic quality and consequently think that one should interpret things as beautiful, *because* one

[200] Interview with president, NAL, 09.05.01, p. 4.

knows they are in harmony with ecological aspects.[201] In other words, they tend to equal "good architecture" with ecological architecture. Thus, this alternative group of architects may bee seen as the iconoclasts of architecture, as they are to a certain extent trying to destroy the icon of good aesthetics.

The analysis shows that two main opposing directions of sustainable architecture exist in Norway. The first is a low-tech movement dating back to the 60s often associated with the use of wooden materials, turf roofs and a style similar to traditional cabins. The other movement promotes high-tech energy efficient buildings that often have double glass facades or complicated ventilation systems, and where the technology traditionally is seen as more important than the shaping of the building. It is important to note that none of these traditions seem to have got their inspiration to perform sustainable architecture from the Norwegian policy related to environment and energy. Their inspiration rather seems to come from a general environmental awareness and commitment. "Green ideology" apparently is the prime motivating factor, especially concerning the low-tech architects.

Most architects consider none of these traditions very relevant or influential, and a holistic alternative to the mainstream architecture does not seem to have evolved, even though there are some positive trends concerning high-tech ecological architecture today. Most architects are quite sceptical towards designing buildings on the basis that they should be good for the environment. Traditionally they have associated ecological architecture with ugly and reactionary architecture, often manifested in wooden buildings with grass or turfed roofs. Thus, the low-tech architects have traditionally been quite successful in their struggle to define "what is sustainable architecture". However, this style, breaks with the modern architecture, which is favoured by the aesthetic tradition. Most architects seem to think that buildings that are built according to criteria of ecology and energy efficiency make a rupture with the modern building style. They associate ecological architecture with dull architecture – houses made of traditional building materials like timber, turf and grass. Some architects think that the use of active solar energy collector systems, photovoltaic cells, and systems based on wind energy causes aesthetic disadvantages. Thus, there is a situation of controversy with a view to translating energy efficiency into something beautiful.

The reason for this is probably related to the architects' definition of good architecture being strongly related to design and aesthetic criteria, and the inability of government policies to translate energy economising into something that converge with these criteria. Thus, the hypothesis that the government has not reached the architects with its energy economising policy

[201] Interview with leader, NABU, 08.05.01, p. 2

and that the policy has not been translated into important criteria of good architecture, seem to be confirmed. Further, no boundary objects that could facilitate such a translation seem to exist, and most architects dismiss the potential boundary objects that are presented to them in the form of new technologies, as they are sceptical towards using technology as design criteria.

The analysis also demonstrates that buildings are social constructions. Buildings are not only designed in different ways; they are also interpreted in different ways and are given different symbolic content, as there is no doubt that the low-tech and the high-tech buildings have different aesthetic expressions and different conceptions of sustainability. This supports the hypothesis that the building has different meanings to different groups, not only to different professions involved in the building project, but also to different traditions within the architect profession. There does not seem to be any winner among the different groups, as none of the arguments or strategies seems to convince the other part. This means that the controversy is not yet closed. The attention to energy efficiency must be understood in this context.

It is obvious that if the goal is to strengthen the attention to energy-efficiency among architects, these "ideal-types" or traditions should not be treated similarly. An information campaign could be useless because the eco-architect regards the campaign as superfluous, and the aesthetic architect as irrelevant. An alternative mixed strategy would be to help the ecological architect to get more commissions, as at the same time the aesthetic architect is challenged on alternative, visual expressions of shape.

From an architect's point of view, the question is how to make energy efficiency relevant. Totality must be a key concept, as thinking about issues related to the climate, situation and totality is a much more rewarding and natural strategy for architects, compared to thinking of different technological devices that traditionally belong to the engineer's domain. The underlying purpose of funding and supporting new energy efficient technologies is that these new technologies will defuse and be implemented by architects and other actors in the design process. However, as the analysis indicates this is not likely to happen automatically, as architects are not very interested in technology in itself. For architects to be interested, the technology has to be integrated in the building, dealing with the body of the building and inspire them in creating interesting shapes and designs. None the less, the employment of technology in order to create new shapes should not become too distinct, as this may create too exaggerated symbols and peculiar designs.

To focus on how energy efficient technology can be integrated into architecture, and thereby result in modern and exciting visual expressions, is

probably a rewarding path if one wants the architect profession to start designing more energy efficient buildings. The leader of the National Association of Norwegian Architects also points in this direction. He claims that one must use the language that the architects understand to make them start designing more energy efficient buildings. The work of architects consists of visualising what they see in their surroundings, what is being done by colleagues, and preferably those with "a name". He therefore asks for good presentations and visual expressions of ecological ideas, which may inspire and catch the interest of the architect.[202]

The energy efficient and sustainable architecture is overlooked in the dominant architect discourse and is rejected by most architects as quite uninteresting. Still, there seem to be some light at the end of the tunnel regarding the future. The work done by these out-groups should not be disregarded, as there seem to be a slow movement towards a larger consideration of environmental concerns in the building design process. The environmentally committed architects also feel this trend. As one of the Gaia-architects says, "Ten years ago we were looked upon as idiots that were completely far out, ... there are still many that think we are, but there are also many that are interested in what we are doing. We are wanted as consultants, and have more job offers than we can take on". During the last couple of years there have also been some efforts to integrate environmental criteria into large building projects. Even though the number of such projects is still limited, these efforts should not be overlooked.

In this chapter we have identified and explored two main routes towards sustainable architecture, the low-tech and the high-tech direction, none of which have proven very successful so far. None the less, there seem to be a third possible road; that is "the modified mainstream route" towards sustainable architecture. By modified mainstream I mean a road towards sustainable and energy efficient buildings that is developed within the dominant regime. This third route towards sustainable architecture is probably relevant in cases where architects within the dominant architect discourse are challenged on energy and environmental issues. Thus, when architects within the dominant discourse try to handle energy efficiency and sustainability without leaving the paradigm. In the next chapter I will analyse three projects with environmental ambitions, in light of these three possible approaches to sustainable and energy efficient architecture.

---

[202] Ødegården, O.: "– Må gjøres fristende", *Arkitektnytt* 19/1999, p. 7.

7.

THREE REALISATIONS OF SUSTAINABLE AND ENERGY EFFICIENT BUILDINGS

The previous three chapters have shown that energy efficient and sustainable architecture has an insignificant role in Norwegian architecture. Energy efficiency is not part of the dominant architect discourse, and energy efficiency and sustainability have a low status among Norwegian architects. In spite of this, lately some building projects have been realised that include energy efficiency and sustainability as part of the demanded solution. Several well-published building projects are presently [December 2002] on the verge of being realised; claiming to be designed motivated by energy efficiency and sustainable considerations. These projects are evidence that at least some policy instruments or institutional frameworks promote efforts to design energy efficient and sustainable buildings, even though they might seem both uncoordinated and occasional.

In this chapter I will study how three such projects are realised and how policy instruments affect them. I will describe the characteristics and distinguishing traits of these three building projects, while exploring the different general rules and regulations and different institutional frameworks that seem important for the outcome. Hopefully, by using this classic approach within political science for the study of implementation processes, I will be able to show what conditions and institutional frameworks that seem favourable to realising energy efficient and sustainable architecture. What instruments work as incentives to make architects design sustainable buildings? The analysis will draw upon some of the insights from the review of implementation theories in Chapter 1.

The previous chapter detected two approaches towards sustainable architecture, a high-tech and a low-tech approach, neither of which are very popular among most architects. However, as indicated in the conclusion, there seems also to be a third possible road towards sustainable and energy efficient architecture. This approach I have called "the modified mainstream route" towards sustainable architecture. By modified mainstream I mean a hybrid path towards sustainable and energy efficient buildings that is developed within the dominant regime of architecture. Thus, this third route towards sustainable architecture is probably relevant in cases where architects within the dominant architect discourse are challenged on energy and environmental issues, and when architects within the dominant discourse try

to handle energy efficiency and sustainability without leaving the paradigm. In this chapter I will analyse the three case projects, to see if and how the three possible approaches have affected the project. Are these three cases just small modifications of the dominant regime, or are they products of the low or high-tech discourse?

Summing up, I will follow two courses when analysing the three case projects in this chapter, one policy-implementation approach, where I study how environmental consciousness might be brought upon the architects from the outside, and one culturalistic approach where I study how architects operate in different mindsets. It is interesting to find out what features these projects have that make it seem feasible to realise energy efficient and sustainable architecture, despite the lack of support of the majority of the architect profession. It is also interesting to ask how the realisation of these buildings finds a way around the problem of aesthetics. By answering these questions we might get some clues to what make the realisation of energy efficient architecture more successful in the future.

In order to be able to answer these questions properly, it is necessary to follow the realisation of such projects in depth. One fruitful approach for gaining more knowledge about how energy efficiency is handled by architects and other relevant actors in practice is to explore how energy decisions are made in these building projects. As mentioned in the chapter on methodology and data material (Chapter 3), these three different building projects have been chosen as *case study objects* for this purpose.

The three building projects are Pilestredet Park, Kvernhuset Junior High and Telenor Fornebu. The first, Pilestredet Park, is a large residence project in Oslo, where the goal is to unite the best environmental solutions and appear as a leading example of sustainable city development.[203] Kvernhuset is a school project whose goal is that the new school building should minimise the use of energy, materials and economic resources during the building's life, and to the greatest possible extent use renewable resources. Its other goal is to make the building itself an educational instrument for sustainable development.[204] The third project, Telenor Fornebu, is the largest office building in Norway. Its goal is to be the leading workplace for innovative activity in Scandinavia with high ambitions concerning sustainable development.[205]

The projects were chosen due to their pronounced efforts to create energy efficient and environmentally sound buildings. Moreover, they

[203] http://www.statsbygg.no/prosjekter/pilestredet/
[204] "Skolen som pedagogisk tanke". *Byggaktuelt* 12. 1999.
[205] http://www.telenor.no/fornebu/fakta.shtml, http://www.telenor.no/fornebu/miljo.shtml

represent three different types of building projects, a school, an apartment building and an office building. Thus, the three cases were picked because they are supposed to fulfil different functions. They also differ in size and location, the Kvernhuset project being significantly smaller than the other two and situated outside of the Oslo region. The Kvernhuset project also differs from the other two, as it is a public project, while the other two are private sector initiatives. There are also differences regarding how profiled the architect in the different projects has been regarding issues of sustainability and energy efficiency.

7.1 The Kvernhuset project

Fredrikstad municipality is the owner of Kvernhuset Junior High and the user is Seiersten junior high school in Fredrikstad. The total floorage of the project is 8500 m^2. The school is dimensioned for 18 classes with a total of 540 pupils and 50 employees. The building started in Mai 2000 and is supposed to be finished in April/May 2002.[206] PirII architects in Trondheim and Duncan Lewis in Paris designed the project.

The vision of the municipality of Fredrikstad was to build Norway's most environmentally friendly school.[207] According to the leader of the building committee, the object was not to build a different school, but rather 'to do the right thing'. Fredrikstad municipality had two main goals. First, to build a school that minimises the consumption of energy, materials and economical resources during the lifetime of the building, and to use renewable resources as much as possible. Second, one wanted to build a school where the building itself was a learning tool for achieving sustainability.[208] Thus, the building owner aspired to manifest measures that contribute to a more sustainable building tradition, in a way so that the measures have a demonstration and teaching effect. The school was designed to make people more aware of ecology. The aim of the R&D project was to increase the competence on "green buildings", and to put the subject on the agenda for coming generations. The goal of the architect was to integrate buildings and surroundings into an architectonic unity in order to conserve the vegetation and terrain as much as possible.[209]

Kvernhuset Junior High School in Fredrikstad is part of the municipality's programme for Local Agenda 21. Already in the planning phase Fredrikstad municipality decided that they desired a school based on

---

[206] "Kværnhuset ungdomskole. Bygger skole i pakt med naturen", *Byggmesteren* 10/2000.
[207] "Kværnhuset ungdomskole. Bygger skole i pakt med naturen", *Byggmesteren* 10/2000.
[208] "En miljøbevisst skole", *Byggaktuelt* 12/1999: 12-14.
[209] "En miljøbevisst skole", *Byggaktuelt* 12/1999: 12-14.

the principle of sustainable development, in line with "the environmentally friendly city of Fredrikstad" project, as Fredrikstad was one of five cities in Norway given official status as an environmentally friendly city in 1994.[210] A study done almost 12 years ago showed that it would be more expensive to renovate the old school than to build a new one. The Labour party and the Left party therefore took the initiative to create a planning committee for elucidating the different opportunities that existed.[211] The planning committee decided that the school in itself should be a pedagogical tool for sustainable development. It was also decided to locate it in the woods, but still at the centre of the intake area of the school. The planning process took place with the co-operation of pupils, parents, teachers, the health service etc. who were all asked what they wanted from the school. The teachers also did a function analysis.

In order to produce a solid program that was to form the basis for the architect competition, a large project within Fredrikstad municipality with different municipal departments and local bureaucrats were organised. According to the leader of the building committee, this was important "to make them use the planning as a foundation" and from the point of "grounding the project properly".[212] Initially, the planning committee travelled to Sweden and Denmark to look at the kind of school they wanted without succeeding in finding one. They searched for a holistic project, but could only find bits and pieces. Consequently, they allowed themselves to fantasise a little bit before they decided what to choose.[213]

The municipality contacted The National Association of Norwegian Architects (NAL) to obtain help in finding reference projects in Scandinavia. However, as already mentioned, reference projects turned out to be hard to find, and NAL put the programming committee in touch with the association of Norwegian Architects for Sustainable Architecture (NABU). NABU assisted Fredrikstad municipality with developing a programme for a three-day workshop with invited architects and groups of users. The idea behind the workshop was to get a platform of ideas, on the basis of which they could program the school they wanted. The workshop was also meant to function as a pre-qualification for the architect firms that were interested in entering the

[210] "Kværnhuset ungdomskole. Bygger skole i pakt med naturen", *Byggmesteren* 10/2000.
[211] "Ungdomskole basert på miljø", *Gartneryrket* 7/2000. and "En miljøbevisst skole", *Byggaktuelt* 12/1999: 12-14.
[212] Interview with building owner, 29.06.2001, p. 2.
[213] "Ungdomskole basert på miljø", *Gartneryrket* 7/2000, and "En miljøbevisst skole", *Byggaktuelt* 12/1999: 12-14.

architect competition, and a chance for them to hear directly from the users what they wanted.[214] Many architects joined the workshop.

The first day of the workshop was a visit at the site where the school was to be built. The intention was to display the possibilities the site offered. At this point a climate analysis was conducted and the biological diversity of the site was mapped out. A historical profile of the area was also presented to the participants. The second day was "user day" where the users presented their wishes and demands related to the school, followed by teamwork sessions on the topic. The result from these two days were presented on day three, "the bureaucrat and technocrat day", where different solutions and opportunities concerning nature-based water purification, environmentally friendly ventilation systems and energy types, and reuse of materials as stone and wood were presented.[215] On the basis of the workshops and the prior work of the planning committee the school was programmed.

Within the building project there were a lot of requirements regarding the environment, covering everything from demanding a "Clean Building" process [Rent Bygg] to quite particular considerations within transportation, handling the building site, material data etc. The energy conservation strategies were:[216]

- The use of daylight to reduce the consumption of high-grade electric energy for artificial lighting. Separately operating zones for artificial lightening, and control by daylight sensors to contribute to energy efficiency.
- The use of natural driving forces, buoyancy and wind for ventilation, to have a minimum of fan power. Control of airflow, heat recovery, and low-emitting building materials to contribute to energy efficiency.
- The use of geothermal heat (heat pump)

There were also suggested different solutions for building materials, for example the use of transparent, environmentally friendly insulation in facades.

With all the preconditions in place the architect competition was announced. The response was overwhelming and six of the best propositions were bought so that the best from each of them could be used further in the project. After the first round, when the architects got the competition material, they were invited to a seminar in Fredrikstad, where among other things, the prime mover behind the new learning plan, Gudmund Hernes, talked about the plan. The learning plan was thought to be a vital aspect of

[214] Interview with building owner, K, 29.06.2001, p. 2.
[215] Interview with building owner, K, 29.06.2001, p. 2.
[216] http://www.sintef.no/units/civil/ark/ark/Norsk/Prosjekter/Kvernhuset.pdf

the project. Fredrikstad municipality presented some of the environmental work that was going on in the municipality and there was room for questions. People representing the municipality stressed that the environmental challenge that they gave the architects was to be taken seriously, as they experienced that "not all the firms believed them on this point".[217]

The jury consisted of a pupil, a teacher, the headmaster and architects appointed by NAL. Pedersen was the leader of the jury. The architect firms had different solutions to the problem. They differed quite a lot regarding floorage, and some were disappointingly area consuming.[218] Two of the projects were regarded as particularly fascinating. The project of Pir II architect firm in Trondheim together with Duncan Lewis Architects in Paris was announced as the winner of the competition, and was given responsibility to accomplish the project.[219] The jury was not unanimous. Some of the jury members wanted a project that the jury leader called "a Sigrid Undset"-building[220] with grass on the roof and such features. However, this building did not meet the expectations of the jury leader as he did not think that it took into consideration that a high school student is much more urban than a primary school pupil is. This project was also significantly bigger.

According to the jury leader, the Pir II project won due to its exciting solutions and careful planning. Compared to the other projects, it was area effective (14-15 000 m^2 less than a conventional school) and had good solutions for all essential aspects. The project was perceived as giving a better answer to the problem on all aspects, from area adjustments to reuse of materials.[221] The jury's assessment of the project was that "the architect tries to use the significant qualities of the site – the mountain, the forest, the light – within the concept of sustainable development".[222] According to the architects, the conservation of the site and the nature around it were important winning criteria as they used a small part of the site for the actual building. The project focused on the situation – letting the building act in accordance with the surroundings in a way that made the building and the surroundings

[217] Interview with building owner K, 29.06.2001, p. 3.
[218] Interview with building owner K, 29.06.2001, p. 3.
[219] "Ungdomskole basert på miljø", *Gartneryrket* 7/2000. and "En miljøbevisst skole", *Byggaktuelt* 12/1999: p. 12-14.
[220] Sigrid Undset (1882-1949) is a famous Norwegian author. Undset received the Prize in 1928, for her powerful description of life during the Middle Ages in Scandinavia. Her reputation has been mostly confined to the three volume series on "Kristin Lavransdatter".
[221] Interview with building owner, K, 29.06.2001, p. 3.
[222] "Pir II Arkitektkontor: Kvernhuset ungdomskole blir 'nyhetens hage'", *Byggeindustrien*, 14/1998, pp. 50.

grow together. There were also unconventional plans for co-use of areas in the building, so that one uses the same area for different functions.[223]

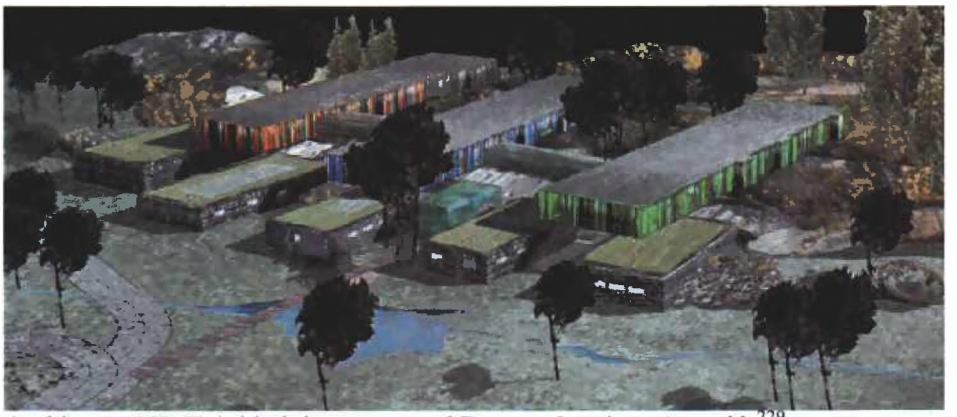
An R&D project supported by the EcoBuild Programme (a national action-oriented programme meant to improve the eco-efficiency by introducing profitable solutions, rules and support to the building and real estate industry),[224] was linked to the building process. The project was financially supported by the programme to cover additional expenses in the planning process, in order to be able to use the time and resources needed to investigate natural and hybrid ventilation solutions and to get an environmentally friendly building. The programme also financed SINTEF (The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology) and NBI (Norwegian Building Research Institute), with intentions to do a management of the experiences from the project and to gather these experiences in a report, which finally would be turned into a guidebook.[225]

The Kvernhuset project won EcoBuild's environment price in 2000. The motivation given by the jury was that "the project makes visible the synergies of a functional and good school and environmental concerns. The project visualises the significance of a cross-sectional planning and development process. The project has achieved significant environmental gains as reduced energy consumption, lower fan drag, energy flexible solutions, environmentally friendly materials, area flexibility, good accessibility for bicycles, the building is a pedagogical tool for learning about nature and environment protection, "grey" water purification and a root zone plant so that the school does not weigh down the public sewerage system."[226] The building project was only marginally more expensive than a conventional school building in the south eastern part of Norway.

The architects wanted to keep as much as possible of the existing site, thus the buildings should be blasted into the terrain, melting into the landscape, and placed carefully on top of it. The project aimed at showing the site and the building as a symbiosis or an architectonic unity, which makes the relationship between outside and inside important. The architect explained that one wanted to give the impression of "a journey from the halls of the troll to the sunlit treetops".[227] To meet the intentions, the different school buildings were given different colours to reflect the main theme of each building. The yellow compartment focuses on energy. The green one on

[223] Interview with architects K, 28.03.2001, p. 4.
[224] http://www.grip.no/Felles/English/ecobuildi.htm
[225] Interview with Ecobuild respondent 1, 01.06.2001, p. 2 and 7-8.
[226] Foil from "Økobygg – et program i GRIP".
[227] "Kvernhuset ungdomskole. Bygger skole i pakt med naturen", *Byggmesteren* 10/2000.

growth and reuse of materials, while in the blue one the circulation of water is in focus.[228]



Architects: PIR II Arkitektkontor as and Duncan Lewis et Associés[229]

The buildings are composed of simple rectangular volumes. This ensures rational constructions with extensive use of elements, which save time and money. Technical solutions integrated in the design contribute to energy saving and better indoor climate. The school has a thermal ventilation system based on underground culverts that minimises the need for air filters, heating and cooling. A heat pump covers as much as possible of the energy for cooling and heating. Daylight is let into the building by ceiling lights and transparent facades to increase the energy efficiency and give better work conditions. A treatment plant for discharge water takes care of the sewerage. The interior is filled with plants to purify the indoor air and regulate the moisture level.[230]

The project has attracted extensive attention and was one of the main attractions at the World Exposition of Architecture in Venice in 2001. The project has also been nominated to the prestigious "Mies van der Rohe" Award 2003, which rewards buildings that are innovative and with artistic added value. This is the most prestigious price given to a single building in Europe and attracts a lot of international attention. Hence, just to be nominated is spectacular.[231] The project has also attained a lot of publicity, in

[228] "En miljøbevisst skole", *Byggaktuelt* 12/1999: p. 12-14.
[229] http://skoleanlegg.ls.no/
[230] "Kværnhuset ungdomskole. Bygger skole i pakt med naturen", *Byggmesteren* 10/2000.
[231] The Prize was established in 1987, and has its name from the famous architects Mies van der Rohe, the last principal of the Bauhaus-school, and the man behind the slogan "Less is more" http://www.adressa.no/nyheter/article.jhtml?articleID=388478. October, 14.,2002.

Norwegian and international professional journals.[232] This is an interesting point, as the analysis of Norwegian architect journals in Chapter 5 indicates that sustainable and energy efficient architecture for the most part is overlooked in the journals. However, the impressive amount of presentations of the Kvernhuset project does not go against this finding. On the contrary, it supports the finding, as it is not necessary features like energy efficient solutions and sustainability that is referred to in these journals. Rather, presentations tend to focus primarily on how the architecture is adjusted to the site, as well as the shape and the functions of the project. For example, it is emphasised the way the building attempts to answer the question of how an artefact may be inscribed into a context that so far is almost untouched by man.[233] Further on, the articles stress the way the architects attempt to shake up a very old antinomy demonstrating above all that the abstract notions of artifice and nature are only constructions conditioning our way of looking and consequently our relationship with the surrounding world, by offering a very wide range of associations. Some of the journals are also preoccupied with the pedagogical aspects of the project, as well as the symbolic.

7.1.1 Experiences from the project and the energy decisions

The architects claim to have learned immensely from working with the project, as they had little competence on energy efficient and sustainable architecture before entering the competition, due to the limited number of such competitions. They also claim that working with the project for three years have contributed to changing some of their attitudes, and they feel that they have been pulled along and appreciate being "part of the family". The ecologically community is so small that they feel they know it entirely after a project like this one. They have used the Kvernhuset project to illustrate that it is not necessary to "write ecology on a building to demonstrate that it is ecological". Further, they are against the attempt to include everything that is ecological only to show off how clever they can be. For example, they were negative towards including a windmill in the project, as they thought it had no place in the project neither from a functional, nor from an aesthetic point of view. They did not want these kinds of "exclamation marks" and objects of display that represent a kind of "shopping philosophy", like "that's nice.

---

[232] see "Edififio escolar en Fredrikstad College in Fredrikstad", *a+t*, 15, pp. 72-79, 2000; "Une école en forêt, Fredrikstad, Norvège, Duncan Lewis, PirII Arkitektkontor AS", *L'architecture d'aujoud'hui* 324, Sept-Oct, pp. 40-45, 1999; "Duncan Lewis & ass + Pir II Arkitektkontor AS, Kvernhuset Ungdomskole. Fredrikstad", *mama* 25, pp. 26-31, 1999; "School in Fredrikstad van Pir II en Duncan Lewis", *de Architect*, Dec. 2000, p. 42-43.

[233] "Tout, dans cette architecture, se référe de differantes façons à une seule et même problématique: comment un artefact peut-il s'inscrire dans un contexte encore très peu touché par l'homme?", *L'architecture d'aujourd'hui* 324, sept-oct, 1999, p. 44.

I'll have that one". They refused using the technology as design, trademarks or symbols of ecology.[234] According to the architect, ecology implies that the solutions grow together.

The research groups have used the building project as a research object. When relevant for the project, they have tried to incorporate the research into the project, for example by improving the use of daylight, on the basis of the calculations they have done. The research projects have tried to take things a step further, documenting, controlling, following up the project so that no great mistakes are made ecologically. A specialist on natural ventilation from Sweden has also followed the project.[235] There have been attempts to create research projects on glass solutions and transparent materials in wall elements, but these projects did not get any funding. "Involvement in building projects, and specially those that get a certain publicity, which means that the message will be spread, is the most important thing a research institute can do to communicate the knowledge it possesses. Schools are particularly excellent in this matter, as they are buildings that get a lot of publicity and have many users." [236]

One of the researchers that has been involved in the research projects at Kvernhuset Junior High explains that they do not call these kind of projects for research projects, but rather "demonstration projects" as the they employ known technology and very little risk is involved. High-risk research projects are normally not tried out on a large scale. However, even low-risk technical solutions like the ones chosen in this project may be tricky to integrate into ordinary building projects. Getting funding for R&D projects and being supported by the EcoBuild Programme encourage big professional working environments where people co-operate, talk together and exchange experiences. This made the introduction go a lot easier, as everyone felt safer.[237] This understanding is shared by the leader of the building committee who emphasised the importance of R&D projects for the feeling of safety, as "security is important when trying to do pioneer work". [238]

However, parts of the research could have been taken even a few steps further, for example by building models to see daylight situations and conducting lab tests. This way one could have been more certain to find optimal solutions and it would have made the alternatives and possibilities more visible. All in all, the HVAC consultant thought that the research part of

[234] Interview with architects K, 28.03.2001, p. 5.
[235] Interview with architects K., 28.03.2001, p. 7.
[236] Interview with researcher, K., 20.04.2001, p. 7.
[237] Interview with researcher, K., 20.04.2001, p. 7.
[238] Interview with building owner, K., 29.06.2001, p. 6

the project could have been better integrated in the project if there had been more money and resources for doing such tasks.[239]

The participants seemed to think of the project as very promising. They felt the architects had done a nice job. There had also been a unique and tremendous interest from the people living in Fredrikstad.[240] The co-operation among the different professions was also reported to be first-class, and all parties have been genuinely interested in finding new, good and constructive solutions. The most enjoyable aspects of the process have been that everyone clearly is pulling in the same direction. There have been some small issues where one objectively has disagreed on the choices that have been made, but these issues have been solved there and then. [241]

Normally, it may be so difficult to implement certain measures that one gives up. An example is another school project that the HVAC consultant was involved in. The process was really tough with people constantly pointing out how difficult everything was. The project eventually ended up with conventional solutions, as the consultant did not have time for anything else, due to the struggle he had to face. Many similar stories illustrate that there have to be some enthusiasm and belief in the project if one is to avoid conventional solutions.[242] Thus, this project seems to have been characterised by co-operation and enthusiasm.

The Kvernhuset project "rises" above the building codes, often perceived as being too loose and out of touch with the latest technology.[243] New solutions were tried out in the project, which means that there were no correct answer and a constant discussion about finding practical solutions.[244]

The largest most important energy-related solution based on renewable energy in the building is the heat pump. The big discussion around heat pumps is often whether they make it acceptable to have higher energy consumption in total, compared to what one ideally would have, as the energy is cheaper. The Swedes have for a long time had the philosophy that if you get the heat from renewable natural sources, you may be allowed to use a bit more energy. There are some indications of this happening in this project as well. In Kvernhuset, the total energy consumption is quite large, whereas the purchased energy part is acceptable. Thus, the heat pump saves the project in many ways as it allows the use of much more glass than would otherwise be considered acceptable from an energy efficiency point of view.

---

[239] Interview with HVAC engineer, K., 05.06.2001, p 9.
[240] Interview with researcher, K., 20.04.2001, p. 5.
[241] Interview with building owner, K., 29.06.2001, p.4
[242] Interview with researcher, K., 20.04.2001, p. 6.
[243] Interview with architects, K., K., 28.03.2001, p. 8.
[244] Interview researcher, K., 20.04.2001, p. 4.

This contributes to a more spectacular daylight, which probably is positively connected to health and well-being. Consequently, there is an improvement potential connected to the use of glass, as it would be possible to use less energy.[245]

Further, the school has a special emphasis on *demonstrating* energy efficient and environmentally sound measures and wants to make visible the solutions that are chosen for the entire complex. However, some technologies and integrated building solutions are rejected because they are too expensive or that they do not fit into the surroundings.[246] One example is the solar collector solutions that were likely to be omitted, as they were not considered remunerative. The solar cell installation was likely to be realised. Whether there will be a windmill connected to the project had not been decided when the interview was conducted. If realised, it would not be to contribute to the energy production on a large scale, but rather to be a small demo installation showing the pupils what contribution a windmill might give.[247]

From the perspective of the HVAC consultant the challenge of the Kvernhuset project was mainly related to how one could integrate a hybrid ventilation system in a project that had already been given its form by the architects. As the building had concrete in lower ground floor and 'light' second floors, there were some difficulties in adapting the necessary culvert, inlets etc. From the HVAC engineers' point of view it would have been better to enter the project at an earlier stage, almost before "the first line was drawn", as he then would have had greater influence on the solutions. The goal of the project was totality, comprehensive solutions, and not to compensate with techniques, but to interact with the building to create the best possible indoor climate.[248]

According to the leader of the building committee, there are traditionally two distinct camps regarding ventilation solutions. A large camp with loyal "tin-followers", as he expressed it, that think that large ventilation aggregates are the best solutions, and a small camp of those that are willing to try other solutions. The HVAC consultant of the Kvernhuset project, was a part of the latter camp. Normally one seems to be very technically oriented in the proposed solutions, but it would perhaps be better if one did a utility evaluation more often.[249] There is also a discussion around heat recovery on the outgoing air, which according to one of the researchers probably should have been the chosen solution. According to the researcher, there has not

[245] Interview researcher, K., 20.04.2001, p. 4.
[246] Interview with researcher, K., 20.04.2001, p. 4.
[247] Interview with researcher,. 20.04.2001, p. 5.
[248] Interview with HVAC consultant, K., 05.06.2001, p.1
[249] Interview with building owner, K., 29.06.2001, p. 5.

been any controversial issues. Heat recovery has been "the hottest potato" in the project, as there is dissent regarding what is the correct method to use. The experts do not seem to agree on this issue. The HVAC consultant, supported by a Swedish HVAC consultant that has broad experience from this kind of solution, was the one who decided to exclude heat recovery. The basis for this was that the heating system is seasonally adjusted. It controls temperature, moisture and CO2 levels, so that when one lowers the airflow there will not be much heat to recover. However, others think that one should have larger air-volumes and pay more attention to the CO2 level. Discussions like this are typical in a commissioning phase, where different attitudes and theories thrive.[250]

7.1.2 Explaining "the success"

According to the leader of the building committee, a sine qua non for being able to take environmental issues into consideration, is to be creative, determined, curious and inquisitive. It is also important, at least when dealing with large buildings, to allow oneself time to set a few goals in the planning phase and to have high expectations. It is also important to be open in the beginning, to allow oneself enough time during the planning phase and to avoid answering the questions before one knows what they should be. This way the project will be an enjoyable and instructive process like the Kvernhuset project has been, containing so many elements that even if the school was not to be built, they would have learned a lot. The process was seen the most important factor for realising this project, as the process has been very broad, as well as deeply rooted. They have had clear wishes and have managed to "hold on to that."[251]

The leader of the building committee thinks one must have a vision in order to accomplish a project like Kvernhuset. His vision was inspired by the observation that most schools built in the same time period all over the world look almost the same. When questioning this phenomenon, he asked himself who are the ones that have been planning our schools and what have been the decisive factors when doing this? Suspecting that architects have been planning most schools, he then asked himself on what foundation they had been doing this; "Is it so that all these absolutes should be universal or are there other aspects that one should look deeper into?" Asking himself such questions, he found that it is important to be conscious about the school as an institution for *learning* and not for teaching, as well as a workplace for a lot of people. He said: "If one dares to think the thought and allow oneself to go

[250] Interview with researcher, K., 20.04.2001, p. 5.
[251] Interview with building owner, K., 29.06.2001, p. 5.

along on a little journey, one will think differently about alternative solutions as well. (...) One must have an ideology of what should be going on at a school, in the same way as one must have an idea of what one should include in a nursing home". [252]

However, he did not think of himself as a pioneer, and he is quick to dismiss that he is an environmental freak. Someone once asked him 'what gave him the salvation', but he insists on not having been 'saved'. His mission is to create a proper school building, where the answers are worked out gradually. He admits being seriously engaged in the project though, as everybody else involved. He feels they have attained something, creating responses on what they have been doing. The response is clearly illustrated by the tremendous international attention the project has got.

The fact that Fredrikstad was one of five 'environmental municipalities' in Norway had been imperative for the process, as the environment and sustainability have become natural parts of the way of thinking and making choices in the municipality. It is not at all that they have become hooked on the environmental platform, but rather that "the terminology has been a sphere that they have walked in for such a long time" – it has been internalised. However, the fact that the project has been hooked on to that platform has probably meant that the Kvernhuset project has got more attention from colleagues, in the politics etc., than it would otherwise have got.[253]

Planning a project like Kvernhuset Junior High is much more time consuming than an ordinary project, as there are many new aspects that have to be sorted out and many things that should be integrated into the building and the architecture; not only ordinary technology, but also building-integrated techniques like natural ventilation systems. Thus, for architects to design more energy-effective buildings like Kvernhuset, they are dependent on the fact that the building owner makes demands and is willing to go through with the process.[254] If the building owner is only lukewarm there will most likely be conventional solutions. Thus, it is very important that building owners have some eagerness if they want anything special, so that it becomes possible to fight the projects through in face of the approbation bodies.[255]

The importance of creative and innovative leaders for the realisation of energy efficient and sustainable buildings is also emphasised by the HVAC consultant. It is also important to go out and pick good professional co-workers and consultants to get the best possible results, and not only to look

[252] Interview with building owner, K., 29.06.2001, p. 6-7.
[253] Interview with building owner, K., 29.06.2001, p. 7.
[254] Interview with architects, K., 28.03.2001, p. 8-9.
[255] Interview with researcher, K., 20.04.2001, p. 6.

at the price. To get a step further, it is necessary to have "ardent souls" and someone that is willing to take a few chances.[256]

What has been fruitful in the process with Kvernhuset is that one has been able to see into each other's professional field, being flexible and generous when trying to find solutions. To be able to get optimal solutions one must not be afraid of rejecting a solution and starting over again.[257]

7.2 The Pilestredet Park project

Pilestredet Park (PP) has been marketed as a "green oasis in the centre of Oslo". The Directorate of Public Construction and Property (Statsbygg) and the municipality of Oslo have collaborated in guiding the development of Pilestredet Park. Pilestredet Park is envisioned as a project uniting the best environmental solutions and hereby forming a totality that promotes and stands out as a leading example of sustainable city development efforts. According to Statsbygg, it is probably the most exciting and innovative city development project in Norway, situated in the capital's most attractive residential area. From their point of view, this project is a way of seriously fashioning the future in the building industry. In the project, this is happening through the goal-oriented commitment to environment and health in the development.[258] The construction of the first building of the Pilestredet Park Project started in August 2001. The first apartments are supposed to be ready for moving in during 2002/2003, and the whole area will be completely developed within 2004/2005.[259]

The local council of Oslo approved the regulation plan for the area 19th of November 1997. The Directorate of Public Construction and Property took over the area in October 2000 after Rikshospitalet (the National Hospital) moved to Gaustad. Immediately after the take-over, extensive demolition work was initiated by Statsbygg and private developers. The development area, about 70 decares was to be rebuilt for the purpose of residences, a college, industry- and public utilities, including a national medical museum. Of the 110 000 square meters of existing buildings, 50 000 were to be demolished in an environmentally friendly way to give place to 75 000 m2 of new residences and apartments. All in all the regulation plan gives room for about 900 residences. The Olav Thon Gruppen, a large Norwegian property firm, bought the "Surgery block" in 1996, planning to turn it into 180 flats, as well as business areas and offices for the College of Oslo in the lower floors.

---

[256] Interview with HVAC consultant, K., 05.06.2001, p.1.
[257] Interview with HVAC consultant, K., 05.06.2001, p.4.
[258] Source: http//www.pilestredetpark.com/Pilestredet/Index.html
[259] Source: http://www.statsbygg.no/prosjekter/pilestredet/

Picture 2: Pilestredet Park [260]

In 1999, Selmer Bolig and OBOS Utviking AS, two large property development firms bought three of the areas within Pilestredet Park from Statsbygg, with the potential of building 400 residences. Together they formed a new firm, called Pilestredet Park Boligutbygging ANS, which handles the development of the project. Thus, Pilestredet Park Boligutbygging ANS, is the building owner, Statsbygg is contract partner and Selmer Bolig has the executive building owner function. Selmer Skanska is their contract partner.[261] In the sales contract there was a point named "Miljøoppfølgingsprogram for Pilestredet Park" (MOP), a programme for sustainable, environmental and energy efficient buildings that the buyers committed themselves to.[262]

The architect competition was an "offer competition" or pre-qualification, explicitly about offering competence, capacity and prices. It had nothing to do with design. The project management wanted to nominate architects, Lund and Slaatto. However, OBOS wanted to engage Lund and Slaatto together with another architect team. Thus, GASA, which originally

[260] http://pilestredetpark.no/miljo/default.asp
[261] Interview with architect, PP, 21.06.2001, p. 2.
[262] The contents of this program will be described in a following section.

was in a team with another architect office, was given the assignment together with Lund and Slaatto Architects AS.[263] Lund & Slaatto and GASA had equal responsibility for the architectural design and collaborated as a group for the contract. However, there was a certain division of labour when it came to responsibility for different parts of the project. For example, GASA has a distinct responsibility to overlook the environmental issues.[264]

The environmental management programme for Pilestredet Park (the "EMP") and the city-ecological programme called "Fra sykehus til sunne hus" are two pillars that are meant to ensure sustainable and ecological city development in Pilestredet Park. The programme is framed as a number of goals and intentions for development of Pilestredet Park as regards environmental aspects. It emphasises that there will be a special focus on developing the area as a valuable chain in the connected green structure that stretches from Tøyen culture park in the East to Slottsparken in the West. The regulation plan opens up the area against the surroundings and will be developed to minimise the need for private car use. According to the programmes, building according to environmentally sound principles will be based on:

- creating a good indoor climate
- protection against traffic noise
- focus on health under projecting
- having a "clean building" process and moist protection under the construction phase
- using building techniques and materials that minimise environmental strain and energy consumption
- documenting the properties of the material throughout the whole life cycle.

According to one of the brochures about the project, "the goal is to reduce the energy consumption by designing the building in an energy-conscious way, both in terms of architecture and building techniques, as to exploit the local solar and climate conditions. There will be limits on the energy consumption in the different buildings, both the new and the rehabilitated ones. Electricity will not be used for heating purposes. District heating will be employed in combination with solar energy and recycled energy, water saving fittings and low-energy lamps in fixed installations".[265]

These guidelines and goals are what Statsbygg and the municipality of Oslo envisioned for the whole area when the project was initiated. As it is

[263] Interview with the co-operative building association/development company, PP, 20.06.2001, p. 6.
[264] Interview with architect, PP, 21.06.2001, p. 1
[265] *Byøkologi i praksis*. Prosjektnytt. Brochure from Statsbygg. 3/1998/2000.

part of the sales contract, it is also valid for the residential project bought by Selmer Bolig and OBOS Utviking AS, which I am studying here. The EMP demands that the enterprise have an overall responsibility to introduce the environmental goals in building plans, architect competitions, when inviting tenders and entering into contracts. In the pre-project phase this responsibility is attended to by GASA. They have been assigned the role as environmental co-ordinators of the project, and they have developed a control plan for environmental issues that is supposed to attend to the environmental demands in the EMP. The control plan for the environment includes a simple form where all the demands in the EMP are stated, together with possible self-imposed demands that are defined through contract negotiations. Thus, all established environmental demands are included, as well as the research needed to elucidate the demands. There are also deadlines that mark which indicators are supposed to fulfil the different environmental tasks. There is also an imposition via the external contract with Statsbygg concerning external control of significant environmental goals. An external firm is engaged as third-party control of the following up. The report from this firm concludes that the management-plan is solid and that it incorporates the environmental demands of the EMP with offensive and ambitious acts to realise these goals.[266] In addition, there are status reports that account for the status of all the main points in the total plan.[267]

It has been a deliberate policy to integrate the environmental aspects as a core part of the project so that it will not be something that lives a life on its own from the rest of the project. Consequently, the project management has been involved in all the groups, like the environmental group. There has been a focus on quality assurance and to motivate all the links in the process so that the person at the end of the chain nailing bolts knows he is an important part of the process of constructing an environmentally sound building.[268]

In sum, the energy goals of this project are quite specifically stated. Annual energy consumption at the gross floor area that is heated should not exceed 100kWh per square meter. This amount equals the values of building code "NS3032 class 'low' for apartment buildings." Other goals stemming from a corrected buying-offer is the demand for energy flexible heating systems through connection to the district-heating network, and more effective energy use through IT systems, flexible heating systems, and alternative heating sources. In addition, there are demands of zone divisions of apartment solutions to attain good heating economy and heavy

[266] Document: "Pilestredet Park – revisjon av kontrollplan miljø – forprosjekt", Hjellnes COWI AS.
[267] Interview with architects, PP, 21.06.2001, p. 1-2.
[268] Interview with the co-operative building association/development company, PP, p.3.

constructions.[269] Except the specific energy requirement not to exceed 100kWh per square meter, there were few demands regarding what ventilation solutions or energy systems to choose. Some quite general possible measures that one could implement were mentioned. All in all, one was given quite free hands to consider different solutions.[270] The HVAC consultant planned a series of energy saving measures together with the architect. Measures with large effects have been prioritised. These measures are; to use windows with better thermal heat transfer coefficient (U-value) than normal, thicker insulation in walls and roof, "green" plantation roofs on 1/3rd of the roof area, stopping up details by windows and the passages wall/floor and wall/roof, energy efficient ventilation aggregates and energy saving lightning. Together, these measures will give an energy consumption of 99kWh/sm. a year.[271]

The sale of the apartments has already started. The residences are marketed as a "green island in the middle of the city", "city-apartments adjusted to today's wishes and simultaneously offering an opportunity to regard what the future expects concerning environmental responsibility, energy solutions and the use of private compared to other transport means". The emphasis is on the qualities of living in a car-free area with garages in the basement, bicycle-lots and access to public transportation, as well as the qualities of living in a park-like environment. Concerning the flats, they are marketed as having modern technological solutions, like balanced ventilation with cleaning of supply air and use of building materials that emit very little dust and gases. They are also marketed as having water-based floor heating, risers for central vacuum cleaning and control systems for heating. Further on, it is emphasised in the brochures that having an environmentally friendly residence with low energy use does not signify that you will have a complicated everyday life, as the solutions require minimal effort from the individual resident.[272]

Despite this, the environmental aspect is not considered commercially important. That Pilestredet Park is an environmentally sound project is not important for the buyer; it is not a marketing argument for the estate broker. According to the property developer, "it is more a bonus that you get with the bargain. The reasons why people want to move there is that they want to live centrally in Oslo, in a modern apartment".[273]

---

[269] Pilestredet Park Miljøoppfølging. Kontrollskjema. 06.06.2001.
[270] Interview with executing contractor, PP, 26.06.2001. p.4.
[271] Notat. Statusrapport. 01. MOP 3.2.3. Vedlegg 3.2.
[272] *Pilestredet Park. Smart og enkelt.* Brochure. Pilestredet Park Boligutbygging ANS/Varden Eiendomsmegling.
[273] Interview with co-operative building association/development company, PP, 20.06.2001, p.11.

The project has been supported with 3,8 million NOK from an integrated project of an EU research programme. The funding has been used for "considering different solutions, description and procurement of experiences from systematic and cross-disciplinary working methods, as well as for installing solutions that one would not have chosen if it had not been for the environmental demands. Some of the money is used for the control systems that are installed (...) and some will be used for control, measuring the effects of the systems after installing them to discover if the preconditions that we made are sustained."[274]

7.2.1 Energy decisions and solutions

GASA is regarded as an experienced and solid architect firm regarding environmental issues and energy consumption. Thus, the choices that they have made do not hamper optimal energy solutions, according to the HVAC consultant: "The walls are quite straight and there are not so many fancy solutions, the apartments are quite small, so they are very energy effective", he says.[275] One has for instance taken energy efficiency considerations when deciding on the room plan, assuring that there is as little facade as possible per apartment, and placing the bedrooms on the shadow side.[276] The bay window solution with lots of glass and woodwork that the architect insisted on for aesthetic reasons, is probably the least energy friendly feature of the building.[277]

According to the project manager, a remunerative way of saving energy has been used in this project. Stricter demands on energy consumption would have demanded more drastic measures, as many measures have a flattening effect (for example insulation).[278] One of the solutions the architects wanted, but which was rejected in the project, is solar-collectors on the roofs. The building owners considered it too expensive.[279]

Thus, the Pilestredet Park project is interesting compared to the Klosterenga project, which is an energy efficient building project designed by the same architects. The estimated total energy consumption is about the same in both projects (approx. 100 kWh/sm.), but the profile of the projects are completely different. Compared to Pilestredet Park, the Klosterenga project has more active architectonic measures, like a double glass facade, a water-based solar collector system on the roof with storage tanks with heat

[274] Interview with architect, PP, 21.06.2001, p. 9.
[275] Interview with HVAC consultant, PP, 21.06.2001, p.6-7.
[276] Interview with executing contractor, PP, 26.06.2001. p.3.
[277] Interview with executing contractor, PP, 26.06.2001. p.3.
[278] Interview with property developer, PP, 21.06.2001, p.6.
[279] Interview with HVAC consultant, PP, p.3; property developer, PP, p.4.

exchanger and a water-based floor heating system. Thus, as the architect points out in the interview, it will be interesting to witness if the kinds of measures used in Pilestredet Park have the same effect as those in the Klosterenga project.[280] If the Pilestredet Park project illustrates that it is in practise feasible to reach these energy goals without implementing extraordinary measures, it will be an important signal for the building industry, as this would mean that it is possible to tighten the energy demands in the building codes, without implying extra costs. Thus, even though the architect thinks it would be interesting to develop and try out new solutions he realises that this is not what the leader of this project wants, and hence, he must use other projects for that purpose.[281]

However, glass facades were dropped for a number of reasons according to OBOS. Firstly, one was very restricted by the volumes and building lines of the development plan, as double glass facades are quite space consuming. Secondly, it was thought to be expensive. Thirdly, it was considered a risk, as one thought there were few experiences with this kind of technology and that one wanted to see the experiences of the Klosterenga project before one considered using it in a large project like Pilestredet Park. Thus, pre-accepted solutions were mainly chosen as one did not want to experiment in such a large project with solutions that had not been sufficiently tried out and that was not yet fully accepted on professional grounds. Further, the property developers did not have experience with these kinds of technologies themselves, and claimed that the effects and characteristics had not been thoroughly documented.[282]

It has been said that if you have water-based floor heating you may reduce heating with one degree Celsius achieving the same level of comfort in a room. However, this has not been documented. In principle, the building owners were very positive towards water-based floor heating motivated by the visual aspects of it. None the less, it was excluded on basis of economy and the fact that the building owners previously had experienced that such systems were distrustful, with technological problems, and that they were unfamiliar to many Norwegian plumbing firms. Thus, they chose a well-known technology, radiators. Radiator installations are normally perceived negatively with "consequences that you don't want in a modern and high grade apartment".[283] However, in this project the architect and the engineers managed to integrate it in a way the building developers found acceptable.

---

[280] Interview with architect, PP, 21.06.2001, p. 9.
[281] Interview with architect, PP, 21.06.2001, p. 10.
[282] Interview with co-operative building association/development company, PP, 20.06.2001, p.8.
[283] Interview with co-operative building association/development company, PP, 20.06.2001, p.5-6.

There is a tendency to regard individualised ventilation as a superior goal, motivated by comfort and energy consumption as it is possible to save money if using little energy. Warm and cold water is measured collectively, while heating and electricity (that is only for lightening and the kitchen stove) is measured individually. So far the project has not included measures that involve the users and their attitudes, but this will be done at a later stage.[284]

The environmental management programme has facilitated some solutions that are good, energy-wise, and that would have difficulties being implemented if the process had been different. One example is the window areas and bow windows that have been reduced due to the wishes of the contractor. According to the contractor, it is impossible to persuade the architect to do this in a normal project. "Specifically when it comes to energy, we have normally no power to convince compared to the architect. The architect decides most of it", he says.[285] However, in this project the demands were very specific and concrete, and were laid down in the architect's contract as well, so that he had to think about it. Another solution in the Pilestredet Park project that is selected owing to the environmental management programme, is district heating. The building site was in an area regulated for district heating. However, normally one may be granted exemption from the requirements for district heating if one applies for it, which is quite common to do, as it is more expensive.[286] However, in this project it was not an option to seek exemption because of the ecological plans and requirements for the area.

Having to relate to an environmental management programme, and documenting and proving that one fulfils the demands, was something new to most actors in the Pilestredet Park project. The management plan on environment does not seem to reduce creativity. On the contrary, when the demands were established in practice, it was regarded to stimulate the imaginativeness with regard to developing new environmentally sound solutions. It was evaluated as something exciting, as solutions that normally are considered non-remunerative were made possible to realise.[287] Examples of such solutions are the ventilation aggregates with very good rate of recovery, and the high-quality windows that Selmer normally would not have chosen.[288] The building owner thinks that energy efficiency ideally should be enforced through the building codes and triggered by demand in the market. However, he thinks that having been a part of a project like the Pilestredet

[284] Interview with executing contractor, PP, 26.06.2001. p.3.
[285] Interview with executing contractor, PP, 26.06.2001. p.7
[286] Interview with executing contractor, PP, 26.06.2001. p.7
[287] Interview with architects, PP, 21.06.2001, p. 10.
[288] Interview with HVAC consultant, PP, 21.06.2001, p.4.

Park project will have a positive effect concerning energy efficiency as they have learned about matters that they will be considering using in future projects.[289] Thus, in sum, all actors seem to think of the participation in the Pilestredet Park project and having to relate to the environmental management programme as a positive experience.

7.3 The Telenor Fornebu project

Telenor's new headquarter at Fornebu is the largest single office complex by any company in Northern Europe. More than 7.000 Telenor employees will be concentrated at Fornebu, relocated from more than 35 offices throughout the greater Oslo area. In September 1999, approximately one year after the projecting began, the actual construction process started. This is an extremely short time frame for developing the 40.000 square meters of buildings and 40-50000 square meters of parking constructions. November 26, 2001 a total of 1.800 people from Telenor Business Solutions started to move into the new complex. The next 6.000 Telenor employees moved to Fornebu in quarterly intervals. A total of 7.500 people had Fornebu as their new workplace by fall 2002.

At Fornebu, Telenor aims to create "the foremost innovative and prosperous working environment in all of the Nordic countries."[290] The vision of being Scandinavia's foremost innovative and prosperous working environment was founded on the assumption that "success in the future will depend on creativity, imagination and innovation – especially in the development of new information and communication technology (ICT). The trend in the workplace of the future is therefore to establish arenas for communication and sharing of knowledge. The design of the workplace must enhance networks - not a hierarchy."[291] As the building will be the workplace of several thousand people working in an extremely dynamic industry, the building requires a great deal of flexibility on the one hand, while on the other hand providing a sense of belonging and a physical framework that respects each employee's individuality and integrity. The building was thought to be readily adaptable to changes in demand and framing conditions, yet enhancing the company's requirements for functional flexibility.

Telenor believed the building should provide the basis for its external profile, while at the same time function as a gathering point for the company and its employees. The company's new headquarters was meant to enhance Telenor's profile to the outside world and proclaim its identity, ambitions and

[289] Interview with property developer, PP, 21.06.2001, p.6.
[290] http://www.telenor.no/fornebu/english/about.shtml
[291] http://www.telenor.no/fornebu/english/about.shtml

self-understanding to its employees. The project was thought to have a functional, aesthetic and environmental profile that reflects Telenor's ambitious technological development based on people and nature's premises.[292]

In 1997 there was a pre-qualifying architect competition where Telenor invited interested architect teams internationally. The competition was based on a relatively extensive building programme that included a room programme that said something about the size and the visions of the project. The competition draft was handed in before Christmas 1997. Three juries evaluated the project, one evaluated the economical aspects, one evaluated the functionality and one evaluated the project as a working place. Among the seven sketches that were turned in, it was difficult to choose, but three were considered interesting according to the project manager of Telenor. These three projects participated in the second round of the competition. At this point the energy efficiency goals were still not put forward.[293]

HUS sivilarkitekter MNAL were pre-qualified together with NBBJ in Seattle. A team consisting of Per Knudsen Architect Office AS (PKA) and Oslo Arkitekter did not get pre-qualified for the job, but PKA were asked to join HUS to strengthen the Norwegian part of the team (consisting of only 15-20 architects compared to NBBJ's 800).[294] The Telenor Fornebu Project was initiated in spring 1998 with the announcement of the selected architectural concept. By the end of August 1998 the projecting group was established, the architect got their contract and started working on the regulation plans etc. from the 18th of May. The building programme, an up to date room programme, as well as the environmental management programme was later produced and functioned as a part of the terms for the projecting work. According to the projecting manager, Telenor had at this point not made any demands on energy use that went beyond the demands of the building code.[295]

Until autumn 1998, the project had one organisation, organised as a single group with solidary responsibility. The project was organised as a projecting team where the consultants and the architect made a group with one project leader as the connecting link to Telenor. Some months earlier, the Telenor Fornebu project changed management, and Bjørn Sund took over as the new leader of the project. According to his wishes, the organisational structure was dissolved and the contracting model was changed so that all technical professions were responsible towards one property developer. Thus,

---

[292] Arve Paulsen (ed.): "The Telenor Fornebu Project". Telenor. www. Telenor.no/fornebu

[293] Interview with project manager, building owner, TF, 22.05.2001. p. 1.

[294] Interview with architect, TF, 31.05.01.

[295] Interview with project manager, building owner, 22.05.2001. p. 2.

the contracts were renegotiated, the group was dissolved and the different actors were given individual contracts. HVAC and Electro were assigned to the property developer, Bravida. Thus, today Telenor has the responsibility for the cross-disciplinary projecting, operation and co-ordination, themselves.[296]

According to executive president Bjørn Sund, the new building boasts an extremely high architectural quality, as it embraces and preserves the unique qualities of the surroundings in an outstanding manner. According to the project manager, the second project had 'fingers - a double comb', while the Nils Torp project came across as 'any business park – separate buildings in a park'. The latter project had no connected buildings, which furnish a lower floorage. However, being forced to go outside in order to meet other people, was against the requests of the building owner. According to the project manager, the Telje, Torp, Aasen project was made of connected and dense buildings with a glass-roof, perhaps even more compact than the chosen project. However, the project manager assesses the project that won as a much more architecturally exiting and profiled project than the others, which were more conventionally designed. The project had a clear functional structure and in the competition the winners delivered an analysis of the programme intentions that was absolutely perfect. At first sight the jury was dumbfounded by the architectonic expression. It did not seem to fit what was described in the programme analysis, it was far too "flashy American" and the concept was difficult to understand, as well as it could not survive as it used far too much glass (50-60% of the facade). Thus, in the first round the group that judged the economy of the projects requested that it should be thrown away. However, one thought that the project took care of the ideas – it was less area consuming, it was "a suite in the park" in stead of a city-structure (...) and it had a strong functional character. It is probably the Norwegian part that had the strongest functional influence drawing upon the way one thinks when designing schools (common places, meeting places etc). Finally, the project was perceived as a building with a clear structure that they believed it was possible to realise.[297]

[296] Interview with HVAC consultant 1, 22.05.2001, p. 5, and 2 , 22.05.2001, p. 7, and project manager, TF, 22.05.2001. p. 9-10.
[297] Interview with project manager, building owner, TF, 22.05.2001. p. 5-6.

Picture 3: Telenor Fornebu.[298]

The company's ambition was that the facilities should "represent an architectural milestone at the start of a new millennium. The architecture is described as "dynamic and unique". Further, "Telenortorget – the Telenor Square – has been given a dynamic and unifying form, defined by the arched and inclined walls leading to the work areas and the atriums. Telenortorget was thought to provide Telenor with a strong, distinctive character both internally and in relation to its surroundings. The eight main entrances together with the two centres, the learning and the customer centre, was seen as welcoming the staff and visitors to a dynamic and progressive organisation."[299]

Telenor presents the building in the following way: "Seen from the outside, the facility appears as a partitioned structure, which in scale, and character adapts to the surroundings and opens to the sea and the spacious, green recreation areas in which the building is nestled. All the workplaces have been designed to give the most favourable light possible, allowing everyone working here to enjoy the fantastic panoramic view. The building

[298] Architect: HUS/Per Knutsen/NBBJ. Photo: Stein Arne Andreassen. Telenor Eiendom. http://www.telenor.no/fornebu/bilder/pressebilder/

[299] Interview with project manager, building owner, TF, 22.05.2001. p. 5-6.

structures, blocks with stone facing, and pavilions with glass facades complement each other and represent varying expressions depending on where in the landscape they are viewed from. Daylight and openness are the two most obvious features of the project with both the buildings and the organisation in mind, that will provide a sound basis for developing creative and innovative workplaces founded upon co-operation between the employees."[300] It is obvious that Telenor was not interested in creating an ordinary office building, but something quite spectacular.

According to Telenor, the construction is supposed to reflect the company's great ambitions to contribute to sustainable development, as it is based on a keen awareness of ecological challenges and will have a positive impact on the local environment. This philosophy is meant to underpin the overall planning of the area and the building's location and design. Telenor claims that the development of nature and the cultural landscape will always be kept in focus[301].

The project has prepared a special environmental management programme that has the declared aim of "ensuring that an understanding of its impact on nature, resources, the environment and society are systematically incorporated into each stage of planning, projecting, and development at Fornebu." This programme is based on a document called the General Environmental Program for Fornebu (GEP), produced by the City of Oslo and Statsbygg, to ensure that all planning and implementation efforts aim towards the establishment of a sustainable community. In the area of energy supply and consumption, the programme states three environmental goals: To adopt a sustainable energy supply and usage patterns, to create a flexible system allowing transformation to future energy sources and to prioritise the use of renewable energy sources. To challenge today's energy technology, a contest for energy solutions at Fornebu was arranged. Based on the winner's solution a combination of heat pumps that exploit the energy in seawater to create heat and district heating was chosen. The heat should be distributed in a flexible, water-based system that would also supply the district cooling system.[302]

Local planning authorities included the GEP in its latest master plan for Fornebu to ensure that the environmental objectives and measures are incorporated at an early stage of the project. There have also been established special environmental plans for infrastructure, soil handling and remediation. The landowners informed the new owners about the environmental

[300] Interview with project manager, building owner, TF, 22.05.2001. p. 5-6.
[301] Interview with project manager, building owner, TF, 22.05.2001. p. 5-6.
[302] Source: "From airport to sustainable community. Sustainable Fornebu." Edited by Beate H. Folkestad. Oslo: Statsbygg.

programme, and the new owners' responsibility for the programme through the sales contracts. Thus, all developers operating in the Fornebu area have been required to integrate the environmental programme in their planning and construction (including building plans, architectural design competitions, calls for tenders and contracts). This means that they have been obliged to develop their own environmental plans, including a set of objectives and measures that is supposed to contribute to the achievement of an environmentally sustainable Fornebu area.[303]

Based on the GEP, the ambitions of the Telenor environmental management programme was that:

- Environmental considerations shall underlie the choice of materials
- The current land-use shall be reduced by 40 percent
- More than 50 percent of energy consumption shall be derived from local renewable energy resources through the use of sea water
- In the operational stage 90 per cent and in the construction phase 70 percent of the waste shall be sorted at the source. In the construction phase the total amount of building waste shall not exceed 65 lbs. per sq. yard.
- All managers in the construction companies working for Telenor Eiendom Fornebu are required to take a course in health, environment and safety and the external environment.[304]

According to the environmental management programme on energy supply and ventilation, the environmental goal for the Telenor Fornebu project is that Telenor's area shall have a water-based energy system that is flexible regarding use of energy-sources that preferentially are renewable. The environmental management programme states that regarding energy sources the Municipal Partial Plan 1 suggests that the heating should be waterborne and produced by a district heating plant. Thus, a water-based central heating installation is viewed as the most relevant installation, as the decision to choose a renewable energy source is upheld in this way. This, decision also makes possible flexibility concerning energy carriers. The following renewable energy carriers are relevant according to the programme and will be the subject of evaluation:

- seawater based heat-pumps
- geothermal heating
- passive solar energy
- bio-energy in a larger district heating plant.

---

[303] Source: "From airport to sustainable community. Sustainable Fornebu." Edited by Beate H. Folkestad. Oslo: Statsbygg.

[304] "Telenors utbygging på Fornebu. Miljøoppfølgingsprogram".[The Environmental Management Programme] By E-B. Strøm (environmental consultant). Telenors Fornebuprosjekt. 09.09.1998.

Concerning energy quantities, the plan emphasise the importance of choosing technical solutions that make the running of the building as little energy consuming as possible, for example by using low energy products and energy efficiency measures. The relevant measures include establishing a system for energy planning and management. Further that the heating systems should be able to use low-temperatures for heating, preheating of ventilation air and production of hot tap water. There should also be a central control unit in each building, giving the possibility of zone divisions and utility controlling based on temperature. According to the programme, super-isolating windows will be evaluated. The buildings will have low effect requirements for lightning, electrical appliances and so on, time and utility control of lighting, photo-cells on outdoor lighting, and low-energy-lighting in office and common areas. A pertinent measure to reduce the energy consumption as regards traditional ventilation systems is utility-based control of ventilation in bigger rooms and offices, as well as regulating the number of revolutions in the ventilation system.

7.2.1 Energy decisions and solutions

One typical finding is that the architect interprets the concept of sustainability and energy in a rather broad sense. When asked about the different technological alternatives, and the foundation, on which decisions are being made in relation to the environmental management programme, the architect seems to emphasise the environmental experience of the user. For example, he wants to create good lighting conditions (daylight), and good contact with the outdoor conditions (nature). He says, "the building structure was chosen in relation to light conditions, the nature, and the building site, so in a way the concept of the environment was extended. But we were also very engaged in ensuring a simple infrastructure, which also considered an environmental factor, as well as ensuring that there is rational types of floor space".[305]

Despite of the environmental management programme, energy issues had no impact in the process of choosing the winning project, according to the project manager. The winning project was the one with the largest glazing areas, chosen on basis of other qualities. The project manager seems to think this is a fair assessment, as he personally thinks it would be a little bit absurd to put energy consumption as the top priority when building a 150.000 square meter office building meant to be a signal building of Telenor. He says, "to say that 'now I am going to draw a house with as little energy consumption as possible', I think is an impossible starting point. I think that you'll have to

[305] Interview with architect, TF, 31.05.2001. p. 5.

start with the other aspects that you want the project to fulfil, and weight these things up against each other, which we have been doing a lot."[306]

The winning project and the concept were chosen on the basis of the architect competition. Hence, even if one could have changed some of the elements regarding energy consumption in the building, there was no point to say that one wanted something that looked completely different, as this was too late, according to the project manager.[307] He explains: "the building owner decides the [energy solutions], but at the same time we have chosen a project and a team of architects with an architectonic idea. Thus, it makes no sense to say that we want something completely different. We have not only chosen the architects for making plans; we have chosen their project. And only two weeks after they got assigned for the project, we regulated the project, so already at this point it was too late in many areas."[308] Thus, many alternatives are ruled out as the project was chosen early on, without having implemented the environmental aspects. This illustrates that, if one wants to build energy efficient and sustainable buildings, these considerations should be implemented from the start of the project. However, after the main decisions were made, there were still some things you could do to make the building as energy-optimal as possible, according to the project manager.[309] He says that there is no doubt that one could have chosen other solutions that would lower the energy consumption of the building significantly more, if the goal solely had been to reduce energy consumption. However, this was not the situation, according to the HVAC consultant, as there were also important demands related to the aesthetics elements of the building, as well as user requirements. "When one builds a new head office for Telenor it is important that it signals something related to appearance, facades etc. and not that it always has to be perfect, energy-wise."[310] Thus, functional and aesthetic considerations were considered more significant than the environmental ones.

The environmental management programme seems to have governed the energy decisions to a small extent. Other factors have been much more influential, as for the example economic limitations. The project leader revealed that this was his first experience of working with declared environmental goals, and that he in the beginning had great expectations that this would help them make good choices. He expected to be somewhat guided by environmental considerations in the choice of building materials and substructure system, but was disappointed as the environmental demands

[306] Interview with project manager, building owner, TF, 22.05.2001. p. 14.
[307] Interview with project manager, building owner, TF, 22.05.2001. p. 9.
[308] Interview with project manager, building owner, TF, 22.05.2001. p. 15.
[309] Interview with project manager, building owner, TF, 22.05.2001. p. 4.
[310] Interview with HVAC consultant 1, 22.05.2002, p. 7.

turned out not to be of any help. It seemed impossible to find consistent information or experiences that summoned the environmental gains or disadvantages from building the house of precast plastic constructions or concrete units, much or little steel, etc.[311]

One of the classic discussions between architects and building owners is about glazing and window areas. This was also one of the main controversies in the Telenor Fornebu project. The architect originally drew the glazing in the pavilions from the ceiling to the floor. By using a energy effective system of double glazing, it was easier to defend this extensive use of glass. It was the same kind of thinking as used in some tall buildings in Germany with double skin and buoyancy systems. According to the architect, this was a major discussion, where Telenor took a stand according to environmental friendliness, while the architect expanded the environment concept and also included the view, the contact with nature and the lighting conditions. However, the result was a demand for an 80cm high window wall everywhere in the building, except for a few meeting rooms. Thus, the building owner wanted to reduce the glass area from an energy point of view, against the will of the architect that considered other aspects as more important.[312] The architect's preference for glass on places where the building owner did not want it, like on the gables, is also mentioned by Telenor's project manager as one of the controversies.[313] He says, "the project could have been less energy consuming if we had chosen to use less glass, but this would probably have had consequences for the working environment, so it is very complex." "There have been discussions about glass and window sizes, with a contradictory relationship between view and daylight, and cooling and coldness. The architect wants much glass and the building owner wants little, however, in this case the board suddenly said that 'no we do not want so small windows".[314]

The electrical consultant engineer and the person representing the property developer do not include the architect to a large degree when asked about energy decisions and alternative solutions. The property developer claims that architects may generally be difficult to work with, because they are more artistic. However, he thinks that they should be engaged in the aesthetic aspects. He claims to have little knowledge of their relationship with energy efficiency, and leaves it to the consultant electrical engineer to answer this question as he has more experience working with them. The consultant

[311] Interview with project manager, building owner, TF, 22.05.2001. p. 4.
[312] Interview with architect, TF, 31.05.2001. p. 8.
[313] Interview with project manager, building owner, TF, 22.05.2001. p. 7.
[314] Interview with project manager, building owner, TF, 22.05.2001. p. 17.

engineer replies, "I have never experienced anything particular, neither reluctance towards, nor comprehension for the subject".[315]

Another controversy relates to shading devices. Exterior shading of the facade was on of the requests in the building programme. However, this was met with great reluctance by the architect team, based on visual and aesthetic considerations. Consequently, one decided to modify the demands and seek other solutions in common areas and atriums that are not as austere regarding climatic demands.[316]

The feature that Telenor regards "as the perhaps strongest environmental goal, that is not really an environmental goal", is the ambitious goal of an average floorage utilisation of approximately 22 m^2 per employee, which is very low. However, the project manager claims that "this was decided after it was said how large the project would be, so that it fits perfectly". (...) "It was not the EMP, or energy concerns that produced this outcome. The rather ambitious floor space goal is still perhaps the strongest measure concerning energy". (...) "It is an interesting discussion whether this is a compact or disintegrated building, it is not easy to tell – the need for daylight and glass increases as a consequence, because people want daylight, but this goes the other way, as you then increase the energy consumption. No attempt is done to optimise this approach to the problem and the project proposals that one received in the Telenor Fornebu contest were totally different on this point.

Summing up, in relation to the environmental plan, the project leader says: "I am not sure how sophisticated this building is as regards the environment. I think we probably want to say that it is quite advanced, because we have tried to document much of the things we have done, and that we actually have an environmental management plan. However, we manage to reach the goals that we have set out, and then you may say that we ought to have been more ambitious. For example, we had a lot of discussions as to whether we should forbid materials that had certain characteristics, but we didn't dare to do it because we do not know the consequences. Maybe we wouldn't get it all together (...) sometimes we make decisions that from an environmental point of view are not ideal, so we did not dare to.[317] He continues, "I am reluctant to say that is a low-energy building. (...) It is a smart building, as everything is being controlled. More than half of the energy consumption is based on renewable energy, which is good, but I am not able to say here and now whether our energy budget is large or small. We

[315] Interview with project manager – el, property developers and consultant engineer el, TF, 23.05.2001, p. 13.
[316] Interview with HVAC consultant 1, TF, 22.05.2002, p. 8.
[317] Interview with project manager, building owner, TF, 22.05.2001. p. 14-15.

have difficulties keeping up with the energy limits. We are within the limits of the building codes, but not by a large margin."[318]

Conclusively, the project leader says, "I have tried to think of most things. You have asked whether this is a project with high energy or energy efficiency profile, but it is not. I am wondering whether I should say that it is, but I am not sure. We have done some quite central decisions from an energy point of view, where one of the strongest is to avoid high emission values. It has had some economic consequences. But it has not been easy to go through with. (...) When I say the most important decision was the floorage, it was not driven by a discussion about energy consumption. The building costs drove that discussion, and you get the energy consumption as a supplement, but it has not been documented that this building has a very high or especially low energy consumption as regards the amount of glass. That is what I am wondering the most about".[319] According to the project manager, the architect has not produced any proposals for solutions that could have been implemented to get lower energy consumption, as this is not really their focus.[320] Thus, the architect involvement in the energy decisions does not seem to have been substantial.

The architect explains that during the first phase of the project, while the architects were working with NBBJ, energy consumption was not discussed: "At this point we thought of having as much glass and light as possible etc. to find the idea and the grip of the design. Design is not primarily energy design. It is associated with the site and the programme. The environmental part was a part of the programme, and the compact situation was the answer to that. When we had decided the main concept, we worked further with the different aspects. In the competition we worked on different energy solutions. We discussed whether to use modern ventilation systems in the pavilions with energy from the air or the sun, as separate energy units, or whether to use natural ventilation systems that were attached to the atrium. In the competition, we had developed parts of this, quite applicable as a matter of fact, but Telenor chose not to emphasise those things, (...) because they did not want to experiment in such a large scale. Actually it was based on things that had already been done and projects that already had been conducted, but we could not demonstrate that it was possible to save money this way and that it would have had operational advantages etc., anyhow not on that scale. (...) In this situation they were interested in safety and not doing anything that they were not sure of."[321]

---

[318] Interview with project manager, building owner, TF, 22.05.2001. p. 14-15.
[319] Interview with project manager, building owner, TF, 22.05.2001. p. 17.
[320] Interview with project manager, building owner, TF, 22.05.2001. p. 17.
[321] Interview with architect, TF, 31.05.2001. p. 3.

The architect also reveals that solar panels were a part of their concept, but Telenor was not interested in using this technology. Thus, the architect did not find them particularly interested in alternative energy solutions. They were interested in the design, heat/cooling from the sea and otherwise in not taking chances, not experimenting. They were relatively conservative in that area. Pre-accepted solutions were the keyword, and non-risk concerns, and the speed, to which the project had to be accomplished, primarily motivated decisions. Thus, the project was not suited for experimenting.[322]

According to the consultant engineer, Telenor thinks they fulfilled their visions regarding environmental friendliness by installing the heat pump. In this project they focus on other things than environmental aspects, and he was not sure how much they thought about the environment when considering other solutions.[323]

7.4 Favourable conditions for realising sustainable architecture

Both in the case of Kvernhuset and Pilestredet Park, some top-down variables seem to contribute to the implementation of environmental considerations. In the Kvernhuset project these were mainly tied to the design process and commitment of the actors. In the Pilestredet Park project these were tied to contract- and control-oriented instruments. Thus, drawing upon Mazmanian and Sabatier's (1983) contribution to implementation studies it is evident that their "minimum list" of factors that ought to facilitate implementation has some relevance concerning the realisation of environmental consciousness in the three cases.

- Clear and consistent goals

Clear and consistent goals seem like being one of the factors that may explain the success of the Pilestredet Park project. Lack of such goals may also be the reason why the Telenor project did not manage to take more environmentally sound decisions.

- Judicial incentives

The environmental management programme of Pilestredet Park (EMP) may indeed be regarded as a judicial incentive, which probably contributed to making decisions on the basis of energy efficiency and sustainability easier. The competition itself may also be seen as a judicial incentive promoting energy efficiency in buildings. However, it is only when environmental criteria are given real value and are used as a basis for deciding among different concepts and projects that competitions can be a tool for promoting energy efficiency. As we saw in Chapter 5, a few competitions in Norway

[322] Interview with architect, TF, 31.05.2001. p. 3.
[323] Interview with HVAC consultant 2, 22.05.2002, p. 6.

have integrated environmental criteria, without giving these criteria poignant force compared to other criteria.

- Committed and competent "implementers", that employ their inevitable judgement in favour of the intentions of the measure

The Kvernhuset project is a particularly good example of how important it is to have actors that are dedicated and who support the intentions of the measures. In the Kvernhuset project there seemed to be devoted and competent implementers on all levels of the process, from building owner to architects and from consultant engineers to researchers. The participants also claim that it felt good to be a part of a process where everyone pulled in the same direction. This does not seem to have been the case in the Telenor project, whereas the Pilestredet Park project probably finds itself on the middle of this criteria, as most people were committed once they understood that there was no other way out than the environmental demands.

- Support for the measure from organised interest groups and affected parts of public authorities

Both, the Kvernhuset project and the Pilestredet Park project had quite strong support from organised interest groups or parts of public authorities. For example, the Pilestredet Park project would probably not have been realised with such a strong environmental profile without the guidelines from Statsbygg. The Kvernhuset project was backed up by the EcoBuild Programme (indirectly by research), and also had strong support in the public.

- Stable socio-economic and political conditions that do not undermine the original political support of the measure (Mazmanian and Sabatier 1983, Sabatier 1986).

The points of Mazmanian and Sabatier (1983, Sabatier 1986) fit into the conventional top-down approach to policy implementation, in which policy is implemented on the basis of a law or some other kind of authoritative resolution. Stable structures and formal authority relations form the organisational frame, and the main steering mechanisms are control and direct influence on subordinate units. Although some of the insight from this perspective seems fruitful for understanding relevant institutional elements and frameworks in favour of implementing energy efficiency and sustainability, it is important to notice that the instruments we are talking about here, operate almost at the bottom of the system. Instruments that are used in relation to these projects are; funding by the Ecobuild Programme, architect competitions that integrate energy and environmental criteria, guidelines from Statsbygg (which was the prime motor initiating the Pilestredet Park competition and creating the city ecological programme for

Pilestredet Park), inspiration from working with LA21 issues (important for the municipality of Fredrikstad), advice, and workshops organised in collaboration with NABU. This shows that there exist quite a few measures that are possible to use at the bottom level, but these instruments do not seem to be very co-ordinated and it is questionable whether they are initiated from the top.

The analysis of the realisations of these three building projects illustrates that the future is not as gloomy as one should think on the basis of the overall architect discourse. Some actors within the building trade take the challenge of building sustainable and energy efficient buildings seriously when the conditions are right. As I am writing this, a number of environmentally friendly and energy efficient buildings are being constructed. The realisations of the building projects discussed above may give some insight into the possibilities and the pitfalls that one meets when trying to construct energy efficient and sustainable buildings from above.

In the following sections I will try to sum up some of the features that seem to be helpful for being able to realise sustainable and energy efficient buildings in the future. In other words, I will sum up some of the elements in relation to the programme and the institutional frames that seem to influence the implementation. These elements are; the importance of having a building owner with a powerful set of visions, an environmental management programme with specific energy demands, an open and interdisciplinary process with a generous time frame and, the importance of including different R&D projects.

First and foremost, the realisation of these three projects show the importance of having a building owner with a powerful set of visions. This seems to be best illustrated in the case of the Kvernhuset project where the building owner obviously has put a great deal of thought into reflecting on what he wanted from the project. There also seems to be a positive effect of having a rather open approach to the building project in the beginning, ensuring that one does not rule out any solutions. This is also central for producing visions. However, to be able to realise the project, visions must be translated into clear goals and demands. In the Telenor project and the Pilestredet Park project this has been done in terms of environmental management programmes.

Having an environmental management programme seems to be crucial for reaching environmental goals, best illustrated by the Pilestredet Park project. The EMP seems to be particularly crucial when the building owners are not seriously committed and motivated by issues of energy and environmental themselves, and have been pushed into taking such

considerations by regulations. It is also an advantage that the EMP lies at the basis of the sales contract, particularly when public property is sold to private developers. It also seems to be crucial that the requirements of the EMP are clear and to the point. The demands should be non-negotiable like in the case of Pilestredet Park, where the building owner unsuccessfully tried to negotiate the requirements when purchasing the property. If the EMP is to work effectively, it is important that the EMP lay as a premise from the start, even before a potential architect competition is held. It is also crucial that the EMP is followed up properly, as has been done in the Pilestredet Park project, and that the control procedures of the programme are grounded all the way to those doing the actual construction. It also seems to be an advantage if an independent actor controls the process and is able to certify that the control routines are fairly implemented so that the programme's requirements are carried out properly, like in the Pilestredet Park case.

Having an environmental management programme also makes it easier to realise new solutions, as architects and consultant engineers feel that it is easier to be heard regarding solutions that otherwise would not have been accepted for economic reasons, or that one otherwise would not have had time to elucidate.

The planning process seems to be one of the crucial points for successfully realising a sustainable and energy efficient building. The planning process should be broad and open-minded, as it is important to enrol as many actors as possible at this stage in order to make a solid foundation for the project. This also benefits the fabrication of new ideas. It is very important to allow some time in the planning phase for developing new ideas and trying to come up with new perspectives, as well as having the time to reflect upon what one actually wants from the building. The sooner the collaboration between architects, consultants and users can start, the smoother the process will go, and the better chances for integrating different technical solutions into the building design will be. Ideally, the HVAC consultant takes part in the planning process before the architect draws the first line. Choosing the project before including the energy efficiency aspects and involving other actors seems to be a pitfall, as this may block many alternatives.

It is also important to enrol actors, like architects and consultant engineers, that take the challenge of realising sustainable and energy efficient buildings seriously, and who do not view this as some kind of superficial gimmick. It is obvious that to be able to do this, you need equally committed building owners. This is probably one of the greatest advantages of the Kvernhuset Junior High project. The Kvernhuset project displays a series of

measures that are possible to include in order to ensuring that those participating in the project are committed to the idea of creating environmentally sound architecture. Examples of such measures are organising workshops (which also contribute to the development of new ideas and dispersal of knowledge), seminars, and inviting actors that are known to be committed to these kind of ideas, like the HVAC consultant in the Kvernhuset project. Partly due to the thorough planning process and the deep commitment of the actors, this project appears to be able to successfully realise energy efficiency and environmentally friendly building without the use of an EMP.

An insight from the Pilestredet Park project is that there may be no need to integrate a lot of new technological solutions to get a sustainable and energy efficient building in the future. If the project is properly thought through from the start, it is probably sufficient to use conventional solutions in order to realise such a building. Thus, if this project proves successful energywise, this may be an argument to make the building codes stricter than they are today, as this project manages to consume one third less than an ordinary building without implementing so-called extreme measures and increasing costs.

To include a few R&D projects seems like a great advantage when realising sustainable and energy efficient buildings. It does not only to increase the general knowledge of different solutions, but also contributes to that the participants feel safer when choosing solutions. Consequently, R&D projects are essential for allowing the participants to be more creative and experimental when choosing solutions. External funding of R&D projects also gives more time in the planning process and thereby more time when considering alternative solutions. Getting funding for R&D projects from the EcoBuild programme is one of the factors that is stressed as having a particularly positive effect, as these projects emphasise the importance of cross-disciplinary work. This means that the different professions must communicate and exchange experiences, which is thought to have a positive effect on the implementation of innovative energy efficiency solutions, as one feels that the basis on which the choices are made is more secure.

7.5 Different ways of thought regarding sustainable architecture

The findings in this chapter may be seen as a compromise between using a classical implementation approach, like the one normally used within political science, and a more constructivist cultural analysis approach. The result is difficult to grasp without an institutionalist approach to the issue.

However, different mindsets and not only system inertia cause lack of implementation.

The beginning of this chapter set the goal of analysing these three case projects, in light of three possible approaches to sustainable and energy efficient architecture. Further on, it aims at questioning whether these three cases represent a twist over the dominant regime, or if they are products of the low-tech or high-tech discourse. On the basis of insights from earlier chapters it is also relevant to ask whether these projects have managed to translate sustainability and energy efficiency into something that converges with the aesthetic tradition within architecture. May these buildings perform as boundary objects linking energy efficiency policy to praiseworthy architecture?

The three case studies above demonstrate that it is possible to realise buildings within a third road towards sustainable architecture, the modified mainstream route, which I have called it. The architects of the Kvernhuset project, as well as those of Telenor Fornebu project seem to come from the dominant aesthetic paradigm within Norwegian architecture, having little knowledge of energy efficiency and sustainability from before hand. Despite of lacking competence, at least that was what the architect of Kvernhuset confessed, they manage to design a school building in accordance with energy efficiency and sustainability. Of course the building could probably have been designed even more in accordance with such criteria; however, the point is that the architects manage to design sustainable and energy efficient buildings, without leaving the dominant paradigm. Thus, they design buildings that have highly modern features and which probably fit well into the aestheticising discourse.

All three buildings presented above seem to differ from what is previously mentioned as arch typical high-tech or low-tech sustainable architecture. However, it is interesting to see that all projects integrate some thoughts and techniques stemming from these positions. The modified mainstream or hybrid sustainable architecture implies a sort of fusion of the two traditional approaches. For instance, the Pilestredet Park project uses mostly conventional energy solutions and has not implemented many of the extreme energy solutions and measures that the high-tech sustainable architecture normally has included. In this respect, the project is fairly mainstream, even though this might have been different if the architect had had free hands.

The merging of the traditional high-tech and the low-tech approach that we have seen is happening in these three cases, may also indicate that there is a process of closure going on concerning the two traditionally

conflicting directions. As we witness in the building projects studied here, there is a mixture of low-tech and high-tech solutions, and architects from different positions are working together. The controversy between high-tech and low-tech is not yet closed, but these case studies indicate that it might be on the way to being closed.

The analysis of the Kvernhuset case suggests that it has managed to translate sustainability and energy efficiency into something considered commendable by most architects. The evidence is quite clear, as the Kvernhuset project has got much attention and positive publicity in a range of national and international journals, at international expositions, and has been nominated for a prestigious architect prize. Even if one sees it as an objection that the sustainability and energy efficiency aspects are played down in these articles, it is interesting to note that one has managed to convert the energy efficiency and sustainability requirements into something aesthetically enjoyable by the profession. The project includes elements from high-tech as well as low-tech approaches, using advanced technology in combination with passive measures, like adjustment to the terrain and the conditions on the site. Thus, the project may definitely be seen as a reference project that may inspire architects into building sustainable architecture, without being trapped in an extreme high-tech or low-tech expression. In this way the project may be seen as a potential boundary object that could facilitate the translation from energy policy to energy efficient building design.

Whether the Pilestredet Park project and the Telenor Fornebu project also function as boundary objects is more difficult to answer. Both the Pilestredet Park project and the Telenor Fornebu project have received quite a lot of publicity in Norwegian media. The Pilestredet Park project has been noticed due to being a large ecological project in the centre of Oslo. Sustainability and energy efficiency seem to be handled seriously in the project, even though most solutions are quite conventional. It is rather difficult to say in what way the project is assessed by the architect profession. However, the shape and expression of the Pilestredet Park buildings are quite similar to traditional modern apartment buildings. This may actually be one of the strengths of this project, as it manages to translate sustainability and energy efficiency by means of well-known technology into something that supposedly does not look strange or special in the eyes of the public. Further, if the performance of the buildings meets the demands, it may function as an argument for curtailing the building codes.

The media attention of the Telenor project has mostly been related to the fact that it is the largest office building in Scandinavia. It is also noticed due to its innovative solutions connected to the working environment (no

private desks etc). The sustainability and energy efficiency requirements in this building are mainly fulfilled by the heat pump installation. Except for some solutions regarding better window quality etc., the building is mostly designed to meet the visions of Telenor as an innovative workplace and a splendid signal building. The energy aspects seem to be played down and compromised to the benefit of aesthetics and functionality. Thus, it is questionable whether this building contributes heavily in translating sustainable and energy efficient technology into something else. It is doubtful that the building will be perceived according to its energy solutions, although, it gives a positive signal regarding energy consumption, as half of the energy it uses comes from a renewable energy source. In sum, all the projects will probably in some way contribute to increasing the consciousness of sustainability and energy efficiency among the actors involved and those who hear about these projects, as environmental considerations are included in the way these projects seek to portray themselves.

However, the study of the realisation of these three buildings does not only demonstrate that it is possible to design sustainable and energy efficient buildings, given the right conditions. They also demonstrate how difficult it is designing these kinds of buildings. Thus, it is not only the fact that the architects generally are uninterested that makes designing energy efficient and sustainable buildings a problematical task. The three building projects demonstrate that it is not an easy task, as it is unclear how one designs an environmentally friendly building. The options are immense and there are no available standard solutions to activate or make effective. The lack of standard methods of implementing energy efficient technologies has also been demonstrated in other studies. A study of the implementation of water based floor-heating systems showed the lack of an available, ready for use technology and subsequently the importance of social learning (Kongsli 2001). Effective implementation of the 'principles' of passive solar design has also been shown to be an elaborate process of case-by-case interpretation, taking account of the orientation, layout and the materials of which the building is made (Guy and Shove 2000). In the Kvernhuset project, the lack of standardised methods for adoption of energy efficient technologies and methods is illustrated by the strong emphasis all actors put on the large amount of social learning experienced from the project. It is not only the architects that feel this way, but also engineers and other actors. In a larger perspective, this demonstrates that it is not only the fact that most architects are situated within a dominant aesthetic discourse that may act as a hindrance to the realisation of energy efficient and sustainable buildings. The problem is a much larger one.

This also tells something about the failure of the energy efficiency policy, as it is obvious that these kinds of social learning processes are not integrated in the policy measures. Even though projects like Pilestredet Park constitute a quite optimistic report, showing that it is possible to realise energy efficient and sustainable buildings, there are clear indications that the building sector has been neglected in the energy and environment policy.

8.

MAKING ENERGY EFFICIENCY AN AESTHETIC SUBLIME?

The classical definitions of the sublime were written by and for intellectuals. Longius, Burke, Kant, Schiller and later commentators spoke to an educated elite. While they stated that certain scenes would affect all minds in particular ways, they took no pains to make obvious that this is the case, being pleased to let the reader experiment or to reflect on personal experience. And even if all readers of philosophy agreed, historians would still consider them as an interpretative community that might be categorised "readers of aesthetics", a group hardly representative of the whole population (Nye 1994). Architects do also convey with this idea of an elite interpretative community – particularly appropriate to be labelled as "readers of aesthetics", as form and aesthetics seem too be their prime concerns.

Burke hoped to lay down immutable principles concerning both the sublime and the beautiful. Like Nye, I do not take the sublime to be immutable, and consequently, I comprehend its changing cultural and political meaning as part of the subject. The historicity and the politics of sublime experiences are seen as emotional configurations that both emerge from and help to validate new social and technological conditions. Society is splintered into interpretative communities, each claiming the right to establish its own aesthetic standards (Nye 1994). In this thesis, I have explored the potential emergence of a new technological sublime, the energy efficient and sustainable building, analysing points of view of the architect profession. I have tried to explore how this profession handles such an artefact, and whether it is living up to the aesthetic standards of the architect profession.

At this point in time, the energy efficient and sustainable building seems far from being an 'architectural sublime' as it has to a small degree been able to communicate with the aesthetic standards of the profession. The lack of alignment between the discourse of energy efficiency and sustainable buildings on the one hand, and the aesthetisising discourse of mainstream architects on the other, is probably the most important finding, here. This finding indicates that energy policy faces vast challenges and has to find new measures in order to persuade the architect profession to design more energy efficient and sustainable buildings.

The introductory chapter demonstrated that Norwegian energy efficiency policy is quite weak and unfocused, and it has few measures that

are directed towards actors in the building process. This is in spite of the fact that the building sector represents about 40 per cent of the energy consumption in Norway. In this respect, architects, as the controlling body in the design process, have an important role as mediators and innovators regarding the designing of energy efficient and sustainable buildings. It is therefore important to understand how architects handle energy efficiency when designing new buildings.

As we saw in Chapter 1 different theories within political science, like implementation studies, policy analysis, programme evaluation and new institutionalism are, for various reasons, not particularly suited to explain the role of architects in energy decisions. Most of these theories presuppose that there exists a channel between the group that the measures are supposed to affect and the general policy measures. However, in this case, the situation is quite different. There is not established a specific policy channel between the sustainable energy policy and the practise of most architects. The broad political measures that are outlined do not seem to target the architects.

Thus, to be able to explain the architects' relation to energy efficiency measures it is necessary to enter the building design process in an open way, exploring what is going on in this field and looking at what architects actually do. It is important to study how architects handle the energy efficiency in the building design process, the actions and values of the architect profession and to understand how this influence the realisation of energy efficiency in buildings. The goal is to understand the architects' domestication process (Silverstone et al. 1989, Sørensen 1996). This is perceived as an alternative reality concerning the energy efficiency measures and the architect profession that the classical implementation and policy approaches within political science do not embrace. Thus, one of the focal points of the thesis is the analysis of an alternative segment of reality than most theories in political science usually deal with. In order to be able to do this, that is to study how architects domesticate (or do not domesticate) energy efficiency and the actions and values of architects, I have used a constructivist approach. Science and technology studies or the Social Shaping of Technology approach is the overall theoretical framework that has been chosen as it is suitable for thinking about technical expertise in ways that are more sophisticated and paying closer attention to scientific practise than the traditional political science approaches.

However, it should be noted that neither political science nor science and technology studies have been much concerned with aesthetical issues. These approaches share a common preference for instrumental and functional

aspects, rather than aesthetics. In this chapter I will explore some consequences of this deficiency.

Also, we need to consider the fact that the concept of energy efficiency is both a political and a scientific concept, in the sense that there are political as well as scientific actors to promote it. This means that the concept is very much the factish that Bruno Latour (1999a) is describing, – the simultaneous product of values and fact making. We need to consider how the factish of energy efficiency could operate on the design of buildings and be integrated into architectural aesthetics.

8.1 Policy and implementation in the building sector

Chapter 2 contained a short description of the most common implementation theories within political science. Many of these theories seem to consider the decisions that politicians make as the correct decision making phase, while many of the decisions that are really important for the outcome of the policy are taken on a completely different level: in the building sector, by architects etc. The usability of these theories is also contested when there exist an absence of couplings between different segments, as in the case of the energy efficiency policy. Another problem with these theories is that they are not very well suited to grasp an alternative reality, where the most fruitful strategy seems to be not to follow the measure, but to follow the actor, in this case the architect profession. Within the group of architects, few seem to expect that something should have happened due to policy goals in the energy field. They are not initiators of the policy instruments, but they do not seem to work actively against such measures either. Architects seem to inherit some kind of logic of liberalisation – they are superior to such 'trivialities' and, define them as "none of their business".

Within this line of thought, it is interesting to look at what is defined as politics and the way of thinking policy – what is the subject matter of policy? The findings of this thesis may indicate that policy concerning energy efficiency in Norway does not actively engage with the problems. The measures used are rational and institutional, and do not communicate with important mediating actors, like architects. Perhaps, there are similar explanations why so many measures do not seem to work in other fields.

As mentioned above, it is possible to criticise the STS approach as well as political science for neglecting the aesthetic elements of society. Both traditions have few and under-developed concepts for explaining this theory world and seem to have a need for generating such tools. This may be related

to the fact that both STS and political science is too concentrated on function and that there is too little thinking about design and form.

SST refutes the idea that technology and society is separate but interacting spheres. It lies claim to terms that stress that technology and social arrangements develop together as part of the same process, and that technological entities always are a mixture of social and material elements (Bijker and Law 1992a, Berg and Aune 1994, Williams 1997). Technology and organisation, cultural forms, values, identities are co-produced and are mutually dependent. Consequently, technological change is always part of a larger sociotechnical transformation. Many different labels have been used to characterise this hybrid features of technological developments and their contexts; a 'seamless web' (Hughes 1986), 'sociotechnical ensembles' (Bijker 1993), 'sociotechnologies' (McLaughlin et al 1999) and 'sociotechnical landscapes' (Russell and Williams 2002). However, these insights do not seem to be part of the consideration when trying to invent policy measures for energy efficiency area. A large part of measures neglect the role of the social, and focus mainly on the technology understood as asocial material structures. A technological determinist notion seems to lie beneath large parts of the policy – by stimulating energy efficient technology one expects diffusion of more energy efficient solutions and thereby more energy efficient buildings. Where are the social aspects of those involved in the process regarding energy efficient technology? They are not problematised by the authorities and have no place in the measures.

One of the problems with the energy efficiency policy in Norway is perhaps that one has not been able to create this seamless web or this sociotechnical landscape where architects and other relevant actors should be a part. The energy efficient technology is so far kept a little bit on the side from the dominant socio-technical regime within the building sector. Apart from some HVAC engineers, the energy efficient technology is not something that touches upon the culture, the values and the identity of those who should be pushing the implementation of it – and the technology is frequently not chosen. The sociological ensemble that also includes architects has failed to appear.

In this thesis I have tried to explore the social aspects of energy efficiency that have yet to be made a particular issue in the formation of relevant measures and strategies. Hopefully, these insights may be used in order to make more efficient strategies for affecting actors in the building trade in the future. None the less, technological and social change are subject to frequent impediments and failures and emerge in the course of local struggles to produce a working technology and accommodate it in its use

setting. It can never be completely designed and calculated. The degree to which a technology realises a dominant group's objectives for it, or promotes its interests, is at least in part an accomplishment, conceivably against the actions of users and others (Russell and Williams 2002).

However, in the case of introducing energy efficient technology in buildings neither of these strategies seems to be successfully employed. Policymakers/Authorities have not tried to fit the innovation (being the notion/idea of energy efficiency) into existing institutions, practices and expectations (at least not when it comes to architects). There have been some attempts to reshape the conditions by creating markets (e.g. subsidies of heat pumps), but users have not been configured and the infrastructure has not been treated seriously. Thus, it is not quite correct that impact has been avoided by the actors that should be involved, i.e. the architects. Energy efficient technology has clearly not achieved this dominant group's objectives for it, or furthered its interests. However, the problem is not that they have struggled against it, rather that they do not take any notice of it at all. They see it as irrelevant. There is no struggle, as the architects do not have any objectives for this technology.

As mentioned in Chapter 2, Fujimura has coined the term of a 'scientific bandwagon' for situations where large numbers of people, direct their resources towards one specific approach to a problem, flocking to a "hot" area, creating a network on short time (Fujimura 1987; Hess 1997). In relation to the energy efficiency policy deregulating markets and using prices as a means to control energy consumption may have been such a scientific bandwagon during the last ten years. There have also been shifting scientific bandwagons related to different alternative technologies, one day it was biomass, the next day windmills and the third day gas power plants. There have never existed equally strong scientific bandwagons related to energy efficiency, even though different groups seem to gather around different technologies – HVAC engineers around balanced ventilation solutions and architects to a certain extent around natural ventilation solutions.

SST has developed its analysis of the ways technological developments are stabilised into particular forms, and the accompanying processes of alignment – the orientation of actors to play a part, the shaping of the development, and the amendment of the actors and their interests on the way. Standardisation has in many STS studies proven to be an important form of alignment (and as a process of competition among visions or early variants of a technology). Standards generally serve to cut diversity and to create order and compatibility, as well as means to establish and maintain networks (Russell and Williams 2002, Bowker and Star 2000). In the

interviews I find that there seem to be a wish for standardisation in the building sector as regards energy efficiency and sustainability issues. Many seem to search for standard and prefabricated solutions in order to escape the process of having to re-invent everything each time they are employing unconventional methods or solutions (for example when it comes to ventilation). STS have so far focused on studying conflict around the establishment of standards, also called wars or games of standardisation (Russell and Williams 2002). However, in this case it is the standard needs that are apt.

For policy-makers concerned to support a specific path of innovation, the clear lesson is that support for R&D alone may be ineffective; promoting adoption and social learning may be productive. This suggests the need:

- to map and probably influence the evolving 'distributed innovation network' of suppliers, intermediaries and users, their strategies, incentives and interactions,
- to help potential users in evaluating and introducing the technology,
- to cultivate localised expertise among users, or sustain the roles of intermediaries.

However, policy issues go beyond helping the successful introduction of specific technologies. They also incorporate wider aspects of sociotechnical change, as the overall shift towards sustainable energy consumption. Public scrutiny and regulatory oversight may need to include predicted or emerging second-order effects. This brings other interests into the process and a central role of public agencies will as a result be promoting dialogue and collaboration among the parties (Rip et al. 1995, cf. Russell and Williams 2002). Consequently, successful innovation entails a process of mutual shaping between new technologies and the regimes in which they are embedded – including policies for promoting innovation, and regulation – both formal legislative requirements and informal rules. The growing emphasis in SST analysis on diverse actors and a wider terrain of socio-technical transformation also points to the profound changes needed in conceptions of policy intervention and technology management, away from top-down planning and control – directed by state or managed within an individual firm – towards a network model (Russell and Williams 2002).

SST studies have also focused on the symbolic aspects of technologies and their relation to broader cultural patterns, on discourses on technology in public and policy arenas as well as in development and use, and on the way these cultural forms help shape socio-technical outcomes. This work can play a role to improve our comprehension of policy and strategy discussions, and gives clear advice on how to structure and facilitate them. One such strategy

is the use of narratives. Narratives are important when we try to make sense of future worlds that we have not experienced ourselves directly and when we try to persuade others to either support or oppose these visions. Knowledge of how we generate and organise these meanings, and how they affect discussion and acceptance of options will be useful for policymakers, strategists and wider publics (Russell and Williams 2002).

It is also important to be aware that technologies are understood in completely different ways by different actors like developers, engineers, designers, managers, policymakers and potential users. Thus, successful development may demand that the communication between these groups with different traditions and commitments is helped in some way (Russell and Williams 2002).

In Chapter 2, these arguments provide the basis of the following two issues that have been analysed in this dissertation. First, the social alliances that lie behind technical choices related to energy efficiency and sustainability. This issue is connected to the boundary work done by architects and the social alliances that we see the contours of in Chapter 7. In Chapter 7 we saw that the social alliances related to the realisations of energy efficient buildings are very local. They are not necessarily stable structures, but show signs of being ad-hoc. As already noted in the analysis of these projects, these social alliances do not seem to be motivated by the energy efficiency measures, in particular, but seem more to be offshoots of a more general environmental concern. For example the leader of the Kvernhuset project sees the decision to build an environmentally friendly school as a natural choice that came out from the fact that the municipality of Fredrikstad has been engaged in Local Agenda 21 for a long time.

Second, we have looked at how different kinds of knowledge compete against each other and how energy decisions are decided locally in the building process. This is related to the question of the existence of a possible empty space in between the networks. These "terra incognita" are the most exciting aspects of ANT according to Latour (1999a, c) and in line with this we asked whether the architects are working in such an empty space. The analysis shows that it is not only a question of whether there exists such a terra incognita. One may rather say that the architects have created their own empty space between the networks, that is the one constituted of aesthetics.

Energy efficiency in buildings has proved to be an arena of development, where it is crucial to look beyond the immediate context of a specific innovation and focus on the broader socio-technical terrain, looking at the way the arena is formed, the restraints that operate on those processes,

the inclusion or exclusion of groups, the favouring of some of the procedures or discourses (Jørgensen and Sørensen 2002).

Chapter 2 mapped four dimensions of the research question. These dimensions are related to the practice, communication, design and appropriation of technology. They constitute a set of non-exclusive and partially overlapping angles from which the research question may be studied. The intention of the chapter was to discuss these dimensions within the theoretical framework, describing the theoretical tools anticipated as useful for explaining different aspects of the problem.

Regarding the 'appropriation of technology'- dimension we have seen, particularly in Chapter 4, that architects to a small degree have appropriated energy efficiency technology. Chapter 4 and 5 demonstrated that there is a lack of concern regarding environmental issues among most architects. The architects remain fairly unaffected with regard to the policy goals of the energy field. The architect profession seems to a small extent to adjust its practice around these kinds of technologies and gives them little value practically, symbolically and cognitively. There seems also to be a situation of non-domestication going on in relation to architects, i.e. there is very little energy efficient technology embedded in their practice. This is probably related to the fact that energy and environmental issues have been neglected in the education. As we saw in Chapter 4 the rejection of this technology may also be linked to the boundary work that is conducted by the architect profession. Particularly the relational comments regarding engineers are characteristic. This may hamper architects' interest in energy and environment issues, as energy efficiency is associated with the practise of engineers, and not the practise of architects. Another important point for successful implementation is the articulation of supply and demand sides, that is the ways a technology comes to be associated with its required functions and its wider roles and meaning. The notion of social learning has been coined to sum up the insights from appropriation and use and the articulation with design and development. The findings demonstrate that it has been difficult to initiate sustainable and energy efficient building projects, and consequently that there has been little social learning concerning these issues from building projects. The Kvernhuset project demonstrates that social learning may be seen as an important factor in such building projects, as all participants seem to emphasise the importance of the social learning gained in the process of designing this building.

This leads to the next dimension of the research problem, that I have called 'the design problem'. As we have seen in Chapter 6, where different routes towards sustainable architecture were discussed, and Chapter 7 where

realisations of energy efficient buildings were analysed, designing buildings is not a narrow and unambiguous process of optimisation. It is rather a matter of assessment comparing material possibilities on the one side and social and cultural requests and suppositions on the other – it is a combination of nature and culture. Buildings are social constructions in a double meaning: they are on one side, the products of human efforts, on the other side, a matter of balancing different technological, social and cultural options. In this way the building may also be seen as a factish – it is a combination of knowledge and beliefs.

The interpretable flexibility of sustainable architecture has been extensively documented throughout the thesis. The conflicts between competing interpretations of available technical options has not yet been closed, as no particular design is taken for granted as the essence of energy efficient technology or architecture. However, the distinction between high-tech and low-tech architecture seems to be dissolving, and as Chapter 7 indicates a modified mainstream route towards energy efficient and sustainable architecture seems to be the most likely in the future.

The 'problem of practise' was also pointed out as one angle from which it was interesting to study how architects handle energy efficiency in buildings. As indicated by the findings both in Chapter 4 and 5, it is obvious that most architects seem to belong to the same object world. The dominant discourse outlined in Chapter 5 is one indication of the object world that many architects live in. Largely it derives from the education and is tempered and shaped by work experience and professional history. On the contrary, the dominant architect discourse is visible in the architect journals, the education and the architect competitions and has norms related to the aesthetic aspects of buildings. It promotes the design of modern and exciting buildings. The architects committed to energy efficient and sustainable building design seem to belong to a different object world, where other criteria than form, shape, visual expression and design are (equally?) important. The boundary work that the architects perform in relation to their practise, and particularly by comparison to engineers, also contributes to maintain object worlds. Architects are thought to make out something different than an engineer, when looking at a building. This is also related to what is considered the expertise of the architect profession. As shown in Chapters 4, 5 and 6 the expertise of the architect profession is to a large degree defined by their knowledge of aesthetics. In Chapter 6 we tried to reveal what is meant by being an expert on aesthetics, a question that is difficult, to answer as this kind of knowledge to a large degree may be characterised as tacit or esoteric knowledge.

The 'communication problem' seems to be the most central dimension of the problem investigated in this thesis. In order to be effective, (that is to produce energy efficient buildings), energy efficiency policy has to be communicated to the architect profession in some way or another. Architects must get the message that they should be more aware of energy efficiency when producing decisions that affect the energy standard of a building. To use concepts from actor-network theory, the advocates of energy efficiency should build a network of actors to get support for their policy. Building the network consist of developing different scenarios and enrolling the actors (Latour 1987). When a scenario is developed, the scenario is translated to appeal to what is believed to be the relevant actors' (in this case the architects') needs and wishes. Translations are described as having four "components": problematisation, interessement, enrolment and mobilisation (Hess 1997, Callon 1986). In this case, those shaping the policy and the measures have not managed to interpret the interests of the architect profession. Thus, they have failed to enrol them, and accordingly to translate energy efficiency in accordance with their wishes.

As the analysis of the dominant architect discourse shows most architects are within an object world where design and aesthetics are thought to be the most important aspects of the building. The focus on aesthetics seems to be what typically constitutes the profession. Thus, the problem may be seen as a lack of communication between the discourse of energy efficiency and sustainable buildings, and the aesthetisising discourse. This seems to be the core finding concerning the research problem of this dissertation.

There are potentially two types of translations going on in relation to energy efficient and sustainable architecture. One is a translation from aesthetics towards energy efficient and sustainable architecture. The other is a translation from energy efficient and sustainable architecture towards aesthetics. Both translations seem to be difficult. The problem seems to permeate all components of the translation process. First, apparently there is no acceptance in both camps regarding what should be the correct definition of the problem, i.e. the problematisation component seems to be difficult. There does not seem to be an acceptance of the knowledge claims or the technology as an obligatory point of passage, as a necessary means to solving their problem. Thus, the process of interessement is also problematic as the roles of the other actors defined by one's problematisation are neither imposed nor stabilised. In other words, there is no process of translating the images and concerns from one world into that of another. As the interessement fails, there is neither any enrolment, which is the device by

which actors are attached to a network in interrelated roles. Consequently, there is no mobilisation, that is the accomplishment of desired representatives to act as spokesperson on behalf of other entities. There also seem to exist few boundary objects that could have made the translations go a lot easier.

As we saw in Chapter 5 the translation from energy efficiency to aesthetics is a difficult one, as the aesthetic expressions of high-tech and low-tech architecture do not communicate well with the dominant architect discourse. It is also difficult to translate energy efficient and sustainable architecture from a position within the dominant design paradigm. Committing oneself to this approach will demand a new way of thinking and is consequently perceived as more expensive and more demanding than to continue in the same old fashion. However, the recent realisations of three building projects demonstrate that it is possible to design sustainable and energy efficient buildings if the conditions are right and the architects are within the 'right frame of thought'.

As already pointed out in Chapter 1, Norwegian energy policy states that the authorities assume that the different environments (building owners, architects and consultant engineers) that are in contact with the user when concrete energy decisions are made, engage themselves in information activity.[324] In this respect the Norwegian energy efficiency policy seem to be in line with the neutral idealism of the techno-economic model, a model in which informed and rational individuals are expected to make use of a growing stock of technical expertise, that seem to inform most international energy research and policy (Guy and Shove 2000). The three first chapters analysing architects and how they handle issues of energy efficiency and sustainability demonstrate that this is not likely to happen as there is little correspondence between the values, knowledge and practise of the architect profession and the Norwegian energy policy. The analysis shows that most architects do not take own initiatives in order to promote the design of energy efficient and sustainable architecture and that most architects do not find any incentives for promoting such buildings. Bringing environmental concerns into design decisions is not something that happens automatically. It is neither something that is awarded among other architects, nor is it something that they think is economically worth while, as they think it will require a competence that they do not hold themselves, and that again will require more time than an ordinary project. Thus, the anticipation of merging interests on which the Governmental White Papers on energy efficiency rests, is very likely to be false. In order to promote energy efficient architecture additional measures that take into account the role of the architect should be

[324] St.melding no 29 *(1998-99): Om energipolitikken.* p. 42, Oslo: Ministry for Petroleum and Energy.

implemented. The realisations of the three energy efficient and sustainable building projects give some clues as to which tools that may be effective for this purpose.

8.2 The prospect of realising energy efficient buildings

As Chapter 7 revealed, it is possible to develop hybrid forms of energy efficient and sustainable architecture, combining techniques and ideas from both high-tech and low-tech architecture, while still remaining within the dominant design regime. However, in order to be able to do this there are certain institutional conditions and features that have to be in place. First of all, there has to be a focus on these aspects of the building design from the start, which requires a building owner with serious a commitment in this direction, or that there is established certain juridical or control elements in the sales documents or similar documents.

The analysis of the three cases suggests that one could divide practising architects into three groups regarding awareness of energy and sustainability issues in buildings, in addition to those that does not care: the idealist low-tech architect, the high-tech architect and the hybrid-architect. The little group of idealist low-tech architects are those who build private homes and participate in quite small building projects, and are known for using low-tech solutions. The high-tech architect found in Germany and other countries, does not seem to exist in Norway, even though some of those involved in research and science are working with similar technological solutions. The hybrid architect, like for example the architects of Pilestredet Park, is the type of architect that design buildings by using elements from both high-tech and low-tech architecture, and which still is able to design buildings within the dominant frame of architectural expression. In an interview, one of these architects talks about the importance of reducing the environmental consequences in relation to building activity. He says: "we have to participate actively in the development of solutions (...) I think the architects are a little passive concerning this. There are some initiatives, but I actually think that this is about architects having a very strong focus on form, and that they conduct themselves more actively in relation to the discussion concerning design developments, than the discussion concerning technological development. And to connect these two discussions, to make architecture that does not reduce the criteria for architectural quality, but that at the same time takes into consideration technological and ecological aspects, that is more or less our programme".[325] The hybrid architect does not seem equally idealistic as the low-tech architects, but is eager to be the

[325] Interview with Gasa architect 2. 21.06.2001. p.10

vanguard of the development, and sees knowledge of energy efficient, sustainable and environmentally sound building design as a niche and a competitive advantage in the market.

However, still, most architect offices belong to those who are not particularly interested in energy efficiency. In these firms one often talks about ecology in terms of adjustment to the site, etc. They do not seem to do anything in the direction of building more sustainable or energy efficient before it has been imposed on them. The resistance towards energy efficiency among architects is also reflected in their verbal rejection of the Norwegian concept of 'energy economising' or 'ENØK' – use of energy in an economically optimal way. It is difficult to make architects talk about energy economising or energy efficiency. The concept of energy economising is inappropriate, as it does not really contain a conception of what is environmentally sound. The concept of energy efficiency is a component of the concept of sustainability.[326] Thus, it seems about time to leave the concept of energy economising behind, and to create a concept that to a larger degree unites energy with environment. The concept of 'environment' is also the one that seems to the largest degree meet the architects' world of ideas, perhaps together with 'ecology'.

There seems also to be two main models for handling ecological and low energy buildings – a warm and a cold model – an 'enthusiast model' and a rational management model. Most prior environmental projects have followed an enthusiast model. These have typically been smaller low-tech projects. The Kvernhuset project seems to have some similarities with such a model even though the project manager in Fredrikstad municipality denies that they have been driven by idealism on this project. The Pilestredet Park project seems to succeed very much as a result of extensive control and management routines from Statsbygg. This also seems to be the case in the Telenor Fornebu project, even though the demands concerning energy consumption seem more modest in this particular project.

The realisation of energy efficient and sustainable buildings today demonstrates that it is possible to make architects design sustainable buildings if the conditions are right. However, in most building projects the different actors seem to think that there are a lot of barriers to constructing energy efficient and sustainable buildings. Not all of these perceived barriers are correct representations of the realities. None the less, they are living myths that keep architects and other actors from initiating such projects.

---

[326] and the efficiency-part of this word is likely to have more connotations towards the world of the engineers than the architects.

One of the biggest myths seems to be the financial consequences of designing energy efficient buildings. Most building owners and other actors in the building design process who have never participated in the realisation of an energy efficient and sustainable building seem to think that it is much more expensive to design in accordance with energy efficiency and sustainability, than the usual way. As the case projects above illustrate, this is not necessarily true. All three cases claim that these buildings are only marginally more expensive due to the energy concerns, and if you look at the total costs, including the construction phase they may even be less expensive than a conventional project. There are also large economical benefits if you look at the reduced energy consumption, in a long-term perspective. One uses more money in the planning phase, which eventually is earned back in the later phases due to shorter construction time, smaller rigging expenses, economy in operation etc.

Other partly interrelated, negative factors that are mentioned in interviews are conservative HVAC engineers, the organisation and the type of property developers, conventional building owners, risk-aversion, time pressure and little degree of interdisciplinary co-operation in the building design process from the start. In other words, it is not fair to only blame the lack of interest among the architect profession for the slow development of realising energy efficient and sustainable buildings. It is evident that, as long as there is little demand of energy efficient and sustainable building projects, it will be hard to promote such buildings from the point of the architect as well. Thus, building owners have a crucial responsibility in demanding energy efficient and sustainable buildings.

This, together with the insights gained from the case studies provides us with some clues towards what could be future strategies and measures in order to promote the design of sustainable and energy efficient buildings. One of the most important factors seems to be a building owner that set specific demands.

Statsbygg, The Directorate of Public Construction and Property, is an important building owner that has a great responsibility in this respect. Due to its important role as a building owner, Statsbygg may function as a motivating power and a measure in itself. As shown in both projects where Statsbygg was involved, the environmental requirements established in the sales contracts, were of crucial importance for realising the energy aspects in these buildings, even though it seems like the demands, at least in the Fornebu project, could have been even stricter. The environmental demands made by Statsbygg makes it possible to realise energy efficient and sustainable buildings even though this was not the original intention of the

building owner/property developer, like for example in the case of Pilestredet Park. Thus, the environmental policy of Statsbygg seems to be an important tool in order to realise energy efficient and sustainable buildings. These tools are developed even further according to the Environmental Action Plan 2001-2003, which is a part of the "Green Government" project and may be powerful incentives in the years to come.[327]

One of the main goals in the Environmental Action Plan is that environmental considerations and requirements shall be incorporated into all the different project phases, and likewise into the management, operation and maintenance of their buildings. Thus, the related measures are to revise and/or propose new environmental requirements for Statsbygg's design instructions and performance descriptions; To co-ordinate revised and/or new environmental requirements with requirements in other relevant documents (building programmes, contracts) and to incorporate them in accordance with requirements in relevant design and performance descriptions. The goal is further to develop routines for ensuring that environment requirements are implemented in their projects, while alerting staff members to Statsbygg's environmental requirements. One also aspires to develop environmental aspects of the building programming in Statsbygg and to integrate environmental criteria into programming and judging of project competitions. This is based on the insight that environmental criteria are all too easily overlooked in project competitions, even where environmental requirements are explicitly included in the competition programme, which is consistent with my findings. This applies to both competitors and judging panels, and is often the result of perceived conflicts between environmental criteria and functional, architectural and economic criteria. Statsbygg perceives weighting, ranking in order of priority, or similar evaluations of the different criteria, as possible ways of dealing with this conflict. They see it as important to define the environmental requirements in such a way that it is possible for both the competitors and the judges to deal with them. In the cases where the building programme is to be used as the competition programme, the ways in which the environmental requirements are to be dealt with in the competition must be specified. Thus, this measure is related to the measure of developing environmental aspects of building programming.

---

[327] The aim of the "Green Government" pilot project is to try out systems and measures that can reduce the environmental impact of governmental activities. "Green State" is a three-year project in which Statsbygg is one of ten participants. The project has been commissioned by the Ministry of Labour and Government Administration, and the Ministry of Environment. The findings from this project will provide a basis for the ministries' evaluation of how government environmental efforts shall be organised in the coming years. http://www.statsbygg.no/env_actionplan/

Statsbygg defines "environmental requirements in all project competitions from 2001/2002" and "the evaluation panel/judges document the evaluation of the environmental aspects in each and every draft in all project competitions" as future milestones.[328] In other words, Statsbygg seems to have a serious commitment towards promoting sustainable and energy efficient building design in the years to come. As Statsbygg is Norway's biggest property management agency in the public civil sector [30.05.00] and administers a total of 1.571 building complexes (approx. 2,7 mill. m^2),[329] it is an important actor regarding reducing energy efficiency in buildings. As the cases show, to follow environmental demands and requirements seem to be viable strategies. However, Statsbygg administer only a small area compared to the area of non-residential buildings owned by private actors (approx. 69 mill. m^2).[330] In the projects where Statsbygg is not involved, there is an obvious need to employ other measures in order to promote energy efficient and sustainable buildings.[331]

Other measures that are likely to promote energy efficient and sustainable architecture, apart from enthusiastic and demanding building owners, are; to have a research group tied to the project, that the projects group comes together at an early phase in the project, and to have HVAC consultant and other specialists with initiative and competence. It is also clear that concrete building projects that increase the competence of the participants through social learning is a very effective measure with signal effect. Increasing focus on environmental issues in the education and integrating these issues into the design-oriented courses is another measure that seems promising. Stricter building codes and technical regulations are other measures that appear as auspicious.

On the basis of this dissertation it is possible to perform a critique of the choice of measures in the energy field in Norway. Traditionally, financial and judicial measures have been used in order to limit the energy consumption in Norway. However, it is difficult to trace the effects of each measure on the energy efficiency of buildings. This finding is quite remarkable, as one should expect that measures, that have existed for several decades and constitute a large number of different measures of information

---

[328] http://www.statsbygg.no/env_actionplan/default.htm

[329] http://www.statsbygg.no/eiendom/ Dec. 2002.

[330] Miljøeffektivitet i bygg- og eiendomssektoren. Hva er miljopotensialet, og hvordan utløse det? Økobygg. Nov. 2000.

[331] However, it is not only the area of buildings that Statsbygg manage themselves that they may influence the profile of. Statsbygg does also have the possibility to influence the profile of building projects where the government sells properties to property developers, like in the case of the Pilestredet Park and the Telenor project.

activity, energy efficiency centres, new organs (like ENOVA[332]) and subsidies of technologies, as for example heat pumps, should be more effective. On the contrary, it is possible to trace a certain ideological effect from more general environmental policy goals and measures, like LA21, that probably have contributed to designing more energy efficient buildings. As already mentioned, those architects that are involved in the realisation of energy efficient and sustainable buildings, seem to be motivated by a general environmental consciousness, and not specific energy efficiency measures.

The difficulty in observing the effects of energy efficiency measures in the building sector, demonstrate that there is a rupture in the chain of translations from policy to practice in the building sector. Drawing upon insights from SST, one may say that the interessement of the actors has failed. This is partly due to the fact that these measures are not particularly concerned with the actors in the building trade, partly because they have no resonance in the architect professions' dominant way of thinking, that is the aesthetic elements of the building process. As already mentioned, this has to do with the fact that the measures have little or no relevance to aesthetic considerations. The aesthetic elements are almost seen as a free-rider and an aspect that will be taken care of no matter what the policy concerns are.

Thus, the challenge for politicians, and consequently political scientists, is to extend their repertoire of measures, liberating themselves from thinking that only economic and judicial measures are suitable for promoting energy efficiency and solving other social and technological problems. In the energy field the market has been relied on as the optimal solution for solving problems related to energy consumption. This strategy has proved to be a deficiency, and is currently taken to blame for the energy crisis that Norway is facing today. While the energy prices currently rise to new heights due to shortages in energy supply, people seem to consume energy in the same way as before. Thus, it is time to start employing other measurers than those related to economic and judicial aspects.

---

[332] ENOVA was established in 2001 in order to strengthen the work on the environmental change of energy consumption and production in Norway. Enova is a state enterprise owned by the Ministry of Energy and Petroleum. "The goal is to make it easier to chose simple, energy effective and environmentally sound solutions for everyone that wishes". The measures employed are mainly based on economic support to projects that reflect their priorities. The stated priority areas are heating (distribution and production), wind (investment aid and application of technology), energy use (non-residential buildings, industry, households and installations), renewable energy, training (production workers, post-qualifying education, material and concepts), nation wide information and consultancy. Source: Enova is http://www.enova.no/ Enova has not existed long enough to evaluate its role and measures concerning energy efficiency in the building sector. However, so far I have registered that much of Enova's attention has been directed towards industry and only to a small degree towards architects, end-users and aspects related to building design. Others, claiming large frustration about Enova's lack of support concerning building related aspects also confirm this assumption.

In this respect, building a bridge between political science and STS seems like a viable strategy in order to find new tools and approaches to the Norwegian energy efficiency policy, as political science generally has been too little focused on technology, while STS has been too little focused on policy. Between the process oriented policy analysis and STS there seem to be a common arena where it is possible to solve these kinds of problems.

REFERENCES

Akrich, M. and B. Latour (1992). A summary of a convenient vocabulary for the semiotics of human and nonhuman assemblies. In W. E. Bijker and J. Law (eds): *Shaping Technology/Building Society: Studies in Sociotechnical Change.* Cambridge, MA: MIT Press.

Alvesson, M. and K. Sköldberg (1994): *Tolkning och reflektion. Vetenskapsfilosofi och kvalitativ metod.* Lund: Studentlitteratur.

Andersen, H. and K. Sørensen (1992): *Frankensteins dilemma : En bok om teknologi, miljø og verdier.* Oslo: Ad Notam Gyldendal

Aune, M. (1998): Nøktern eller nytende. Energiforbruk og hverdagsliv i norske husholdninger. Doctoral thesis/ STS report no. 46. Centre for Technology and Society, NTNU.

Bally, C., A. Séchenhaye and A. Riedlinger (1962): *Cours de linguistique générale.* Paris: Payot.

Bardach, E. (1977): *The Implementation Game.* Chicago: University of Chicago Press.

Barett, S. and M. Hill (1984): Policy, Bargaining and Structure in Implementation Theory: Towards an Integrated Perspective, *Policy and Politics* 12, 219-240.

Barthes, R. (1972): *Critical Essays.* Translated from French by Richard Howard Evanston, Ill. Northwestern University Press.

Baszanger, I. and N. Dodier (1997): Ethnography. Relating the Part to the Whole. In D. Silverman (ed.): *Qualitative Research. Theory, Method and Practice.* London: Sage.

Bech-Danielsen, C. (1998): *Økologien tager form: Byøkologi, æstetik og arkitektur.* København: Christian Ejlers Forlag og Statens Byggeforskningsinstitut.

Berg, A.-J. and M. Aune (1994): *Domestic Technology and Everyday Life: Mutual Shaping Processes.* COST A4, Luxemboug: Office for Official Publications of the European Communities.

Bijker, W. (1987): The Socialconstruction of Bakelite: Towards a Technology of Invention. In W. Bijker, E. Hughes and T. Pinch (eds.). *The Social Construction of Technological Systems.* Cambridge, MA: MIT press.

Bijker, W. (1993): Do not Despair: There is a life after constructivism, *Science, Technology and Human Values* 18, 113-138.

Bijker, W. (1995): *Of Bicycles, Bakelite and Bulbs: Towards a Theory of Sociotechnical Change.* Cambridge MA: MIT Press.

Bijker, W. E. and J. Law (eds.) (1992a): *Shaping technology/building society.* Cambridge, MA: MIT Press.

Bijker, W., E. Hughes and T. Pinch, (eds.). (1987): *The Social Construction of Technological Systems.* Cambridge, MA: MIT press.

Bowker, G. C. and S. L. Star (2000): *Sorting things out. Classification and its Consequences.* Cambridge, Mass.: The MIT press.

Brewer, G. D. (1974): The Policy Science Emerge: To Nurture and Structure a Discipline, *Policy Science* 5, 239-244.

Brochmann, O. (1986): *-disse arkitektene. En historie om deres liv og virke i Norge fortalt av Odd Brochmann.* Oslo: NAL.

Brown, G. and G. Yule (1983): *Discourse analysis.* Cambridge: Cambridge University Press.

Browning, B. (1998): Buildings as Engines for Environmental Restoration. In A. Scott (ed.): *Dimensions of sustainability.* London: E & FN SPON. An Imprint of Rouledge.

Bucciarelli, L. L. (1994): *Designing Engineers.* Cambridge, MA: the MIT Press.

Butters, C. (1999a): Fra hageby til high tech?, *Arkitektnytt* 4, 20-21.

Butters, C. (1999b): Økologien tar form, *Arkitektnytt* 8, 10-12.

Butters, C. and F. Østmo (2000): *Bygg for en ny tid. Mot en miljøvennlig arkitektur.* Oslo: NABU.

Callon, M. (1986): Some elements of a Sociology of Translation: Domestication of the Scallops and Fishermen. In J. Law (ed.): *Power, Action, and Belief.* Sociological Review Monograph 32. London: Routledge.

Clarke, A. (1990): A Social Worlds Adventure. In S. Cozzens and T. Gieryn (eds.): *Theories of Science in Society.* Bloomington: Indiana University Press.

Clarke, A. E. and J. Fujimura (1992): *The Right tools for the job: at work in twentieth-century life sciences.* Princeton, N.J.: Princeton University Press

Cold, B. (1991a): Arkitektonisk kvalitet i norsk trehusbebyggelse. *Tidsskrift for arkitekturforskning* 4 (1), 7-32.

Cold, B. (1991b*): Om arkitektur og kvalitet: Ikke den teknisk, funksjonelle, målbare kvaliteten, men den opplevde estetiske.* Oslo: Norges allmennvitenskaplige forskningsråd.

Cold, B. (1995): *Estetisk kvalitet.* Oslo: Kommuneforlaget.

Collins, H. (1983): An empirical relativist programme in the Sociology of Scientific Knowledge. In K. Knorr-Cetina and M. Mulkay (eds.) *Science Observed.* Beverly Hills: Sage.

Collins, H. (1998): Cultural Competence and Scientific Knowledge. In R. Williams, W. Faukner and J. Fleck (eds.) *Exploring expertise: Issues and Perspectives.* London: MacMillan Press.

Cornell, E. (1966): *Om rummet och arkitekturens väsen.* Scandinavian university books: Göteborg Akademiförlaget.

Coulthard, M. (1977): *An introduction to discourse analysis.* London: Longman.

Czarniawska, B. (1997): *Narrating the Organization. Dramas of Institutional Identity.* Chicago: The University of Chicago Press.

Czarniawska, B. (1998): *A Narrative Approach to Organization Studies.* Thousand Oaks, CA: Sage.

Duffy, F. (with L. Hutton) (1998): *Architectural Knowledge. The Idea of a Profession.* London: E & FN Spon, an imprint of Routledge.

Eggertson, D. (2002): Arkitektkonkurranser – en lek for de voksne? In *Norsk Form Bulletin* 36 , 13-14.

Elmore, R. (1980): Backward Mapping: Implementation Research and Policy Decisions, *Political Science Quarterly* 94, 601-616.

Emerson, R. M., R. I. Fretz and L. L. Shaw (2001): Participant observation and Fieldnotes. In P. Atkinson (ed.) *Handbook of ethnography.* London: Sage.

Fages, J.-B. (1969): *Hva er strukturalisme?* Oslo: Gyldendal.

Faulkner, W., J. Fleck and R. Williams (1998): Exploring expertise: Issues and Perspectives. In R. Williams, W. Faukner and J. Fleck (eds.) *Exploring expertise: Issues and Perspectives.* London: MacMillan Press.

Feenberg, A. (1999a): *Questioning technology.* London: Routledge.

Feenberg, A. (1999b): *Teknikk og modernitet.* Oslo: Universitetsforlaget.

Findahl, O. and B. Höijer (1981): *Text och innehållsanalys. En översikt av några analystraditioner.* Sveriges radio: Publik- och programforskning. Stockholm: Arkitektkopia.

Fitch, J. M (1965): The Profession of Architecture. In K. S. Lynn (ed.) *The Professions in America.* Boston: Houghton Mifflin.

Fleck, J. (1998): Expertise: Knowledge, Power and Tradeability. In R. Williams, W. Faukner and J. Fleck (eds.) *Exploring expertise: Issues and Perspectives.* London: MacMillan Press.

Foucault, M. (1971): Orders of Discourse, *Social Science Information* 10: 7–30.

Foucault, M. (1972): *The Archaeology of Knowledge*. London: Tavistock.
Fujimura, J. (1987): Constructing Do-able Problems in Cancer Research: Articulating Alignment, *Social Studies of Science* 17: 257-93.
Fujimura, J. (1991): On Methods, Ontologies and Representation in the Sociology of Science: Where Do we Stand? In D. Maines (ed.) *Social Organization and Social Processes: Essays in Honor of Anselm L. Strauss*. Hawthorne, NY: Aldine de Gruyter.
Fujimura, J. (1992). Crafting Science: Standardized Packages, Boundary Objects, and Translation. In A. Pickering (ed.): *Science as Practise and Culture*, 168-211. Chicago: University of Chicago Press.
Gadamer, H.-G. (1976): *Hegel's Dialectic : Five Hermeneutical Studies.* London: Yale University Press.
Gadamer, H.-G. (1977): *Philosophical Hermeneutics* (translated and edited by David E. Linge). Berkeley, Calif. : University of California Press.
Gadamer, H.-G. (1984): *Truth and method.* New York : Crossroad.
Gieryn, T. F. (1999): *Cultural Boundaries of Science. Credibility on the Line.* Chicago : University of Chicago Press.
Gieryn, T.F. (1995): Boundaries of Science. In S. Jasanoff et al. (eds.) *Handbook of Science and Technology Studies*. New York: Sage.
Gilbert, G. N. and M. Mulkay (1984): *Opening Pandora's Box : A Sociological Analysis of Scientists' Discourse*. Cambridge: Cambridge University Press.
Gjøen, H. and M. Hård (2002): Cultural Politics in Action: Developing User Scripts in Relation to the Electric Vehicle, *Science, Technology and Human Values* 27, 262-281.
Goddard, A. & J. Powell (1994): Using naturalistic and economic evaluation to assist service planning, *Evaluation Review* 18, 472-492.
Grant, D., T. Keenoy and C. Oswick (1998) (red): *Discourse + Organization.* London: Sage Pub.
Greene, J. C. (1994): Qualitative program evaluation: Practice and Promise. In N.K. Denzin and Y.S. Lincoln (eds). *Handbook of qualtitative research.* Thousand Oaks, CA: Sage.
Greimas, A. J. (1983) [1966]: *Structural Semantics. An Attempt at a Method.* Lincoln: University of Nebraska Press. [Org.: *Sémantique Structurale. Recherche de méthode*. Paris: Larousse.]
Guston, D. H. (1999). Stabilizing the Boundary between US Politics and Science: The Role of the Office of Technology Transfer as a Boundary Organization, *Social Studies of Science* 29 (1), 87-111.

Guston, D. H. (2001): Boundary Organizations in Environmental Policy and Science: An Introduction, *Science, Technology and Human Values* 26, 399-409.

Guy, S. and G. Farmer (2001): Reinterpreting Sustainable Architecture: The Place of Technology, *Journal of Architectural Education* 54 (3), pp. 140-148.

Guy, S. and E. Shove (2000): *A Sociology of Energy, Buildings and the Environment. Constructing Knowledge, designing Practise.* London: Routledge.

Hall, P. A. (1986): *Governing the Economy: The Politics of State Intervention in Britain and France.* New York: Oxford University Press.

Halliday, M.A.K. (1978): *Language as social semiotic: the social interpretation of language and meaning.* London: Edward Arnold.

Hammersley, M. and P. Atkinson (1995): *Ethnography.* 2nd. Ed., London: Routledge.

Hammersley, M. and P. Atkinson (1996): *Feltmetodikk. Grunnlaget for feltarbeid og feltforskning.* [translated by Tone M. Anderssen og Ane Sjøbu]. Oslo: Ad Notam Gyldendal.

Helland, A. (1988): Byggekunst. *Arkitektnytt* 1. Oslo: Arkitekturforlaget.

Henderson, K. (2002): *Ethics, Codes and Culture: How Green Building activism has resulted in either prescriptive or performance building codes.* Paper presented at the 4S conference in Milwaukee, November 2002.

Heradstveit, D. and T. Bjørgo (1987): *Politisk kommunikasjon. Introduksjon til semiotikk og retorikk.* Oslo: Tano.

Hess, David J. (1997): *Science studies. An advanced introduction.* New York: New York University Press.

Hesselgren, Sven (1977): Vad vackert är: varför vi vill ha vackra hus och städer, *Statens råd för byggnadsforskning* 32: 77. Stockholm: Byggforskningsrådet

Hestnes, A. G. (1996): *Alle hus er solfangere* / [project leader; A.G. Hestnes/(ed.) I. Andresen et al.]. Oslo: Norsk arkitekturforlag.

Hjern, B. and D.O. Porter (1981): Implementation Structures. A New Unit of Analysis, *Organizational Studies* 2, 211-227.

Holgate, A. (1992): *Aesthetics of Built Form.* New York: Oxford University Press.

Holter, H. (1996): Fra kvalitative metoder til kvalitativ samfunnsforskning. In H. Holter and R. Kalleberg (eds.): *Kvalitative metoder i samfunnsforskning,* 2.utg. Oslo: Universitetsforlaget.

Hope, K. (2002): *Frå ferskt til friskt? Om prosessen frå feltnotat til bruk av data.* Metodeessay til kurset HF 8215. Forskningens design, metode og iscenesettelse. Trondheim: Senter for teknologi og samfunn.

Hubak, M. (1998): *Synlig kostnad - skjult gevinst? VVS-bransjen og realisering av ENØK mellom politikk, kunnskap og praksis.* Thesis for the Degree of Doctor Politicarum. Department of Sociology and Political Science. Norwegian University for Science and Technology.

Hughes, T.P. (1986): The Seamless Web: Technology, Science, etcetera, etcetera, *Social Studies of Science* 16, 281-292.

Immergut, E. (1992): *Health Care Politics: Ideas and institutions in Western Europe.* Cambridge: Cambridge University Press.

Janda, K. B. (1998): *Building Change: Effects of Professional Culture and Organizational Context on Energy Efficiency Adoption in Buildings.* Doctoral Dissertation. Ann Arbor: UMI Dissertation Services: Bell and Howell.

Jasanoff, S. (1987): Contested Boundaries in Policy Relevant Science, *Social Studies of Science* 17, 195-230.

Jasanoff, S. et al., (ed) (1995): *Handbook of science and technology studies.* Thousand Oaks: Sage.

Jørgensen, M.W. and L. Philips (1999): *Diskursanalyse som teori og metode.* Roskilde: Roskilde Universitetsforlag/Samfundslitteratur.

Jørgensen, U. and K. Sørensen (2002): Arenas of Developmenet: a Space Populated by Actor-Worlds, Artefacts and Surprises. In K. Sørensen and R. Williams (eds.): *Shaping Technology, Guiding Policy. Concepts, Spaces and Tools.* Cheltenham, UK: Edward Elgar.

Kiran, K. (1999): Sexy arkitektur, ansvarlighet og misforståelser, *Arkitektnytt* 6, pp. 19.

Kjellberg, F. and M. Reitan (1995): *Studiet av offentlig politikk – en innføring.* Oslo: Tano.

Kjelstadli, K. (1997): Å analysere skriftlige kilder. In E. Fossåskaret, O. L. Fuglestad and T. H. Aase (eds.): *Metodisk feltarbeid. Produksjon og tolkning av kvalitative data.* Oslo: Universitetsforlaget.

Knoke, D. and E. O. Laumann (1987): *The organizational state: social choice in national policy domains.* Madison, WI: University of Wisconsin Press.

Kongsli, G. (2001): *Vann, varme og virkelighet. En studie av sosial læring ved innføring av vannbåren gulvvarme*. Master thesis/STS report 50/2001. Centre for technology and society. NTNU.

Krasner, S. D. (1983): *Institutional Regimes*. Ithaca, NY: Cornell University Press.

Krasner, S. D. (1988): Sovereignity: An institutional perspective, *Comparative Political Studies* 21, 66-94.

Kvale, S. (1997): *Det kvalitative forskningsintervju*. Oslo: Ad Notam. Gyldendal.

Lane, M. (1970): *Introduction to structuralism*. New York: Basic Books.

Latour, B. (1987): *Science in action. How to follow Scientists and Engineers through Society*. Milton Keynes: Open University Press.

Latour, B. (1987): *Science in action*. Milton Keynes: Open University Press.

Latour, B. (1988): Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer, *Social Problems* 35, 298-310. [written under pseudonyme, Jim Johnson].

Latour, B. (1999a): On recalling ANT. In J. Law and J. Hassard (eds.) *Actor Network Theory and after*. Oxford: Blackwell.

Latour, B. (1999b): *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, Mass.: Harvard University Press

Latour, B. (1999c): Give me a Laboratory and I will raise the World. In Biagoli, M. (ed.) *The Science Studies Reader*. London: Routledge.

Law, J (1999): After ANT: Complexity, Naming and Topology. In J. Law and J. Hassard (eds.): *Actor Network Theory and after*. Oxford: Blackwell.

Law, J. (1987a): The Structure of Sociotechnical Engineering: A Review of the new Sociology of Technology. *Sociological Review* 35, 404-425.

Law, J. (1987b): On the Social Explanation of Technological Change: the Case of Portuguese Maritime Expansion. *Technology and Culture* 28, 227-252.

Law, J. (1991): Introduction, in J. Law (ed.): *A Sociology of Monsters. Essays on Power, Technology and Domination*. London: Routledge.

Lewis, R. K. (1998): *Architect? A Candid Guide to the Profession*. Rev. Ed. Cambridge, Mass.: MIT Press.

Lie, M. and K. Sørensen (1996): *Making Technology our own? Domesticating Technology into Everyday Life*. Oslo: Scandinavian University Press.

Lund, K. and N. Slaatto (1988): Kreditkassens hovedbygning, *Byggekunst* 6, 442

Macdonell, D. (1986): *Theories of Discourse: An introduction*. Oxford: B. Blackwell.
MacKenzie, D. and J. Wajcman, (eds). (1999): *The social shaping of technology*. 2nd ed., Buckingham: Open University Press.
Madsen, P. (1970): *Strukturalisme. En antologi.* København: Rhodos.
March, D. and R. A. W. Rhodes (1992): *Implementing Thatcherite Policies: Audit of an Era*. Buckingham: Open University Press.
March, J. and J. P. Olsen (1984): The New Institutionalism: Organizational Factors in Political Life, *American Political Review* 78, 738-49.
March, J. and J. P. Olsen (1989): *Rediscovering Institutions*. New York: Free Press.
March, J. and J. P. Olsen (1995): *Democratic Governance*. New York: Free Press.
Maren-Grisebach, M. (1974): *Litteraturvitenskapens metoder*. Norsk utgave ved K. Heggelund og H. Rønning. Oslo: Gyldendal
Mazmanian, D. and P. A. Sabatier (1983): *Implementation and Public Policy*. Glenview: Ill.: Scott Foresman.
McCracken, G. (1988): *The Long Interview*. Sage University Paper Qualitative Research Methods Series, vol. 13. Beverly Hills, CA: Sage.
McLaughlin, J., P. Rosen, D. Skinner and A. Webster (1999): *Valuing Technology: Organisations, Culture and Change*. London: Routledge.
Mishler, E. G. (1986): *Research interviewing: context and narrative*. Cambridge, Mass.: Harvard University Press,.
Moe, T. M. (1990): Political Institutions: The Neglected Side of the Story. *Journal of Law, Economics and Orgainizations* 6, 213-253.
Mohr, L. B. (1995): *Impact Analysis for Program Evaluation*. 2nd ed. Thousand Oaks, CA: Sage.
Mueller-Vollmer, K. (red.) (1986): *The Hermeneutic Reader: Texts of the German Tradition from the Enlightenment to the Present* (introduction and notes by Kurt Mueller-Vollmer). Oxford : Basil Blackwell.
Neumann, I. B. (2001): *Mening, makt, materialitet: En innføring i diskursanalyse*. Oslo: Fagbokforlaget.
Newman, R. (1974): The basis of arhitectural design – intuition or research, *Oxford Architectural Research Papers* 1, Dept. of Architecture, Oxford Polytechnic.
Nordberg-Schultz, C. (1986): *Sted og arkitektur*. Oslo: Gyldendal.
Nunan, D. (1993): *Introducing Discourse analysis*. London: Penguin.

Nye, D. (1994): *American Technological Sublime*. Cambridge, Mass.: MIT Press.

Næsje, P. (2000): *Pumps and Circumstances. The Political Configuration of heat Pump Technology in Norway*. Doctoral thesis/ STS report no. 46. Centre for technology and Society. NTNU.

Orr, J. E. (1996): *Talking about Machines: An Ethnography of a Modern Job*. Ithaca, N.Y.: Cornell University Press.

Pêcheux, M. (1982): *Language, Semantics and Ideology. Stating the Obvious*. London: Macmillan.

Peters, G. B. (1999): *Institutional Theory in Political Science. The 'New Institutionalism'*. London: Continuum.

Pinch, T. (1996): The social construction of technology: a review. In R. Fox (eds.) *Technological Change*. Amsterdam: Harwood academic publishers.

Pinch, T. and W. Bijker (1984): The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other, *Social Studies of Science* 14, 399-444.

Pinch, T. and W. Bijker (1987): Social Construction of Technology, in W. Bijker, T. Hughes and T. Pinch (red).: *The Social Construction of Technological Systems*. Cambridge, MA: MIT press.

Polanyi, M. (1958): *Personal Knowledge*. London: Routledge & Kegan.

Potter, J. and M. Wetherell (1987): *Discourse and Social Psychology. Beyond Attitudes and Behaviour*. London: Sage.

Pressman, Andy (2001): *Architectural design portable handbook*. New York: McGraw-Hill.

Pressman, J. L. and A. Wildavsky (1973): *Implementation*. Berkely: California University Press.

Repstad, P. (1992): *Mellom nærhet og distanse*. Oslo: Universitetsforlaget.

Rip, A. (1995): Introduction of New Technology: Making Use of Recent Insights from Sociology and Economics of Technology, *Technology Analysis and Strategic Management* 7, (4), 417-431.

Rip, A., T. Misa and J. Schot (eds.) (1995): *Managing Technology in Society: the Approach of Constructive Technology Assessment*. London: Pinter.

Rittberger, V. (1993): *Regime Theory and International Relations*. Oxford: Clarendon Press.

Rokkan, S. (1966): Votes Count but Resources Decide. In R.A. Dahl (ed.) *Political Oppositions in Western Democracies*. New Haven, CT: Yale University Press.

Russell, S. and A. Bunting (1998): *Privatisation, electricity market and new energy technologies.* Paper to conference: Technology in the Making, RSSS, ANU, Canberra, 2-3 Jul 1998.

Russell, S. and R. Williams (2002): Social Shaping of Technology: Frameworks, Findings and Implications for Policy with Glossary of Social Shaping Concepts. In Sørensen and Williams (eds.) *Shaping Technology, Guiding Policy.* Cheltenahm: Edward Elgar.

Ryghaug, M. (2000): Estetikk eller miljøhensyn? Arkitekters syn på energiøkonomisering, *Tidsskrift for samfunnsforskning* 41 (3), 324-352.

Ryghaug, M. (2002): *Arkitekturens vitenskapelige grunnlag.* Essay to doctoral course in philosophy of science/Working paper 2/02, Dept. of Interdiciplinary Studies of Culture, NTNU.

Røstvik, H. N. (1994): Byggekunst reflekterer ikke virkeligheten, *Byggekunst* 4, 207.

Sabatier, P. A. (1999): *Theories of the Policy Process* (ed.). Boulder: Westview Press.

Sabatier, P. A. and D. Mazmanian (1980): The Implemetation of Public Policy: A Framework of Analysis, *Policy Studies Journal* 8 (4).

Sabatier, P.A. (1986): Top-down and Bottom-up Approaches to Implementation Research, *Journal of Public Policy* 61, 23-25.

Schleiermacher, F. (1998): *Hermeneutics and criticism and other writings.* Translated and edited by Andrew Bowie. Cambridge: Cambridge University Press.

Schmitter, P.C. (1974): Still the Century of Corporatism? *Review of Politics* 36, 85-131.

Scott, R. W. (1995): *Institutions and Organizations.* Thousand Oaks, Ca.: Sage. Foundation of Organizational Science.

Shackley, S. and B. Wynne (1996): Representing Uncertainty in Global Climate Change Science and Policy: Boundary-Ordering Devices and Authority, *Science, Technology and Human Values* 21, 275-302.

Silverman, D. (1993): *Interpreting qualitative data: Methods for Analysing Talk, Text and Interaction.* London : Sage.

Silverstone, R. and E. Hirsch (1994): *Consuming technologies: media and information in domestic space.* London: Routledge

Silverstone, R., D. Moreley, A. Dahlbergh and S. Livingstone (1989): *Families, Technologies and Consumption: the Household and Information and Communication Technologies*, CRICT discussion paper, Brunel University.

Skocpol, T. (1985): Bringing the State Back in: Strategies of Analysis in Current Research. In P. B. Evans, D. Ruescemeyer, and T. Skocpol (eds.) *Bringing the State Back in.* Cambridge, UK: Cambridge University Press.

Skocpol, T. (1992): *Protecting Soldiers and Mothers: The Political Origins of Social Policy in the United States.* Cambridge, MA: Harvard University Press.

Skogheim, R. (1985): *Kunstnerrollen i det praktiske liv. En sosiologisk analyse av arkitektprofesjonen med spesiell vekt på dens rolle innenfor byplanlegging.* Avhandling innlevert til magistergraden i sosiologi. Institutt for sosiologi. Universitetet i Oslo.

Smith, V. (2001): Ethnographies of Work and the Work of Ethnographers. In P. Atkinson (ed). *Handbook of Ethnography.* London: Sage.

Solberg, A. (1984): Metodekapitlenes blanke sider. In B. Dahle, M. Jones and W. Martinussen (eds.) *Metode på tvers.* Trondheim: Tapir.

Star, S. L. (1991): Power, technology and the phenomenology of conventions: On being allergic to onions. In J. Law (ed.): *A Sociology of Monsters. Essays on power, technology and domination.* London: Routledge.

Star, S. L. and J. R. Griesemer. (1989): Institutional Ecology, Translations, and Coherence: Amateurs and Professionals in Berkley's Museum of Vertebrate Zoology, 1907-1939, *Social Studies of Science* 19, 387-420.

Stortingsmelding nr. 29 (1998-99): *Om energipolitikken.* Det kongelige olje- og energidepartement.

Stubbs, M. (1983): *Discourse analysis: The sociolinguistic Analysis of Natural Language.* Oxford : Blackwell.

Sturrock, J. (1989): *Structuralism and since. From Lévi Strauss to Derrida.* Oxford: Oxford University Press.

Symes, M., J. Eley and A. D. Seidel (1995): *Architects and their Practices. A changing profession.* Oxford: Butterworth Architecture.

Sætnan, A. R. (1995): *Just what the Doctor ordered? A Study of Medical Technology Innovation Processes.* Doctoral thesis. Department of Sociology and Political Science, University of Trondheim. Also published: Centre for Technology and Society: STS report 25.

Sørensen, K. H. (1984): I lyset fra leselampen, *Tidsskrift for samfunnsforskning* 25, 269–292.

Sørensen, K. H. (1996): Learning Technology, Constructing Culture: Sociotechnical Change as Social Learning. *STS Working paper*

18/96. Centre for Technology and Society, Trondheim: University of Trondheim.

Tannen, D. (1984): *Coherence in Spoken and Written Discourse*. Norwood, N.J.: Ablex.

Thagaard, T. (1998): *Systematikk og innlevelse. En innføring i kvalitativ metode*. Bergen: Fagbokforlaget.

Titcher, S., M. Meyer, R. Wodak and E. Vetter (2000): *Methods of Text and Discourse Analysis*. London: Sage.

Torgersen, U. (1972): Profesjonssosiologi. Oslo : Universitetsforlaget.

Undheim, T. A. (2002): *What the Net Can't Do. The Everyday Practice of Internet, Globalization and Mobility*. Doctoral thesis/ STS report no. 55. Centre for technology and Society. NTNU.

van Dijk, T. A. (1985): *Handbook of Discourse Analysis*. London: Academic Press.

van Dijk, T. A. and W. Kintch (1983): *Strategies of Discourse Comprehension*. New York: Academic Press.

van Meter, D.S. and C.E. van Horn (1975): The Policy Implementation Process: A Conceptual Framework. *Administration and Society* 6, 445-488.

Vickers, G. (1999): *Key moments in architecture. The evolution of the city*. New York: Da capo press.

Wadel, C. (1991): *Feltarbeid i egen kultur. En innføring i kvalitativt orientert samfunnsforskning*. Flekkefjord: Seek a/s.

Weaver, R. K. and B. A. Rockman (1993): *Do Institutions Matter? Government Capabilities in the United States and Abroad.* Washington, DC: Brookings Institution.

Weber, K. M. and S. Paul (1999): Political Forces Shaping the Innovation and Diffusion of Technologies: an Overview, *SEIN Working Paper* no. 4.

Weimer, D. and A. R. Vining (1992): *Policy Analysis. Concepts and Practice*. 2nd edition. New Jersey: Prentice Hall.

Williams, R. (1997): Globalisation and Contingency: Tension and Contradictions in the Mutual Shaping of Technology and Work Organisation. In I. McLoughlin and M. Harris (eds.) *Innovation, Organisational Change and Technology*. London: International Thomson Business Press.

Williams, R., J. Stewart and R. Slack (2000): *Social Learning in Multimedia*, Final Report to European Commission, DGXII TSER, Research Centre for Social Sciences, Edinburgh: University of Edinburgh.

Williams, R. and K. Sørensen (eds.) (2002): *Shaping Technology, Guiding Policy: Concepts, Spaces and Tools*. Cheltenham, UK: Edward Elgar.

Wynne, B. (1995): Technology Assessment and Reflexive Social Learning: Observations from the Risks Field. In A. Rip, T. Misa and J. Schot (eds.): *Managing Technology in Society: The Approach of Constructive Technology Assessment*. London: Pinter.

Ødegården, O. (1999a): Akademiet inviterer til jubileumskonkurranse, *Arkitektnytt* 2, 7.

Ødegården, O. (1999b): –Utdanningen ligger etter, *Arkitektnytt* 3, 5.

APPENDIX

Appendix A.

Extract from the Chapter VIII Environment and health in Technical Regulations of under the Planning and Building Act 1997

§ 8-1 Environment and health
The life of works shall in all phases, i.e. execution, usage and demolition, be managed with a reasonable load on resources and environment, and without worsening quality of life and living conditions. Materials and products for use in construction works shall be manufactured with justifiable use of energy and with the aim of preventing unnecessary pollution. Construction works shall be so designed and executed that little energy is consumed and little pollution is caused during the life of the works, including demolition.

Use of energy
§ 8-2 Use of energy
Construction works with installations shall be executed in such manner as to promote a low demand for energy and power which does not exceed the overall limitations established in this Chapter. The demand for energy and power shall be such as to ensure a justifiable indoor environment.
The construction works and its installations shall be executed in such manner as to minimize the need for cooling and so as to avoid an unnecessary cooling demand.

§ 8-21 Energy and power
Requirements for the need of energy and power for a building may be established in one of the three alternative ways:
by the use of overall energy limitations adapted to various categories of buildings
by satisfying requirements for the heat insulating performance of each and every element of the building
by the use of overall limitations to heat loss based on a redistribution between the different building elements.
The alternatives are given in the following subsections No. 1, 2 and 3.
1. Overall energy limitations
The energy demand of buildings for heating and ventilation shall not exceed the overall limited values resulting from calculations by a recognized method. The overall energy limit is to be given per year and m2 of net floor area (NTA) for the heated parts of the building. In the case of more than one

temperature zone in the construction works, the overall energy limit shall be calculated for each zone and distributed over the net area of each zone.

Limitations on the energy demand for heating are to be calculated from a given reference temperature, the heat loss of transmission given in No. 2, and heat loss of infiltration. Overall energy limit for the use of ventilation are obtained through the requirements defined for indoor climate. In establishing the overall energy limitation the energy gain obtained in terms of internal heat and solar radiation shall be considered.

The real need for energy in a building is to be calculated on the bases of the different building elements coefficient of heat transfer (U), window areas and their locations, solar factor, air quantities, amount of internal heat, heat capacity, operation periods, etc. applying to the works in question. Where such values are not known, calculations are to be made according to the rules in Norwegian Standard.

2. Thermal insulation

The thermal insulation ability of each part of the works shall be calculated with the coefficient of heat transfer as given in the table below. The tabulatedvalues apply as long as the total area of windows, glass roofs and walls, and exterior doors does not exceed 20% of the net area of the building within 10 m from the external wall, for the heated parts of the construction works. If the construction works is permanently divided into temperature zones, then the relevant parts of the works in each zone shall be thermally insulated relative to the room temperature of the zone.

The effect of thermal bridges caused as a result of poor or non-existent local insulation shall be taken into account in the calculation of the coefficient of heat transfer, U, of building elements and shall be considered in planning the indoor climate.

(see Table: Highest average U-values for exterior building elements Chapter VIII Environment and health in Technical Regulations of under the Planning and Building Act 1997).

3. Overall heat loss limitations

The overall heat loss limitations may be established by calculating the total transmission loss of the building using the coefficients of heat transfer in No.2.

The heat transfer properties and the window area of each building element may be changed relative to the values in the table of No. 2, provided that the transmission loss does not exceed the overall heat loss limitations for the construction works.

§ 8-22 Air tightness

Buildings shall be so impervious that the effect of thermal insulation is not reduced by unintentional flow of air through them.

Moisture shall not be allowed to penetrate and reduce the effect of thermal insulating or worsen the design life of the building.

Buildings shall be so impervious that the indoor climate is not negatively affected and in such manner that unpleasant draught does not occur.

§ 8-23 Materials favourable to energy and the environment

Where it is documented that a building is made from materials requiring low energy consumption in their production and abolishment, and the materials otherwise have good environmental qualities, it may be accepted that the building consumes more energy in its period of operation than what follows from § 8-21 No. 1.

It must be shown as being probable that the total energy consumption for production of materials, operation of the building and abolishment of the materials does not exceed the general level expressed in this Chapter.

Appendix B.

The interview material

The interview material may seem a bit casual in the first impression, as many different actors are involved some of which have overlapping roles. One example is the president of the Architect Association who in addition to representing this important organisation also is a representative of practising architects when speaking on behalf of his own experiences as manager of an architect firm. Due to the different roles that the informants play in the dissertation as a result of their status, I have chosen to make some of the names official while others are made anonymous. The logic is as follows.

The actors that normally have a public role and which normally function as spokespersons for the architect profession or organisations are quoted by their real names. This for the obvious reason that they usually speak on behalf of the organisation that they represent and are used to having their opinions displayed publicly. On the other side, there is no reason why the names of architect firms and the architects working in private firms should be made public. They represent different voices of practising architects, and which firm they work in is irrelevant. Thus, these firms and the names of architects working there have been given new names.

However, some names of architect firms and practising architects have been impossible to make anonymous as the firms are directly linked to the three case studies Telenor Fornebu (TF), Kvernhuset Ungdomskole (K) and Pilestredet Park (PP). As it is known which architects and architect firms that worked with these projects, it is impossible to make these completely anonymous, as I wanted to reveal the identity of the cases. Thus, when talking about the case building projects architects and other actors are named by their title. However, when the architects that designed these cases are speaking in generally about topics that are not related to the cases, the names of the architects have been changed as for the same reasons as the other firms – to assure their anonymousness. In consequence, an enumeration of all respondents cited in the text, will reveal a higher number of respondents, than what was actual, as some will be counted two times as they are both named by a title and a new name.

I think that revealing the names of these cases is central for the analysis of the projects as each has different features that are highlighted in the description of them, and which make them special, and which accordingly reveal their identity.

This logic is also representative for the other professions involved in the cases that I have explored. In addition, one of the property developers that was not interviewed in relation to any specific case is made anonymous.

Nonetheless, in the following section there is a list of the anymous architect firms with a short description of them, based on some of their features. This is done in order to make them stand out as more well known and less distant to the reader.

Overview of informants

Architect firms

"Abode Architects"
New, small architect firm in Trondheim, with two young architects and a landscape architect. Interest in environment and ecology.
2 informants called Birkeland and Martinsen (partners/ architect and landscape architect)

"Moe Hansen Architects"
Small-middle large architect firm in Trondheim. Working with rehabilitation etc. Some interest in ecology.
1 informant Moe (manager)

"Archtic Architects Inc."
Relatively large architect firm in Trondheim. No peculiar announced competence in ecology or energy efficiency.
1 informant called Sundahl (manager/partner/ practising architect)

"Frost Architects Inc."
Large architect firm in Trondheim. No particular announced competence or interest in ecology.
1 informant called Lundgaard (practising architect)

"Berg and Westman Architects"
Young, middle to large architect firm in Trondheim. Not any announced interest in ecology, sustainability etc., but have some competence in these issues from recent building projects
2 informants called Winther and Davidsen (partners) (15 employees)

"AKKS Architects"

Relatively large (middle range) architect firm in Trondheim. No expressed competence or particular interest in ecology etc.
1 informant called Robertsen

"EcoArchitects"
Small, established ecologically profiled architect firm in Oslo.
1 informant called Dahl

"Arco Architects Inc."
Midle sized architect firm in Oslo with profiled interest in energy efficiency and sustainable building design.
2 informants called Johnsen and Sand. The informants where interviewed separately, Johnsen in December 1999 and Sand in May 2001. (partners)

"Jacobsen Architects Inc."
Large, "hot", architect firm in Oslo with no profiled interest in energy efficiency or environmentally sound design.
1 informant called Jacobsen. (partner)

"Storm Architects Inc."
Large, established architect firm in Oslo. No announced interest in environmentally sound building design.
2 informants. Martinsen (partner and general manager)
Lindfjord (practising architect)

"Focus Architects Inc."
Middle range architect firm in Oslo. (11 employees)
1 informant (general manager)

Other architects working as "Profession politicians", in education and research
Architect Professors
Employed at one of Norway's three architect schools
2 professors called Nordberg and Carlsson
1 assistant professor called Smith

The Norwegian Association of Architects
Interview with president, Ketil Kiran

NABU: Norwegian Architects for Sustainable Development

Manager, Chris Butters

Norsk Form, the Norwegian foundation for design, architecture and built environment
Manager, Peter Butenschøn

Arkitektnytt [Architect News]
Editor, Jan Carlsen

Others professions in the building design process
EcoBuild/NVE's Building operator
2 informants

Property developer, "Greenberg Property Developers Inc."
1 informant, general manager

The Telenor Fornebu project (TF)
1 architect
1 projecting manager, employed by building owner
2 consultant engineers HVAC (consultant 1)/energy solutions(consultant 2), employed in large consultant engineering firm
1 consultant engineer electro, employed in consultant engineering firm for el-solutions
1 project manager – electro, employed by the property developers

The Pilestredet Park project (PP)
1 architect
1 respondent from the co-operative building association/development company (environment and market group)
1 project manager/assistant project leader, The Directorate of Public Construction and Property, (property management and construction)
1 environmental manager, property developer
1 consultant engineer on HVAC, employed in large consultant engineering firm
1 environmental co-ordinator, employed by executing contractor
1 projecting manager, employed by executing contractor

The Kvernhuset project (K)
2 architects

1 building owner, politician, manager of technical committee, leader of the building committee, Fredrikstad Municipality
1 consultant engineer HVAC, small firm
1 researcher, A Norwegian Research Institute

Appendix C.

Interview guides

Short interview guide in Norwegian:

Designprosessen i praksis

Arbeidsdelingen i et byggeprosjekt

Kriterier for arkitektonisk kvalitet (egen mening og arkitektkonkurranser)

Rammebetingelser for miljøriktig prosjektering

Symbolinnhold (hva skal en bygning være? enøk, økologi)

Viktigheten av en miljøvennlig arkitektur

Etterutdanning

Omgivelsene/ressursene/stedstilpasning

Forskriftene og energiforbruket

Bruk av miljøteknologi

Veien videre – tiltak som kunne vært gjort

Short interview guide in English:

The design process in practice

Division of work in a building project

Criteria for architectural quality (own opinion and competitions)

Conditions in order to design in accordance with environment

Symbolic contents (what should a building be? Energy efficiency, ecology)

The importance of having an environmentally friendly architecture

Post-experience courses

Surroundings/resources/adjustment to site

Building codes and energy use

Use of energy technology

The future – possible measures