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Key Drivers and Main Implications

Bente Beckstrøm Fuglseth

FRIDTJOF NANSENS INSTITUTT
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Bente Beckstrøm Fuglseth
bente@byokologi.no

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Bente Beckstrøm Fuglseth

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Abstract

This report has explored changes in two regulations targeting energy performance of buildings in Sweden, energy requirements and certification of buildings. The objective has been to investigate the effect of the implementation of the EU directive on energy performance of buildings (EPBD) on these two regulations and to what degree the directive can explain the regulative changes. The analytical framework has also included domestic factors; the influence of the national government and the organizational field. The analysis revealed that whereas the EPBD has acted only as facilitator in connection with the changes in energy requirements, it has been the sole driver of some of the changes in Sweden's new certification system. Several of the changes during the period studied can however be traced to the national government and the organizational field. But the EPBD has also worked as a facilitator of the changes promoted by domestic actors. The directive has been used to legitimize radical changes that would have been difficult to implement in other ways.

Key Words

Europeanisation, energy performance of buildings, EPBD, goodness of fit

Orders to:

Fridtjof Nansen Institute
Postboks 326
N-1326 Lysaker, Norway.

Tel: (47) 6711 1900
Fax: (47) 6711 1910
Email: post@fni.no
Internet: www.fni.no

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1 Introduction

The building sector is responsible for a substantial part of energy use and greenhouse gas emissions in Europe. Moreover, according to the Intergovernmental Panel on Climate Change (IPCC), that is the sector with the highest cost-effective potential to reduce greenhouse gas emissions (Levine et al. 2007). Substantial reductions are possible with existing technologies. However, barriers like physical infrastructure, prices on energy carriers and technologies, and norms and values prevent the widespread diffusion of these technologies (Fuglseth 2008). Regulations have an important role to play in overcoming such barriers. By setting specific standards that must be fulfilled, the government aims at affecting the technological choices of its citizens (Christiansen 2001, Vedung 1998). Regulations may therefore be central in ensuring that the barriers to improved energy performance of buildings are overcame. On the other hand, regulations may also be set in such a way that they hamper such improvement, and thus become barriers themselves (Fuglseth 2008). The main objective of this study is to explore regulative changes targeting the energy performance of buildings, in order to detect the main implications and the key drivers of the changes in the case of Sweden.

Sweden has made considerable efforts in recent decades to promote energy efficiency and renewable energy. Ambitious climate goals exceeding the Kyoto commitments were adopted in 2001 (Ministry of the Environment 2001a) and these targets have already been achieved (Swedish Environmental Protection Agency 2008). The energy performance of buildings has also been improved substantially. The use of fossil fuels for heating has been reduced significantly (Swedish Energy Agency 2008), and there has been a reduction in energy used for heating of buildings (Swedish Energy Agency and SCB 2007). In addition, in an International Energy Agency (IEA) comparison of building codes, Sweden proved to have the highest overall energy requirements among IEA countries (IEA 2008:37). These features provide a highly relevant context for analysing regulations targeting the energy performance of buildings.

The EU directive on energy performance of buildings (EPBD) adopted in 2002 instructed member states to implement several regulations aimed at triggering the potentials for energy saving in the building sector. But to what extent has the directive induced regulative changes in the member states that may lead to improved energy performance of buildings? It is widely recognized that there exists an implementation gap between EU environmental legislation and national application (Knill and Lenskow 1998). Central to theories of how the EU affects domestic regulative change is the fit between EU legislation and existing domestic regulations. A medium level of fit will yield the most changes, as domestic regulations are required to change to comply with EU legislation, and domestic actors are more likely to facilitate changes that do not differ too much from existing regulations (Knill and Lehmkuhl 2002, Cowles et al. 2001). That means that we should not expect major changes in countries that have a high degree of regulative compatibility with the EU directive on energy performance of buildings. However, Swedish regulations on energy performance of buildings have undergone significant changes that

seem to match the EPBD requirements, despite the high degree of fit between previous regulations and the new directive. An important objective of this report is to contribute to the theory debate on how EU policy affects domestic change. By studying regulative changes in Sweden, the report seeks to explore how the EPBD has influenced Sweden, a frontrunner in the field of energy performance. Have Swedish policies developed independently of the EU policy, or has the directive acted as a reinforcing source, giving rise to radical changes?

The study will analyse the changes of two specific regulations: energy requirements and certification of buildings from 2002 until 2008. The reason is twofold. First, both regulations have undergone significant changes during this period. Second, both the setting of minimum energy performance requirements and energy certificates are included in the EPBD. Member states are required to implement these instruments, but may select those measures that are best suited to their particular situation. However, none of these policy instruments are new in the Swedish context: Sweden has had energy requirements for decades, and a certification system of buildings had been in preparation since 1995.

In this study, three explanatory approaches will be applied to explore these questions and explain the changes during the 6-year period in question. These are the *EU policy perspective,* the *national government perspective* and the *organizational field approach*. The first approach, the *EU policy perspective,* assumes that the changes have been induced by EU policy. The EPBD sets several requirements which EU member states must adopt. Hence, according to this perspective, we may expect that the changes occurring during the period studied will be a result of implementation of the EPBD. However, several scholars have criticized studies of the effect of EU policy on domestic change for giving too much credit to the EU level (Mastenbroek and Kaulen 2006, Boasson 2006). Hence, two approaches stressing the influence of domestic actors will be applied here. The *national government perspective* focuses on the role of the national governments in policy change. Domestic politicians have their own agenda, and in accordance with this perspective we may expect any regulative changes to follow the interests of the government concerned. By contrast, the *organizational field approach* stresses the influence of actors within the field of energy performance of buildings: energy companies, property owners, construction companies and governmental authorities with regulative responsibility for energy performance of buildings. According to this perspective we may expect regulative changes to reflect the interests and values of such organizations operating within the field of energy performance of buildings.

Changes in the Swedish regulations are studied from 2002, as that is when the EU directive on energy performance of buildings was adopted. The end point has been set to December 2008, which was the final deadline for implementation of the directive (Directive 2002/91/EC). The study is based on analysis of policy documents, relevant reports, archival materials and qualitative interviews conducted with a range of actors involved with energy performance of buildings in Sweden.

The report is structured as follows: section 2 presents the analytical framework and the three explanatory approaches more thoroughly. In section 3, changes to the two regulations during the period studied will be presented. Section 4 presents the empirical material in relation to the explanatory perspectives. In section 5, these findings are then discussed in terms of the explanatory approaches. And finally, section 6 offers some concluding remarks and summarizes the findings of this study.

2 Analytical Framework

2.1 Energy Performance of Buildings

'Energy performance of buildings' is here understood as three different aspects of energy use of buildings: energy demand, energy form and energy source (Fuglseth 2008). The *energy demand* of a building is determined by its location, design and construction. Favourable local climate, grouping of buildings, size, and design, construction and materials that limit heat loss and exploit passive solar energy are measures that will reduce the demand for energy. Energy demand will be understood as those qualities of a building that determine the amount of energy necessary for normal use of that building. *Energy form* concerns the relation between the quality of energy and the purposes to which it is put. Electricity is high-quality energy that can be used for both heating and machinery, while thermal energy from for instance bio-energy can serve one purpose only: heating. The most efficient use of energy is when the energy quality of the source correlates with the demand (Næss 1997). Converting from electrical heating to thermal energy may lead to less need for electricity generated from fossil fuels. The choice of *energy source* is important for reducing the environmental impacts of energy use in buildings. A range of renewable energy resources can be used for heating buildings and can substitute for fossil fuels. For instance, heat pumps extract the heat from the surroundings, solar collectors exploit solar energy and bio-energy can be used both in district heating and in individual heating systems.

2.2 Explanatory Approaches

Several studies on implementation of EU policies have pointed out how EU policies tend to affect member states to differing degrees, depending on national contexts and the contents of the specific EU policy (Knill and Lehmkuhl 1999, Schmidt 2001, Risse et al. 2001). The adaptational pressure of EU policy is a necessary condition, but is not sufficient for the EU to affect domestic change: there also must exist mediating domestic structures to facilitate the changes (Gualini 2004, Risse et al. 2001, Knill and Lehmkuhl 2002). One criticism of this approach is that the focus on adaptational pressure leads to the neglect of domestic factors (Mastenbroek and Kaulen 2006, Haverland 2005, Boasson 2006). Domestic organizations may have their own agendas, and spur change independent of EU policies. Hence, in this study three different analytical perspectives will be applied. By applying explanatory approaches to both the EU and the national level, the objective is to contribute to the theory debate on Europeanization and domestic change, providing a more valid and balanced picture of how the EU affects domestic change.

The EU policy perspective stresses that domestic regulative change is the result of policies at the EU level. Today all policy areas are, to a greater or lesser extent, affected by the EU (Bulmer and Radaelli 2004). A range of actions and legislations at the EU level prescribe both specific rules and more general requirements that the member states must adopt. Through these regulations the EU exerts a direct impact on policy development in its member states. However, as several studies have revealed, the mere existence of such formal rules is not sufficient for EU to affect domestic change. Central in the theory debate on how EU policy affects domestic change is the concept of 'goodness of fit'. The level of fit between existing domestic structures and the EU policy determines the adaptational pressure of that policy. Where there is a good fit, adaptational pressure will be weak, since no change is required. By contrast, a misfit can be expected to create strong adaptational pressure (Mastenbroek and Kaulen 2006, Risse et al. 2001). However, the mere existence of an adaptational pressure is not sufficient for EU policy to affect domestic change. Additionally, the prevailing domestic structures must facilitate the changes. Domestic support is likely to be higher if the changes required do not diverge too markedly from the existing structures. Hence, a medium level of fit is most likely to induce domestic change, as both domestic adjustments are required and prevailing domestic constellations are more likely to facilitate such changes (Knill and Lehmkuhl 2002). From the EU policy perspective, we will expect that the regulative changes occurring in Sweden under the period studied are a result of the adaptation pressure of the EPBD, and that there is a misfit between the requirements of the EPBD and existing regulations.

The national government perspective assumes that domestic regulatory change first and foremost reflects the objectives of the national government. The national government has its own agenda and chooses the measures that it perceives as best suited for achieving its objectives. Hence, the changes are driven by the intentions, views and relative power of the government in question (Olsen 1992). The idea that regulative change reflects the preferences of the government further implies that the existing regulations were in line with the interests of the government, so changes in regulations require changes in the government's preferences. This may be the result of shifting norms and values of the government, or the shift to a new government with different preferences. From the national government perspective, we will expect that the regulative changes occurring in Sweden under the period studied have been driven by the preferences of the government, and that there has been a shift in their preferences to bring them in line with the new regulations.

The organizational field perspective emphasizes the influence of the domestic organizations with activities related to energy performance of buildings. An organizational field can be understood as 'those organizations that in the aggregate constitute a recognized area of institutional life' (DiMaggio and Powell 1983:148). This may be key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar products and services (DiMaggio and Powell 1983). This perspective stresses how the organizations within the field work actively to influence regulations targeting energy performance of building, and will ensure that the regulations favour their own interests

and values. The organizations may however have different interests and values, which will reslut in a power struggle between the organizations. According to the organizational field perspective, we would expect that regulative changes occurring in Sweden under the period studied have been induced by organizations active within the field of energy performance of buildings, and that the changes reflect the interests of these organizations.

3 Regulative Changes

This section presents the major changes in the energy requirements and certification of buildings in Sweden from 2002 until 2008.[1] The two will be presented separately, as the changes in these two regulations can be characterized as two parallel processes, and can also be assessed differently.

Table 1 shows the key changes that the energy requirements for new buildings have undergone between 2002 and 2008. The changes are assessed in terms of how they target the different elements of energy performance of buildings.

Table 1: Changes in Sweden's energy requirements for new buildings between 2002 and 2008

	Changes	**Assessment**
Energy demand	From requirements for heat loss, to maximum energy use per m^2/year, defined as delivered energy	Less focus on qualities of the building shell
Energy form	Stricter requirements for buildings using electrical heating	Increased focus on thermal heating
Energy source	From facilitating renewable energy in general, to only solar energy	Less focus on renewable energy

The most significant change concerns the formulation of energy requirements. While the 2002 requirements target thermal insulation and heat loss (maximum U-value and air tightness) (National Board of Housing, Building and Planning [hereafter: NBHBP] 1993), the 2008 requirements set a maximum limit for the energy use of the building. Whereas the calculated energy demand of the projected building was the focus of the 2002 energy requirements, the 2008 requirements focus on actual energy use, defined as the amount of energy delivered to the building.[2] To ensure that the energy requirements are fulfilled, the 2008 requirements are to be verified by measuring the energy use of the finished building (NBHBP 2008a). In addition to the qualities of the building shell, also other factors

[1] There have also been several other changes in these two regulations, but this study focuses on the most radical and extensive changes

[2] Electricity for household purposes and for activities in non-residential buildings is exempted from this requirement

will affect the amount of delivered energy to the building, such as energy production within the system borders of the building, and the actions of those living in the building. These changes in energy requirements have led to less focus on the qualities of the building shell, and increased attention on other factors that influence the need for delivered energy.

Another important change is the introduction of stricter energy requirements for buildings using electrical heating. While the 2002 requirements made no distinction between energy forms, the maximum limit for energy use for buildings with electrical heating in the 2008 requirements is half that of buildings with thermal heating (NBHBP 1993, NBHBP 2008a).[3] Whereas the 2002 energy requirements were neutral as to energy form and made no distinction between electrical and thermal heating, the 2008 requirements favour thermal heating.

The 2002 regulations had requirements for heat recovery of ventilation air, but with an exemption for buildings that used renewable energy as the major heating source (NBHBP 1993). In the 2008 requirements there are no such exemptions. However, the requirements favour solar energy technologies, as energy use can be reduced by energy from solar cells or solar collectors installed on the building (NBHBP 2008a). All in all, the 2008 energy requirements are less focused on renewable energy, as less distinction is made between renewable energy and fossil fuels compared to the 2002 requirements.

Certification of buildings had not been implemented in Sweden in 2002, but a system was under development and testing at that time. It is the differences between a system tested in 2001, known as building certificates, and the final system implemented in 2008, known as energy certificates, that are compared in this study. The main differences between the two systems are summarized in Table 2.

Table 2: Changes between the building certification system proposed prior to 2002 and the system of energy certificates under implementation in 2008

	Certification of buildings	**Assessment**
The contents	From covering several different subjects, to two: energy and indoor environment	Less comprehensive
The scope	From voluntary certification of residential buildings, schools and preschools, to mandatory certification of all buildings	More comprehensive
Implementation	From the owner implementation, to certified independent experts	More comprehensive

[3] The energy requirements make a distinction between three climate zones and residential and non-residential buildings. This figure is valid for residential buildings in climate zone 1 (BFS 2008).

The proposed system of building certificates included information on several points: 1) a description of the building with general information, 2) design and availability, 3) indoor environment, health and safety, 4) materials with environmental and health risks, and 5) efficient use of resources and impact on the external environment (NBHBP 2001). Today's energy certificates include only two of these. The energy performance of the buildings is the most prominent, and in addition the certificates include information on whether the ventilation system has been inspected and if radon measurement has been carried out (NBHBP 2007).

Another important difference is the scope of the system. The building certificates included only residential buildings, schools and preschools, and were intended as a voluntary system. By contrast, the energy certificates are mandatory, and include all types of buildings. As from 1 January 2009, all buildings constructed, rented out or sold in Sweden shall have an energy certificate. The third main difference between the building certificates and the energy certificates lies in the implementation of the system. Whereas the owners of the buildings were meant to implement the building certificates themselves, with the energy certificates this is to be the responsibility of certified independent experts (NBHBP 2001, NBHBP 2007).[4] These experts shall also hand over one copy of the certificates to a national energy certification register, which shall be used for statistics, research, the follow-up and evaluation of energy performance and indoor environment and the supervision of the certification system (NBHBP 2007:11).

The changes from 2002 until 2008 have made the certification system more comprehensive: it was made mandatory and applicable to all types of buildings, and has to be carried out by certified independent experts. On the other hand, it also become less comprehensive, as today's system encompasses only two of the elements included in the earlier system.

4 Explaining the Changes

4.1 EU Policy

Energy Requirements

According to the EU policy perspective, it is the EPBD that has been the source of the changes in Swedish energy requirements. As the energy requirements focus more on thermal heating and less on renewable heating and the building shell, we would expect these changes to be in line with the emphasis and requirements of the EPBD.

First, to get a grasp of the underlying assumptions of the EPBD, let us take a look at the rationale behind introducing a directive targeting the energy performance of buildings. The main motivations stressed in the directive are the need to reduce greenhouse gas emissions and to increase

[4] The energy experts have to be certified by an accredited certification body (NBHBP 2007)

security of energy supply. As the building sector accounts for a significant share of energy consumption within the EU, measures targeting energy use in buildings were considered of great importance for reaching these objectives. This was not a new thought; the importance of buildings had been recognized by the Commission ever since the early 1990s (Directive 93/76/EEC). With the EPBD, EU policies targeting the energy consumption in this sector became stronger as the measures prescribed in the directive were specified in greater detail than previously.

As one of the main motivations for launching policies targeting the building sector was to achieve reductions in greenhouse gas emissions, we could expect the directive to emphasize the substitution of fossil fuels with renewable energy. However, this is not the case. The emphasis is on energy efficiency, the rationale being that implementation of energy-efficiency measures will reduce the energy consumption of buildings and thus contribute to reduced greenhouse gas emissions. This is also expressed through the understanding of energy performance of buildings applied in the directive. The focus is on the *amount* of energy, not the energy source or form. The issue of energy source is present, as the directive states that the positive influence of heating and electricity systems based on renewable energy is to be taken into account when calculating the energy performance of buildings. However, this is only a secondary issue. Moreover, electrical versus thermal heating is not discussed in the EPBD at all (Directive 2002/91/EC) even though this issue can be seen as a question of energy efficiency. For the purpose of heating buildings, it is more efficient to use a low-quality energy form like thermal heating, rather than electricity, an energy form with high quality. Heating was not an issue in the EU at the time when the EPBD was adopted, and it is only very recently that heating with renewables has gained attention. The considerable focus on the amount of energy can be interpreted as a stronger emphasis in the EPBD on raising the security of energy supply than on reducing greenhouse gas emissions.

We now turn to the specific requirement of the EPBD examined in this section: the setting of energy performance requirements for new buildings, which includes adopting a methodology for calculating the energy performance of buildings. The directive opens up for using both actual energy consumption and calculated energy demand as a basis for determining energy performance. The methodology for calculating energy performance is not restricted to qualities of the building shell, but includes ventilation and air-conditioning installations, among other points. Thus the EPBD favours the inclusion of several factors influencing the actual energy use of the building, rather than stressing only qualities of the building shell as such (Directive 2002/91/EC).

The EPBD opens up for using both actual energy use and calculated energy demand as basis measure for energy requirements. Hence, the transition to applying delivered energy as a measure is not in conflict with EPBD – but neither was the earlier system of using calculated energy demand (Swedish Energy Agency and NBHBP 2003). Thermal heating is not dealt with at all in the directive, so the stricter requirements for electrical heating in the Swedish energy requirements cannot be explained by implementation of the EPBD. When it comes to the less-

ened focus on renewable energy in the Swedish energy requirements, this change reflects how the issue of energy source is only secondary in the EU directive. However, the favouring of renewable energy is still encouraged by the EPBD, so it is not likely that the directive is the source of this change. The EU policy perspective may offer some explanation for the changes, as neither of them is in conflict with the requirements of the EU directive, but the directive cannot be said to have acted as a key driver of the changes in energy requirements.

Certification of Buildings

According to the EU policy perspective, we would expect the EPBD to be the source of the changes in Sweden's certification system. As the certification system has become more comprehensive and puts greater emphasis on energy performance, we would expect these changes to be in line with the rationale and the requirements of the EPBD.

As discussed in the previous section, the EPBD is rooted in the EU objectives of increasing the security of energy supply and reducing greenhouse gas emissions, and the main target is to contribute to unleash the energy-saving potential inherent in the building sector. The indoor environment of buildings is mentioned, and the EU directive stresses that it shall be taken into account when calculating energy performance, in order to avoid negative effects on the indoor climate. Other qualities of buildings are not an issue, except for a general mention that measures to improve the energy performance of buildings should not conflict with other essential requirements of the building. However, no further prescription is given as to how to achieve this (Directive 2002/91/EC).

The energy certification system prescribed in the EBPD is quite comprehensive. When a building is constructed, sold or rented out, an energy performance certificate is to be made available to the owner, potential buyers or tenants. A reference value is to be included in the energy certificate, to make it possible to compare and assess the energy performance of the building. In addition, the certificate is to contain recommendations for cost-effective measures that can improve the energy performance of the building in question. The directive also specifies that this certification shall be carried out in an independent manner by qualified and/or accredited experts (Directive 2002/91/EC).

Another central characteristic of the EPBD is the heavy emphasis on information as a way of achieving improved energy performance in buildings. By securing transparency, the objective is to increase the demand for buildings with good energy performance. In addition, the intention behind providing the owners of the buildings with information on cost-effective measures to improve energy performance is that such measures shall be carried out.

The changes in the certification system of buildings in Sweden are to a large extent in line with the system prescribed in the EPBD. Energy performance is the main target of the Swedish certification system, as it also is in the EPBD. The inclusion of indoor environment is not in conflict with the EPBD, but neither is it promoted to a degree that can ex-

plain why this area was included in the final Swedish energy certification system and not any of the other elements in the building certifictates. When it comes to the comprehensiveness of the system, also this is in line with the requirements of the EPBD. The exceptions are the establishment of a national register of energy certificates and the system of certified experts, which goes further than the system prescribed in the EPBD. However, all in all, the EU policy perspective can explain most of the changes between the certification system proposed in Sweden in 2001 and the final EU system of 2008.

4.2 National Governments

Energy Requirements

According to the national government perspective, the changes in energy requirements towards increased focus on thermal heating and less focus on renewable energy and the building shell indicate that the government has become more concerned about energy form and the need to limit electrical heating, and less focused on promoting the substitution of fossil fuels with renewable energy or on the qualities of the building shell.

Energy performance of buildings has been a continuous concern for Swedish governments since the oil crisis of 1973/74, although their policies have had differing motivations and emphases. This is also the case for the two governments in office during the period studied. The government in office from 1994 until 2006, the Swedish Social Democratic Party, emphasized the need to phase out nuclear power, to reduce the use of fossil fuels and to achieve more efficient energy use (Swedish Social Democratic Party 2001). In 2001 they launched environmental objectives covering a range of issues, also the energy performance of buildings. The main focus was on reducing the amount of energy consumed and reducing the use of fossil fuels for heating. Even though electrical heating was not mentioned explicitly in the environmental objective, this has clearly been an important issue. The phase-out of nuclear power makes it necessary to reduce the use of electricity for heating. In fact, the government considered a ban against direct electrical heating in new buildings, and commissioned the National Board of Housing, Building and Planning (NBHBP), the national agency responsible for regulations targeting buildings, to analyse this issue further (Ministry of the Environment 2001c). However, they concluded that stricter energy requirements for buildings using direct electrical heating would be more effective, and decided not to recommend an outright ban (NBHBP 2003). The government followed this recommendation, and suggested in a governmental proposition from 2006 stricter energy requirements for buildings using electrical heating.

The government put increased emphasis on the environmental aspects of energy use by transferring energy from the purview of the Ministry of Enterprise, Energy and Communications to the Ministry of Sustainable Development in 2004. According to our interviewees, this led to a stronger political focus on energy performance, both as the environmental impacts of energy use received greater emphasis and as bringing together matters concerning energy performance of buildings under one ministry

made the process more effective and easier. This resulted, among other things, in a governmental proposition on energy efficiency in the building sector in 2006, with quite ambitious objectives for the sector. By 2020, total energy use per heated area is to be reduced by 20% compared to 1995, and the dependency on fossil fuels in the building sector is to be broken (Ministry of Sustainable Development 2006:20). In this proposition it is also suggested that the energy requirements for new buildings should be tightened.

It was the government that initiated the revision of the energy requirements through the 2002 governmental commission to the NBHBP. They were instructed to revise the entire building code and develop verifiable functional requirements. The revisions were also to support Sweden's environmental objectives and EU harmonization (Ministry of the Environment 2001b). The shift to setting requirements for the actual energy use of the finished building and the removal of the exemption for heat recovery of ventilation air for buildings using renewable energy was rooted in the desire to develop verifiable requirements. The previous requirements for thermal insulation and heat loss were converted into the energy demand of the building, understood as kwh/m^2/year (NBHBP 2006). The NBHBP was the architect behind these changes, and as long as the Board remained within its mandate it was given the leeway to perform the actual revision. Hence, the government had no direct influence on these changes.

The 2006 general elections broke a 12-year period of Social Democrats in government, and a coalition of non-socialist parties formed the government. Energy issues were moved back to the Ministry of Enterprise, Energy and Communications – which, according to our interviewees, hampered the strong focus on energy performance of buildings initiated by the previous government. The new government also stressed the need to improve energy performance in the building sector, though not to the same degree as its predecessors. Moreover, they had a different approach to the issue, focusing on the importance of a system approach that extended outside the boundaries of the building itself. However, the work of the previous government on sharpening the energy requirements for new buildings using electrical heating was continued, and culminated in stricter requirements for new buildings using electrical heating in 2008. However, the new government has yet to follow up the proposal as to more stringent energy requirements for new buildings.

The Swedish government has given increased attention to the energy performance of buildings under the period studied, though the efforts were weakened after the shift of government in 2006. The government has introduced policy objectives supporting reduced consumption of energy in the sector, substitution of fossil fuels with renewables and reduction in electrical heating. Whereas this can explain the stricter requirements for electrical heating and the greater emphasis on energy form, the government has not been behind the lessened focus on renewables and the building shell.

Certification System

According to the national government perspective, the changes in the certification system towards greater focus on energy performance and a comprehensive system indicate that the government has become more concerned about energy performance of buildings than other qualities of the building, and that it prefers a comprehensive system of certification to a more limited one.

Indoor environment was one of the main motivations for initiating the development of a system of building certification (NBHBP 2001). This was also the case with the further development of the certification system. In a government proposition on indoor environment in 2002, the government stressed the need to improve the indoor environment of Swedish buildings. They stated that radon, damp and mould have negative effects on the health of the residents, and that measures are needed to curb these problems. Certification of buildings was seen as an important measure to secure the improvement of the indoor environment in Swedish buildings. The government was also aware of the importance of seeing the indoor environment and energy use in buildings in relation to each other. However, they found the certification system that was developed and tested by the NBHBP to be too extensive, as it covered a range of qualities of the building. They would rather have a system that specifically targeted the indoor environment and energy use of buildings. The government was also sceptical to a voluntary system of certification, fearing that it could give rise to several parallel certification systems. That would create uncertainty and might reduce public acceptance of the system (Ministry of the Environment 2002). However, they did not make a clear statement in this matter when mandating a governmental commission in 2002 to develop the system further (Dir. 2002:93).

As discussed in the previous section, the government put increased emphasis on energy performance of buildings during the period under study. The gathering of energy and building issues in the Ministry of Sustainable Development was also important for focusing more on energy in the certification system. In fact, in 2003 two certification systems were under development in Sweden: a system based on building certificates, and one based on the EPBD. The Ministry of Environment had commissioned the former, while the Ministry of Enterprise, Energy and Communications had commissioned the latter. After these reports were handed over to the government in 2004, the final system of energy certificates was developed on the basis of these two systems.

The two elements included in the energy certification system – energy performance and indoor environment – are in line with the interests of the government. Energy as the primary target can also be explained by the heightened governmental focus on energy performance of buildings. The government was also in favour of a more comprehensive system based on mandatory certifications of all building types, without taking a clear standpoint on this matter. Thus we see that the governmental perspective may help to explain several of the changes in the certification system.

4.3 The Organizational Field

Energy Requirements

According to the organizational field perspective, the shifts in the energy requirements towards greater emphasis on thermal heating and less focus on renewable energy and the building shell reflects the values and norms of the organizations involved in energy performance of buildings. If these changes result from the organizational field, then the organizations should have come to favour thermal heating rather than electrical heating, and become less concerned about the building shell and the use of renewable energy sources.

Energy performance of buildings is a complex field, as the organizations involved have a range of different activities related to the energy performance of buildings. Energy companies are responsible for delivering energy and energy technologies. Construction companies construct new buildings, including the installation of energy technologies which in many respects determine the energy form and source of the building, at least in a short-time perspective. And the property owners are responsible for the long-term operation, maintenance and rehabilitation of the buildings, and thus possible improvement of the energy performance in a longer perspective. In addition, several regulative authorities are involved, because of the interconnected responsibilities in this field.

According to our interviewees, what the construction industry opposed was not the change from calculated energy demand to actual energy use, but that the energy requirements in practice have become stricter. This was due to the inaccuracy of the previous calculation method, which led to higher energy use, as well as to the removal of the exemption for heat recovery for buildings using renewable energy. Moreover, construction companies now have to operate with an extra margin to compensate for the behaviour and habits of those living in the building, to ensure that actual energy use will not exceed the level set in the requirements. Further, the industry stressed that this meant increased costs, and that sharpening the requirements was not a part of mandate of the governmental commission. At that time, the energy performance of buildings was not an important issue for the construction companies. However, according to our interviewees, greater public awareness on climate change towards the end of 2006, induced by among other things Al Gore's film on global warming, put energy and greenhouse gas emissions on the construction companies' agenda. Criticisms of the new energy requirements died down, and especially the major construction companies started to put significant efforts into bringing energy performance into their projects. For instance, NCC decided in 2007 that all residential houses constructed under their management should have at least 20% lower energy use than specified by the building code *(NCC nyheter* 3, May 2008), whereas all residential buildings constructed by JM were to be low-energy houses *(Byggvärden,* 5 February 2008). According to our interviewees, the building shell is the main concern of the construction companies. They focus on constructing buildings with low energy demand, whereas energy source and form are secondary issues. This does not imply that the companies are indifferent to the choice of energy source and form of the buildings they construct. In fact, they have favoured the use of primary

energy in the building code, as they believe that the use of delivered energy will lead to greater use of heat pumps and thus electrical heating.

This point of view is shared by the renewable heating companies, with the Swedish district heating industry at the forefront. The critique primarily concerns the system border applied in the energy requirements. By applying delivered energy as a measure for energy performance, the system border is set to the building. This means that energy delivered to the building as electricity and district heating are outside the system border, and are therefore included in the energy use. However, if a building has a heat pump or solar collectors which extract energy from the surroundings, only the electricity needed to operate these will be counted as energy use. The energy these technologies extract from their surroundings is considered as being inside the system border of the building and is therefore not perceived as delivered energy to the building. This implies that two buildings with exactly the same building shell, but where one building has a heat pump and the other has district heating, will have differences in energy use.[5] However, if the district heating plant uses heat pumps, the energy produced from the heat pump will be defined as delivered energy, since energy production occurs outside the system border of the building, and will be included in the energy use. One implication may be that instead of constructing buildings with low energy demand, heat pumps will be employed to lower the need for delivered energy. Construction and energy companies have therefore promoted the use of primary energy in the energy requirements, to shift the system border. By applying weighting factors on delivered energy that reflect the transformation losses from production to consumption, the energy produced by a heat pump will be assessed the same, whether it is placed in the building or in a district heating plant. However, the latest revision of the energy section in 2008, leading to stricter requirements for building using electrical heating, has been supported, as this change compensates for some of the shortcomings of the use of delivered energy as a measure in the energy requirements.

Primary energy has not been an issue for the NBHBP. According to our respondents, the main concern has been to ensure that the new energy requirements are verifiable. The Board perceives that the best way to achieve this is to set requirements for the actual energy use of the building. In addition, it is stressed that the main point is to ensure that the energy consumption of buildings is as efficient as possible, regardless of energy supply system. Buildings without heat recovery of ventilation air have on average 20–30% higher demand for delivered energy than buildings using heat recovery. Hence, one important reason for removing the exemption for heat recovery for renewable heating has been to prevent buildings using renewable energy from having a higher demand for delivered energy. Another reason is to make the energy requirements technologically neutral (NBHBP 2006).

[5] Heat pumps extract the heat from the surroundings (air, water or ground), and transfer it via a fluid to the building. Electricity is needed to transport the heat and drive the heat pump. For 1 kW input, approximately 3 kW of heat output is gained, depending on local conditions and type of heat pump (Nowacki 2006).

The National Board of Housing, Building and Planning has been the architect behind Sweden's new energy requirements. Within the general governmental mandate to make the building code more verifiable, they have induced a system change compared to the previous requirements (NBHBP 2006). They have been quite resistant to criticisms from the construction and energy companies opposing the use of delivered energy. However, the changes in values towards a greater focus on energy performance in the construction industry has moderated some of the protests. On the other hand, primary energy remains an important issue among construction and renewable heating companies. Especially the district heating branch has been promoting this issue. Stricter energy requirements for buildings using electrical heating are, however, in their interest, and are seen as a way of weighting the delivered energy.

Certification of Buildings

According to the organizational field perspective, the changes in the certification system towards a greater focus on energy performance of buildings and a comprehensive certification system reflect the values and norms of the organizations involved in energy performance of buildings. If the changes result from the organizational field, then the organizations should have become more concerned about the energy performance of buildings than other qualities of the building, and should favour a comprehensive certification system.

Certification of buildings primarily targets the property owners, as it is the owners of the buildings that are responsible for the certification. The property associations have been positive to the overall idea of having a Swedish certification system for buildings. In fact, several had developed or started to develop their own certification systems (NBHBP 2001). As discussed in the previous section, energy and reduction in greenhouse gas emissions have received greater attention in recent years. This has also increased the support for certification of buildings among the owners. Higher prices on energy have given owners additional reasons to focus on measures that can reduce the demand for energy. However, they did oppose a comprehensive system that would increase the expenses of the owners. First they criticized the building certificates for being too extensive and detailed, but then the energy certificates were criticized for going further than the requirements of the EPBD.

The need for inspection was a main topic of debate during the development of the energy certification system. In the original proposal, inspection of buildings was required, but this was modified in the final draft. Now, inspection is required only if it may lead to recommendations for cost-effective measures. The higher energy use per square metre, the more likely is the need for inspection. Another issue that the property owners have been concerned with is the need for a national register for energy certification. Both the need for certified experts and the national register were the main sources of conflict related to the energy certificates. These are measures that are not required in the EPBD, and several actors hold that these are unnecessary measures that will mean higher costs for the owners, who are responsible for providing the energy certificates.

The NBHBP was first tasked with developing building certificates, and is also responsible for the system of energy certificates. The Board is also concerned with other qualities than energy performance, as is illustrated by the many aspects included in the original proposal for building certificates. The Board was from the start sceptical to a mandatory certification system, and promoted a voluntary system to be carried out by the owners of the buildings. On the other hand, it has from the start promoted a national certification register, which may be perceived as providing a more comprehensive system. As noted, property owners have criticized this register for being unnecessary and costly.

The organizations within the field of energy performance of buildings have from the start favoured a system of certification of buildings. Increased concerned about energy performance of buildings throughout the period studied here indicates that they would prefer a system that places greater emphasis on the energy aspect. However, a more comprehensive system based on mandatory certificates for all buildings carried out by independent, certified experts would not be in the interests of the organizations active within the field.

5 Detecting the Sources of Change

In fact, all three perspectives can offer explanations for the changes in the two Swedish regulations under the period studied. However, we may note significant differences in their ability to explain the changes in the energy requirements and the certification system.

Whereas the energy requirements in 2002 fulfilled the EPBD criteria, there were several differences between the certification system prescribed in the EPBD and the building certificate system tested in Sweden in 2001. According to the 'goodness of fit' hypothesis, we would expect the directive to have no influence on the changes in the energy requirements, as they already fulfilled its requirements. A good fit makes domestic change unnecessary, so we could expect that the regulations would remain unchanged. As the energy requirements nevertheless have seen significant changes during the period studied we could expect that the sources of change would be found at domestic level. There is on the other hand a misfit between the certification system prescribed in the directive and the building certificates tested in Sweden in 2001. The building certificates did not match the certification system of the EPBD, which is a much more comprehensive system. But as there at the time of implementation already existed plans for a Swedish certification system of buildings that would include information on energy performance, we may say that there was a medium level of fit between the existing domestic structures and the requirements of the EPBD. That in turn should indicate strong adaptational pressure from the EPBD, and we could expect implementation of the directive to produce significant changes in the certification system.

Turning to the empirical findings, we see that the picture is more complex. Even though that the energy requirements fulfilled the directive, the EPBD still has had an impact on the changes. True, the revision of Sweden's energy requirements was initiated by the government and was

not due to implementation of the EU directive. But as the actual revision was carried out parallel to the implementation of the directive, the revision process was also affected. EU harmonization is an underlying guideline of the revisions in the Swedish building code (NBHBP 2004), and the NBHBP has ensured that the new energy requirements fulfill the measures prescribed in the EPBD. However, the key drivers for the changes examined in this report are found on the national level. The Swedish government initiated the revision of the energy requirements, but of the changes studied here, stricter requirements for electrical heating are the only change that can be traced directly to the government. Both the change to employing delivered energy as a measure and the lessened focus on renewable heating were the work of the NBHBP. These changes do not, however, reflect the interests of other central actors in the field, as renewable heating companies and also, to some extent, construction companies, favour the use of primary energy.

When it comes to the certification system, the EPBD has had a much more active role in the changes. The empirical mapping supports our expectation that the EU directive has been important in the development of Sweden's final system of energy certificates, because the certification system has undergone significant change during the period studied and because these changes are in line with the system prescribed in the EPBD. However, when we study the process of change in depth we find that the picture is more complex, and that also domestic actors have been drivers for the final certification system. Even though the new energy certificate system matches the requirements of the EPBD, these changes cannot be explained solely by the EU policy perspective. Domestic actors had been promoting several of these changes even before the EPBD was implemented in Sweden. The government had restricted the certification system to cover issues related to energy performance and indoor climate before the adaptation of the EPBD, and also opened up for a more comprehensive system of mandatory certificates for the building sector. The latter point was not, however, settled by the time the EPBD was implemented.

On the other hand, these changes might have been difficult to implement if it had not been not for the directive. Sweden's energy certification system of 2008 is a comprehensive system that has implications for a range of actors. Especially the owners of buildings have been opposed to such a system, because of the higher costs of paying consultants to carry out the certification. According to our respondents, the EPBD has been important for legitimizing a comprehensive system, and protests have been dismissed by referring to the requirements prescribed in the directive. This is also evident as the criticism of the requirements of the EPBD died down, and instead focused on the elements that were *not* required in the EPBD: certified experts and a national certification register. We may conclude that the EPBD has had both a direct role as a key driver of change, as some of the changes in the certification system are clearly due to the implementation, and a mediating role for changes that were in the interest of the government but would have been difficult to implement as they were opposed by several actors, including the government authority responsible for the certification system.

The empirical findings show that many different forces have been involved in the process of regulative change in Sweden. The rise in energy prices and the heightened public awareness on climate change must not be underestimated in this process. This has increased the concern for better energy performance of buildings among the organizations within the field. Especially among the construction companies this silenced the protests against the changes in the energy requirements: instead they have started a race to construct buildings that not only meet the requirements but go beyond them. Also the introduction of a comprehensive system of energy certificates has been eased due to these issues. The influence of exogenous factors like rising energy prices and increased concern for climate change, implementation of the EPBD prescribing specific requirements concerning the energy performance of buildings, the interests of the government and the organizational field have worked together to affect the regulative changes under the period studied. They have all been important as reinforcing sources of change, since they have pointed mainly in the same direction: to ensure regulations that promote improved energy performance of buildings. True, there have been disagreements on the best way to achieve this. One of the most prominent has been the issue of broadening of energy use and using primary energy instead of delivered energy in the energy requirements.

What is especially interesting with the Swedish case of implementation of the EPBD, is that the regulative changes have gone beyond the requirements of the directive. For the energy requirements this applies for the higher requirements for electrical heating and the verification of the energy requirements through measuring the energy use of the finished building, and for the certification system – the use of certified experts and establishment of a national certification register. The explanation for these overachievements can be found both in the EU policy and at the domestic level. Despite some skepticism for the certification system prescribed in the EPBD, the government, the ministries and national agencies soon started to concentrate on how to develop the best possible system. The implementation of the EPBD was important to legitimize these changes, but could not have occurred without the strong emphasize on energy performance of buildings in Sweden for decades, strengthened further by increased energy prices and concern for climate change. The regulative changes during the period of study have maintained Sweden's position as a frontrunner in the field of energy performance of buildings.

6 Conclusion

This report has explored the regulative changes that have targeted the energy performance of buildings in Sweden. The objective has been to investigate the effect of the EU directive on energy performance of buildings and to what degree this directive can explain the changes. The analytical framework has also included domestic factors.

Initially we asked: what is the effect of EU policy on a member state that can be perceived as a frontrunner in the current field? What seemed puzzling was, on the one hand, the significant level of change in Sweden that seemed to match the requirements of the EPBD, and on the other

hand the hypothesis that good fit between the EU policy and the domestic arrangements would induce no change. However, a more in-depth look at the changes showed that whereas the energy requirements had a good fit, the certification system of buildings had only a medium fit. The analyses revealed that whereas the EPBD has acted only as facilitator in connection with the changes in energy requirements, it has been the sole driver of some of the changes in Sweden's new certification system. Hence, this study supports the 'goodness of fit' hypothesis, as the medium level of fit between the requirements prescribed in the EPBD and domestic regulations has resulted in more changes than would have been the case with a good fit.

Several changes in the regulations during the period studied can be traced to the national government and the organizational field. But the EPBD has also worked as a facilitator of the changes promoted by domestic actors. The directive has been used to legitimize radical changes that would have been difficult to implement in other ways. This is a role that should not be underestimated, as it may prove crucial for proposed changes to gain support and be implemented. Hence, the EU policy, the national governments and the organizational field have worked together to induce the regulative changes.

However, the EU may also have had effects that have not been possible to detect in this study. EU policies launched prior to the EPBD may have influenced domestic-level actors in Sweden and been incorporated into their norms and beliefs, appearing to be their own. Institutionalization of previous EU policies may for instance be the case with the certification system of buildings, as the SAVE directive adopted in 1993 included requirements for a certification system of buildings. In addition, national-level actors were aware of the EPBD well before it was adopted, and may have adjusted at an early stage.

The findings of this study support those scholars who stress the importance of including national-level factors when exploring the effect of EU policy on domestic change. The development of the Swedish certification system of buildings from 2002 until 2008 illustrates that what may seem to be an impact of EU policy may in fact also be highly influenced by domestic forces working independently of the EU. Whereas several studies on the impact of the EU on domestic change include national-level actors, these are treated as facilitators or inhibitors of the changes prescribed by the EU policy. This study has shown that domestic actors should be studied independently of the EU policy in question, to ensure that the true sources of change can be detected.

Interviews

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Erik Thornström, Ministry of Enterprise, Energy and Communications. Interviewed in Stockholm, 2 June, 2008

Hans Olof Hjort Karlsson, the National Board of Housing, Building and Planning, Karlskrona, 11 June, 2008

Jan Söderström, Villaägarnas Riksförbund. Interviewed in Sollentuna, 5 June, 2008

Olle Oskarsson, Ministry of Environment. Interviewed in Stockholm, 5 June, 2008

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Fridtjof Nansens vei 17, P.O. Box 326, NO-1326 Lysaker, Norway
Phone: (47) 67 11 19 00 – Fax: (47) 67 11 19 10 – E-mail: post@fni.no
Website: www.fni.no