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**OVERSTEPPING THE BOUNDS:
INDUSTRY INVOLVEMENT IN THE DEVELOPMENT OF ENERGY
REGULATIONS**

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The 2002 European Union (EU) directive on the energy performance of buildings (Directive 2002/91/EC) set minimum standards on the energy performance of new buildings and existing buildings. It also indicated that these would be subject to periodic renovation. In some countries the directive supported policymakers in their bid for national commitments to carbon reduction. In others, it affirmed existing commitments. In most countries, it informed the ongoing reformulation of building regulations. This paper explores energy related developments in building regulations for new housing in Denmark (DK) and the United Kingdom (UK). The interest of the comparison lies in similarities in the type of changes introduced into the regulations and differences in industry responses.

In DK, the EU directive served to affirm and strengthen national level commitments to sustainable construction; in the UK it supported the introduction of dramatically new national goals for carbon reduction. In both countries, changes to the energy section of the building regulations were accompanied by experiments with new, progressive types of regulation which blurred the line between building regulations and voluntary assessment methods. In 2006 and 2008 DK and the UK respectively introduced new progressive forms of regulations, which combined minimal thresholds with aspirational targets for beyond compliance design. In DK, the government tightened regulations by introducing a new baseline plus two (voluntary) low energy classifications with substantially higher targets. In the UK, a new building assessment method – the Code for Sustainable Homes - was introduced, the energy credits were made mandatory and a

clear timetable for future changes culminating in ‘zero-carbon’ houses in 2016 was set. Energy requirements in the Code were directly linked to building regulations.

While the type of change was roughly similar, the response of housing developers differed significantly. In DK, housing developers responded to these changes by adjusting their business practices to meet the new, voluntary goals. It was only when industry objected to government attempts to modify progressive regulations that the government created new forms of consulting bodies to better engage with industry. In the UK, in contrast, housing developers objected vociferously to the new type of regulation. Their protests set off a chain of events which led to a change in the role of industry in the formulation of building regulations. Differences in response can be ascribed to differences in dominant design templates (business models, key actors, criteria of value), markets, national regulatory systems and the nature of the challenge which this new type of regulation posed.

As this brief introduction suggests, the interest of the energy section of building regulations is twofold. First it is an important arena for the operationalization of national commitments to sustainability. Secondly, it highlights some of the basic unspoken rules governing ongoing changes to building regulations and what happens when they are violated. Building regulations by their nature are dynamic. Industry expects periodic revisions to reflect changing government and societal standards and goals. A key finding in this paper concerns some of the assumptions legitimizing that arrangement.

The comparison of DK and the UK suggests that the regulatory system rests on an implicit understanding regarding the feasibility of successive targets. In DK, regulatory reforms remained within the confines of the dominant design template and market constraints; in the UK they extended beyond them, setting off a process which, for the moment, looks as if it will lead to significant change in governance structures. Far from a

contingent development, this development reflects the potentially disruptive nature of sustainable construction and the challenges which it poses to both governments and industry.

Regulations and the new housing sector

The interest of the housing sector lies in its simultaneous importance for the achievement of national carbon reduction goals and the conservative nature of the industry. Thus while new forms of governance may have transformed other sectors such as the petrochemical industry, the construction sector has remained relatively immune. Until the seventies, building regulations in both DK and the UK were technically driven and highly prescriptive, specifying in detail how things should be done, although the degree of enforcement varied. In the UK, regulations are strictly enforced by building controllers, employed by local authorities to ensure compliance; in DK compliance is much more loosely monitored. In both countries, industry involvement in the formulation of these rules has historically been limited to consultation processes, where individual organizations contribute their views, with no requirement on policy makers to take their input into account. Since the eighties there has been a gradual shift from prescriptive to performance based regulations, which set minimum performance levels, leaving builders with a fair amount of discretion on how to meet them. While these have provided builders with a greater margin for manoeuvre in living up to the requirements, they do not challenge the basic command and control character of the rules.

Industry acceptance of government regulation – and more specifically of the periodic revision of regulations – rests on a shared assumption that targets will stretch the industry, but will not threaten dominant business models or ways of working. This unspoken rule has, however, been challenged by government experiments with the form and extent of energy regulation. In the UK, the introduction of extremely ambitious, but

underspecified regulatory targets challenge the commercial viability of dominant design templates and mobilized the industry. In DK, the situation appears almost to be the opposite – the new progressive energy requirements worked well for significant sectors of the industry. In the Danish case it was the government's decision to rescind certain performance based requirements, rather than their introduction, which led to industry protest. While the catalyst for industry engagement in the two countries differed, in both cases it was provoked by threats to the dominant design template and in both countries it led to increased, and in the UK unprecedented, industry involvement in the formulation of building regulations.

As this brief discussion suggests, the literature on governing and governance provides a framework from which to consider recent developments in energy regulations. It also situates industry engagement in broader policy trends. Conversely, the case of housing developers and energy regulations draws attention a relatively under theorized aspect of the literature on sustainability governance, namely the role of industry actors in the formulation and thus transformation of traditional (rather than novel) mechanisms of government and the processes leading up to it.

Regulations, government and governance

One of the contributions of the literature on sustainable governance (Adgar & Jordan, 2009) is to draw attention to the role of policy instruments in the process of governing (or governance) and to the different actors engaged in the process. The literature on governance tends to distinguish between state and non-state actors or between government, industry and civil society actors. When it comes to environmental regulation, this has the advantage of drawing attention to the central importance of regulation in environmental policy and to the engagement of particular actors in the policy process and to the exclusion of others. As the discussion which follows indicates, in the case of

building regulations, the expansion of environmental regulations provided an occasion for the engagement of the larger industry players, but it did little to engage and/or support the involvement of either small and medium firms or ‘civil society’ in the ongoing specification of environmental regulations.

As a policy instrument, regulations play a somewhat ambiguous role in the literature. For many authors, they are associated with the command and control instruments associated with traditional forms of government. For others, they (also) offer a central tool of indirect governance as evidenced by the neo-liberal shift from direct to indirect forms of intervention. In this model, the state specifies regulations, while non-state actors implement the requirements. State control enters into this model through the medium of assessment and auditing practices. In a third approach, a number of scholars of horizontal or decentralized governance note the engagement of non-state actors in the development of regulations, suggesting that they too can become object of horizontal governance (Hutter, 2006). A number of scholars call for inquiry into the combination of traditional tools of government and new types of policy tools at the level of practice. This is particularly true for environmental policy, where even the loudest proponents of ‘governance’ note the persistence of environmental regulations as the primary tools of direct and indirect government.

Regardless of which model is adopted, scholars agree that when it comes to environmental policy, regulations continue to dominate (Jordan et al., 2005). To the extent that public policy has moved in the direction of more horizontal governance, these efforts figure in the implementation of regulations, rather than in their formulation. To the extent that recent developments in energy regulation of new housing involves non state actors in the formulation – rather than implementation - of regulations, their engagement can be seen to mark a break with traditional models of governing and with governance.

CASE STUDY 1: UK - THE CODE FOR SUSTAINABLE HOMES AND THE ZERO CARBON HUB

Building Regulations and The Code for Sustainable Homes

The UK building regulations stretch back to the London Building Act of 1667 in response to the Great Fire of London in 1666. In its modern form, the first set of building regulations came into force in 1964. The Building Act 1984 paved the way for the 1985 regulations which introduced the concept of performance based Approved Documents which gave greater flexibility to the design of buildings. Prior to this, the regulations were highly prescriptive in nature.

Before 1972, the regulations did not contain energy requirements, but focused on the traditional issues of structural integrity, fire resistance, and so on. Conservation of fuel and power provisions appeared for the first time in the 1972 version of the regulations. This shift was directly linked to issues of security as well as cost and concerns over resource depletion. From 1990 and through the 1995, 2002, 2006 and 2010 version of the regulations, the energy requirements improved and refocused first on energy efficiency and then on carbon dioxide emissions.

In 2006, the UK government introduced an ambitious, legally binding set of targets for carbon emission reduction for the country as a whole. The act called for a reduction of 20% by 2016 and 80% by 2050, relative to energy use in 1990 levels. In implementing this strategy the government singled out the construction industry as a key player. Curiously, initial policies focused on new housing. In choosing housing developers as the main focus for their policies, the government chose the most conservative and one of the least flexible sub-sector within the industry. While commercial buildings are often built to client and site specifications, housing is a highly standardized business, with a relatively standard designs and repetition of work. The sector is highly concentrated with a number

of large volume house builders. Architects have almost no role in the design of houses, which are built to standardized designs.

To get housing developers to contribute to national targets, the government devised a complex policy mechanism, linking a revised version of (previously voluntary) assessment methods with anticipated revisions to the energy section of the building regulations. While the Code addresses nine sustainability issues, the discussion which follows focuses exclusively on the energy category as the most controversial of the nine and the one which posed the most radical challenge to dominant ways of working within the industry. The UK, the Code for Sustainable Homes set out an anticipated programme of performance requirements to 2016. This is to be achieved through a progressive tightening of the energy efficiency Building Regulations (Part L) (DEFRA, 2007) – by 25% in 2010 and by 44% in 2013 (relative to 2006 levels) – up to the zero carbon target in 2016 (CLG, 2007a, v).

Industry reaction and organizational innovation

The initial specifications for the Code called on housing developers to produce ‘zero-carbon’ homes by 2016, but it failed to specify what it meant by ‘zero-carbon’ (CLG, 2006). While the precise specifications of the concept were unclear, the radicalness of the demand was not. Housing builders realized immediately that whatever ‘zero-carbon’ meant, its achievement depended on radical innovation in both design and business models. Housing developers responded with anger, both at the seeming impossibility of the targets and the lack of engagement over both the target and time scales. The Building trade journal, summarised the mood as follows:

...for months now, the industry has been complaining bitterly that these changes were being rushed through the ODPM [Office of the Deputy Prime Minister] at breakneck speed and the industry could not possible cope. ... Interesting, nobody is complaining about the tougher energy performance targets. “I’ve got no problems with regulations that drive energy efficiency but I do have a

problem with the way they've been forced on the industry without an adequate lead-in time," says Derek Field, McCarthy and Stone [a UK housing development company]" (Lane, 2006).

The Home Builders Federation (HBF), a major housing developer industry representative group, sought dialogue with the Department for Communities and Local Government (CLG) to work with the government in the development and implementation of the Code. From these (and other) discussions, the 2016 Zero Carbon Taskforce was established in January 2007, following the publication in December 2006 of the Government's policy statement Building a Greener Future (TSO, 2008).

The 2016 Task force is jointly chaired by the Housing Minister and the HBF Executive Chairperson. The Taskforce's terms of reference are to (CLG, 2007b, p.97):

- identify the barriers to implementation of the zero carbon 2016 target, and put in place measures to address them;
- develop a commitment publication alongside the final Building a Greener Future policy statement, which will set out the respective roles of Central and Local Government and business as we move towards the zero carbon 2016 target; and,
- develop a timeline for steps that need to be taken over the next ten years to support the implementation of the zero carbon 2016 target.

The Zero-Carbon Hub (ZCH) (<http://www.zerocarbonhub.org/>) was launched by the Housing Minister in June 2008 to support the delivery of zero carbon new homes by 2016 (ZCH, 2008). The organization represents an innovation in the governance structures linking industry and the state. The organization brings together state and industry actors, as well as NGOs such as the Carbon Trust, whose interests map across numerous sectors. The organization reports directly to the 2016 Taskforce. The need for the venture was identified in the one of the recommendations in The Review of House building Delivery – The Calcutt Review, which stated that “Government and the house building, construction products and energy supply industries should jointly sponsor a delivery unit to monitor, co-ordinate and guide the zero carbon programme” (CLG, 2007b, p.96).

Viewed from the perspective of the regulatory process, the establishment of the 2016 Task force and ZCH was unprecedented. Until this point building regulations had been specified by government, sent out for a period of consultations, and then decided behind closed doors. Thus while industry input was 'invited', industry representatives were not involved in the actual specification of regulations. In contrast, the ZCH combines state and non-state actors with diverse, often contradictory interests and views on role of the housing sector in carbon reduction.

The ZCH and the regulatory process

The stated purpose of ZCH is to assist the housing development sector understand the challenges, issues and opportunities involved in developing, building and marketing low and zero carbon homes. In addition, the ZCH advises the Government on the development of important parts of the Code. For example, at the end of July 2010 the Housing Minister and Local Government commissioned the ZCH to establish a Task Group to recommend an appropriate national Carbon Compliance limit which would form part of the overall definition of a zero carbon home in the 2016 Building Regulations (ZCH, 2010a). To coordinate the delivery of zero carbon homes and to monitor delivery against the Government's targets, the ZCH has been working closely with the new build housing sector and other interested parties to establish a common view on a series of broadly representative timelines. The timelines have been designed to help build an understanding across the industry of what is required for zero carbon delivery and to allow progress towards the 2016 target to be monitored and evaluated. A consolidated form of the timeline forms part of the Zero Carbon Delivery Report presented to the 2016 Zero Carbon Task Force and Minister for Housing on a quarterly basis (e.g. ZCH, 2010b).

More specifically, ZCH activity has been organised into five work streams: building energy efficiency, energy supply, examples and scale up, skills and training, and

consumer engagement (ZCH, 2010a). Each work stream is managed by a Steering Group and supported by a range of key actors from across the industry and private, public and non-governmental organisation sectors. The consumer engagement work stream, for example, has had input from the Sponge Sustainability Network, CLG, Energy Saving Trust, Berkeley Homes PLC, Chartered Institute of Marketing, Royal Institution of Chartered Surveyors, Crest Nicholson PLC, and so on.

ZCH and the energy regulations

The ZCH serves a number of novel functions in the specification and implementation of energy regulations. First, it provides a vehicle for the involvement of industry and relevant non-government organisations in the specification of standards and regulations. Over the past year, the ZCH has played a central role in the specification of carbon compliance limits and in the definition of zero carbon. One of the key criticisms of the original formulation involved the insistence that the 'zero-carbon' requirement extend to the entire housing unit and that zero carbon be achieved at the level of the individual unit. In 2010, thanks to the work of the ZCH, the government back pedalled on the single unit criteria, opening the way for 'allowable solutions.' Where originally zero-carbon was to be achieved as an individual unit, compliance with the 2016 Building Regulations will now be through a combination of Carbon Compliance (individual unit carbon emission performance) and Allowable Solutions which are off-site carbon reduction solutions which meet the short-fall of the Carbon Compliance performance. Carbon compliance solutions involve unit specific issues such as the energy efficiency of the fabric, the performance of the heating cooling and lighting and low and zero carbon technologies.

Allowable solutions have yet to be specified but they open the way for the export of low to zero carbon heat to existing stock, the improvement of existing housing stock on another site, offsite low to zero carbon electricity generation with a hard wire connection to

the housing development in question or investment in offsite low to zero carbon generation. While the concept opens the way for support for community level carbon reduction measures which are rare in the UK, its introduction was almost exclusively driven by economic considerations. To ensure that achieving zero carbon is affordable, hence per unit of carbon saved, 'allowable solutions' must be cheaper than Carbon Compliance measures. As this suggests, the ZCH plays a crucial role in developing more technically credible and commercially viable requirements which are more easily understood by housing developers, thus reducing the possibility of misinterpretation.

A second function of the ZCH involves its role in informing the housing sector of upcoming developments and advising them on how to adjust their practices to accommodate a changing policy context. This is critical, in that it provides the industry time to accommodate to change and prepare its standard practice to meet the new challenges which it faces. The ongoing specification of the Allowable Solutions by the ZCH is, for example, being complemented by a new verification process, backed up by an Allowable Solutions Certificate. This mechanism reduces the risk of policy change to housing developers by allowing them to experiment and develop solutions now which will be deemed to comply with the 2016 building regulation, even though the latter has yet to be fully specified.

A third function of the ZCH involves the legitimisation of the Code and building regulations in the eyes of housing developers. Whereas the initial Code and (associated, future) energy regulations were dismissed as unachievable and, more importantly, illegitimate, the co-option of key industry players into the ZCH and their genuine engagement in the specification of upcoming regulations has largely removed that hostility. This legitimisation function is tacitly recognised by the UK government when it states that "The Zero Carbon Hub has the lead responsibility for delivering zero carbon dwellings by

2016 It will be important therefore to work with and through the Hub in achieving the general improvements which are required” (CLG, 2009, p.60)

Finally, the ZCH through its very creation and activities also introduced a new type of regulatory process, aimed at the specification of regulations. Whereas previously the construction sector responded to proposed policy through a consultation process, the ZCH involved industry directly in the policy process. This influence is evident in the government’s recent statement that:

"The Government will introduce more realistic requirements for on-site carbon reductions, endorsing the ZCH's expert recommendations on the appropriate levels of on-site reductions as the starting point for future consultation, along with their advice to move to an approach based on the carbon reductions that are achieved in real life, rather than those predicted by models." (BIS, 2011, p.117).

Nor is the ZCH a temporary body. Instead the government has stated its intention to retain the organization as a formal consultative body. Thus, in the UK Government's Plan for Growth document, it is noted that the ZCH Task Group work on ‘Carbon Compliance’ will form the basis for consultations on future changes to the Building Regulations up to and including those in 2016 (BIS, 2011).

In the language of the governance literature, the ZCH appears to be a viable co-operative, reflexive government institution for the progression of the Code. It has stimulated broad ownership of the Code by the housing development sector and has been an experimental space for diverse parties to come together and develop and support a significant amount of technical innovation, particularly in the areas of the definition of zero-carbon and the carbon compliance limits.

Conceptualizing sustainable construction?

The UK government is pursuing an articulation of sustainable construction which balances the needs of the environment with the needs of the economy through the

recognition that “through its impact on the built environment, construction plays a central role to promote sustainable growth and development (BERR, 2008: 4). The Code, in its original formulation in 2006 was in tension with the commercial interests of the industry. The ZCH and the redefining of the energy requirements offer the industry and the Government a meaning of sustainable construction which both sides find legitimate.

Practically, this involves the bundling of many pre-existing commitments and priorities, such as waste management, water, materials, site management and worker welfare (including commitments to “considerate construction”, health and safety and local employment) under the heading of “sustainable construction”. The only genuinely new area of concern and associated set of programmes to come under this heading is concern for biodiversity. Within this context, energy requirements and more specifically the concept of “zero carbon” is the first target to threaten housing developers’ highly standardized mode of production. As such it is also the only topic to invoke significant industry mobilization.

CASE STUDY 2: DK – FLOUNDERING WITH SUCCESS?

According to the Danish government Denmark has one of the strictest building regulations in the world (Regeringen, 2009, p.6); regulation that has been instrumental in fostering innovation (FORA, 2011). Judging from the media debate and statements from various actors within the construction industry not all aspects of Danish building regulations are equally celebrated. In what follows we expand upon what role industry has in the regulatory process and how the DK building code strategy has given particular content to the notion of sustainable construction that may not be quite so ‘progressive’ and such a big success as many readily claim.

The DK building code strategy – a gradual tightening of the reins

Regulating energy use in buildings is an offshoot of DK energy policy, which has for more than 40 years given primacy to reducing the country's dependence on fossil fuels. With the growing concern for climate change, this goal has, according to the government, been given even greater priority (Regeringen, 2009). However, one thing is what you commit to on paper, another is how these commitments are enacted and enforced.

When it comes to housing, the way in which energy requirements have made their way into this sector is through the building codes. Like in the UK, DK's building regulations have a long history, dating back to responses to great urban disasters in the 16th and 17th centuries – fires. However, 'the modern era' in DK building regulation starts in the 1960s with the introduction of prescriptive standards of how housing should be built (SBI, 2009). Subject to regular revisions since then, the DK building code has undergone a number of substantial changes: A decade later, in the 1970s, there is a move to introduce more open, functional standards with the purpose of among other things enhancing energy efficiency. This marks the beginnings of a performance based approach to regulating the energy-use of buildings that would continue to evolve over the next 30 years: In the mid-1980s, the heat loss standards for new buildings are tightened substantially and a distinction between low-energy housing and other forms of housing is introduced. In the 1990s emphasis is given to working with energy frameworks and this, in turn, gave way in the 2006 revision to the introduction of energy performance frameworks, i.e. the DK government's response to the EU directive on the energy performance of buildings (2002/91/EC). The 2006 revision refined the notion of low-energy housing, introduced in the 1980s, by further distinguishing between houses that could be considered as either low-energy class 1 or 2, with the latter being the more stringent standard of the two.

In 2009 the Danish government introduced its "Strategy for reducing energy

consumption in buildings” (2009), flagging that government would progressively tighten the performance requirements for new housing – with 25% reductions in 2010, 50% in 2015, and 75% in 2020, relative to energy use in 2006. These reductions are almost comparable to the changes made in the UK Building regulation. Even though the Danish government considers the strategy to be part and parcel of the country’s energy and climate policies, “energy consumption has to be reduced by the most cost-effective means without jeopardizing the quality of the indoor climate and architecture” (Regeringen, 2009, p.4). The concern for architecture in this formulation is striking, given the absence of concerns for aesthetics in the UK and reflects the very different role of the architect in the two countries. As in the UK, energy policy is governed by potentially conflicting requirements. In DK, efficiency, indoor climate/livability and aesthetics are not always reconcilable. They represent three quite distinct ‘logics’ or modes of justification that industry as well as government must ‘straddle’.

The strategy is the result of a cross-ministry collaboration¹, based on inputs – assessments and suggestions – provided by a “partnership” consisting of representatives from 22 private companies, trade associations, and non-governmental organizations across the construction sector’s entire value chain, including representatives from the NGO The Ecological Council and several universities. This industry-government collaboration provided the backdrop for the most recent revision of the building code (2010) that entailed rescinding the classification of low energy housing (from 2006). While this group has not been formalized in a new type of organization, the development of a quasi-collective voice, rather than individual inputs in to a general consultation process, and extent of their role is

¹ Ministry of Economics and Business Affairs/Danish Enterprise and Construction Authority (chair), the Climate and Energy Ministry/Energy Agency, Ministry of Finance and the Ministry of Social Affairs.

new, thus paralleling the increased density of industry-state interaction surrounding national energy targets.

These developments exhibit a number of characteristic features: First, the gradual introduction of (various kinds of) performance measures has allowed industry to become accustomed to this mode of regulation – performance-based regulation can hardly be considered something ‘new’ in the Danish regulatory arena. Second, the frequency with which the regulatory changes have been introduced has increased – to begin with changes were made roughly once a decade, whereas more recently changes have been made almost every other year, which, all else being equal, adds to the complexity of the regulatory landscape. This is similar to the situation in the UK where the projected schedule of post-2006 changes marks an acceleration in the pace of reform. Third, all regulatory changes have been subject to a formal hearing process prior to implementation; hearing processes in which it is customary to try to accommodate as many positions as possible without undermining the regulatory content too much politically. Although the general model for industry consultation was not fundamentally changed, the creation of a partnership between companies across the construction sector value chain marks an innovative approach in soliciting industry input. Given the diversity of the companies and organizations involved, it is very likely that they have had contradictory interests and claims that the regulators somehow have had to address.

Industry reactions have been varied

Needless to say, there are differences across the industry as to how responsive the various actors have been to these regulatory changes. The national building code strategy has – over time – provided development opportunities for some parts of the industry, notably some of the component industries such as the window and insulation industries (Lauridsen & Jensen, 2011) whereas other parts of the industry (e.g. smaller installation

companies) have felt that it was more of an economic burden that they would either have to bear or, if possible, pass on to their customers. Looking back over time, the interest for and against a tightening on the building codes has, needless to say, varied and there have been some interesting shift in who has been 'for' and who as been 'against' the energy regulations.

Going back to the 1995-revision of the building code, which was the first revision that caused an extended media debate (Reijonen & Georg, 2009), because of the increased insulation requirements and the introduction of a maximum allowable energy use per m², Despite popular acclaim amongst politicians, this was met by wide spread critique by architects, notably because of the insulation requirement's presumed aesthetic effects. As one architect from the Århus School of Architecture put it: "the thickness of insulation will have such a catastrophic effect on brick building's aesthetic expression that it is best not to insulate" (Politiken, 09/10/94). Others were afraid that the combination of increased insulation and more stringent energy requirements would lead to what was derogatorily dubbed "goggle-architecture", i.e. buildings with many small, deep windows filled with thick glass that presumable would let so little light in that the houses would be likely candidates for giving people winter depressions (Ingeniøren, 20/05/94). Although other actors (notably government agencies) emphasized that the building code would allow the architects more manoeuvre room, because they would be able to off-set poor performance in one area with another, the architects and their professional organizations continued to remain critical of these changes. And judging from the debates in the professional architectural journal, *Arkitekten*, the architects remained sceptical until well into the next decade (mid-2000s), at which time almost all architectural firms started claiming e.g. on their web-sites that they had competencies within sustainable construction (Reijonen & Georg, 2009). The glass and insulation industries, needless to say, saw the 95-revision as a

window of opportunity (no pun intended), upon which they have continued to capitalize.

With the subsequent revisions, other industries have been able to see new development opportunities, i.e. notably other component industries (e.g. heating pumps, solar panels, window glazing) and some large contractors, who consider being able to manage energy and environmental concerns as a way of distinguishing themselves in an increasingly tough market. These developments have presumably helped to ensure industry acceptance of the building code – it didn't go against the grain of what a growing number of industries could accommodate. The overall sentiment in the industry was by 2008 rather positive, as captured by the title of a collaborative report, written by a working group consisting of representatives from government and the construction industry: "Climate friendly building in practice – what are we waiting for?" (Teknologirådet, 2008).

According to the report, industry had the necessary technology and knowhow to meet the future regulatory demands: Things were looking good on the supply side. What was missing was a stronger demand. To this end, the report argued, government should play a much more active role in: developing specific goals for reducing CO₂ emissions in the building sector; developing financial incentives to promote climate friendly buildings; standardizing the ways in which the total costs of constructing and operating climate friendly buildings are done; constructing demo-houses; and acting as an exemplary owner of new (and old) buildings. According to CONCITO, a Danish 'green think tank', the underlying argument for strict regulation is a competitive one – it will provide industry with a sense of direction and an incentive to innovate, because they will be able to test their technologies and methods on a receptive home market (interview). Low Energy Class 1 and 2

Low Energy Class 1 and 2

While the overall thrust of the building code revisions have been to provide the

building sector with stricter energy standards and introduce new methods for calculating energy demands, the introduction of the voluntary low-energy class 1 and 2 was intended to do as the think tank CONCITO suggests – provide the sector with a sense of direction and, hence, an incentive to increase energy efficiency. Whether this, indeed, has been the case is subject to much debate: Some, notably within the industry say that it has induced companies to innovate (Dansk Byggeri, 2009) whereas others argue that the fact that these were voluntary performance measures meant that many companies refrained from going beyond the status quo (Information, 29/07/08). According to Lauridsen and Jensen (2011) it appears as if the building codes are interpreted as more or less representing the limits to what is achievable. However, the development of zero-emission houses, energy+ houses, and eco-labelled (Swan-) houses has demonstrated that it is possible to reduce energy consumption to levels that are lower than even the most stringent building code. There are, however, relatively few companies pursuing these options.

The distinction between LEC 1 and 2 was rescinded in connection with the introduction of new progressive performance targets in the latest (2010) revision of the building code. With a target of 25% reduction of energy use in 2010, relative to what it was in 2006, energy use in new buildings will correspond to what was formerly required according to LEC 2, thus making this category superfluous. Rather than continue with an LEC1, government decided to introduce a new LEC, LEC2015, to signal that this will be “the standard that all new buildings will be expected to live up to in five years” (Jyllandsposten, 2010). Industry acceptance of this was mixed: According to the trade association for the construction industry it was a good thing: “Even though there are some companies that have specialized in providing solutions that already live up to the 2020 requirements, there are many companies that are not ready yet. What is needed is a broader spectrum of solutions, if we are to maintain breadth and versatility architecturally, in the

choice of materials, and in pricing that is *characteristic of the current market conditions*. It is important that the *future requirements are known well in advance*, but there has to be time and room for innovation and product development across the board of industries, and not for pulling the rug out from underneath them” (Licitationen - Byggeriets Dagblad, 02/07/10). Others criticized the development for doing the opposite – by rescinding LEC 1 and 2, government was weakening the code’s signal effect. As the Swedish contractor NNC commented: “It is unfortunate and unambitious for several reasons. First and foremost, the voluntary LECs have proven to be an important motivation factor that has strengthened rather than weakened the Danish construction industry. Second, the EU has recently decided that all new housing should be almost zero-energy houses after 2020 and that publically owned buildings have meet this requirement two years earlier. The unambitious building code will in this way have negative consequences for the Danish construction industry, for the climate and for Denmark’s possibilities for living up to future EU regulations” (Licitationen - Byggeriets Dagblad, 12/07/10). NCC was not alone in their critique. Several other contractors and component companies have voiced similar sentiments.

What this debate is indicative of is the ‘divide’ between large and small companies in the Danish construction industry; a divide that was created within the last decade’s restructuring processes, in which the big have gotten bigger and the small have either remained small or vanished altogether. At the same time, industry was witness to a rapid ‘nordification’ process. Through a wave of mergers and acquisitions, big contractors from the other Nordic countries were not only transgressing national boundaries to challenge the existing home market orientation and gain control over large parts of the value chain, they were also introducing new ways of doing business, including putting more emphasis on partnering (Kristiansen et al., 2005, pp. 506-508), and becoming quite vocal in the debate.

Hence, the trade association's position of fending off regulation to "protect" was at odds with other parts of the industry.

In light of this tension, it is not surprising that government responded quickly (in 2010) by launching a collaborative process for developing the 2020 standard. The Minister for Economic and Business Affairs commissioned a work group consisting of a broad range of stakeholders, including many of the same organizations that had participated in the "partnership" two years earlier. Their task was organized into four work streams: economics, development of building components, indoor climate and architecture, and each work stream was responsible for developing a state-of-the art report. These reports served as input to two open, stakeholder seminars, which provided additional inputs to the work group developing the 2020 standard. The first hearing process was completed in late June 2011. By launching the 2020 code now, nine years prior to its taking effect, it is the government's hope that the code will provide the sense of direction called for by industry.

Conceptualizing sustainable construction?

Even though some companies may be on the forefront, the housing industry as a whole has yet to leverage this in gaining a competitive advantage (IRIS Group/FORA, 2009). Other countries such as Germany, Austria, Sweden and Switzerland appear to be taking the lead when it comes to becoming the front-runners in the development of sustainable housing. One of the reasons for this may well be the building code's relatively narrow focus on energy efficiency and energy related issues. This has excluded considering other dimensions regarding sustainability, such as in the UK Code for Sustainable Homes. Other issues appear to be making their way into the regulatory process through increased stakeholder engagement, i.e. through processes of formal consultation, partnerships and working groups as well as open stakeholder seminars. The Danish building regulations are still 'command and control' regulations, but the ways in which the

regulations are defined and given meaning takes place in a much more cooperative manner than the label 'command and control' captures.

DISCUSSION AND CONCLUSIONS

Government experimentation with a new progressive type of energy related building regulation in both DK and the UK points to the challenge which EU directives and ambitious national targets are seen to impose on the industry. Historically, regulations have been used to institutionalize widely agreed upon core values (such as structural integrity); recent energy regulations break with this practice. In both DK and the UK policy makers have linked current building regulations with targets for beyond compliance levels of achievement, with the understanding that these will be progressively incorporated into future building regulations. The new regulations effectively incorporate features of voluntary building assessment methods such as BREEAM into government regulations. The result is a new type of regulation which combines minimal and aspirational targets and which provides state backing for beyond compliance designs.

This move can be associated with the growing recognition amongst policy makers and academics of the limited effect of environmental regulations on innovation and the need to develop new ways to actively encourage more radical innovation (Kemp, 2000; Porter & Van der Linde, 1995). While these developments are too new to adequately assess their impact on innovation, they do provide an opportunity to examine the process of regulatory reform and the role of industry therein. They also provide a window into the ongoing construction of 'sustainable construction' as an official category.

The comparison between recent reforms to energy regulations in DK and the UK and the response of housing developers to those changes underlines both similarities and differences. In both countries regulators broke with traditional practice by introducing a

new progressive form of regulation, in both countries this development was associated with a heightened pace of regulatory reform and in both countries this development led to an intensification of industry-state coordination around the specification of building regulations. This was evidenced in the creation of industry wide partnerships in Denmark to assist in the development of regulations and in the creation of the Zero Carbon Hub in the UK. At the same time, the reaction of industry in the UK was far more dramatic than in DK. Whereas Danish housing developers accommodated the changes, adapting their practices and using the new guidelines as a source of competitive differentiation, UK housing developers responded openly objected to the Code, at least in its initial form.

A comparison of the response of housing developers in the two countries underlines a number of factors which help to explain this difference. These include issues related to the nature of the regulations and to the housing sector. Relevant dimensions of the regulations include the certainty and pace of changes. Relevant dimensions of the housing sector include the market position of housing developers, their dominant design templates - including the dominant business model and division of professional labour and differences in the enforcement of building regulations. This general point echoes a growing recognition in the literature on the relation of regulation and innovation concerning the mediating effect of market context and organizational fields (or systems) (Evangelista & Vezzani, 2010; McKay, 2001; Sexton & Barrett, 2005).

When it comes to the regulations themselves, the contrast between DK and the UK underlines the importance of certainty for the building sector. In DK, the 2006 regulations laid out three clearly defined sets of targets – a minimal level and two above compliance levels. Housing developers knew precisely what they were aiming for. This certainty allowed them to use those targets as a source of recognition, thus translating “sustainable construction” into a source of market differentiation. In the UK in contrast, the concept of

“zero carbon” was first and foremost a political category with no technical basis. Policy makers and housing developers had no idea as to the precise demands which the concept would impose when it became mandatory in 2016. This uncertainty made it impossible to develop a clear business strategy. Instead of encouraging innovation, it stymied it (at least as far as the more ambitious targets were concerned) as housing developers limited themselves to incremental changes in order to meet current requirements and waited to see what would come of the political fall out.

Differences in the mobilization of housing developers in the two countries was also related to the feasibility of anticipated changes which, in turn, varied with the dominant design template and market context. In Denmark, housing developers work in a relatively differentiated market, with considerable public support for “green” construction. In addition, homeowners tend to buy their homes with future generations in mind. The result is that home buyers are interested in more sustainable properties and developers can pass on the added cost of aspirational targets. Finally, in Denmark building regulations are only loosely enforced, thus lessening the potential threat of increasingly ambitious energy targets.

In the UK, in contrast, housing developers face a very unreceptive market. UK homebuyers do not prioritise energy efficiency; they often view their homes as financial investments and they tend to move every seven years. The result is that their primary focus is on short term capital cost rather than life cycle or maintenance costs. In terms of the dominant business model, housing developers’ primary business is land speculation. UK housing developers tend to rely on highly standardized products and processes to maximise economies of scale and the efficiencies of repetition. Whereas in Denmark, architects are an important member of the project team, in the UK they have been largely cut out of the volume housing market. In addition, innovation is limited by the home

warranty industry which is cautious about unproven designs and technologies as the warranty is usually for a period of ten years. This, in turn, places a major obstacle to design and technology innovation. Finally, in contrast to Denmark, housing regulations in the UK are strictly enforced. A team of building control inspectors ensures 100% compliance.

Differences in the extent to which progressive regulations challenged dominant design templates in turn help to explain differences in the challenges which the industry set for the regulatory process. In DK, dissatisfaction with the 2010 revisions to progressive regulations led to the creation of new collective industry actors and a much greater engagement of housing developers in the specification of regulatory reforms. In the UK, anger and anxiety over announced, but underspecified, changes in the building regulations led to institutional innovation, as evidenced in the establishment of the Zero Carbon Hub, bringing together a variety of industry and other non-governmental actors.

This analysis, in turn, provides a basis to move beyond simple generalizations about the relation of regulation and innovation. In keeping with much of the literature it suggests that, in the case of housing developers, regulations can support component innovation, but that the effect of innovation varies with market context and dominant design templates. Moving beyond that literature, it also suggests that regulations which directly challenge dominant design templates can lead to institutional innovation in the regulatory process itself and that the extent of the challenge is likely to be proportional to the commercial and technical feasibility of the new regulations. Thus in Denmark, difficult but feasible regulatory reforms intensified the engagement of industry and state actors, without radically changing the basic system of governance. In the UK, underspecified and potentially impossible targets led to a major reworking of the regulatory process, the stability of which remains to be seen.

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