Rethinking Local Housing Policies and Energy Planning: The Importance of Contextual Dynamics

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Evidence from the Netherlands, Denmark and Germany shows that promotion of sustainable energy technologies in the housing sector by means of regulation, subsidy or information dissemination may hinder the take-up of these technologies, particularly if such instruments are applied singly. It is argued that local authorities need to exploit the dynamic interaction of markets, actors and infrastructure in an area if they are successfully to influence the development of green housing.

Introduction

Local authorities are generally accorded an important role in conserving energy and minimizing climate gas emissions, as recognized in the Agenda 21 document of the Rio Conference on Environment and Development. By virtue of their various avenues of influence over local development, ranging from spatial planning powers to ownership of energy utilities, the larger local authorities are well placed to influence local energy consumption. Over the last 20 years municipalities across Europe have taken considerable steps towards promoting the dissemination of sustainable energy technologies in the housing sector in particular. Numerous pilot projects of sustainable housing are a testament to the pioneering role of local authorities in encouraging the take-up of new technologies such as high-efficiency condensing boilers, solar domestic hot water systems, heat pumps, and combined heat and power plants.

Despite these success stories it is undeniable that most local energy policies directed at housing fail to live up to expectations. Criticism is levelled in particular at the relatively modest rates of technology dissemination (van der Waals, 2001). Even if pilot projects of green housing prove successful in their own right they seldom stimulate significant take-up of the innovative technologies beyond this protected sphere. Local authorities have in the past often responded to this problem by identifying 'barriers' to technology innovation which they then seek to remove by introducing new regulations, providing funding incentives or launching information campaigns. This paper questions this approach to dealing with the dilemma of limited dissemination of new energy technologies in the housing sector. The line of argument challenges the rational choice logic still underpinning many decision-making processes in urban development, as criticized in the literature. It draws instead on a growing body of knowledge on urban planning as essentially a capacity-building process in a specific time and place driven by the relational webs between the key actors and framed by regulatory and

economic forces of governments and markets (Healey, 1997).

This paper begins by exploring some common explanations given by local authorities for low dissemination rates: inadequate regulations, lack of funding and poor information transfer. These perceived problems, it is argued, tend to generate rather selective solutions which fail to reflect the complexity of factors influencing decisions by investors, developers, housing associations and owners to adopt or reject sustainable energy technologies when building, refurbishing or managing housing. The second part of the paper describes some of the more important contextual factors and how they are currently undergoing substantial change. The central message is that shifts in these 'contextual dynamics' are creating new openings for technology innovation which will require novel approaches to planning green housing in the future. In the conclusion we outline the implications of these contextual dynamics for the role of local authorities in promoting new energy technologies in housing. Drawing on experiences from three European countries with strong traditions of municipal influence over local energy and housing issues – the Netherlands, Germany and Denmark – we seek to demonstrate how the loss of local government influence in some quarters (e.g. following the liberalization of energy markets) may be compensated by a more facilitative, coordinating role which exploits opportunities being created by shifting contextual dynamics.

Perceived Problems and Selective Solutions

Perceived Problem 1: Inadequate Regulations

One general explanation for the limited dissemination of new energy technologies is that building regulations are not strict enough (e.g. Umweltbundesamt, 1998). The line of argument here is based on the understanding that architects, developers and builders tend, for commercial reasons, to follow the minimum legal requirements when designing and building housing. Disseminating environmentally sustainable technologies not (yet) commercially viable will, it is argued, require adequate regulatory incentives and/or sanctions. Following this logic regulations in many European countries have been made more stringent in order to raise levels of insulation, promote the use of double glazing, and increase the

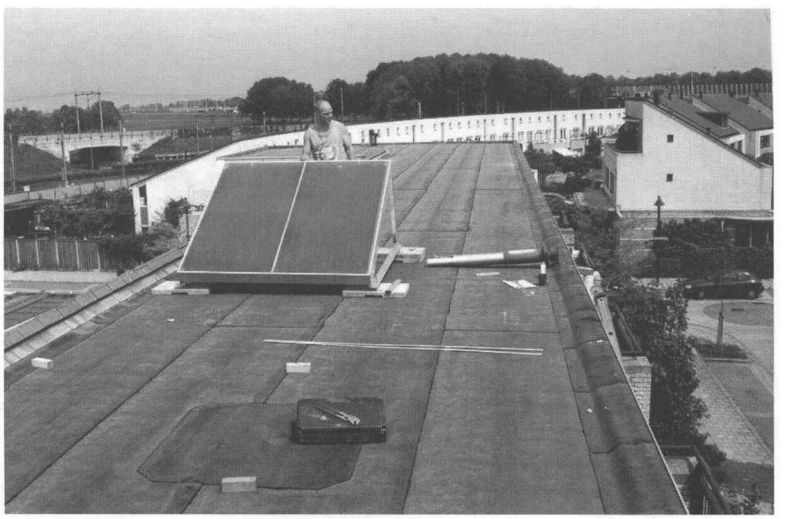

Figure 1. Installing a solar collector on a Dutch housing estate.

efficiency of heating equipment. Experiences in Denmark and the Netherlands have shown that raising standards for insulation may indeed contribute to a decrease in the energy used for heating buildings (Ministry of Foreign Affairs *et al.*, 1996; RIVM, 2000).

However, the strategy of introducing or tightening regulations to promote new energy technologies in building has its limitations and unintended side effects. These relate to the process of rule making and of applying and enforcing those rules.

With regard to the *rule-making process*, regulations on sustainable building have to be integrated into a complex web of existing building regulations addressing a variety of situations. Exceptions are often necessary as uniform rules tend to lack context sensitivity. In Denmark a strict energy planning regime designed to promote district heating as the predominant form of heating is today nick-named 'Heat-planning Stalinism' because of its inflexibility towards alternative heating sources (Elle, 2001). Efforts to make the rules more contextually sensitive (Stilling, 2000; Elle, 2000) are, however, strongly opposed by the Ministry of Environment and Energy (Arnborg, 2000). An additional problem lies in keeping pace with the rapidly changing technologies for sustainable building. Considerable time can elapse between the introduction of a technology into the market and its prescription by regulations. A time lag of 10 to 15 years, as in the case of high-efficiency condensing boilers, is not exceptional (Haug *et al.*, 1998). We can observe, further, that the rule-making process may even limit technology diffusion, as those interested in adopting new technologies await the new regulations and those disinterested submit their building plans long before they actually build in order to avoid new rules (van der Waals, 2001, p. 164).

During the *process of rule enforcement* regulations designed to promote sustainable energy technologies can have negative side effects. Thorough enforcement often demands a major administrative commitment, particularly on the part of local authorities. Lack of adequate local enforcement capacity and the continuous adjustment to regulations in the Netherlands have resulted in little attention being paid in practice to the supervision of Dutch green building projects (van der Waals *et al.*, 2000, p. 98; Inspectie Volkshuisvesting, 2000). Furthermore, unpopular regulations tend to generate creative ways of avoiding their stipulations. In the Netherlands loopholes in the rules on green housing have been exploited to ensure that certain urban reconstruction projects have not had to accommodate sustainable energy technologies where the local political will is lacking (van der Waals *et al.*, 2000, p. 107). In Berlin, a plan to introduce a clause in the city state's Energy Conservation Act requiring new buildings to install solar heating panels was shelved when it was realized, in the course of the debate, that evasive measures would be likely to have an environmentally negative impact (von Schlippenbach, 2001, pp. 84–86). For technical reasons, the requirement applied only to those buildings with a centralized water heating system. Consequently many house owners and developers, fearful of a 2–3 per cent increase in building costs, were aiming to circumvent the requirement by replacing centralized water heating systems with a separate (electrically heated) system for each flat.

Some of these limitations and unintended side effects may be overcome by applying more flexible regulations such as the energy performance coefficient (EPC) introduced in 1996 in the Dutch building code and made stricter in 1998 and 2000. The EPC is a reference figure expressing energy use as a result of a large number of energy measures. It leaves the actual choice of measures to the designer and is, therefore, a more flexible tool. It is widely regarded as being successful, but still suffers to some extent from problems of time lag and incompleteness (Koopmans, 2000, p. 108). Problems relating to enforcement exist here too. Research

conducted four years after the introduction of the EPC reveals how low levels of staffing and expertise have contributed to inadequate controls or miscalculations in 36 per cent of the cases investigated (Inspectie Volkshuisvesting, 2000, pp. 4–7, 16, 27).

Perceived Problem 2: Lack of Funding

A second explanation frequently given for the limited dissemination of sustainable energy technologies is lack of funding. The argument here is that new energy technologies are relatively expensive, being at an early stage of development, and require initial subsidies to help them become commercially viable and more widely recognized. Early subsidies may in time even reduce production costs by increasing the amount of production.

To some extent the limitations and side effects of subsidies are comparable to those associated with regulation. Here, too, a time lag can be observed between the emergence of new technologies and their inclusion in funding schemes. Studies of Swedish campaigns for energy saving have indicated that proposals for funding schemes encouraged those interested to wait for the funding rather than investing in energy saving immediately (Vedung, 1999). It may also prompt those potentially interested users to postpone their decisions. This time lag may well be shorter than with regulation, however, due to a generally simpler administrative process in introducing subsidies.

Another limitation revealed by research is that the use of subsidies is subject to what is termed the 'Matthews effect'. This refers to the frequent cases where those who receive subsidies would have introduced the technologies anyway without additional funding (van der Doelen, 1989). For various environmental subsidies it has been found that of the targeted groups only a small proportion (between one-fifth and one-third) change their behaviour as a result of receiving subsidies (Vermeulen, 1992).

This limited effectiveness may be explained partly by the complexity of funding programmes. For example, in the Netherlands in 2000 more than 250 funding schemes existed in the field of sustainable building and energy saving, promoting over 100 technologies. These schemes change nearly every year, with new schemes being added and others withdrawn. The shifting nature of these schemes and difficulties in applying for funds has over time discouraged companies and individuals from taking advantage of them.

These limitations seriously question the assumption that subsidized pilot projects will lead to widespread future dissemination. Dutch demonstration projects of sustainable energy in housing all depend heavily on substantial subsidies for technologies which are not commercially viable. For example, in the 1 MW solar energy project for 500 dwellings in the new building location of Nieuwland in Amersfoort over 75 per cent of the investment costs were covered by subsidies, leaving only 25 per cent as the selling price. Although presenting the professionals involved with a good opportunity to gain experience with this innovative technology, none of them is prepared to use this technology in other locations without such subsidies (van der Waals, 2001, p. 94).

There have been similar experiences in Berlin, Germany. Early model projects of green housing there were characterized by heavy public subsidies. Apart from the high cost, which dampened political interest in further model projects, this practice of subsidizing – whilst enabling a few demonstration housing estates to be built – has had the negative effect of covering over fundamental difficulties in disseminating green technologies, such as their real or assumed additional cost. In several cases, such as the green housing complex of Berliner Straße, the support of the key actor – the owner and developer – was literally bought by the Berlin Senate agreeing to

cover all additional costs incurred by installing the new environmental technologies (Mauruszat, 2001).

Perceived Problem 3: Lack of Information

A third common explanation for poor dissemination levels is a lack of information and inadequate information transfer. The underlying assumption is that the relevant actors, provided with proper information, will act rationally in ways framed by their knowledge base. The logical solution has been to seek ways of improving data collection, information transfer and communication (Nijkamp and Perrels, 1994; Selman, 1996; Umweltbundesamt, 1998). In some countries, available knowledge has been collected in sizeable technical handbooks, such as those developed by the Danish and Dutch governments (Miljørigtig projektering, 1998; Stichting Bouwresearch, 1999). Other forms of information transfer are encouraged with the help of information centres, training programmes for professionals, information campaigns or energy advisory services for housing associations and households.

Here too, several limitations and negative side effects may be observed. In practice there may be a discrepancy between the information that is needed and the information that is available. Supply of information, usually part of a 'technology push' strategy, may be heavily technical; contextual information, by contrast, is often missing (Almlund *et al.*, 2001). A study by van Hal (2000) of demonstration projects for environmental innovations in housing across Europe shows that information transfer is often poorly organized. Attention is often focused on the innovation itself and how to implement the demonstration project. Silvester (1996) has shown that the diffusion of the 'minimum-emission' house in the 1980s in the Netherlands was limited in part because the network built up for this purpose did not include sufficient actors central to implementation, such as developers, housing corporations, and consumers. For designing the means of information transfer this implies that more attention needs to be given to the perspective of the recipient of information. However, as the level and complexity of information increases it will be necessary to cope with potential prob-

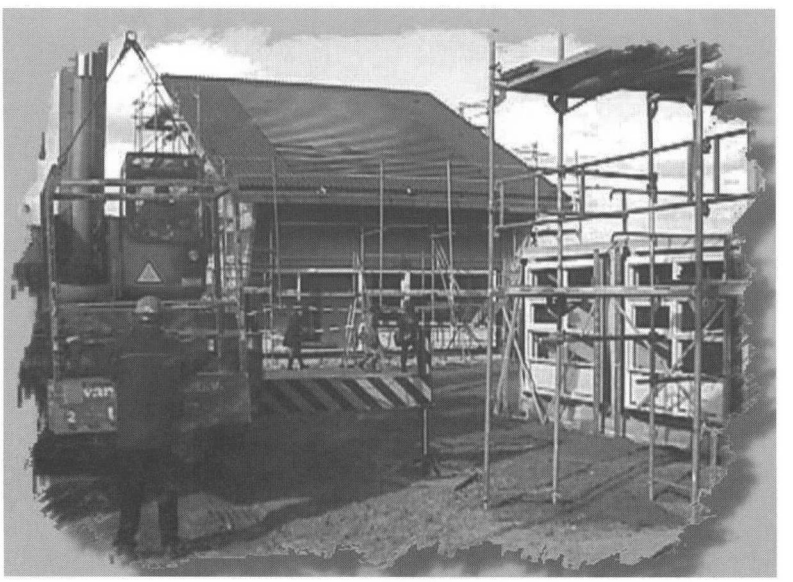

Figure 2. The Information Centre for Sustainable Living in Utrecht, a zero-energy house, under construction.

lems of information overkill, competing information, and distrust of divergent information (Almlund *et al*., 2001).

Contextual Dynamics

The limited success in establishing sustainable energy technologies in housing by means of additional regulations, funding, or information suggests that the dissemination process is more complex than is widely assumed. The notion of being able to identify and isolate a single 'barrier' to technology take-up and to remove it with a single adjustment to existing institutional arrangements appears, on the basis of past experiences, to be problematic. The 'barriers' commonly identified by policy-makers and planners may indeed be genuine but appear not to provide the whole story behind the take-up or rejection of sustainable technologies or practices. There are clearly many other factors which contribute to the success or failure of isolated policy initiatives.

The image of an iceberg is helpful here. The tip of the iceberg represents the visible problems of promoting sustainable energy use, as identified by many policy-makers and planners and discussed above. Beneath the water line and generally out of sight lie the contextual factors which have a determining influence on the effectiveness of the three policy instruments of regulations, funding and information. These contextual factors – categorized as markets, actors and infrastructures – are particularly important today, as they are undergoing considerable transformation as a consequence of liberalization, new energy services, and the viability of small-scale technologies.

New Markets

The role of housing markets or energy markets in the diffusion of energy efficient technologies in buildings has received little attention in the past. If considered at all it is largely as constants which represent the economic framework for action, rather than as drivers of change themselves. Yet markets for energy as well as for housing are changing quite dramatically across Europe – albeit in very differing degrees – creating new openings for energy technologies.

The liberalization of energy services is the more obvious case in point. As territorial monopolies of supply for electricity and gas are eroded and competition between utilities increases, new market dynamics are emerging (Guy *et al*., 1997; Guy and Marvin, 1996; Guy *et al*., 2001). In their efforts to cut costs and retain or attract customers, energy utilities are gradually distancing themselves from the costly 'build and supply' logic which so characterized infrastructure management in the past (Guy *et al*., 1997). Instead, they are reorienting their business strategies towards raising cost efficiency and providing a wider range of energy services. This new approach to energy management is creating a number of opportunities for sustainable energy use. Housing associations and developers, being key determinants of energy consumption in residential buildings, represent important customers for electricity or gas utilities. In a competitive energy market they can often be beneficiaries of energy services, such as free energy audits or tailor-made packages for a whole housing estate which might comprise the installation and management of low-energy heating appliances. In the Netherlands, for instance, social housing corporations are negotiating collectively with energy companies for low-price, green electricity for their tenants.

Changes in the housing market can also create new opportunities for energy efficiency technologies. In the past the status of a local housing or building market was rarely considered as a contextual factor influencing the diffusion of environmental technologies, yet recent localized shifts in the supply and demand of housing suggest this can be crucial to technology take-up. In

Berlin, for example, where a combination of extensive building programmes and out-migration since reunification has produced a housing surplus, developers and housing associations are having actively to attract potential tenants and house buyers. One method favoured by some housing suppliers is to install environmental technologies. This makes the property more attractive by offering opportunities for users to save energy and reduce utility bills, as well as appealing to a distinctive, 'greener' lifestyle (Mauruszat, 2001). In a buyers' market environmental technologies can give the edge over the competition. Conversely, the omission of energy saving measures can, in certain hotly contested markets, leave houses unsold (van der Waals *et al.*, 2000). We can observe how, in several European countries, green technologies have acquired an important image-building function under certain market conditions (Roedekro Kommune, 2000).

Parallel to the housing sector it is worth noting that the market in environmental technologies has its own dynamics which influence green building. The emergence of a large number of companies specializing in the manufacture, installation and maintenance of energy efficient technologies has in recent years created a substantial driving force for technology diffusion in new and refurbished housing (van der Waals, 2001). These emerging market dynamics offer considerable potential for energy saving technologies. Those involved in promoting green housing could benefit from ensuring their strategies build on, rather than ignore or run counter to these dynamics.

New Actors, New Roles, New Relationships

Following the liberalization of utility services the traditional relationship between energy provider and user – limited essentially to one-directional contact via the annual bill – is giving way to more complex forms of interaction involving a wider range of actors. New services such as energy audits, price deals and appliance management are creating a more intensive relationship between energy utility and consumer as well as engaging third parties – such as independent energy consultants or contractors – operating between utility and end-user (Guy *et al.*, 1997; Guy and Marvin, 1996). In the housing sector these newly emerging actor constellations are particularly apparent where substantial contractual commitments exist, as with larger housing associations or developers.

Contributing to this emergence of new actor groups and forms of interaction is the growing diffusion of small-scale energy technologies which engage a wider range of actors than under existing centralized systems of energy generation and distribution. The decision to install a solar collector is made by the house owner, not the utility; its operation is similarly a matter for the owner, if necessary with professional assistance. What we can observe is, therefore, not only the emergence of new actors in the energy management of housing, but also the redistribution of roles and responsibilities between a larger number of actor groups – a process often requiring the renegotiation of established positions. To take one example: in Berlin the local gas utility offers owners of housing apartments the installation and maintenance of block-type combined heat and power plants (CHP), relieving the house owner of maintenance tasks, providing a more cost-efficient source of heating and electricity for tenants, and developing a market niche for itself in an increasingly competitive local energy market.

The changing social organization of energy provision and consumption requires a rethinking of the role of the state in promoting sustainable energy use. Local authorities need to consider, when designing their energy policies, what different options might mean in terms of the actor groups involved, their interests and life-

styles, their scope for action and their relations to other relevant groups (on the importance of lifestyles, see the contributions by Farmer and Guy and Rohracher and Ornetzeder in this issue).

New Technologies, Old Infrastructure Networks

The emergence of small-scale environmental technologies which are economically viable has created multiple openings for energy efficient housing. Indeed, many green housing projects are strongly oriented towards promoting innovative decentralized technologies at the micro level of a building. The problem with addressing only the end-point of the energy distribution chain, however, is that technological diffusion of this type tends to create 'islands of sustainability' which relate little or not at all to the surrounding technical networks of power lines and gas pipes. Proponents of green housing rarely show any interest in the compatibility between their new technologies and existing technical systems. This may be accidental, but more often it reflects a deliberate attempt to escape the influence of large-scale, centralized technical systems.

Recent research suggests that incompatibility between small-scale technologies and existing infrastructure networks – whether of a physical, social, or economic nature – limits the effectiveness of the small-scale technologies (Jensen, 2001 and in this issue). The more successful cases of technology diffusion in buildings, it is shown, are those which respect the wider technological environment of infrastructure networks. If this entails some adaptation of original designs to meet local circumstances this need not mean following the dominant logic of the existing system. Rather, it requires understanding this logic and identifying opportunities for integrating specific technologies within this context. Failure to respect the socio-economic as well as the technical rationales underpinning large-scale supply systems – as in the familiar conflict between district heating and solar heating in Denmark and elsewhere (Elle, 2001) – can seriously limit the dissemination of new technologies. To summarize, we can observe how the contextual factor 'existing physical infrastructure' acts primarily as a limiting factor for technology diffusion but is itself undergoing transformation as the old mono-structural, centralized networks are complemented by new, smaller-scale technologies.

Implications for Local Energy Policy

Interestingly, these recent developments in the contextual dynamics of technology dis-

Figure 3. Solar collectors on a Dutch housing estate.

semination are often viewed by local authorities as a threat to their traditional avenues of power. They point rightly to their loss of influence over municipal utilities as a result of the liberalization and/or privatization of energy services. The emergence of new actors and actor constellations in the dissemination of sustainable energy technologies has made local energy policy and planning more complex. As a result local authorities are finding it harder to implement their energy policies and to control processes of technology dissemination. The command and control logic of the past is being undermined.

On the other hand shifts in energy, housing, and technology markets are creating new openings for local government involvement. To a greater or lesser extent the new market opportunities require increasingly detailed knowledge of a locality, its economic development, physical infrastructure, consumption patterns, and spatial development plans. Energy utilities keen to maximize use of their existing technical networks for commercial reasons are showing a growing interest in the performance of individual sub-networks, differentiating between areas of high and low demand. The introduction of small-scale power or heat generation plants within larger energy supply networks also requires a more spatially sensitive approach to infrastructure planning than in the past. Both examples illustrate the need for new forms of cooperation between energy service providers and local agencies responsible for spatial planning and economic development through which local authorities could influence energy-relevant decisions in housing and other sectors.

Exploiting these opportunities will require new forms of local government involvement in linking housing policies to the planning of energy infrastructures and the provision of energy services. Initiatives of this kind will need to identify in advance where these opportunities might lie. The following step-by-step approach is intended to illustrate how this might be achieved:

1. *Identifying Relevant Market Trends*. Research is conducted to establish what (local) market forces are working for or against the take-up of sustainable energy technologies in housing. Consideration should be given to energy, housing, and technology markets and how they are currently undergoing change.

2. *Identifying the Relevant Actors*. A simple actor analysis should reveal who the relevant actors are and what functions they perform, taking into consideration how actor constellations in the energy sector have changed markedly in recent years. Techniques such as focus group interviews could then be applied to ascertain actors' interests and how these are being shaped by the contextual dynamics above.

3. *Identifying Windows of Opportunity and Contradictory Interests*. The third task would be to establish which interests are complementary and which contradictory. This activity could commence with a desktop study and be followed by discussions and workshops with the relevant actors designed to identify common ground and perceived differences of opinion.

4. *Targeting Resources*. On the basis of this contextual approach to problem-solving, it should be possible to direct resources in a more cost-effective manner. This could entail on the one hand encouraging those with complementary interests to pursue these with greater respect for local energy policy and on the other hand identifying opportunities to overcome existing disincentives to introducing sustainable energy technologies. Where desirable, regulations, funding, information and other measures could then be targeted at those options which, following the above analysis, appear the most promising.

If local authorities were to initiate and coordinate such a process they could gain some influence over local energy planning and management, compensating at least to some extent for opportunities lost in recent years. The kind of influence they would exert would, however, be different from that associated with the ownership of utilities, strong planning powers, and the distribution of subsidies. Rather than intervening in decision-making processes to rectify a perceived problem with the help of more rules, money or information, local authorities would be acting as facilitators of a mutual exchange of ideas between all relevant actors in the policy process. To return to the metaphor of the iceberg, local energy policies should be geared to understanding and working with the less visible, determining forces at play beneath the water line.

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