

UK GOVERNMENT NATIONAL CARBON REDUCTION TARGETS AND REGIONAL HOUSING MARKET DYNAMICS: COMPATIBLE OR CONTRADICTORY?

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Key findings

The aim of this study was to address the question of whether the government's national carbon reduction targets for housing are capable of being achieved in the two RICS regions of the East Midlands and the East of England.

With funding from RICS East, Sarah Monk, Fiona Lyall Grant, Sanna Markkanen and Michael Jones of the University of Cambridge have explored the structure of the housing market in these two regions and what this means for the likelihood of the regions meeting the government's national carbon reductions targets.

This involved assessing the nature of the existing and future new build housing stock in both regions; reviewing the evidence on retrofitting the existing stock; examining alternative renewable energy sources; and examining evidence from campaigns that have achieved changes in public attitudes.

- The housing stock in both the East of England and the East Midlands has a higher proportion of dwellings built after 1964 than other regions, at 48 percent in the East of England and 46 percent in the East Midlands. This more modern stock is more energy efficient. Both regions have correspondingly smaller proportions of pre-1918 stock which is difficult and costly to retrofit
- This puts these two regions in a better position for carbon reduction, despite having a higher proportion of energy poor tenures (owner occupation) and a lower proportion of energy efficient tenures (social housing)
- Both regions include significant Growth Areas, so over time, the profile of the housing stock will change to one that is even better in terms of overall SAP ratings and carbon emissions – especially by 2050
- Both regions include significant rural areas which provide opportunities for the location of renewable energy
- Thus, the research found that there was nothing specific to these two regions that prevented the government's targets from being achieved there. The issue is national, and depends on the availability of sufficient financial resources to improve the energy efficiency of dwellings and to increase the amount of renewable energy supplied
- Barriers to achieving the targets include the 'rebound' effect which means that when energy costs fall, people spend the savings on consumption that in turn causes carbon emissions to increase

- Coupled with this, as households reduce their carbon emissions, diminishing returns set in and it becomes increasingly difficult to make further reductions
- In order to meet targets, the actual savings from retrofitting need to be above the target, to cover the increase in emissions from additional new households who will consume additional energy even though some of them will live in better insulated homes
- Nevertheless, the government's carbon reduction targets could be met in both regions, provided sufficient resources are allocated to achieving them. The two main measures – improving the energy efficiency of dwellings and increasing renewable energy supply – would go a long way towards meeting them
- However, the behaviour of residents is crucial both in terms of willingness to take up renewable energy and energy efficiency measures and in determining the size of the carbon footprint
- Thus in addition to financial resources, there are three options for producing behavioural change - education, regulation and incentives – and on the evidence of other attempts to change behaviour and attitudes, all three will be needed
- Information is also required – people cannot change their behaviour if they do not have the right information
- One important finding from undertaking this work is the lack of consistent information about carbon emissions from housing and how these can be produced in a form that is easily available, particularly at the regional level.

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Introduction

In response to the global challenge of climate change, the UK government has set challenging national carbon reduction targets, which it is hoped will go a long way towards meeting its commitments. The government's national targets are:

- To reduce carbon emissions by 18 percent on 2008 levels by 2020
- To reduce carbon emissions by 80 percent on 1990 levels by 2050
- To end fuel poverty for vulnerable households by 2010 and for all households by 2016.

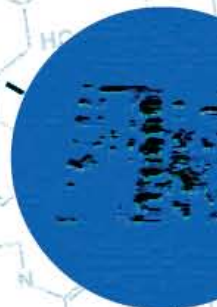
What this study set out to do is to explore whether these are capable of being achieved at the regional level within the UK, looking at two RICS regions - East of England and East Midlands – as case studies, focusing particularly on the nature of the housing markets in these two regions.

Why housing?

Households are responsible for 27 percent of carbon emissions of which roughly half comes from space heating, 20 percent from water heating, and 25 percent from cooking, lighting and appliances.

The potential to reduce these carbon emissions from households depends on:

- The nature of the existing housing stock in terms of age, quality, energy efficiency (measured by SAP ratings), tenure and location (urban/rural)
- The degree to which the energy efficiency of dwellings – both new build and existing – can be improved
- The capacity to generate more energy from renewable sources
- The ability of households to change their habits in terms of energy consumption
- The quantity and quality of new build housing.



Introduction

The current situation

The last 35 years have seen major changes in domestic comfort (the average indoor temperature in homes rose from 12 degrees Centigrade in 1970 to 18 degrees by 2004, a 50 percent increase) and in the ownership of domestic appliances (which rose from a typical 17 appliances per household in 1971 to 47 by 2004, an increase of 174 percent). These changes took place as the number of households rose from 18.6m in 1971 to 24.6m by 2004, a 32 percent increase (Sturrock, 2003) (figures relate to Great Britain).

Yet despite these increases of nearly a third in the number of households, each heating their home to a 50 percent higher temperature and each owning nearly three times as many appliances, the total energy consumed by domestic households only increased by just under a third, while total carbon emissions fell by a quarter. This was because the very large potential rises in energy consumption and carbon emissions were offset by even larger real falls in consumption and emissions. In particular, rising external temperatures, improved insulation and heating efficiency and the switch from coal to gas fired power stations mitigated the impact of household growth and higher standards of living.

In principle, approaches to reducing carbon emissions in the residential sector can be divided into two strands:

1. Reduced energy consumption via residential energy efficiency improvement and lifestyle change
2. Increased use of microgeneration and renewable heat in residential buildings

Both of these strands consist of a number of more specific measures, policies and challenges. Much of the policy in the residential sector is national. Certain specific measures under the broader approaches, however, may be more suitable in certain regions than others.

1. Reduced energy consumption via residential energy efficiency improvement and lifestyle change

Because such a high proportion of carbon emissions are created by the heating of rooms and water, improved energy efficiency is critical to reducing carbon emissions in housing. Newly built homes are to be carbon neutral by 2016, and total emissions from the housing sector will be influenced by the proportion of new more energy efficient housing of the overall stock. By 2050, 30 percent of the existing stock will be zero carbon. However, to achieve targets before that date, the majority of carbon savings must come from improved energy efficiency of existing dwellings.

The key source of savings is in the energy used for heating rooms and therefore largely depends on the energy efficiency of the dwelling. Energy efficiency of existing dwellings can be improved by:

- loft and cavity wall insulation
- solid wall insulation
- replacement of older boilers with more energy efficient models
- more efficient appliances and lights
- minor lifestyle changes.



Government measures include:

- Improved insulation is to be retrofitted to six million homes by 2011
- Smart metering to help households monitor their energy use and incentivise energy saving should be installed in all homes by 2020.
- By 2030, all homes are to be retrofitted with all relevant cost effective energy saving measures.

The long pay back period relative to the cost of these improvements, however, may mean that these ambitions are not achievable within the set timeframe.

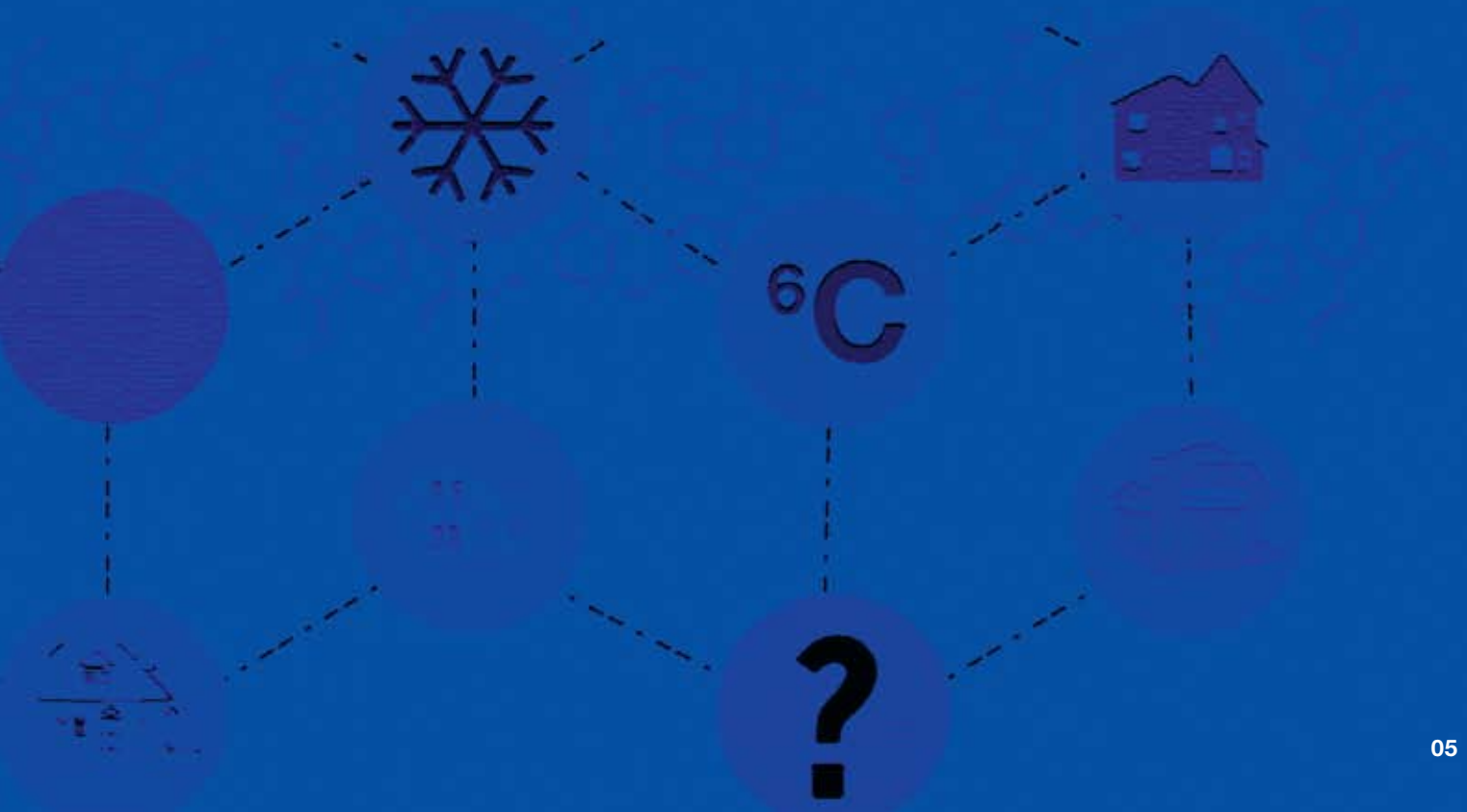
To try to address this high upfront cost problem, the government is piloting a move from upfront payments to 'pay as you save' models of financing to spread the upfront costs into the future, as they are offset by energy savings.

2. Increased use of microgeneration and renewable heat in residential buildings

Any reductions caused by a reduction in electricity consumption per household will be at least partly offset by the increase in the number of households. It is therefore important to ensure that an increasing proportion of heat and electricity is less carbon intensive. This means increased use of microgeneration renewable heat, and electricity generation from renewable sources.

By 2020, 12 percent of the heat used in housing could come from renewable small scale energy generation supplying four million households in England. These include biomass, biogas, solar panels, small wind turbines and heat pumps. Regions will have to play a major role in encouraging take-up of these technologies, because the efficiency and suitability of such measures in any one area depends on the local environment and the characteristics of the local housing market and existing stock.

Two national policies, the Renewable Heat Incentive (RHI) and Feed-In Tariffs (FITs), are to come to force in 2010 and 2011 to increase and incentivise the deployment of small scale renewable heat technologies. These effectively pay people to use renewable energy and pay a higher tariff not to use it but to sell it to the national grid. Similar measures have been highly successful in Germany and Spain.



The regional housing markets

As part of its strategy to reduce greenhouse gas emissions, the government uses building regulations and policies to enforce and incentivise energy efficiency. The Standard Assessment Procedure (SAP) ratings are used to determine the energy efficiency of a property; the higher the rating the more energy efficient the property is. Based on the energy costs for space and water heating, SAP ratings are scored on a scale from 1 to 120, where 1 is the worst and 120 the best. Until 2001, the top SAP rating was 100.

Median SAP ratings for the housing stock as a whole vary by region:

- National 49.9
- East of England 49.0
- East Midlands 47.7

There is also variation by type of area and by housing tenure:

- Urban 50.6
- Suburban 51.3
- Rural 43.7
- Owner occupied 47.8
- Private rented 48.5
- Local authority 57.4
- Housing association 60.8

The regional variation in local area characteristics, the housing stock and the housing market therefore explain some of the regional variation in median SAP ratings.

But the most important factor determining SAP ratings is the age of the dwelling. Older housing is less energy efficient than newer housing.

Both the East of England and the East Midlands have proportionally more post 1990s housing than England as a whole, while the East of England also has an above average proportion of very old (pre 1850s) housing. Interestingly, both regions have less inter-war housing than most other regions.

Overall, the housing stock in both the East of England and the East Midlands has a higher proportion of energy poor tenures and a lower proportion of energy efficient tenures, as well as significantly higher proportions of housing in rural areas where housing is, on average, less energy efficient than in urban and suburban areas.

On the other hand, the large size of rural sector provides these two regions with opportunities to utilise wind and biomass technologies, which are better suited for rural areas.

Take-up of energy improvements compared to the England average shows:

- loft insulation is higher in both regions
- condenser boiler take-up is close to national average
- cavity wall insulation (for dwellings with cavity walls) is below average
- storage radiators and biomass fuel systems are above average
- use of warm air systems is close to national average.

Data on carbon dioxide emissions per resident by region shows that for the domestic sector, both regions are at the England average – but the East Midlands has higher emissions from the industrial, commercial and public sectors than the East of England.

While there is a long way to go to meet the government's emissions targets, the two regions are in a better position than many other regions, particularly those that are more rural such as the South West.

Challenges to achieving reduced energy consumption

1. The age of the existing housing stock

While there are indeed challenges in terms of the need to retrofit older dwellings, the East Midlands and the East of England are not as badly off as England as a whole. Both regions have smaller proportions of dwellings built before 1900 and a much larger proportion built post 1990.

2. Population and household growth

The number of households in England is projected to grow by approximately 252,000 households per annum in 2006-2031. If this is accurate, the number of households in England will total some 25 million by 2020, an increase of over four million from 2006.

New households need new housing. The East of England and East Midlands are amongst the regions where the growth is expected to be the greatest, and the number of households is projected to increase by over 30 percent from 2006 values by 2030. This demographic change may have implications for these regions' ability to meet the government's carbon emission targets for 2020. Because of the sheer quantity of new housing required, it is important to start building zero carbon homes as soon as possible.

3. Current heating emissions

Where current heating emissions are higher, it will be correspondingly easier to achieve the government's emissions reduction targets. Equally, where steps have already been taken to reduce emissions, it may be harder to achieve these goals (because of diminishing returns). Both the East Midlands and the East of England have already taken steps to reduce energy use. Simple measures, such as replacing outdated appliances with new, more energy efficient ones, could work to reduce energy consumption. This is a one-off carbon saving.

Reducing emissions through retrofitting is also a one-off reduction. The targets are cumulative, so that as they are reached, a new step change in behaviour will be required.

In order to meet the targets, the actual savings from retrofitting need to be above the initial target to cover the increase in emissions from additional new households who will consume additional energy even though some of them will live in better insulated homes.

4. Lacking a gas supply

Carbon emissions from households currently without gas could be reduced by extending the gas grid. In the more rural areas it might be better to introduce micro-generation schemes such as biomass, wind and solar and combined heat and power using renewable sources of fuel.

5. Consumer attitudes and behaviour

A major barrier to reduced energy consumption is people's attitudes and behaviour. Even if the entire housing stock could be retrofitted to the most energy efficient standards, people's attitudes towards energy use would need to change. At present, however, there is a limited desire among existing home owners to retrofit their dwelling, particularly if this is expensive.

6. Conflicting messages from central government

The government seems to be sending out contradictory messages. It is recognised that tax incentives are effective in reducing energy consumption, but this is seen as unfair to poorer households whose carbon footprint is lower than that of the wealthy.

7. The role of the planning system

The planning system is crucial in terms of the location of new build housing. Will the additional homes required to meet the needs of new households be located in places which minimise energy use? Another issue associated with the planning system is the question of skills.

8. Problems of definition

The government consulted over the definition of zero carbon earlier this year and RICS was pleased to find that government had taken its advice. RICS argued for a 70 percent threshold for carbon reductions from new domestic buildings which the government has now accepted. However, RICS remains concerned that off site renewable energy cannot be counted towards the remaining 30 percent of energy reductions, because on-site and near site renewable energy will not be appropriate everywhere. The government has delayed its response to the consultation in terms of the details of how this zero carbon level can be achieved.

9. Modelling greenhouse gas emissions from Scottish housing

A model of carbon emissions from housing in Scotland tested a range of scenarios for carbon emission reductions. The results found that even if the Scottish government intervened sufficiently to ensure that households upgraded their homes, this would not necessarily deliver the energy savings that are required. This was because of the 'rebound effect' whereby householders will take the benefits of improved energy efficiency as improved comfort rather than savings in energy use. In addition, the 'indirect rebound effect' means that if households do reduce spending on energy, they will inevitably spend part of their savings on consumption, which will raise total carbon dioxide emissions.

So what can be done?

Energy efficient homes and greater use of renewable energy themselves would go a long way towards meeting the government's national carbon reduction targets. The main barrier is the amount of resources that the government is prepared to allocate towards meeting its goals. If sufficient funding was made available, the targets could be met in the two regions.

However, much also depends on household behaviour. People need to be prepared to buy new homes which meet the highest Code for Sustainable Homes levels, even if they are more expensive (although this will be outweighed over time by savings on energy costs). This is difficult especially in a recession.

More importantly, people need to be motivated to retrofit their current homes. Yet there is a long pay-back period for anything other than the basics such as loft and cavity wall insulation. As many people think they will only stay in their current home for a short time – seven years on average – they are unlikely to contemplate retrofitting without further incentives or subsidies.

There are three main ways of getting people to change:

- Education – provision of information
- Incentives – grants and subsidies but also understanding that fuel bills will be reduced
- Regulation – when education and incentives are not enough.

Technology may help – such as smart meters for energy consumption.

Smart meters

One aid to changing behaviour is the smart meter. Smart meters send information on real time electricity and gas use in households and small businesses direct to utility companies. The government plans to ensure that every home in the UK will be fitted with a smart meter by 2020 to reduce energy use and pave the way for a low carbon smart grid. The meters will reduce the utilities' running costs by making meter reading redundant and reducing the need for customer care, while customers could benefit by savings achieved through increased awareness of their energy use. Studies have shown energy use in homes cut by 3-15 percent, although the technology requires consumer education and is not an 'install and forget' measure like loft insulation.

Smart meters are already being provided by energy companies including British Gas and Npower. Smaller companies such as First Utility supply them as standard to all their customers. The first to be supplied under the government's plan are expected in 2012.

Education

Education is a key to instigating change in people's behaviour. Individuals are more likely to change their behaviour as a result of receiving information or advice. Attitude change, however, is a necessary pre-condition, as it is via attitude change that education may result in changed behaviour. It is therefore people's attitudes that educational campaigns should seek to influence.

Examples of successful education campaigns that changed attitudes and behaviour include:

- Road safety campaigns – the number of cars on the roads has risen hugely but accident and death rates have been reduced
- Children's safety in the home – accidents have fallen as a result of campaigns raising awareness
- Health education to pregnant women who smoke – this campaign has reduced neo-natal death rates and improved babies' health
- Sex and HIV education for young people.

Often success is greatest when education is combined with incentives – and possibly with regulation (e.g. seat belt wearing is compulsory by law).

Incentives

Cash incentives paid either directly or indirectly (through tax breaks) are known to change the way in which people may or may not behave.

Studies have shown that students who receive the Education Maintenance Allowance are more likely to stay on in further education than they would have been before the incentive was introduced.

Similarly, there has been an increase in the numbers of people taking up paid employment and becoming less benefit reliant since the Working Families Tax Credit was introduced.

Incentives such as the Warm Front scheme have not only provided those on a low income (who have applied) with more fuel efficient homes, which in turn acts as a lever out of fuel poverty, but it has also had an impact on their health and well being.

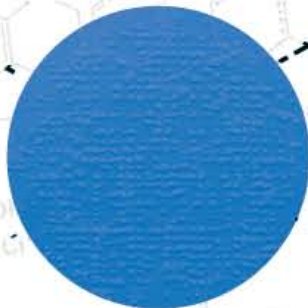
Regulation

Regulating behaviour is difficult, not least because people can always choose to ignore the regulation.

The most fundamental regulatory system aimed at behaviour is the criminal justice system. Yet each year thousands of people end up in court and have to pay a penalty for their transgression. Nevertheless, most people would probably agree that the system works for the most part. What they might not agree on would be including environmental misbehaviour in terms of energy consumption as part of the rule of law. How could it be measured? Would each person be given a carbon emissions allowance? Could poor people, who tend to produce fewer emissions, trade their allowance to richer people? How would it be enforced?

Despite problems in using regulation to alter behaviour, one example of success is the law on the use of safety belts in cars – although interestingly enough the change in behaviour was not achieved through regulation alone. It is generally agreed that education to change attitudes was a greater incentive to changing behaviour by wearing seat belts than regulation. The famous ‘Clunk, click, every trip’ advertising campaign which included statistics on road deaths is seen as having made a difference. Perhaps the overall conclusion from the seat belt example is that all three – education, regulation and incentives, in this case personal safety – were necessary to change (the majority of people’s) behaviour.

This may be the case for environmental changes as well. After all, incentives to reduce carbon emissions already exist in the sense that it is the only way to plan for future generations and energy efficient buildings will reduce fuel costs. At the same time, education is necessary to ensure people understand this and regulation may be needed to ensure that targets will be met.

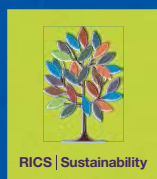


12 A role for RICS

In conclusion, the study as a whole has found a distinct lack of comprehensive and consistent information on carbon emissions and the housing sector, particularly at regional and sub-regional levels. While there is a range of data on aspects of the problem, much of the material is inconsistent and therefore not comparable across areas, or simply does not exist for some areas. The community aspect was raised at the round table discussions and some good examples of community action were pointed out, but it is difficult to find out about them. Equally grants are available for retrofitting in some local authorities but there is no easy way to find out if a grant exists and who is eligible.

Thus a key finding from the research is the lack of information. There is a lot of material available on various web sites, so that it is difficult even for the interested professional (RICS member) to find out good quality, reliable information about what could be done – both through retrofitting existing housing and through the use of renewable energy in the home.

Another important finding is that despite having fewer energy efficient tenures and more poor energy efficient tenures, as well as large rural areas, this does not put the two regions in a worse position than other parts of the country. If the targets are to be met, they will need to be met nationally, and sufficient resources will have to be made available. The government has gone some way towards this with its incentives such as Warm Front and grants towards insulation and other basic forms of energy efficiency improvements, as well as FITs and RHIs to encourage renewable energy provision.



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The study of carbon emissions from Scottish housing (CAR et al, 2009) found further evidence of the need to alter behaviour in its conclusion that government targets may not be met even if households upgrade their homes, because of direct and indirect ‘rebound’ effects. Energy cost savings are partly spent on improved comfort, and partly on increased consumption, which itself increases carbon emissions. More research is needed into household behaviour in terms both of how they manage their energy use and what motivates them to upgrade their homes to make them more energy efficient.

RICS can take these messages forward in the following ways:

- Providing expert advice, material and evidence to influence government on education, regulation and incentives. For example RICS was identified as part of the UK Government’s Heat and Energy Savings Strategy, and is currently working with the Communities and Local Government on the topic of Energy Performance and Value as it applies to the existing stock.
- Influencing government and local authorities to do more in terms of leading by example, such as maintaining its own estate to a highly energy efficient standard
- Educating its own members through practice guidance, such as the Renewable Energy information paper published in 2009, and Continuing Professional Development (CPD) to increase understanding of the technical issues involved in planning, developing, valuing and marketing energy efficient homes, as well as highlighting the commercial opportunities available to chartered surveyors with the relevant skills and knowledge.

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