Translating From Politics: The Definition of Zero Carbon Buildings

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Abstract

The United Kingdom's Labour government made policy commitments to require zero carbon design for all types of new buildings in the near future. This chapter examines how the 2008 *Consultation on the Definition of Zero Carbon Homes and Non-Domestic Buildings* paper documents the government's attempt to translate the term zero carbon from the political to the regulatory discourse. It introduces the context of the consultation paper, examines the meaning of translation, and then unpacks some of the translation suggested by the UK government in the consultation. It shows that the meaning of zero carbon will likely change in translation, despite a perceived maintenance of equivalence. The chapter argues in favour of further research into the translation process from policy to regulation.

Introduction

The United Kingdom's Labour government made policy commitments to require zero carbon design for all types of new buildings in the near future (DCLG 2006, 2008a, 2008b). Yet, the meaning of the term zero carbon as applied to buildings is contested and for a long time its official definition remained uncertain. This chapter examines how the *Consultation on the Definition of Zero Carbon Homes and Non-Domestic Buildings* paper documents the government's attempt to translate the term zero carbon from the political to the regulatory discourse. To enhance understanding, it will also draw on the paper summarising the responses to the same consultation paper. This chapter will introduce the context of the aforementioned consultation, before examining the meaning of translation, and then it will unpack some of the translation steps documented by the consultation paper. It will conclude that the meaning of zero carbon does change in translation, despite attempts to maintain equivalence.

Both public and scientific discourses now overwhelmingly accept that humankind needs to reduce carbon dioxide (CO_2) emissions to avoid serious environmental damage with consequential harm to humans, in particular as a result of CO_2's impact on global warming (Gore 2006; McMichael et al. 2003; Metz et al. 2006; Stern 2007). This emerging consensus exists despite substantial resistance from some commercial and industrial interest groups in the public discourse (Monbiot 2006). The significance of buildings, and therefore architectural design, in CO_2 emissions is seen as substantial by experts. The UK Department for Communities and Local Government (DCLG) estimates that 27 per cent of the UK's carbon dioxide emissions come from the use of homes and a further 17 per cent from the use of non-domestic buildings (DCLG 2008b, 9). Scholars have also estimated CO_2 emissions from buildings as high as 50 % (Campbell 2007; Guy & Osborn 2001, 87; Henderson & Shorrock 1992). Carbon dioxide emissions are directly linked to energy consumption from fossil fuels and, hence, there has been a widespread emergence of government and private initiatives to promote, test and disseminate zero carbon building design. Although concerns about carbon dioxide emission levels began in scientific discourses, they are now part of the UK political discourse and are being taken forward into policy from there. Improving energy efficiency in buildings, including new buildings, is an integral part of the UK government's strategy to reduce emissions (DCLG 2008a; 2008b). Policies have been announced that new buildings are to be designed to zero carbon standard by 2016 for homes and by 2019 for non-domestic buildings (DCLG 2006; 2008a; 2008b).

The meaning and practices of zero carbon building design are contested at several levels; in practices, in regulation, in academia, etc. Prior to the 2008 *Consultation on the Definition of Zero Carbon Homes and Non-Domestic Buildings* paper, none of the UK governments' initiatives provided a detailed and firm definition of zero carbon, and in particular no definition that is specific to buildings. The 2006 *Code for Sustainable Homes* specifies that a zero carbon home has 'zero net emissions of carbon dioxide from **all** energy use in the home' (DCLG 2006, 7, their emphasis). It does not elaborate further, except to give an example of a building that would achieve this through a combination of efficiency measures and renewable

energy technologies, which is described in the broadest terms (DCLG 2006, 27). The first technical guidance published on the *Code for Sustainable Homes* does not elaborate either (DCLG 2008c), and a very short definition was only provided in the revised guidance in 2009, making reference to a new extension of the Simplified Assessment Procedure (SAP) (DCLG 2009b, 46). In short, except for very general statements, there was little regulatory guidance on how to understand and translate the term 'zero carbon building' from politics into regulatory practice until the consultation process began.

Despite this, the term zero carbon building was used by UK politicians as if it had a settled and clear meaning. In politics, it is generally assumed that a building is zero carbon if it does not emit more carbon dioxide than it absorbs, or prevents being emitted elsewhere. It is also assumed that a zero carbon building does not contribute to climate change. However, in order for these understandings to have application in regulation, agreement has to be reached on how to measure or estimate carbon dioxide emissions from buildings, which mechanisms of mitigation are acceptable, and how to enforce this mitigation. This chapter argues that this level of agreement gives carbon zero a different meaning in regulation than it has as a political concept. In order to achieve genuine meaning in regulation, zero carbon needs to be translated from politics (and/or science) into regulation. The next section explores the theory of translation.

Translation

Translation, as understood in this chapter, is the process by which a concept, in this case zero carbon, is taken from one context or discourse to another. The term translation in the study of science and technology was first coined by Michel Callon (1986). He has since revised his views on translation and described it as a defining aspect of laboratory science (Callon 2009). However, Callon's use of translation is linked very closely to his specific case studies and is thereby not directly applicable to the definition of zero carbon. Instead, the understanding of the concept of translation put forward by Bruno Latour has more utility in the case dis-

cussed in this chapter. In his celebrated work on the success of Louis Pasteur in developing and popularising a vaccine for anthrax in sheep (Latour 1988), Latour clarifies translation in a three-part statement, which begins as follows:

> First, translation means drift, betrayal, ambiguity (…). It thus means that we are starting from equivalence between interests or language games and that the aim of the translation is to render two propositions equivalent. (Latour 1988, 253)

Translation shows that two concepts in two contexts can be considered equivalent. In the specific case discussed here, language is employed, as the name of the concept is the same in both contexts: zero carbon. Nonetheless, meanings can drift and change; ambiguity can inadvertently or deliberately be lost and introduced in translation, thereby altering meanings without losing the equivalence of the two sides of the translation entirely. Latour takes this to the extreme by suggesting that changes in meaning can go as far as betrayal. He does not clarify to which degree this process is a necessary product of translation and to which degree it is merely a possibility. Latour continues his definition of translation:

> Second, translation has a strategic meaning. It defines a stronghold established in such a way that, whatever people do and wherever they go, they have to pass through the contender's position and to help him further in his own interests. (Latour 1988, 253)

Translation is thus not only about establishing equivalence between two terms, but also about establishing the authority of the translator. The UK government does this at least partly through its statutory powers. The final outcome of the process that determines the official definition of zero carbon will pass into regulation. Once in regulation, it will be enforced as a minimum standard by building inspectors. Latour concludes his definition of translation by continuing:

> Third, it has a linguistic sense, so that one version of the language game translates all the others, replacing them all with 'whatever you wish, this is what you really mean'. (Latour 1988, 253)

Latour describes enlisting and retaining others in the process by the translator, who has to convince every actor involved that the translator's translation is the best. Translation is thereby closely linked to control, but also to the ability to enlist and mobilise actors. The government does this in part through the very use of consultations like the one discussed in this chapter. Consultation suggests deliberative democratic legitimacy (Catt & Murphy 2003; Kane & Bishop 2002). This holds true even if the government already has firm views about the use of the term zero carbon in architecture, and the consultation process serves to anticipate and disarm opposition, and to convince interested groups that they had a part in the eventual decision on the definition of zero carbon in buildings.

Consultation on the definition of zero carbon buildings

In December 2008, the Department for Communities and Local Government (DCLG) launched the *Consultation on the Definition of Zero Carbon Homes and Non-Domestic Buildings* (DCLG 2008b). Consultations are a mechanism to augment legitimacy and improve the quality of democratic decision-making by soliciting the opinions of interested members of the public on decisions that are about to be taken by elected representatives or civil servants (Catt & Murphy 2003; Kane & Bishop 2002). In this instance, the format of the consultation was to invite responses to 36 questions with sub-questions on the definition from anyone – person or institution – who was willing to write to the DCLG. It began on 17 December 2008 and closed on 18 March 2009, and attracted 270 responses. For legal reasons, the consultation applied only to England and Wales, and further devolution of building regulations to the Welsh National Assembly was anticipated; hence limiting actual applicability to England. Nonetheless, the other countries in the United Kingdom can be expected to take their lead on this issue from the English regulatory framework (also see Adams & Robinson 2002).

The 2008 consultation paper gave a preview of the Department of Communities and Local Government's intentions on how to define zero

carbon in regulation and of the areas in which the translation was still unclear to the department. This chapter will not examine all questions asked and issues raised in the consultation, but instead it will focus on some of particular interest.

Quantifying emissions annually minus embedded energy

In the following, the principles of zero carbon expressed in the consultation will be outlined before turning to the proposed model for achieving zero carbon buildings. The core principle of zero carbon buildings as defined in the consultation is that such buildings will 'have net zero carbon emissions over the course of one year' (DCLG 2008b, 10). Zero carbon is in this case concerned with net emissions and not absolute emissions. This means that the building may emit carbon dioxide, as long as this is offset at some point in time. It is almost impossible to design a contemporary building that does not emit any carbon dioxide ever, in part because of the impact of most building materials, and hence the regulatory focus was always expected to be on net emissions. However, there are arguments for calculating such emission in life-cycle analysis, as this would allow including construction and demolition. Scheuer et al. (2003) undertook an example assessment of a building of the University of Michigan drawing on life-cycle assessment and showed that energy can be conceptualised, and defined, across the building's entire life span. Instead of pursuing this avenue, the DCLG chose to limit the reference time frame for the definition of carbon zero to one year. Implicit in this move is the decision to exclude construction, materials (so-called embodied energy) and demolition from the calculations underlying the regulatory compliance claim of zero carbon buildings. In terms of translating zero carbon from political discourse to regulation, it is the first step of stripping a proportion of actual, real-life emissions of every construction project out of those that need to be accounted for under the regulations. It is a first disparity to be introduced in the translation of zero carbon from policy to regulation, and it is arguably the first betrayal of the concept. The addition of the words

'over the course of a year' (DCLG 2008a, 10) removes a set of emissions from consideration.

The definition of zero carbon in the 2008 consultation paper is more detailed than merely limiting focus on annual net emissions. It also provides three bullet points, which explicitly list those forms of energy consumption that are to be considered as part of the energy that needs to be taken into account in the zero carbon definition. The first two aspects of building design to be taken into account when calculating (net zero) carbon emissions are:

– 'emissions from space heating, ventilation, hot water and fixed lighting
– expected energy use from appliances' (DCLG 2008a, 10).

Considerations for space heating, ventilation, hot water and fixed lighting are of no surprise; these forms of energy use are the bare minimum that all existing calculation schemes for building emissions take into account. The inclusion of expected energy use from appliances is more interesting and controversial; the wording making it explicit that the energy under consideration is 'expected' and not actual. It is implied in the *Code for Sustainable Homes* that zero carbon accreditation will take place before the building is occupied, which means that all energy calculations are about expected use. There is some literature that points out that actual user behaviour, and hence actual energy consumption, can vary substantially from the predicted behaviour of carbon calculations (Abi Ghanem 2008; also see Rohracher 2003). Highlighting the expected, instead of actual, nature of the energy use in this context serves to exempt designers and construction companies from committing to the installation of particular appliances. The government's suggestion is that design calculations must take into account the appliances that users are expected to install, but they do not have to specify or require the actual installation. This simplifies the design and construction process, but it also raises questions about the reliability of expectations. Households have been shown to often install more appliances as well as less efficient appliances than designers anticipated (Crosbie & Baker 2010; Crosbie 2009; Crosbie 2008). Translating into expected rather than actual emissions may result in discrepancies between reality and regulatory intent.

The third matter to be taken into account when calculating a zero carbon building's net emission is

– 'exports and imports of energy from the development (and directly connected energy installations) to and from centralised energy networks' (DCLG 2008a, 10).

In other words, the carbon emissions calculation has to take into account both expected electricity consumption and, on the converse, any electricity fed into the national grid from renewable energy sources on the building's site. It also has to take less common energy grids into account, such as district heating networks, which deliver space heating for entire neighbourhoods from one plant. Some architects suggest that a genuinely zero carbon building should be independent from the national electricity grid; for example, the Brighton Earthship, a visitor centre built by the Low Carbon Trust in accordance with guidelines from celebrated architect Michael Reynolds, which combines rammed earth walls and natural ventilation with photovoltaic panels and a wind turbine, is billed as zero carbon and off-grid (Low Carbon Trust 2009). Similarly, Kemp showcases a number of North American high-efficiency dwellings that are disconnected from the national electricity grid, and shows that the drive for energy independence predates much of the zero carbon regulations debate (Kemp 2005, 123). The issue of grid connection goes back to the question whether zero carbon should be net or absolute. More commonly calculations assume that the zero status of emissions is only net; in this case the electricity grid can be used as a source of energy when on-site provisions are low or demand is high.

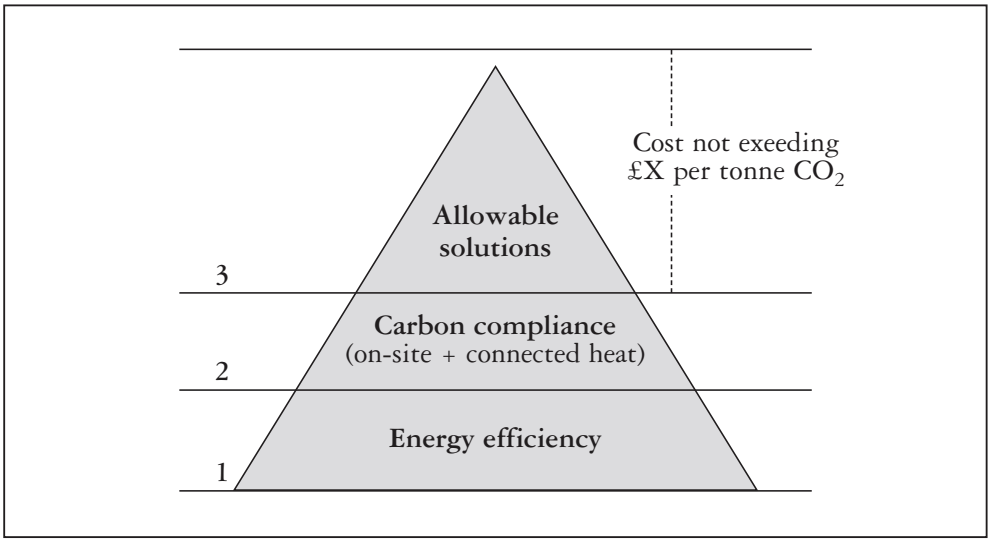
However, in theory the national grid can also serve as a mechanism to take zero carbon energy into account that has been generated off-site. Thus, renewable energy generation elsewhere could serve to provide a letter of indulgence for energy use on-site, which has the potential to be controversial, as the long-term link between building and off-site provisions would need to be clear. To clarify the role the government is envisaging for off-site solutions, the consultation's suggested mechanisms for achieving and demonstrating zero carbon compliance are investigated next. Thus,

the use of net rather than absolute emissions in translating zero carbon introduces uncertainty and possibly unreliability into the concept.

The zero carbon pyramid as a guide to design

The consultation paper suggests that buildings, and especially dwellings, should follow a three-part strategy to achieve zero carbon compliance. This strategy can be displayed graphically, with the area of the pyramid representing the approximate proportion of emissions to be dealt with by each strategic element:

Figure 1. Zero Carbon Pyramid



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This chapter will first examine some of the issues surrounding energy efficiency and carbon compliance, before turning to the more controversial topic of allowable solutions.

Energy efficiency is the first step in achieving regulatory zero carbon building design. The government aims to achieve efficiency in the form

of measures such as high levels of insulation, passive use of solar energy, low levels of air leakage through unsealed joints, passive pre-heating of fresh air and mechanical ventilation with heat recovery (DCLG 2008b, 34). Due to the similarity in these aims to those of Part L of the Building Regulations, which regulates the conservation of fuel and power in buildings, the government acknowledges that some changes in efficiency regulations may have to come through the consultation and review mechanism for Part L, which is meant to take place every three years. The consultation refers to the *Passivhaus* Standard as an example of a high-efficiency approach (DCLG 2008b, 34). It is notable that the consultation mainly focuses on changes to the building and its technologies to achieve efficiency, but not on changes in user behaviour. This is despite the fact that changing user behaviour is seen as a legitimate alternative approach to sustainability, and some have argued that sustainability can best be achieved by combining technological and socio-behavioural approaches (Brand 2005).

The term carbon compliance in the consultation paper covers technologies that provide energy, either in the form of electricity or heat, from zero or low-carbon sources. Examples would include renewable energy technologies like solar panels for hot water, photovoltaic cells, wind turbines, but also energy technologies that are more efficient than the current standard, such as near-site combined heat and power plants on a district heating network. These are calculated against energy from traditional, carbon-intensive sources, such as electricity from the national grid. The consultation asks whether or not to count in off-site sources of renewable energy, but suggests that these should, for simplicity, belong into the 'allowable solutions' category (DCLG 2009a, 28).

The consultation paper suggests that it is necessary to continue to set minimum energy-efficiency standards for buildings and their technology, rather than to rely on performance codes alone. In other words, the government intends to regulate towards a preference for efficiency over carbon compliance measures. This is due to efficiency measures being judged as particularly cost-effective in the long term by the government. Also, they are expected to generate wider benefits to the economy (DCLG 2009a, 28). In this instance, political and economic considerations that transcend the previous meaning of zero carbon enter the regulatory process.

The translation of zero carbon in this case is not direct, but is subject to the interests of the translator, in this case the Department of Communities and Local Government.

While the approach of energy efficiency plus carbon compliance is in close keeping with many international approaches to energy efficient building, the use of allowable solutions is less obvious. Allowable solutions are there to deal with any remaining carbon dioxide footprint that has not been addressed by efficiency and carbon compliance. The government makes it clear in the consultation that it would like allowable solutions to be used to cover the smallest proportion of building energy; hence the pyramid analogy and allowable solutions being the small top of this pyramid. For this smaller proportion of energy needs, the consultation suggests a mixture of measures that are not all obviously related to each other. Three measures are directly related to the carbon dioxide emissions of the building itself: allowable solutions include carbon compliance beyond the minimum level (provided the minimum level allows for further compliance), installing energy efficient appliances or a building control systems that reduce emissions beyond levels assumed in the Standard Assessment Procedure (or Simplified Building Energy Model for non-dwellings), and connecting low or zero-carbon electricity sources via a direct physical connection (DCLG 2008b, 45–46). Counting efficient appliances has been criticised, as these have a short lifespan and might be replaced by other devices. Also, building control systems are already part of the SAP in any case (DCLG 2009a, 49–50). Connecting renewable electricity sources via direct wire can be combined with credit for feeding zero or low-carbon electricity into the national grid. Electricity that is fed into the grid at one time offsets energy taken from the grid at other times.

Another two allowable solutions are forms of local emissions off-setting. The mitigating of emissions from other, existing buildings nearby is taken as an off-set for the emissions from the new building. This can be linked to the new building by using it to export low-carbon or renewable heat to other properties that were previously heated by fossil fuels. However, it can also be done without a direct physical link to the new development by transforming the 'energy efficiency of existing buildings in the vicinity of the development' (DCLG 2008b, 45). Finally, the con-

sultation suggests a number of financial off-setting strategies. Within the same borough, developers can pay towards local zero or low-carbon energy infrastructure through a credit for S106 Planning Obligations. These are obligations under the planning laws to make financial contributions to local, but not on-site, renewable energy sources. Off-setting can be further removed from the actual building by investment in zero or low-carbon energy infrastructure where the benefits are passed to the building's owner. In this case, the renewable energy infrastructure can be located anywhere in the UK and the connection to the building is only through the ownership of both by the same person. The consultation seeks views on how tightly such a development needs to be tied to the building in legal terms, but the government appears open to including off-setting that is only notionally related to a building in the carbon calculations (DCLG 2008b, 45–49). The result of such a translation of zero carbon would be that a building could be zero carbon by the benefit of an accounting link to off-set projects elsewhere.

The use of this carbon pyramid approach to zero carbon buildings is doubly interesting. On the one hand, it legitimises the controversial technique of carbon off-setting through a number of measures recognised as allowable solutions. On the other hand, the translation produces a guide on how to design zero carbon buildings as part of their very definition. It does not explicitly exclude buildings that prioritise carbon compliance over energy efficiency, for example, from the definition, but it suggests that the regulatory definition should drive building design towards certain design principles, such as prioritising energy efficiency.

The government also introduces the idea of capping the cost of allowable solutions. It does not commit itself to cap the cost for individual developments, but instead intends to review the allowable solutions mechanism to determine whether a large number of developments exceeded the capped cost after a period of time. Only if a substantial number of developments were found to be in excess of the capped costs, the government would then legislate on the matter. In other words, the government is trying to send the message that it will not tolerate the costs of zero carbon to spiral beyond a certain level, but it is also not willing to commit itself at this stage to limiting the cost on individual projects. This would

only occur if a significant number of projects found themselves struggling financially. The consultation paper suggests four mechanisms for determining the level of capped cost, each set at the per-tonne-of-carbon-dioxide level, so that the capped cost would vary from building to building depending on its emissions. The first suggestion is to use the shadow price of carbon used for government's appraisal of policies and this price was £25.5/t CO_2 in 2007 (DCLG 2008b, 54). The government is concerned that the shadow price of carbon, which is meant to reflect the social cost of emissions, is calculated from figures which are still evolving, and that it may be too low to encourage innovation. The second suggestion is to use the future price of Renewable Obligation Certificates, which are used in the electricity generation industry to prove that energy was generated from renewable energy and which can be traded. The government currently estimates the future price of these certificates to be in the region of £100/t CO_2 (DCLG 2008b, 55). The third suggestion is to use the same price, but to require two certificates per tonne of carbon dioxide, thus lifting the price to approximately £200/t CO_2 (DCLG 2008b, 55). The reasoning is that some of the more innovative renewable technologies are in fact more expensive and are therefore currently entitled to double the number of certificates compared to established renewable energy sources, which is done in order to foster innovation. Similarly, the government wishes to promote innovation in the building sector by requiring a higher price cap, which should match the cost of innovative technologies. Finally, the fourth suggested price cap is at the level of avoided renewables, which is the price the government will calculate that would theoretically have been needed to pay to put the necessary renewable energy sources in place. At the time of the consultation, the government did not have an estimate of how high this cap would be (DCLG 2008b, 55). Hence, among those three suggested caps that had been quantified, levels ranged from £25.5 to £200/t CO_2. The consultation also asks whether allowable solutions should apply for predicted carbon dioxide emissions over 30 or 60 years.

Both the price cap issue and the question about length show that the government is widely flexible on how to translate zero carbon, and it is concerned with other issues than the matter of carbon dioxide in itself.

Cost and predictability are of sufficient concern to include capping in the definition of zero carbon. Although there is no official commitment to capping costs for every individual project, the inclusion of considerations on capping can be seen as a signal that the government will not prioritise zero carbon above cost – not even in the very definition of zero carbon. The potential absurdity of this move is that, should the government eventually choose to impose a cap for individual projects, a building would then be considered zero carbon if accountants had demonstrated that further emission reduction measures are too expensive. This would be the case even if the building were calculated to emit substantial amounts of carbon dioxide.

Conclusions

This chapter examines some aspects of the government's attempt to translate the concept of zero carbon into building regulations. By focussing on a particular consultation paper, it provides a snapshot only; the process of translation is still ongoing and by no means complete. Even once the regulation is eventually published, it will still be subject to revision and interpretation. However, the paper provides one of the best insights into the DCLG's 2008 plans on translation. This plan is to include guidance on how to achieve zero carbon buildings in the definition of the very words 'zero carbon'. It involves prioritising building efficiency over other measures, then using renewable energy sources as an alternative generation and partial off-setting strategy (called carbon compliance), and finally drawing on a range of other options to off-set any further emissions (called allowable solutions). Including guidance of this kind in the definition results in a change in meaning; the regulatory zero carbon building is really a particular kind of zero carbon building which prioritises certain kinds of energy savings while neglecting other energy consuming practices – such as construction – completely. In fact, it is very debateable whether the zero carbon building in regulation is, in the scientific sense of the word, a zero carbon building at all, as life cycle analysis would be unlikely to deem the building zero carbon.

Allowable solutions are a particularly controversial aspect of the definition and their examination highlights the potential for regulation to lead zero carbon building design down a track that does not curb carbon dioxide emissions to the degree expected. There is particular uncertainty surrounding the concept of cost capping, which may – if applied to individual projects – allow buildings with poor emission performance to be defined as zero carbon, as long as there is an economic justification to do so. If the government were to cap the cost for achieving zero carbon, then a building would automatically count as such if reducing emissions further would exceed the cost cap.

In the political discourse, it is generally assumed that a zero carbon building does not contribute to carbon dioxide emissions into the atmosphere. In the regulatory sense, a zero carbon building will be likely to still create carbon dioxide emissions, whether they are from construction, from activities not taken into account, or from having too few renewable energy resources due to cost capping. Despite this discrepancy, the process of translation retains a sense of equivalence. By calling both building types the same, by linking them in policy documents, by holding a consultation on their definition, and by drawing on a position of authority and expertise, the government is able to legitimise such a counter-intuitive translation even to those who know about the various discrepancies.

Examining translation uncovers how a concept changes as it is translated from one context or discourse to another. This chapter only focussed on one suggested translation published by the UK government ahead of forthcoming regulation. Further research is required to understand the process in full and to gage its implications for the UK's emission reduction policies. This chapter suggests that such research should pay close attention to the changing meanings of the concept of zero carbon as it is translated from policy into regulation.

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