Concern or compliance? Drivers of urban decentralised energy initiatives

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ABSTRACT

The UK has set an ambitious plan to substantially cut its greenhouse gas (GHG) emissions. In order to meet this 2050 target of 80% reduction, the UK is facing a significant challenge of restructuring its energy system. One way to do this is via the wider use of decentralised energy (DE) systems in urban areas. A significant lack of understanding exists however, regarding the main factors that drive these energy projects. Following semi-structured interviews with key stakeholders, nine UK and four international exemplar cases have been analysed and critiqued in order to investigate the variety and inter-relationship of the drivers employed and involved encouraging their implementation. The role of regulation, and environmental awareness and concern as drivers for implementation are explored, as are the differing impacts of these drivers. Whilst academic literature commonly portrays financial incentives and the impact of policies as the main or initiating driver, many stakeholders investigated here emphasised the role of environmental awareness and concern as a prominent driver. Compliance with regulations and environmental awareness and concern seem not mutually exclusive; instead, environmental concern reinforces the willingness to comply (and over-comply) with the regulations.

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1. Introduction

Discussion related to a shift towards a more DE system is not new, with particular emphasis on the benefits of DE systems, including a reduction of greenhouse gas (GHG) emissions, enhanced energy security and resilience, and support of local empowerment and financial opportunities (e.g. Alanne & Saari, 2006; Bergman & Eyre, 2011; Coaffe, 2008; Leicester, Goodier, & Rowley, 2011; Walker, Hunter, Devine-Wright, Evans, & Fay, 2007). However, there is an increasing recognition that in order for this shift to be made, technological solutions, economic arguments and appropriate business solutions are not sufficient, and it is important to understand the complex set of stakeholders involved in this shift as well as their motivation and drivers to perform the shift (Cole, 2011).

As will be demonstrated in this paper, the empirical analysis of drivers and motivations employed remains scarce, and, whilst information regarding the drivers for decentralised energy (DE) is available, studies to date are not consistent and do not investigate the full spectrum of drivers, but rather focus more on common drivers such as financial incentives. Thus the aim of this paper is to contribute more towards the grey area regarding personal and community drivers that motivate the implementation of DE projects. Two sets of drivers which are typically investigated separately are considered and explored together: regulations, which contemporary literature suggests as being one of the crucial and most common drivers; and environmental awareness and concern, which as a driver is often overlooked but was raised by many of the DE stakeholders interviewed in this study.

In light of the earlier work described in Section 2, the objective of this paper is therefore to critically analyse the role of regulations as drivers behind the implementation of DE projects and to explore the role of environmental awareness and concern when regulation as a driver is either absent, or is not prominent. This paper therefore explores the hypothesis that regulations and policies, and environmental awareness and concern not only play important roles in stimulating the implementation of DE projects, but can also complement and support one another.

The research was carried out as part of the CLUES project (Challenging Lock-in Through Urban Energy Systems) (see Rydin et al., 2012), aiming to critically assess the development of decentralised energy systems in urban areas in the light of national decarbonisation targets and urban sustainability goals.

After an overview of the current policy framework and existing literature on drivers to DE is introduced, the case study methodology deployed for this research is described. The results are then

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presented, starting with compliance with policies and regulations and then moving to environmental awareness and concerns. A discussion of the role of these drivers in instigating DE follows.

2. Literature and policy overview

In its 2003 White Paper, the UK Department of Trade and Industry (DTI) characterised future energy systems by “more local generation, in part from medium to small local/community power plants, fuelled by locally grown biomass, from locally generated waste, from local wind sources, or possibly from local wave and tidal generators. These will feed local distributed networks, which can sell excess capacity into the grid. Plant will also increasingly generate heat for local use.” However, for this future vision to be achieved, the UK needs to overcome the great challenge of energy system restructuring, possibly via introducing and supporting larger numbers of DE projects.

As Vaze and Tindale (2011) argue, whilst energy problems are large-scale, small-scale solutions do exist. An emphasis on the potential benefits of a more localised and distributed pattern of energy generation and on the involvement of the community emerged in the UK in the late 1990s (Walker et al., 2007). For example, Local Agenda 21 principles were called to be applied to local energy planning in 1999 by the Local Government Association (LGA, 1999). The UK has a legally binding target of delivering 15% of all energy from renewable sources by 2020, and of reducing GHG emission by 80% by 2050, with a reduction of at least 34% by 2020 and a target to achieve 9% energy savings by 2016 (DECC, 2008). A variety of policies that may stimulate DE has been introduced in recent years ranging from financial tools such as the Low Carbon Building Programme, Feed in Tariffs (FiTs), the Renewable Heat Incentive and the Carbon Emission Reduction Target, to local innovative planning policies and subsidies for the installation of new technologies, such as the Green Deal.

As mentioned in the introductory section, despite the increasing amount of literature on DE, the empirical analysis of drivers employed remains scarce. Building on the Oxford dictionary’s (2010) definition of driver – “a factor which causes a particular phenomenon to happen or develop” – the authors of this paper understand drivers as factors that potentially contribute to the development of DE projects, can be specific to a particular location, or general to the context; and can also be internal (personal or organisational) or external (related to society or policy).

Marques, Fuinhas, & Pires Manso (2010) and Marques and Fuinhas (2011) investigated drivers promoting renewable energy (RE) in the European Union (EU) and suggested that both the lobby of the traditional energy sources and CO2 emissions restrain deployment of RE, whereas the objective of reducing energy dependency stimulates RE use. Watson and Devine-Wright (2011) discuss five drivers for moving to DE (climate change, energy security, technology trend, the governance of energy markets, and social change) in order to understand their impact on energy system scale. Many of those discussing drivers argue that financial drivers such as financial policy instruments and procurement mechanisms play the most crucial role in promoting DE (e.g. Alagappan, Orans, & Woo, 2011; Foxon et al., 2005). However, others have argued that the drivers behind DE project instigation are more diverse: Allen, Sheate, & Diaz-Chavez (2012) interviewed 16 public, private and third/community sector stakeholders in community RE projects in the Lake District National Park aiming to reveal drivers, enablers and barriers to community energy projects. The interviews suggested that stakeholders disagreed on the main drivers for community energy; public sector stakeholders saw national and local top-down policies as key drivers, while community stakeholders were driven more by the bottom-up nature of such initiatives, which relates to aspects of self-sufficiency, trust and participation.

There is a considerable literature suggesting that legal drivers, such as regulations and policies, are an effective tool in encouraging energy efficiency and environmental performance (e.g. Marques et al., 2010; Testa, Styles, & Iraldo, 2012). The role of regulations is to provide the enabling environment for the DE, i.e. provide support that will establish a system for the market development of DE (White, Lunnan, Nybakk, & Kulisc, 2013). Several studies (e.g. Carley, 2009; Menz & Vachon, 2006) emphasise that political motivation demonstrated via implementation of regulations is the best way of promoting DE, and that the promotion and use of DE through price regulations are the most favourable for DE use. Regulations are thus seen as a set of rules that should lead DE users towards achieving the governments’ aims for DE, regardless of the differences of the DE projects (e.g. energy, sustainability, climate change, employment) that fall under the jurisdiction of various governmental bodies (White et al., 2013). Lund (2007) evaluated the effectiveness of the policies and concludes that, while their effectiveness may vary considerably depending on the context, policies are an effective tool for deploying RE.

There is a variety of policies available for promoting DE; not all of them, however, are directly aimed at the deployment of RE – efficient use of energy is also an area of such policies. The International Energy Agency (IEA) database lists more than 30 different policies and measures, most of which can be summarised in five categories: legislative and regulatory policies; research and technology development, fiscal measures, information dissemination and awareness raising; and other assisting or voluntary measures (IEA, 2005). National energy policies have common objectives such as GHG mitigation and energy security.

In order to reduce their dependency on imported fossil fuels and to be in line with Kyoto targets, the European Commission (EC) proposed Directive 2009/28/EC (EP and Council, 2009), which sets mandatory national targets for integrating energy from renewable sources into the gross final energy consumption. It encourages not only energy consumption from renewable sources but also technical development, economic stimulation and efficient energy use. The tools for reaching the targets set by the Directive varies between member states, but most of them use a variety of policies. For example, Germany widely uses Feed-in Tariffs (FiTs) as well as supporting Public–Private Partnerships (PPP). Buildings standards have also been tightened and integrated more with the use of RE (e.g. the Barcelona Solar ordinance).

In the USA, national energy policy has been introduced under the Bush administration: it was mainly aimed at alleviating problems with oil imports, but also encourages increasing energy supply from renewables. The implementation of RE is mainly supported through financial policies, namely Renewable Portfolio Standards (RPS), adopted by state governments. An RPS is a state-mandated program in which a percentage (or share) of a state’s overall electricity generation must come from RE. Under an RPS program, utilities are required to invest in RE systems in order to meet their percentage requirement (Carley, 2009).

By setting the targets, the national policies provide the framework that has to be implemented then on a local level. This can be done via a variety of instruments, as discussed in the cases presented here, from subsidies to RE developers (e.g. the Morris Model), to city carbon targets (e.g. the BESP), to strict regulations (e.g. Riverside Dene).

However, despite the great variety of policies and regulations encouraging implementation of DE, some projects find that regulations are not the only driver (if at all), and they are still implemented regardless of the lack of regulations, as will be discussed further in this paper. Literature mainly focuses on incentives as non-regulatory motivations (e.g. Feige, Wallbaum, & Krann, 2011;
Hoffman & Henn, 2008) suggesting that a variety of incentives, including fiscal, financial, information and other incentives, can be used to kick-start DE projects. The effectiveness of these motivational tools is likely to depend on the local context, as well as the type of stakeholder, as differing types have specific concerns. However, it is often overlooked that many projects are implemented without the desire to gain financially – in this case the stakeholders are more interested in pursuing their own beliefs and concerns, and pursue the opportunity to show what can be done (e.g. Bruvoll, Halvorsen, & Nyborg, 2002; Rege, 2004). This driver depends on two factors: the belief that the action would benefit others; and the perception that the action is governed by an applicable norm observed in the community. It also allows individuals and groups to achieve and maintain a self-image as socially responsible (Nyborg, Howarth, & Brekke, 2006), which resonates with the motivations of the DE project stakeholders described in this paper.

### 3. Methodology

This study analysed 13 case study projects (nine UK and four non-UK projects, Table 1), which were selected from an initial detailed database of 217 possible case studies. The 13 case studies were selected based on diversity in terms of location (with the focus on urban projects), technology deployed, and type of leading stakeholder. For the non-UK projects another consideration was that the cases were innovative and had not yet been attempted in the UK. The overview of the projects is presented in Table 1 and is based on analysis of secondary data sources (e.g. reports, web site materials, etc.).

| Table 1 | Summary of the case studies. |
| --- | --- |
| Location | Technology/area | Scale | Aim |
| Energy neighbourhoods Gloucestes, England | Behaviour change competition | ~100 houses | Carbon savings (through behaviour only) |
| Energy Saving Partnership Berlin, Germany | Financing building retrofit | 1400 buildings | Financial savings for the local government |
| Glencraig Glencraig, Belfast, Northern Ireland | Biomass district heating | 21 buildings | Carbon and financial savings, self-sufficiency |
| Kungsbrohuset office building Stockholm, Sweden | Eco-smart building | 1 building, 27,000m² | Financial gain |
| Morris Model Morris County, New Jersey, USA | Financing PV | 19 municipal buildings; 3.2 MW | Financial savings for the local government |
| Newport Newport, Wales | Wind turbines on industrial site | Two 2.5 MW wind turbines | Financial gains |
| Renewable Heritage Edinburgh, Scotland | Solar hot water systems | 49 flats in 7 stairs of Georgian buildings | Improving buildings, doing research |
| Riverside Dene Newcastle, England | Biomass district heating | 6 tower blocks and a shopping centre | Regeneration, carbon savings |
| Seawater district heating The Hague, Netherlands | Seawater heating and cooling | 800 houses | Sustainable renovation |
| Shimmer London, England | Solar PV systems with user interface | 12 houses | Alleviating fuel poverty |
| Sustainable Moseley Birmingham, England | Solar PV and home refurbishment | 4 community buildings and 20 houses | Saving carbon in the local community |
| Wandle Valley Low Carbon Zone London/Borough of Merton, England | Solar PV and resident engagement | 900 houses and 2 primary schools | Saving carbon and piloting resident engagement approach |
| Zero Carbon Homes Slough, England | New built homes and energy centre | 10 houses | Identifying impact of zero carbon homes on energy provider |

Within each of the case studies, two to five interviews were conducted with the main stakeholders representing various aspects of the project (governance, finance, social and technical). Overall 48 interviews were conducted, each of them approximately 60 min long.

Interviewees were asked questions regarding the main drivers involved and the role of regulations in the implementation of the project, amongst other wider questions regarding the project implementation and operation. Interviews were recorded, transcribed, and coded electronically using Nvivo 8. Subsequently, thematic analysis (Braun & Clarke, 2006; Joffe, 2011) allowed identification of a variety of drivers. Thematic analysis was chosen due to the complexity of the dataset and the need for a flexible analytical process to provide structure. The coding framework included 20 top-level and 18 sub-codes, based on the collected data and research questions. This was checked for reliability by independently coding two interviews by two researchers, which found high levels of inter-researcher agreement, and helped clarify and refine code definitions. Material coded under ‘project drivers’ was used in this paper.

The research did not aim to compare the UK directly with non-UK countries, but rather to investigate the variety and inter-connectivity of possible drivers for the implementation of DE projects, the results of which would have been narrower if conducted within a single-country setting.

### 4. Results

For the purpose of this paper, building on the gap in the existing academic literature and the evidence gathered as a part of this research, the drivers were divided into two groups. The first group relates to compliance with regulations and policy-related advantages. The second group relates to environmental awareness and concern, which indicates stakeholders’ motivation to preserve the environment, and includes willingness to demonstrate that the project can be carried out without the support of the policy. This paper focuses specifically on this subset of hitherto neglected non-regulatory drivers, without discussing other drivers such as those related to financial or carbon savings as these have already

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1. Full database can be found at [www.ucl.ac.uk/clues/outputs/project_reports](http://www.ucl.ac.uk/clues/outputs/project_reports).
been extensively covered in the existing literature mentioned earlier.

The drivers across the cases vary greatly; thus it is important to bear in mind that the drivers discussed in this paper do not represent the complete set of drivers experienced by the stakeholders when the project was implemented, e.g. the authors do not imply that the only driver for the Hague case study was environmental concern, but rather that this was a prominent driver among others, with other drivers being outside the scope of this paper and already described in detail elsewhere (e.g. Chmutina & Goodier, 2012). Certainly, some drivers played a more important role in shaping some projects than others, but having such a wide range of drivers shows that the adoption of DE projects is more complex than just a cost–benefit model and cannot be explained by only economic or governance factors.

4.1. Compliance with policies and regulations as drivers in implementing DE projects

The idea behind most of the environmental regulatory instruments is that the stakeholders would not undertake any environmentally beneficial projects without any regulatory pressure from the authority; this is due to the costs often associated with undertaking environmentally sustainable actions, which are borne by the project instigators alone but benefits of which are shared by the society (Gangadharan, 2006). Some argue that the main disadvantage of compliance as a driver is that it does not engage the stakeholders proactively as they are likely to be driven by principle of ‘satisfying rather than optimising’ (Morton, Bretschneider, Coley, & Kershaw, 2011), thus the implementation of DE projects driven by compliance with regulations is only likely to be made in response to specific events (penalty for non-compliance) rather than by long-term goals and ideas (such as willingness to contribute to climate change mitigation).

Despite the literature describing the importance of the regulations and policies in implementing DE projects, the case studies provided evidence that carbon targets and direct regulations played only a small part as a driver and were only important when the project was implemented by the local government or other public body, or when the private companies had to comply with the regulation due to the nature of their activity (e.g. chemical company).

Compliance with energy regulations was only mentioned as a crucial driver in one case study, where a local authority and its social housing management partner needed to comply with a national standard relating to building quality, the Decent Homes Standard, which played a dominant role in driving the project:

“They obviously were very driven by having to meet the governments’ Decent Homes Target. And they knew that unless they came up with a workable plan that tackles the issue of these multi storey blocks then they would never achieve their Decent Homes Target because as it stood these blocks had had underinvestment for so many years.” (Riverside Dene).

Some projects encountered a bigger role from other types of regulations during the implementation stage, for example due to differences in local context; a prime example is the Newport case, which is located on the site of a chemical company, and therefore the construction phase was particularly intensely regulated:

“I would say Solutia was a difficult site in as we were constructing a wind farm on an industrial site whereas obviously green field sites can be a lot easier. (. . .) The fact that we are constructing on a chemical plant and all the health and safety implications to that . . .” (Newport).

Most of the cases discussed were said to be driven by policies rather than regulations: the local authorities have signed various voluntary agreements with established carbon targets, which showed the willingness of local authorities to be involved in sustainability projects:

“The Council has signed up to the Covenant of Mayors subsequently and things like Nottingham Declaration on Climate Change. So the council have obviously quite aspirational CO₂ reduction targets. And this project alone was an ideal way of actually making a big impact on the council’s carbon reduction targets.” (Riverside Dene).

In the Energy Neighbourhoods project, the fact that local authorities had signed up to these agreements was used by the project managers as a means of persuading them to participate in the project, alongside their existing commitments to carbon reduction policies:

“I mean over here, we would have sold it if that’s the right term, to the Local Authorities in terms of their climate change plans that they have to draw up. And the Climate Change Act and things like that (. . .) But also local policy as well, things they have to do. And also the Nottingham Declaration which most of them here have signed. That’s how we would have encouraged them along.” (Energy Neighbourhoods).

The above two quotations highlight the at times blurred boundary between environmental concern and regulatory drivers. While signing up to agreements like the Nottingham Declaration illustrates a certain willingness to act on environmental issues, it also signifies how these intentions were formalised into a shape that pushes signatories to act, almost in a similar way as regulation. These voluntary agreements subsequently not only influenced the actions of the stakeholder that signed up but also of those intermediaries around them that attempt to coerce them into environmental action.

Local authorities across the case study projects, including those in the BESP, the Morris Model and the Wandle Valley projects, have also set carbon reduction targets and therefore were interested in getting involved in DE projects that could potentially contribute to the achievement of these targets. Thus in these cases the projects were initiated to help reach the targets rather than the stakeholders had to comply with regulations. For example, in order to help reaching the Morris County 30% carbon reduction target by 2030, Morris Model was instigated. It was not seen as the main tool for reducing the emissions, but incorporated with the 1603 Grant Programme introduced by the federal government, and the RPS introduced by the State Government of New Jersey. This created a suitable environment for solar businesses to develop – and for the Morris County to reduce their energy payments and increase the use of renewable energy:

“There’s nothing in the law that really pushes us towards that [using renewable energy]. It’s more, you know, you’re doing it on your own.”

Interestingly, most of the case studies actually over-complied with regulations or implemented their projects despite a lack of regulations, which can be seen as internal motivations. Studies assessing the overall compliance rate (Arora & Cason, 1996; Gangadharan, 2001) have indicated that approximately 80% of stakeholders comply with environmental regulations and many voluntarily exceed them, despite the level of penalties being low. The decisions to comply and to over-comply with regulations normally have different motives. As such, the decision to comply with regulations is determined by regulatory laws, inspection rates, penalties and fines imposed by authorities. On the contrary, the decision to over-comply is often related to companies creating
a green image to increase their market share and reputation (Gangadharan, 2006), or is driven by their environmental awareness and concern, providing evidence of the interdependence of these two drivers, as will be argued later in this paper.

Over-compliance with the regulations, or the implementation of the DE project regardless the lack of the regulations was indicated by stakeholders to be driven by their willingness to ‘be ahead of the game’, particularly when the regulation was anticipated or the company was eager to gain a competitive edge:

“We are regulated by the Environmental Agency who is sourcing all their offices power from green sources. And we thought, well it wouldn’t be very long before they require the people who are regulated too do a small proportion of their own supply from green as well. So we’re probably a bit ahead of the game by doing that.” (Newport).

This example again illustrates the interplay between regulation and more voluntary drivers that underlie DE developments. Taking anticipated regulation into account allowed the company to forecast the effects of new regulations on their businesses and to adjust the business strategies accordingly if needed:

“The Government decided that all new houses would be zero carbon from 2016 […] This project helps us prepare to some extent for all those things.” (Zero Carbon Homes).

While the Government’s rigorous statement on the universal implementation of zero carbon homes standards motivated the inception of this project, a stakeholder seemed to suggest that the now different definition of zero carbon homes may have led to a different type of project, while the use of the words ‘totally back tracked’ imply a level of disagreement with changes in these regulations:

“The government have totally back tracked on their definition of zero carbon so these houses are belt and braces zero carbon, now the new rules have been much different. It doesn’t impact, we’ll still learn lots with this project that would apply to the new rules as well.” (Zero Carbon Homes).

When regulations were not in place, some of the cases had established self-imposed targets. The operator of the biomass district heating system in the Riverside Dene project was obliged to use the biomass boiler at least 40% of the time. Jernhusen explains who this refers to had an aim of reaching 50% less energy consumption in their Kungsbrohuset building per square metre compared to current building regulations in Sweden:

“We decided we wanted to halve the building’s energy usage to 50% of the regulations. That was kind of a target.”

Vestia Housing Corporation tried to come up with the heating system for the Duindorp area which would be 50% more efficient compared to conventional gas heating; in addition, The Hague seawater project acted as an inspiration for the City of The Hague in implementing 2050 Carbon Neutral City Programme.

In some of the UK cases, the lack of regulation in itself acted as a driver, as stakeholders perceived this signified a lack of urgency in this particular area of addressing ‘hard to treat’ pre-1919 homes. For example, a DE project itself acted as a demonstration project which was hoped to identify best practice and was meant to inform local policy guidance in relation to planning permission for solar panels:

“It’s kind of anti-legislation really, it was more the fact that we were using legislation to refuse these things when we shouldn’t be doing that […] There aren’t really any national schemes in place to address things like […] hard to treat housing […]. So we are very much looking at reducing the environmental impact of these buildings because the restrictions put on them at the moment condemn then to being quite inefficient in a lot of ways.” (Renewable Heritage).

The evidence provided in this section illustrates that while compliance with regulations is unavoidable for some, many of the stakeholders choose to comply voluntarily, thus proving that there is more to the notion of compliance than just a fear of being penalised.

4.2. Environmental awareness and concern as a driver for DE projects

As illustrated in the previous section, some of the projects were implemented regardless of the lack of regulations, and while the drivers for implementation were never singular, one of the prominent drivers present in most of the cases was environmental awareness and concern. Undoubtedly, it is a complex driver that incorporates both altruistic and egoistic motivations and is related to the previous section in the sense that it can underlie a desire to prove a project’s or technology’s feasibility. Environmental awareness and concern can sometimes be attributed to the instigating stakeholder – or a project champion – whose presence does not guarantee the success of the project but their personal motivation is often ‘contagious’ and lead to a faster development of an energy initiative. The literature suggests (e.g. Andersson, Shivarajan, & Blau, 2005; Dunlap, Van Liere, Mertig, & Jones, 2000) that environmental concerns influence the environmental actions of an organisation or partnership to which a person belongs.

Interviews suggest that across cases, project champions shared the following characteristics: vision, credibility and respect, access to resources, experience, and active engagement in the project:

“He’s the father of the energy saving partnership. In the first year he [the representative of the City of Berlin] was very active in going to the districts.” (BESP);

“[…] my experience and my ability to look beyond and take an idea from an idea into reality. … It needn’t be me, but you needed somebody with that level of experience, no question about it.” (Morris Model).

Literature defines project champions as a single person (e.g. Howell & Higgins, 1990; Smith, 2007) however the case studies illustrated that a group of people or an organisation can also act as one. A good example of an organisation being a project champion is the Vestia Housing Corporation, for whom environmental awareness was a corporate value that allowed the implementation of the seawater district heating in The Hague:

“It has always amazed me that Vestia had the initiative to be energy efficient. They were miles ahead of regulations, miles ahead of what the municipality asked then and actually wanted.”

Similarly, the fundamental values of the wider Camphill Community acted as a driver in the Glencraig project implementation:

“Environmental considerations have always been part of Camphill’s ethos, besides the care for people with learning disability or people with needs, the care of the land and so on.”

Importance placed on environmental concern was indicated to originate from various sources, most notably religion:

“We’re Quakers which means that we’re particularly interested in social justice and preserving the environment and all those sort of things.” (Sustainable Moseley).

While in this case the personal religious motivations acted as a central driver behind the project, in other projects, individual awareness and passion about renewable energy played a more
indirect role by enabling a company to work on the growth of the wind energy sector:

“Most people work here because they feel passionate about renewable energies. Of course we need to make profit but we’re here because we’re passionate about renewable energies and the climate.” (Newport).

Furthermore, environmental awareness was triggered by the information received from media sources:

“I see all the documentaries and things on the TV and I’ve been very conscious about this fact since the seventies when acid rain first started happening. At that time there was thinking you couldn’t do anything about it, it’s always the government but as you get older you find out these things should be happening from the roots, not from the top.” (Sustainable Moseley);

“Al Gore’s movie, An Inconvenient Truth, had its Nobel prize and Oscar prize. That was when we found that this might be something big coming here and this will be a major issue. Such an important movie and we felt, both in our hearts and in our minds that this is going to be important in a few years.” (Kungsbrohuset).

The willingness to demonstrate their awareness and concern was also a driver – it was related to innovation and pioneering, and appeared in some of the cases with the aim to demonstrate the feasibility of the DE project as well as the ability to carry it out. The projects did not necessarily feature innovative technologies, although some have not yet been used frequently in the UK, but rather the innovative ways of using existing technologies:

“We wanted to show that it’s [energy efficient building] possible anyway. We had no research in this building. There are no special materials that you just can buy from the American government or something. This is all purely made with normal stuff that you can find everywhere. And put together in a very delicate way. We don’t want to be first with anything because we don’t want to take the risk, and thereby showing people that you can do it as well if you just put your effort in it.” (Kungsbrohuset).

Another aspect of this driver was to prove to a sceptical audience the feasibility of such projects. One of the stakeholders in The Hague dropped out because it was not convinced that the project could be implemented due to its technical difficulty:

“No one believed that the system would ever work, which was very hard. It was very difficult to convince people also from the point of view of finance because the main finance people, the party that contributed financially, they then said “No, we don’t believe it,” and it was our role to convince people, convince organisations that it would really work.”

In the Renewable Heritage project, one of the central drivers was to demonstrate, especially to potentially sceptical stakeholders such as conservation bodies, the feasibility of doing energy generation work on historic homes:

“One of the things we really wanted to show that the key to pushing the agenda and being able to make these [hard to treat] buildings energy efficient and generate their own energy is partnership working (…) there is a real fear in building conservation circles of too much energy efficiency and renewable energy because they think it can ruin the buildings.” (Renewable Heritage).

Furthermore, this driver relates to an element of spreading DE and enhancing an understanding of sustainability, enabling others to take action as well:

“It’s about spreading the message that there is something that everybody can do to contribute towards helping the environment […] so we have to try and help educate people about that.” (Wandle Valley).

This element clearly co-existed with other drivers that related to internal achievements such as carbon reductions:

“The main aims of the project would be to reduce our carbon footprint. Encourage other people to become more involved with renewable energy because like you probably know it might be different in England but Northern Ireland there is still a lot of suspicion regarding renewable energy.” (Wandle Valley).

This section indicated that many stakeholders in urban DE projects are influenced by their environmental awareness and concern, which can be triggered and informed by various sources, from media to ethical and religious beliefs.

While in some cases one set of drivers is more prominent than the other, it is clear that regulations and environmental concern often go hand in hand:

“I don’t know if it [Morris Model] was triggered or not by it [regulations]. I mean we looked at the 30% [carbon reduction target]. We were trying to meet that goal. There’s nothing that’s in the law that really pushes us towards that. You’re doing it on your own, but yet it’s like a suggestion that they’re putting out for you.”

This interconnectedness will be further discussed in the following section.

5. Discussion and conclusions

The objective of this paper was to discuss two sets of drivers for implementing DE projects in the UK and abroad: regulations as a driver (often mentioned in existing literature); and environmental awareness and concern as a driver (which is often overlooked in academic literature but was suggested by DE stakeholders in these case studies). The paper aimed to illustrate that despite the fact that these drivers are discussed in literature as being separate, they are frequently interconnected and re-enforce one another, as stated by one of the case study stakeholders.

Regulatory drivers are widely described in literature (e.g. Marques et al., 2010; Testa et al., 2012) (as demonstrated in the earlier sections of this paper); however over-compliance with regulations has been largely ignored. The same refers to the concerns of the stakeholders: literature mainly focuses on the internal motivations of energy end-users (e.g. Wustenhagen, Wolsink, & Burer, 2007), leaving DE project stakeholders and their concerns and motivations neglected. This paper contributes to this existing knowledge by investigating the importance of the above-mentioned drivers in the implementation of DE projects.

Despite the large number of regulations both in the UK and internationally, regulatory drivers do not seem to play as important a role as might be presumed when it comes to the implementation of DE projects. Environmental awareness and concern was a prominent driver in most of the cases discussed here (Table 2), whereas compliance with regulations was only reported in 4 of the 13 cases. Since this study was qualitative in focus, looking in-depth at a relatively small number of cases, it can only provide empirical evidence. Whilst Table 2 implies a clear distinction between the two drivers, in reality it does not mean that regulations are less important than environmental awareness and concern. Instead it provides evidence based on the case studies that having such concerns stimulates the implementation of DE projects regardless of the existence of legally-bound targets. Regulatory drivers that play a role in our cases are implemented on a local level; additionally
Table 2
Summary of prominent drivers across the case studies.

| Case study                      | Impact of regulations or lack of such | Environmental awareness and concerns |
|---------------------------------|--------------------------------------|--------------------------------------|
| The Hague                       | ×                                    | ×                                    |
| Berlin Energy Saving Partnership | ×                                    | ×                                    |
| Morris Model                    | ×                                    | ×                                    |
| Kungsbrohuset                   | ×                                    | ×                                    |
| Energy neighbourhoods          | ×                                    | ×                                    |
| Glencraig                       | ×                                    | ×                                    |
| Newport – Solita wind turbines  | ×                                    | ×                                    |
| Renewable Heritage              | ×                                    | ×                                    |
| Riverside Dene                  | ×                                    | ×                                    |
| Shimmer                         | ×                                    | ×                                    |
| Sustainable Moseley             | ×                                    | ×                                    |
| Wandle Valley Low Carbon Zone   | ×                                    | ×                                    |
| Zero Carbon Homes               | ×                                    | ×                                    |

most of them are self-imposed in a form of voluntary agreement or internal target. The participation in voluntary regulation shows that the stakeholders are willing to have carbon targets due to their environmental awareness and concerns, and are eager to play a role in it, or at least a desire to be perceived as environmentally friendly. Compliance with regulations, on the other hand, encourages taking the projects further, and acts as a kick-start to new ideas by those having environmental concerns and wanting to do something about it, but are not sure how to go about it, rather than putting pressure on the stakeholders and forcing them to do something they oppose to. The evidence also suggests that the stakeholders influenced by the regulatory drivers are mainly those in the public sector, whereas the decisions about DE in private and community sectors are often driven by their own awareness and concerns, reflecting the results of Allen et al. (2012) discussed earlier.

In addition, Table 2 indicates that compliance with regulations and environmental awareness and concern are not mutually exclusive; instead, internal motivations encourage compliance (or often over-compliance) with regulations. It is clear that regulation is a straightforward driver that, when complied with, leads to the benefits; however, the benefits are not necessarily short term and tangible, and therefore may be ignored by those who are not interested in longer-term sustainability. Thus, when environmental awareness and concern exists, these benefits become clearer and the stakeholders are more eager to achieve them.

Over-compliance and implementation of DE projects, despite the lack of the regulations, is mainly driven by business decisions related to new business opportunities in the context of anticipated regulations. However, rather than being encouraged by financial profits, these business decisions are often triggered by environmental awareness and an ability to identify business opportunity in addressing one’s environmental concern. Over-compliance allows companies to gain a competitive edge by proving that a project can be implemented and the stakeholders engaged in the project have an expertise to do so; this helps improve a company’s reputation and present the company as ‘green’, which also can act as a driver on its own. Over-compliance also relates to environmental concern in a sense that many of the stakeholders tried to prove that the implementation of the DE project was possible despite the lack of governmental support.

As discussed, environmental awareness and concern can be triggered by a variety of information sources as well as moral and ethical values. While ethical values are personal, information sources are external and influence opinions on topics such as climate change and sustainability.

Demonstrating project feasibility is an important aspect of many DE projects and is undoubtedly related to environmental awareness and concern. The ability to find new and innovative ways of project implementation is often very relevant to DE projects, as they are commonly viewed as being niche and not widely used. It can also be argued that the role of the project champion is thus vital; throughout the cases project champions – individuals as well as groups of people – shared visions, credibility and respect, access to resources, experiences, and active engagement. Willingness to innovate is supported by environmental awareness and concern, which help in finding new ways of solving the problem. Stakeholders are willing to demonstrate their concern by showing that something can be done or improved, and thus be first in the field.

Our cases suggest that these projects would not have been implemented if the involved parties did not have environmental concerns, including the business-led cases such as Kungsbrohuset and the Morris Model. While financial aspects were important for all businesses investigated, it was noted that the stakeholders involved in the DE projects were passionate about sustainability; in some cases it had also been demonstrated that the projects had been implemented even when they were not financially feasible.

While environmental awareness may stimulate compliance (and over-compliance) with regulations and participation in voluntary agreements, at the same time, existence of regulations and policies can act as stimuli to those with environmental concerns but who may not be sure how to act upon them. The basis for regulatory drivers for DE projects lies in a local demand for climate policy rather than in multilateral or national policies. Environmental awareness and concern is however a complex and diverse notion; it can range from personal religious beliefs to altruistic feelings towards those worse-off to an organisational ethos. It can be informed by new information as well as by norms and values relevant to the instigating stakeholder or a group of stakeholders. Environmental concern can also play an important role in business decisions: once it can be demonstrated that DE projects can be status-enhancing and improve reputations, they may achieve an important demand, which would lead to economies of scale, and make the implementation of DE projects more popular due to the lower financial risks. Often environmental awareness is seen as three-dimensional incorporating economic, environmental and social justice. It is seen as a way of improving living and health standards as well as financial well-being, whilst contributing to carbon reductions, and DE projects are seen as a way of achieving all three.

This paper demonstrated possible drivers and their role in the implementation of DE projects. Currently there is a lack of investigation and knowledge regarding the motivations of the organisations implementing DE projects. Thus, it is important to try and understand the reasons why public and private sector stakeholders implement DE projects: future research is required to corroborate these findings and investigate drivers of urban DE initiatives in more detail, and in additional contexts.

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