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**ASSESSING THE IMPLEMENTATION  
OF RENEWABLE TECHNOLOGIES  
  
IN THE RESIDENTIAL SECTOR  
OF THE BUILT ENVIRONMENT  
ON A LOCAL SCALE IN THE UK.**

By Chris Senior

A thesis submitted in partial fulfilment of the requirements for the degree of

**MSc Architecture: Advanced Environmental and Energy Studies**

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*'The past 20 years have seen a growing realisation that the current model of development is unsustainable. In other words, we are living beyond our means. From the loss of biodiversity with the felling of rainforests or over fishing to the negative effect our consumption patterns are having on the environment and the climate. Our way of life is placing an increasing burden on the planet.*

*The increasing stress we put on resources and environmental systems such as water, land and air cannot go on forever. Especially as the world's population continues to increase and we already see a world where over a billion people live on less than a dollar a day.*

*A widely-used and accepted international definition of sustainable development is: 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs' - Globally we are not even meeting the needs of the present let alone considering the needs of future generations.*

*Unless we start to make real progress toward reconciling these contradictions we face a future that is less certain and less secure. We need to make a decisive move toward more sustainable development. Not just because it is the right thing to do, but also because it is in our own long-term best interests.*

*It offers the best hope for the future. Whether at school, in the home or at work, we all have a part to play. Our small everyday actions add up to make a big difference.'*

*(Defra, October 2008)*

*'Many houses and apartments now have multiple electronic appliances and are more luxurious. We build larger homes for fewer people and use more energy in our homes. We also buy increasing numbers of electronic goods like TVs, DVDs, PCs, laptops, mobile phones, stereos and various kitchen appliances, and replace these more frequently. As a result, even though the energy and resource-efficiency of each unit is improving, households continue to contribute the same share of greenhouse gas emissions and generate increasing amounts of waste.'*

*(EEA, October 2008)*

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## ABSTRACT

This thesis sets out to 'assess the implementation of renewable technologies in the residential sector of the built environment on a local scale in the United Kingdom'. To do this it, was felt that a series of sub-questions would best summarise the data and research gathered.

It found that the global objectives set out in the Kyoto Protocol have been adopted by the EU-15 and that the UK is on track to meet its targets in reducing GHG emissions.

Two questionnaires were distributed. The first targeted planners across the UK and received 193 responses. The second was a local survey of Cambridge City Council, focusing on the principal decision makers in the design process of typical residential developments.

The findings can be summarised as follows:

- **More funding is required to assist developers in implementing renewable technology in new residential developments.**
- **Good examples of renewable technology deployment is needed.**
- **More resources are needed for professional use.**
- **Additional training is urgently required within the planning system.**
- **A wider survey is required and an additional energy review suggested.**

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## GLOSSARY

<b>BRE</b>	Building Research Establishment
<b>CABE</b>	Commission for Architecture and the Built Environment
<b>CCC</b>	Cambridge City Council
<b>CDIAC</b>	Carbon Dioxide Information Analysis Centre
<b>CH<sub>4</sub></b>	Methane
<b>CHP</b>	Combined Heat and Power
<b>CIAT</b>	Chartered Institute of Architectural Technologists
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>COP</b>	Conference of the Parties
<b>CPD</b>	Continuing Professional Development
<b>DCLG</b>	Department for Communities and Local Government
<b>DEFRA</b>	Department for Environment, Food and Rural Affairs
<b>DfT</b>	Department for Transport
<b>D-P-S-I-R</b>	Driving force-Pressure-State-Impact-Response Framework
<b>DPD</b>	Development Plan Document
<b>DTI</b>	Department for Trade and Industry
<b>EEA</b>	European Environment Agency
<b>EERA</b>	East of England Regional Assembly
<b>EPC</b>	Energy Performance Certificate
<b>EPI</b>	Earth Policy Institute
<b>ER</b>	Environment Report
<b>GHG</b>	Green House Gas
<b>HFC</b>	Hydrofluorocarbons
<b>HIP</b>	Home Information Pack
<b>LDF</b>	Local Development Framework
<b>NHBC</b>	National House Building Council
<b>N<sub>2</sub>O</b>	Nitrous Oxide
<b>ODPM</b>	Office of Deputy Prime Minister
<b>OECD</b>	Organization for Economic Co-operation and Development
<b>PFC</b>	Perfluorocarbons

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<b>POE</b>	Post-Occupancy Evaluation
<b>PPS22</b>	Planning Policy Statement 22
<b>PV</b>	Photovoltaic cells
<b>RIBA</b>	Royal Institute of British Architects
<b>RSS</b>	Regional Spatial Strategy
<b>SAP</b>	Standard Assessment Procedure
<b>SEA</b>	Strategic Environmental Assessment
<b>SF<sub>6</sub></b>	Sulphur Hexafluoride
<b>SPD</b>	Supplementary Planning Document
<b>SUDS</b>	Sustainable Urban Drainage Systems
<b>UK</b>	United Kingdom
<b>UNCED</b>	United Nations Conference on Environment and Development
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change

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# 01 INTRODUCTION

*“We need urgent global action to tackle climate change. We are showing leadership by putting the UK on a path to a 60% reduction in its carbon dioxide emissions by 2050.” (Tony Blair, 2003)*

This thesis aims to assess the implementation of renewable technologies in the residential sector of the built environment on a local scale in the United Kingdom (UK).

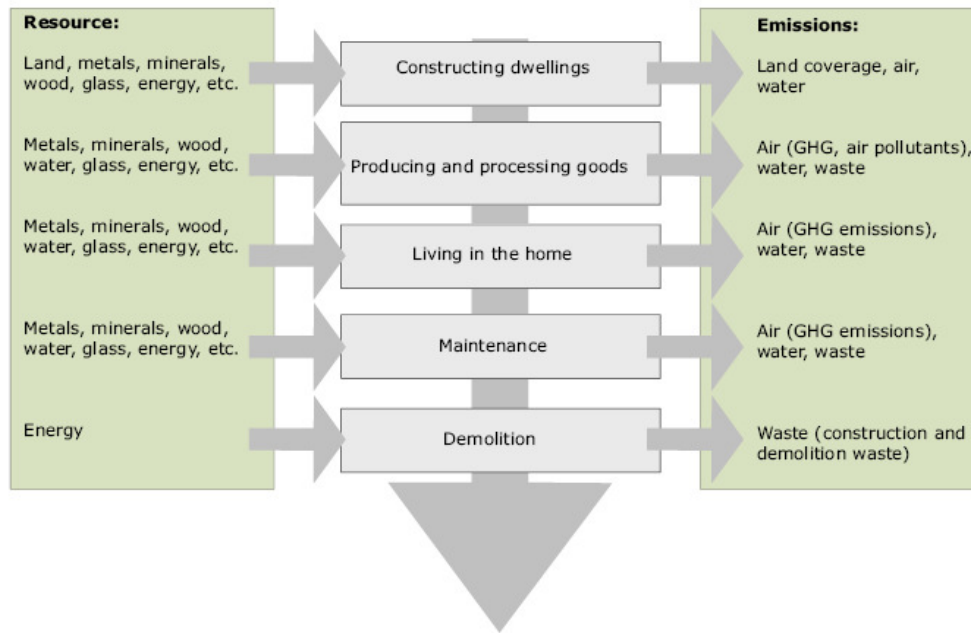
It is necessary to first consider the importance of the subject in terms of the wider environmental context in order to further understand why local councils adopted the policies they have in place. To do this the paper will give an overview of strategies and targets on a global, european, national and regional scale.

A study in the form of a questionnaire will then look at how different regions in the UK are meeting these targets in housing developments and assess whether councils and officers receive adequate training to implement renewable technologies effectively.

Cambridge City and Cambridge City Council will be focused on as a case study to closely monitor how policy is initiated and executed on a local scale. A further questionnaire will study the knowledge, understanding and communication between planning officers, architects and developers.

It is important to understand the consequences of meeting our housing needs. Diagram 1 shows the environmental impact our housing has on the environment.

Diagram 1 Environmental effects of housing activities



Source: Household consumption and the environment, 2005

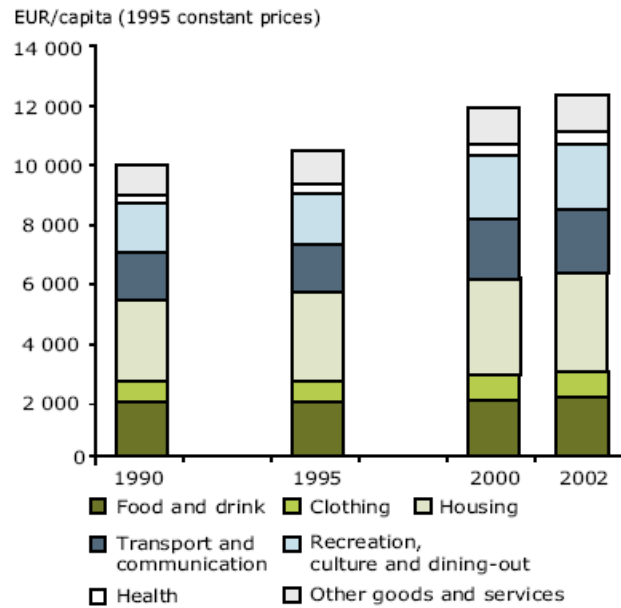
Former Chancellor of the Exchequer, Prime Minister Gordon Brown was quoted as saying:

*“Environmental sustainability is not an option... A new paradigm that sees economic growth, social justice and environmental care advancing together can become the common sense of our age.” (United Nations, Gordon Brown, April 06)*

The above quote, defining the term “Sustainable Development” or “three legged stool of sustainability”, acknowledges the importance of balance between economic, social and environmental factors, highlighted in the report ‘Our Common Future’ (Brundtland, 1987).

Chart 1 suggests that transport, communication, tourism and leisure have also emerged as major components of household consumption, which would not have applied fifty years ago. Indeed, housing expenditure is shown to have increased by approximately one third in the twelve years between 1990 and 2002. (EEA, 2005)

Chart 1: Household expenditure per capita in EU-15 Member States: 1990 to 2002



Source: Household consumption and the environment, 2005

In order to fully answer the title proposition ***‘Assessing the implementation of renewable technologies in the residential sector of the built environment on a local scale in the United Kingdom’*** the following secondary questions will be reviewed over the forthcoming chapters:

- *What are the targets or objectives?*
- *How are countries performing?*
- *Are the targets being implemented?*
- *How are they being implemented?*
- *What are the implications for the Residential Sector?*

To help answer the above questions raised in each chapter, a framework first suggested by the Organization for Economic Co-operation and Development (OECD) called Driving force-Pressure-State-Impact-Response Framework (**D-P-S-I-R**) will be applied. This will provide a regimented summary of each argument discussed in the following chapters as outlined below:

---

## **Chapter 02 GLOBAL & NATIONAL TARGETS**

The challenges facing carbon emissions will be studied and the objectives set out in the Kyoto Protocol will be investigated. This chapter will then look at how the European Union and subsequently the UK have addressed these objectives and the targets set out in The White Paper on Energy, The Energy Review Report and the White Paper. The final section of this chapter will look into how the planning system has adopted these targets in the Planning Policy Statement 22.

## **Chapter 03 REGIONAL TARGETS & LOCAL POLICY**

### ***(case study Cambridge)***

The White Paper on Energy, The Energy Review Report and the White Paper note the responsibilities of local authorities. This section is dedicated to a case study region of Cambridgeshire, with a review of current local policies set out by Cambridge City Council to establish the 'knock-on' effects incurred by global and national objectives/targets.

## **Chapter 04 DESIGN GUIDELINES & ASSESSMENT METHODS**

Design guides and assessment methods have been developed on a local and national scale. These aids are to assist designers, builders and home owners in the decision making process. This section reviews a selection of these and the implications renewable energy has on the home.

## **Chapter 05 DEVELOPMENT OF QUESTIONNAIRE**

To fully assess the implications renewable technologies have had on the residential sector it has been necessary to obtain new data. Two questionnaires have been developed and distributed. The first is focused on planners, giving an overview of the planning system (*by region*) across the UK. The second is focused on the principal bodies involved in the decision making process of a typical residential planning application in the Cambridge City region.

## **Chapter 06 SUMMARY OF RESULTS**

This section is dedicated to summarising the results from both questionnaires, with reference to the previous chapters and general research conducted.

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## Chapter 07 CONCLUSIONS

Conclusions will be drawn from the findings accompanied by recommendations, implications, wider context, limitations and suggested further research.

We can input these subheadings into a flow diagram to gain a better picture of how each role can have implications on the next, creating a chain effect from global – local and even individual actions.

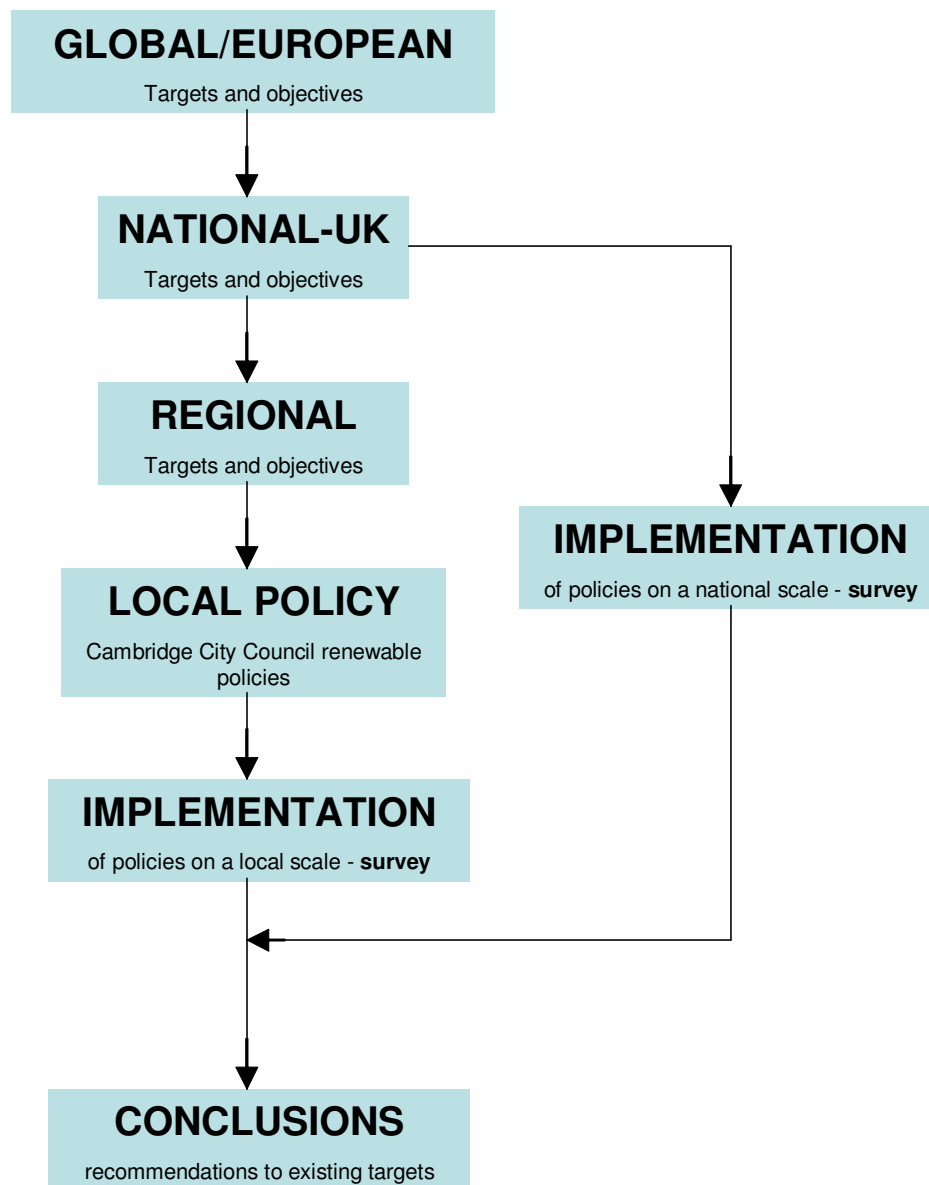


Diagram 2 – suggested chain of action

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## 02 GLOBAL & NATIONAL TARGETS

*“We are determined to become a low carbon economy.”  
(Alistair Darling, 2007)*

To fully assess the implementation of renewable technology on a local scale, it will first be important to review the foundations on which local targets and objectives have been based. To do this we must ask the questions *What are the targets or objectives?...* On a global scale and *How are countries performing?.* The following D-P-S-I-R Framework highlights the global concern fuelling the pressure put on countries to reduce carbon emissions and the response, which will now be discussed in more detail.

Table 1

	D-P-S-I-R Framework
<b>Driving force</b>	Fossil fuel consumption
<b>Pressure</b>	Emission of greenhouse gases
<b>State</b>	Atmospheric concentration of greenhouses gases
<b>Impact</b>	Global warming
<b>Response</b>	United Nations Framework Convention on Climate Change – Kyoto Protocol

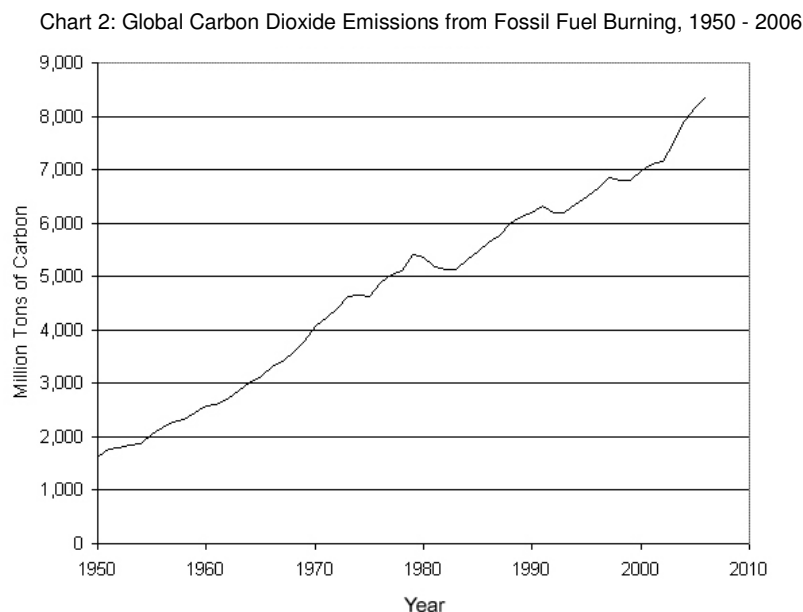
### **02.1 Kyoto Protocol**

The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC); an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), originally held in Rio de Janeiro in July 1992. Adopted by consensus at the third session of the Conference of the Parties (COP) in December 1997 (EUROPA, 2008), it contains legally binding emissions targets for developed (Annex I) countries for the post-2000 period, in order to achieve the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. These gases are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>),

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nitrous oxide (N<sub>2</sub>O), sulphur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFC), and perfluorocarbons (PFC). It was stated at the convention that “Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.” (UNFCCC, 2008)

**02.2** Chart 2 highlights how in 1950 carbon emissions stood at around 1.6 billion tons. During the 1970’s it more than tripled to 4.9 billion tonnes. In 2000 carbon emissions continued to rise approaching 6.5 billion tons, quadrupling the total in just 50 years. “Since the atmospheres capacity to fix carbon is fairly constant, as the volume of emissions rises, the earth fixes a decreasing percentage of emissions. The increased atmospheric concentrations of CO<sub>2</sub> and other greenhouse gases (GHG) trap more of the earths’ heat, causing temperatures to rise”. (Earth Policy Institute, 2008)

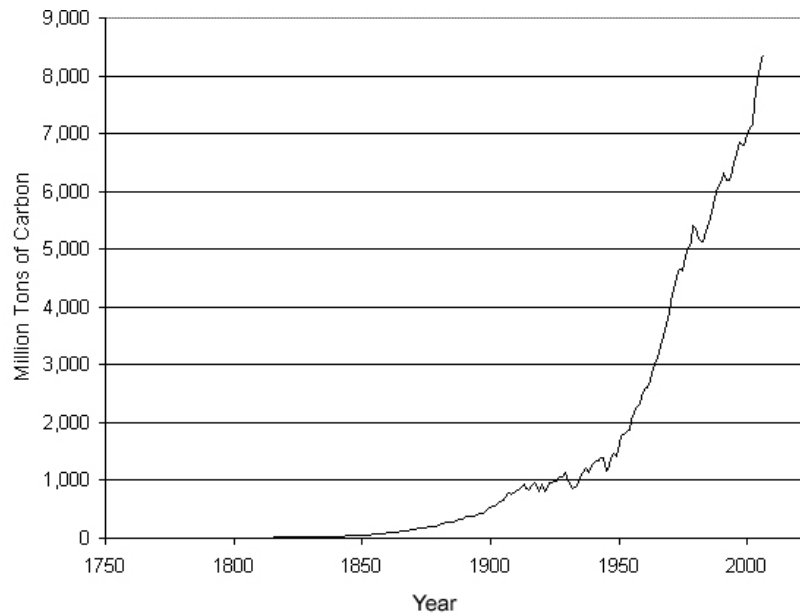


Source: Earth Policy Institute, 2008

Chart 3 below compares the last fifty years with carbon emissions over the last two hundred years at the start of the Industrial Revolution. Cheap coal and rapid periods of industrial growth saw carbon emissions start to rise. During the 1750 -1770s it is recorded that around 3 million tonnes per year of

carbon was emitted, comparable to 8.38 gigatons recorded in 2006. (Earth Policy Institute, 2008)

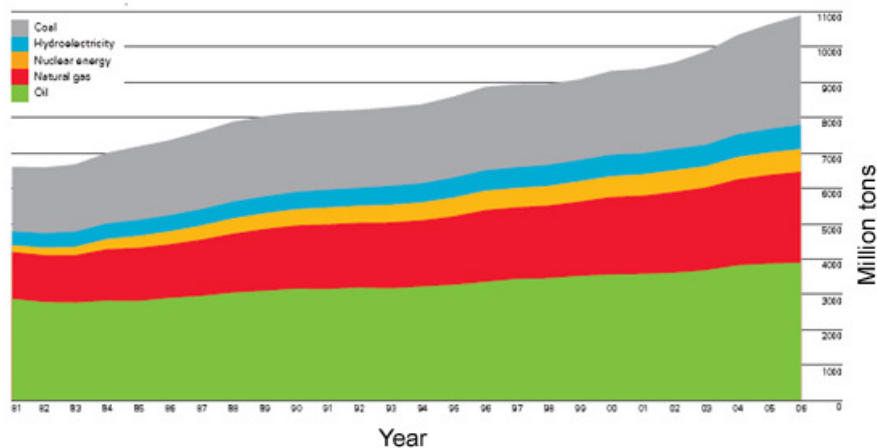
Chart 3: Global Carbon Dioxide Emissions from Fossil Fuel Burning, 1751 – 2006



Source: Earth Policy Institute, 2008

BP prepared a Statistical Review of World Energy in June 2007 highlighting global trends for primary fuel consumptions. Chart 4 highlights world fuel consumption increasing from 6.5 million tonnes in 1981, to approximately 11 million tonnes in 2006. (BP, 2008)

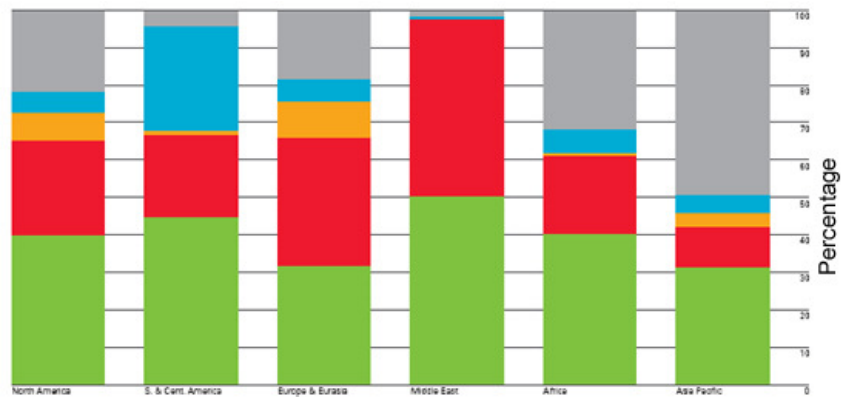
Chart 4: World consumption (million tonnes oil equivalent), 2006



Source: BP, 2008

Chart 5 below highlights regional consumption for North America, South & Central America, Europe & Eurasia, Middle East, Africa and Asia Pacific. Europe's primary fuels are indicated at 35% for gas, 32% for oil and 18% for coal with small amounts of Nuclear and Hydroelectricity in comparison. (BP, 2008)

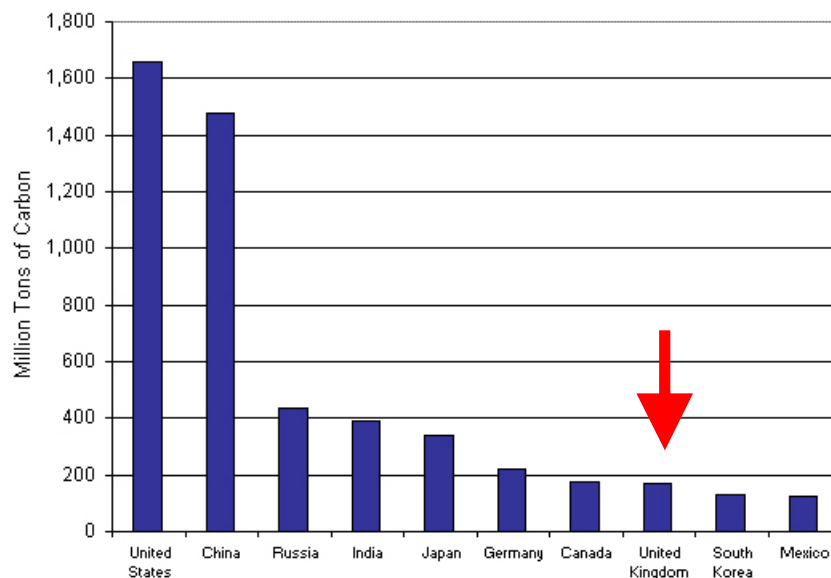
Chart 5: Regional Consumption, 2006



Source: BP, 2008

The Earth Policy Institute (EPI) compiled data obtained from the Carbon Dioxide Information Analysis Centre (CDIAC) and BP which suggests that the UK is one of the top ten countries for highest carbon emissions. Chart 6 indicates that the UK is ranked 8<sup>th</sup> on the global scale for worst contributors of CO<sup>2</sup> emissions from data obtained in 2006. (EPI, 2008)

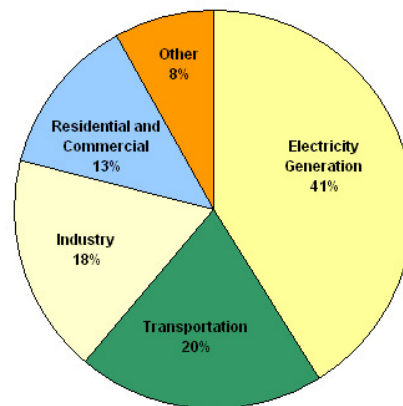
Chart 6: Top ten countries for fossil fuel burning, 2006



Source: Earth Policy Institute, 2008

The EPI compiled further data to highlight where emissions related to different sectors. Chart 7 suggests 13% is produced in the residential & commercial sector whilst a staggering 41% of CO2 emission is from the production of electricity to use in our offices, shops and **homes**.

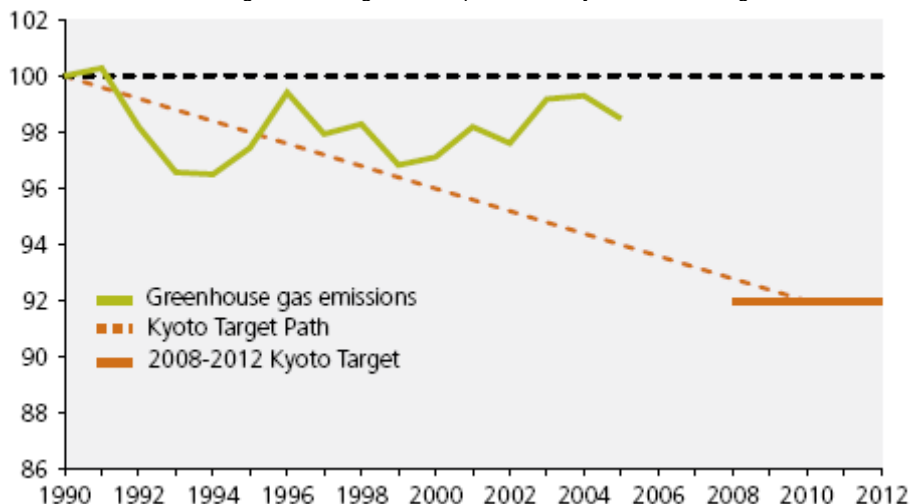
Chart 7: Global Carbon Dioxide Emissions from Fossil Fuel Burning by Sector, 2004



Source: Earth Policy Institute, 2008

The EU-15<sup>[1]</sup>, under the Kyoto Protocol, has a target to reduce GHG emissions by 8 per cent below 1990 (base-year) levels by 2008-2012. Chart 8 shows a drop of almost 1% after a rise in the two years prior.

Chart 8: EU emissions of greenhouse gases compared with Kyoto Protocol target: 1990-2012

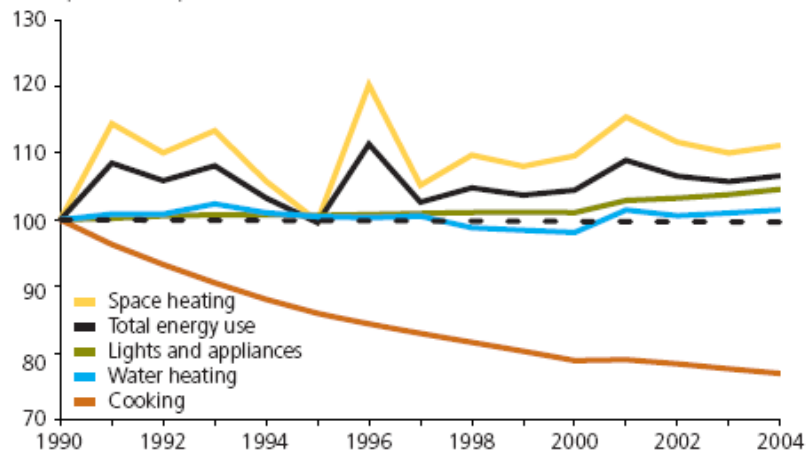


Source: The environment in your pocket: 2007

[1] EU-15 refers to the 15 member states of the European Union in the period prior to enlargement in 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

The total energy consumption in the household by end users has risen 7% in the UK since 1990. Around 60% of the energy consumed in households is from space heating. This could be due to climate change in recent years. Chart 9 also shows that approximately 25% of energy consumption is from water heating.

Chart 9: Energy consumption per household, by end use in the UK: 1990-2004



Source: The environment in your pocket: 2007

**“The UK contributes about 2 per cent to global man-made emissions of CO<sub>2</sub>, the main greenhouse gas, which are currently estimated to range between 6.2 and 6.9 billion tonnes carbon per annum.”** (The environment in your pocket, p23: 2007)

The Kyoto Protocol and EU-15 objectives placed increased pressure on the UK to reduce its carbon emissions. In response to this the UK developed its own targets and objectives which will now be discussed further. To do this we must ask the question *What are the targets or objectives?...* On a national scale.

Table 2	D-P-S-I-R Framework
<b>Driving force</b>	Kyoto Protocol objectives
<b>Pressure</b>	Stabilization of greenhouse gas concentrations in the atmosphere
<b>State</b>	UK is one of the top ten countries for highest carbon emissions
<b>Impact</b>	Target to reduce Carbon emissions
<b>Response</b>	The White Paper on Energy

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### **02.3 The White Paper on Energy: Meeting the Energy Challenge**

The current White Paper on Energy published in 2007 comprises of previous works including; *The Energy White Paper, 2003* and *The Energy Review Report, 2006*. It sets out the Governments' international and domestic energy strategies to reduce carbon emissions and achieve the following goals:

"Our four energy policy goals are:

- to put ourselves on a path to cutting the UK's carbon dioxide emissions - the main contributor to global warming - by some 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity; and
- to ensure that every home is adequately and affordably heated." (A White Paper on Energy, 2007)

Within the latest publication of the White Paper, a section has been devoted to planning legislation and outlines the importance for planning and the role it has to play in order to meet the overall goals set out above. The White Paper (p253: 2007) states that, "The planning system plays an important role in delivering the necessary energy infrastructure to meet our national needs. In so doing, it has to integrate national, regional and local benefits; economic, environmental and social objectives; and possible tensions between the interests of individuals or local communities and the needs of society as a whole."

The White Paper feels that by reducing costs, delays and uncertainties they can achieve the right market framework in the private sector. By adhering to the following aims they also state (p274: 2007) that it will help "improve the accountability of the system, the transparency of decision-making and the ability of individuals and communities to participate effectively in the planning process."

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These aims include:

- ensuring that there is a clear policy framework for nationally significant infrastructure;
- helping promoters improve the way that they prepare and consult on applications;
- streamlining the procedures for infrastructure projects of national significance by rationalising the different consent regimes and improving the inquiry procedures for all of them;
- clarifying the decision making process, and achieving a clear separation of policy and decision making, by creating an independent commission to take the decisions on nationally significant infrastructure cases within the framework of the relevant national policy statement;
- improving public participation across the entire process. (A White Paper on Energy, 2007)

#### **02.4 *The Energy Review Report***

Following on from 'The White Paper on Energy: Our Energy Future – creating a Low Carbon Economy' published in 2003, 'The Energy Efficiency Implementation Plan' published in 2004 and the 'DTI Microgeneration Strategy: Our Energy Challenge published' in 2006, it was announced in 2005 that a full scale energy review was to be undertaken. Published in 2006, one of the main objectives was a study of over five-hundred participants from organizations to individuals with an aim to highlight the outcome and understanding of the 2003 White Paper.

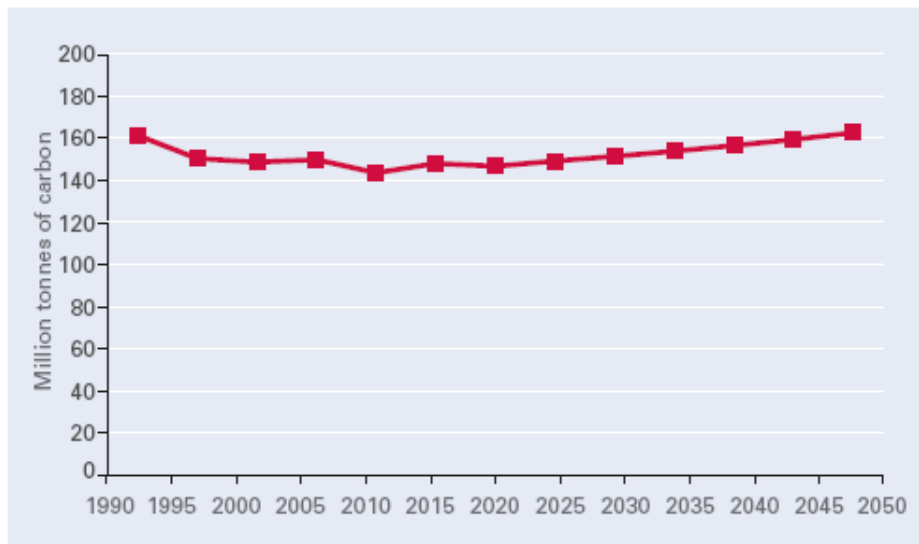
The Review (p157: 2006) highlighted the following (relating to the residential sector) as its 'next steps'

- **“Code for Sustainable Homes:** we will announce the 5 Levels for the Code for Sustainable Homes later this year. All government-funded housing will be required to reach at least Level 3 – significantly more energy efficient than current Building Regulations.”

- **“Review of Permitted Development Rights for Microgeneration:** Department for Communities and Local Government will consult on changes to the General Permitted Development Order in the autumn. We aim to ensure that, so far as possible, all microgeneration is exempted from the need for a planning application.”

A study published in the review predicts that if the UK stays on its current course, energy demand and carbon emissions are likely to grow past the 2020 targets, including emissions in the residential sector.

Chart 10: Long term predicted CO<sub>2</sub> emissions: 1990-2050



	Residential sector	Transport sector	Industry	Services	Total CO <sub>2</sub> emissions (including LUC)
1990	40.3	40.0	56.4	23.8	161.4
2000	38.8	41.1	48.9	20.7	143.5
2010	36.7	42.4	45.8	19.5	146.7
2030	41.1	41.5	46.6	21.6	151.4
2050	47.3	40.5	50.3	23.8	162.6

Source: The Energy Review Report: 2006

## 02.5 *White Paper: Planning for a Sustainable Future*

A supplementary paper was published alongside the ‘White Paper on Energy’ in May 2007. The executives comprised Ruth Kelly, Secretary of State for Communities and Local Government, David Miliband, Secretary of State for

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Environment, Food and Rural Affairs, Alistair Darling, Secretary of State for Trade and Industry and Douglas Alexander, Secretary of State for Transport, stated (p2: 2006) that “This White Paper sets out a wide-ranging package of reforms. We propose to streamline further the process in the town and country planning system, improve the ability of local authorities to shape their local communities, and ensure that there is a stronger approach to supporting sustainable economic development alongside work to tackle climate change in a way that is integrated with the delivery of other sustainable development objectives.” (Planning for a Sustainable Future: 2007)

The report notes the need for local authorities to have the power to take control over their district and to promote sustainable development. It also acknowledges the importance of the planning system and the effect it can have on the quality of people’s lives. “When planning is done well it enables us to build thriving, healthy, sustainable communities where people want to work, shop, live or visit.” (Planning for a Sustainable Future p5:2007). The report aims to create a planning system which supports vibrant, healthy sustainable communities, promoting the UK’s international competitiveness.

### **02.6 *Planning Policy Statement 22: Renewable Energy***

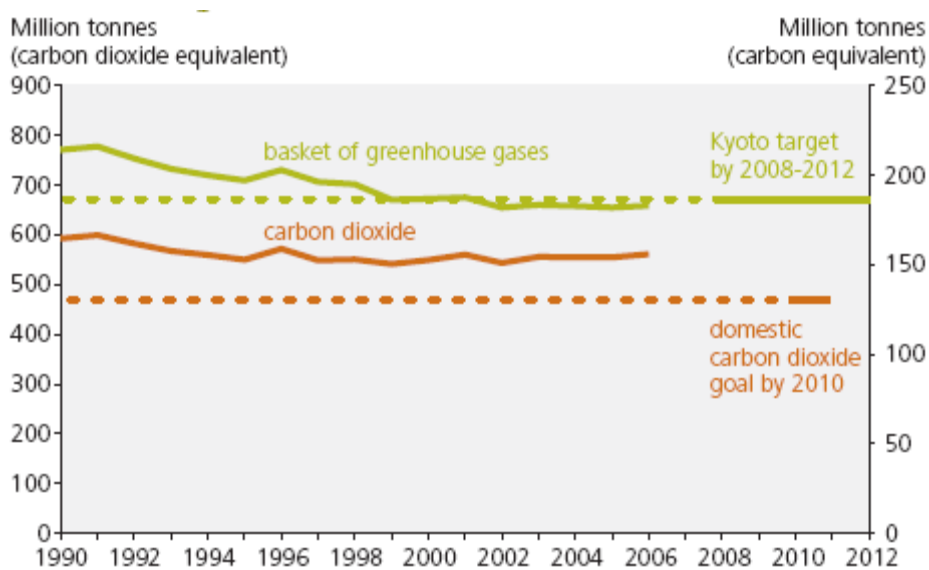
Planning Policy Statement 22 (PPS22) forms part of the British Government’s National Policy. They are legally binding and can be treated as material consideration when determining a planning application. PPS22 replaced PPG22 in 2004 and refers to renewable energy. Positive planning which facilitates renewable energy will be achieved when it complies with all four elements of the Governments’ sustainable development strategy:

- social progress
- effective protection of the environment
- prudent use of natural resources
- maintenance of high and stable levels of economic growth (PPS22: 2004)

Local authorities should not dismiss small scale developments due to low levels of output. The policy highlights that all renewable technologies have their place, however small the contribution. Regional spatial strategies should encourage and promote sustainable development rather than restrict. However, renewable energy developments should only be granted if environmental, economic and social impacts can be addressed. (PPS22: 2004)

**02.7** If the UK is to achieve its targets set out in the Kyoto Protocol and subsequent reports, local authorities are going to have to do their part for the environment; enforcing, encouraging and monitoring renewable technologies in new developments.

Chart 11: Emissions of greenhouse gases in the UK: 1990-2006



	Million tonnes (carbon dioxide)					
	1990	1995	2000	2004	2005	2006(p)
Basket of gases	770	709	672	657	654	658
Carbon dioxide	592	550	549	555	554	561

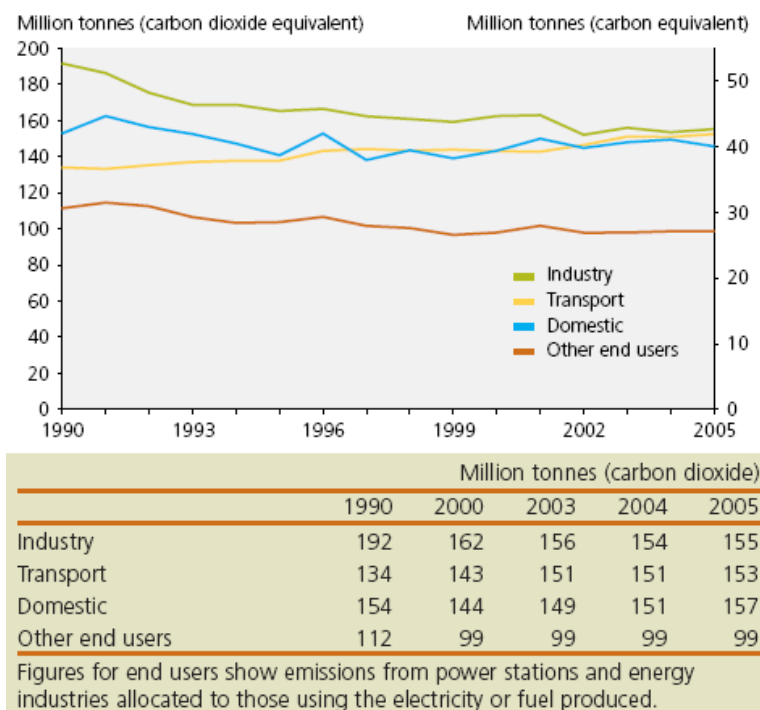
Source: The environment in your pocket: 2007

So far, evidence suggests that we seem to be on track. In 2005 emissions of the 'basket' (6 gases highlighted earlier in the chapter) were 15½ per cent lower than the Kyoto base year figure of 775 million tonnes, and emissions of carbon dioxide, the main greenhouse gas, fell by 6½ per cent between 1990

and 2005. “The UK aims to move beyond the Kyoto target and reduce CO<sub>2</sub> emissions by 20 per cent below 1990 levels by 2010.” (The environment in your pocket, p28:2007)

Chart 12 below suggests that whilst the Industry sector fell by approximately 19% in its CO<sub>2</sub> emissions during 1990-2005, the residential sector saw little or no change from 154 million tonnes of carbon dioxide in 1990 to 157 million tonnes of carbon dioxide in 2005.

Chart 12: Carbon dioxide emissions, by end user in the UK: 1990-2005



Source: The environment in your pocket: 2007

To further understand the importance of the research collected in this chapter, and to fully answer the title question, it is important that we now look at how this has been dealt with on a local scale.

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## 03 REGIONAL TARGETS & LOCAL POLICY

### *case study – Cambridge, East of England*

*“The achievement of sustainable development will require action by many people and organisations. It will require radical changes in the way we plan and make decisions; in the way we live and carry out our business. Facing up to these radical changes will strengthen us as a region now and benefit generations to come.”*  
(Michael Allen, John Kent, Richard Ellis, 2001)

We have already established the global objectives set out in the Kyoto Protocol and how the UK aims to respond to the fundamental goals of reducing GHG emissions. This chapter will now look into how these goals have been applied to the built environment, focusing on the East of England and Cambridge for the purpose of this exercise. To do this we must ask the question *Are the targets being implemented?*

Table 3

	D-P-S-I-R Framework
<b>Driving force</b>	The White Paper on Energy objectives
<b>Pressure</b>	Cut UK's CO <sup>2</sup> emissions by some 60% by 2050
<b>State</b>	41% of CO <sub>2</sub> emission is from the production of electricity to use in our offices, shops and homes
<b>Impact</b>	The planning system plays an important role in delivering the necessary energy infrastructure to meet our national needs
<b>Response</b>	Energy Sustainability Appraisal for the East of England

### **03.1 Sustainability Appraisal for the East of England**

The Sustainability Appraisal for the East of England, incorporating the Report of the Strategic Environmental Assessment (SEA), also known as the Environmental Report (ER), outlines the Regional Spatial Strategy (RSS) for the East of England, including Cambridgeshire.

It sets a framework for spatial and land use planning across the region, (including setting aside land for new housing up to 2021). Local development

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Frameworks and other planning documents, including masterplans and site briefs for developments have to reflect it. In turn, it is required to be consistent with national planning policy (including the Sustainable Communities Plan) and other regional strategies such as the Regional Economic Strategy.

The aim of the report is to describe the likely significant sustainability effects of implementation of RSS for the East of England, and to put forward recommendations for reducing any significant adverse effects and enhancing any significant positive effects identified during the appraisal process. It provides an account of how both the earlier sustainability appraisal and the subsequent SEA have influenced the preparation of RSS, including the consideration of alternative spatial strategies. It also puts forward recommendations for monitoring. (RSS for the East of England, 2004)

**RSS for the East of England Vision**

“To sustain and improve the quality of life for all people who live in, work in, or visit the region, by developing a more sustainable, prosperous and outward-looking region, while respecting its diversity and enhancing its assets.”

(RSS for the East of England, p5: 2004)

The renewable energy related objectives outlined in the RSS are as follows:

- protect and enhance the built and historic environment and encourage good quality design and use of sustainable construction methods for all new development;
- protect and enhance the natural environment, including its biodiversity and landscape character;
- minimise the demand for use of resources, particularly water, energy supplies, minerals, aggregates, and other natural resources, whether finite or renewable, by encouraging efficient use, re-use, or use of recycled alternatives, and trying to meet needs with minimum impact.

(RSS for the East of England, 2004)

**03.2** The RSS highlights Cambridge as an area for potential sustainable energy generation and use. A regional energy study suggests there is great potential for wind energy and also biofuels such as oilseed rape. The implications for the RSS is outlined as “Opportunities for renewable energy sources should be encouraged and used to their full potential.” (RSS for the East of England, p26: 2004)

The East of England Regional Assembler (EERA) commissioned Arup, White Consultants and the University of Northumbria to undertake a study that would inform the further Review of the East of England Plan, with regard to renewable energy generation. The findings were published in the Placing Renewables in the East of England: Final Report, 2008

Table 4: Regional electricity output estimates, by county: 2007

technology	Beds (MWh)	Cambs (MWh)	Essex (MWh)	Herts (MWh)	Norfolk (MWh)	Suffolk (MWh)	unattributed (MWh) #	total MWh
Biomass*	5,853	274,385	100,659	145	309,009	106,597	30,893	827,540
Landfill gas	251,941	135,360	658,842	62,733	120,673	85,179	11,999	1,326,730
Off-shore wind							157,680	157,680
On-shore wind		208,287	14	512	48,855	6,277		263,940
Sewage gas / other <sup>x</sup>	4,133	2,612	2,551	11,022	7,478	3		27,800
county total (GWh)	261.93	620.64	762.06	74.41	486.01	198.06	200.57	2,603.69
% of onshore generation	10.7%	25.4%	31.2%	3.0%	19.87%	8.1%		

Source: Placing Renewables in the East of England: Final Report, 2008

Table 4 indicates that Cambridgeshire currently provides 25.4% of East of England’s onshore renewable energy output. This ranks it as second highest out of the six counties in renewable energy contributions. This includes Biomass, On-shore wind and Landfill/Sewage Gas.

In December 2007, the East of England had an installed renewable energy capacity of approximately 458MW. This was 38% of the 1192MW target for 2010 in the Draft RSS. The region currently generates approximately 2,600 gigawatt-hours (GWh) of renewable electricity. This is 60% of the 2010 target in the previous Draft RSS. Table 5 shows that some technologies are supplying much more than their target output, while others have taken longer

to become established. In particular, wind schemes have not been installed as quickly as anticipated. (RSS for the East of England, 2004)

Table 5: Progress against target renewable electricity output: 2007

technology	Draft RSS target (GWh)	Renewables East figure (Dec 07) (GWh)	% complete
onshore wind	1,700	264	15.5%
offshore wind	1,300	158	12.2%
biomass	700	827	118.1%
landfill gas	600	1,327	221.2%
sewage gas	not stated	28	n/a
other	6	not stated	n/a
<b>Total</b>	<b>4,306</b>	<b>2,604</b>	<b>60.5%</b>

Source: Placing Renewables in the East of England: Final Report, 2008

The East of England has set out regional targets and highlighted the potential of renewable energy in each county. To fully answer the title question we will now look at how this has been implemented on a local scale. To do this we must ask the question *How are they being implemented?* As outlined in the introduction, Cambridge City has been chosen as a case study.

Table 6	D-P-S-I-R Framework
<b>Driving force</b>	RSS objectives
<b>Pressure</b>	encourage good quality design and use of sustainable construction methods for all new development
<b>State</b>	East of England has potential for renewable energy contributions
<b>Impact</b>	East of England regions to develop Local Policy to enforce National objectives
<b>Response</b>	Policy 8/16 & 8/17 of the Cambridge Local Plan

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### 03.3 Policy 8/16 of the Cambridge Local Plan

***“8/16 Renewable Energy in Major New Developments Developers of major proposals above a threshold of 1,000 square metres or 10 dwellings will be required to provide at least 10% of the development’s total predicted energy requirements on-site, from renewable energy sources. These requirements may be relaxed if it can be clearly demonstrated that to require full compliance would not be viable.***

*8.41 The sustainable use of energy is central to reducing carbon dioxide emissions which are causing climate change. The Energy White Paper has a goal of reducing the UK’s CO<sub>2</sub> emissions by some 60% by 2050, with real progress by 2020.*

*8.42 For the purposes of this policy renewable energy could include those technologies set out in the supporting text to Policy 8/17, and also passive solar design. Passive solar design is designing a building to take maximum advantage of the light and heat from the sun and natural ventilation, and can significantly reduce the overall energy consumption of a building. This can be achieved by the location, grouping, orientation and layout of buildings, but must be considered early in the design process. Passive solar design provides a one-off opportunity to save energy during the lifetime of a building.*

*8.43 Developers will be expected to use the renewable energy technology, or mix of technologies, that is most appropriate to the type of development proposed, its location and design.*

*8.44 Developers of major proposals will be required to provide evidence, to be submitted with the planning application, to show how they have met the requirements of this policy. Typically this can be submitted as part of the Sustainability Statement required by Policy 3/1 and set out in the Sustainable Development Guidelines.*

*8.45 Further guidance will be produced to support this policy and Policy 8/17 on renewable energy. There is significant scope for making use of renewable energy technologies in the areas of major change. The City Council will require that this be fully considered in the Masterplanning of these areas.” (CCC LDF, 2006)*

Policy 8/16 of the Cambridge Local Plan sets out to achieve a 10% production of energy requirement in new developments, for schemes of over 1,000m<sup>2</sup> or 10No. dwellings in a renewable form. This Policy aims to address the Energy White Papers objective of reducing the UK’s CO<sub>2</sub> emissions by 60% by 2050, with real progress by 2020. Policy 8/16 (CCC LDF, 2006) states that technologies “could include those technologies set out in the supporting text to Policy 8/17, and also passive solar design.” These technologies include, but are not limited to, active solar thermal, Photovoltaic cells (PV), Wind turbines, Biomass for community heating or Combined Heat and Power (CHP) and ground source heat pumps.

Developers are to use a single renewable technology or a mix of technologies that is most appropriate for the site. However, this does not outline when it will

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be suitable to assume that renewable technologies may not be appropriate for the site. Policy 8/17 below does highlight that proposals should be sensitive to minimize potential impacts on the environment and local amenity. However, this can be overcome if evidence is provided to show the benefits of implementing the technology/technologies to help reach the White Energy Papers aim in reducing CO<sup>2</sup> emissions. Therefore, it is safe to assume that if a developer can give evidence that it is complying with Policy 8/16 of the Cambridge Local Plan, whilst being in accordance with Policy 8/17, a renewable technology can be implemented on a 'major development' regardless of its design and siting. This could also lead to potential disregard to the character of the surrounding area, if the wider environmental, economic or social benefits of generating energy from renewable sources are seen as greater.

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### 03.4 Policy 8/17 of the Cambridge Local Plan

***“8/17 Renewable Energy Applications for renewable energy schemes or technologies will be permitted if applicants can demonstrate that: a - any adverse impacts to the environment or amenity have been minimised as far as possible; b - where any localised adverse environmental or amenity effects remain, that these are outweighed by the wider environmental, economic or social benefits of generating energy from renewable sources.***

*8.46 Renewable sources of energy such as the sun, wind, water power, and geothermal energy can offer diversity and security of supply and can reduce harmful emissions to the environment. The Government's target is to generate 10% of UK electricity from renewable sources by 2010, with an aspiration to generate 20% by 2020.*

*8.47 The City Council supports the development of renewable energy schemes. In particular the development of small-scale, community based renewable energy schemes appropriate to local need. The proposed urban extensions offer a significant opportunity for renewable energy schemes, however there will also be opportunities within the rest of Cambridge. The types of renewable energy technologies which may be suitable include:*

- Active solar thermal*
- Photovoltaic cells (PV)*
- Wind turbines*
- Biomass for community heating or Combined Heat and Power (CHP)*
- Ground source heat pumps*

*8.48 Applicants will be required to minimise any potential impacts to the environment or local amenity by careful site selection, choice of technologies and mitigation measures. Potential impacts may be acceptable if they are minor, or are outweighed by wider benefits, such as the national need for energy from non-fossil fuels which will contribute to reducing CO2 and other emissions.*

*8.49 Other policies in the Plan deal with safeguarding the environment and the protection of international, national or locally designated sites. Although such sites should be avoided if alternative sites exist, each application will be judged on its merits, and renewable energy schemes are not automatically ruled out at these sites. Renewable energy schemes will only be acceptable in the Green Belt if applicants can demonstrate that development is appropriate, or that there are very special circumstances for their development in this location.” (CCC LDF, 2006)*

There are no guidelines within the Policy which give guidance to the design of a renewable technology in context with the proposed works and surrounding area. Policy 8/17 (CCC LDF, 2006) does states that it will be satisfied if “any adverse impacts to the environment or amenity have been minimised as far as possible”. This does not, however, outline when a renewable technology would have an adverse impact on the character of the area.

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## 04 DESIGN GUIDELINES & ASSESSMENT METHODS

*“The barriers to installing renewable energy generation have been clear for a while.”  
(Samantha Heath, 2004)*

As a qualified Architectural Technologist, I have been working as a Senior Technologist for a small but reputable firm of architects in Cambridge for the past four to five years.

The majority of our work is residential, focusing on the private sector with small/medium scale developments for developers. Our work is mainly located within the City, but we are currently involved in schemes in South Cambridgeshire, East Cambridgeshire, Forest Heath and Huntingdonshire Districts.

As a large majority of our work caters for 10+ units, they are subject to Policies 8/16 and 8/17 of the Cambridge City Local Plan (2006), Renewables. Major applications require consultation with the sustainable construction and biodiversity officers and additional documentation giving evidence to the steps and measures which have been taken to encourage sustainability and biodiversity across the site.

These documents currently include:

- Sustainability Summary
- Sustainability Statement
- Biodiversity Checklist
- Biodiversity Statement

As part of the above, evidence has to be given highlighting which renewable technologies are to be implemented if an approval is granted; providing at least 10% of the development's total predicted energy requirements on-site. To

comply with these policies we currently use the design guidelines which will be reviewed in this chapter.

Understanding how developers and designers are responding to renewable energy policies and the effect this is having on new developments is important in order to fully answer the title question. To do this we must ask the question *How are they being implemented?... On a local scale.*

Table 7	D-P-S-I-R Framework
<b>Driving force</b>	New developments to provide renewable energy
<b>Pressure</b>	Material consideration in determining applications
<b>State</b>	10% of the total predicted energy requirements on-site, from renewable energy sources
<b>Impact</b>	Pressure on developers and designers to provide renewable technology in new developments
<b>Response</b>	Design guidelines and methods required to assist designers

#### **04.1 NHBC Guide to Renewable Energy**

The technical report was published by NHBC in May 2007 with input from BRE in response to earlier publications ‘Building A Greener Future: Towards Zero Carbon Development’ and ‘Code for Sustainable Homes’. Acting as a guidance to NHBC registered builders specifying or installing renewable technologies, it has been produced independently from the Government. It sets out to give the user guidance on the use of microgeneration technologies such as solar thermal, solar electric, heat pumps, wind turbines and biomass, giving a comprehensive and technical review of each technology and installation guidelines. The report also looks into design considerations and approximate installation costs for each of the technologies.

#### **04.2 London Renewables**

The London Renewables, published in September 2004, was developed by representatives from various organising bodies within the London district. ‘It

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aims to facilitate increased renewable energy generation in London and to contribute to UK (10% by 2010) and London targets for renewable energy generation through planning facilitation and awareness raising amongst key stakeholders' (London Renewables Toolkit, p9: 2004).

The toolkit also acts as a design guide to help developers, their consultants and planners during the decision making process of renewable technology implementation. The renewables section comprises templates, guidelines, data sheets and case studies to aid users through the design process. However, the toolkit focuses on a limited number of renewable technology solutions, giving the impression that it may already be out of date. The five technologies covered include wind turbines, photovoltaics, solar water heating biomass heating/combined heating and power and ground source heating/cooling. Although the chapters covered are arguably the 'primary' technologies suited to the London area and give a fairly comprehensive understanding in both the theory and practicality, the renewables suggested can sometimes come across as rather 'tunnel vision'. This could be due to a number of possibilities, the most likely being a lack of current data/research as suggested earlier. The report does touch base with a few alternatives for further reading, including geothermal, ground cooling air systems and micro hydro, and also includes a self assessment questionnaire for energy efficient measures within the home (*available on page 22 of the Toolkit*). As a principle design guide available for the public and designers within the London district, it could be argued that the techniques outlined in the toolkit are misleading and uninformative to the intended recipients and does not provide the information required for third parties to make the most effective and efficient decisions for new sites in the area. In response to the essay question, it is evident that in this instance, up-to-date resources have not been made available for use in the decision making process and are therefore having a negative impact on the practicality of implementing renewable technologies on a local scale.

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### **04.3 Sustainable Design and Construction:**

#### *Supplementary Planning Document (SPD)*

The SPD, published in 2007 by Cambridge City Council replaces the previous guidance of Sustainable Development Guidelines (2003) and is used as material consideration when determining a planning application in the city. Their concerns follow plans to see ‘considerable growth over the next decade, as a result of being designated as part of one of the four national growth areas. A further 10,000 homes will be built, with 6,000 of these in urban extensions to the City.’ (CCC SPD, p5: 2007) leading to the need to see major developments constructed and designed in a sustainable manner. As outlined in the preface section of this thesis, CCC currently requires the following when determining a ‘major’ (*defined in Policy 8/16 of the Cambridge Local Plan*) application:

- Sustainability Summary
- Sustainability Statement
- Biodiversity Checklist
- Biodiversity Statement

This document was produced to help third parties design, consult and determine as part of the above.

The document goes on to say in the opening chapter that, ‘Applicants are encouraged to consider how they are going to meet this policy as early as possible in the design process. This is to help ensure that the renewable energy systems are successfully integrated into the layout and design of the development and that costs are kept to a minimum.’ (CCC SPD, p19: 2007). As an Architectural Technologist working on major applications within the City continuously over the past few years, it has become evident that not **once** has Policy 8/16 and 8/17 of the Cambridge Local Plan been discussed at pre-application stage (*a stage which is not mandatory but certainly encouraged in the design preparation*) or even upon submission. Further research into

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participants experience of this will form part of the local questionnaire distributed and discussed in Chapter 08.

The SPD outlines the essential design considerations as being:

- Urban Design
- Transport, Movement & Accessibility
- Sustainable Drainage (SUDS)
- **Energy (essential for Major New Developments)**
- Recycling & Waste Facilities
- Biodiversity
- Pollution

(CCC SPD, 2007)

The energy consideration is the only compulsory policy for major developments. The chapter aims to 'walk' the user through the design process, highlighting the submission requirements and calculation requirements and also outlines the benefits of combined heat and power and passive solar design. It does not however, indicate what technologies are preferred by CCC, or the viability of each technology within the city. It simply states; (CCC SPD, p23: 2007) 'In general the choice of technology will be left to the applicant.' As the **only** design guide available to local residents/designers provided by their council, taking into consideration the compulsory policies 8/16 & 8/17 of the Cambridge Local Plan, it would be safe to assume that the level of information, data and guidance freely available from CCC is very poor and extremely limited.

To ensure developers and designers are complying with these targets, various assessment methods have been put in place to rate the efficiency of new developments. A review of these will be outlined below to give a better understanding of the information provided to the end user to show compliance with local Policy.

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#### **04.4 Standard Assessment Procedure**

The Government's recommended Standard Assessment Procedure (SAP) for dwellings includes a SAP rating, from 1 to 100, where 100 indicates a zero energy cost. SAP also includes an Environmental Impact rating, again from 1 to 100, where 100 indicates zero emissions. This rating looks at the performance of a dwelling with regards to the CO<sub>2</sub> emissions generated by space and water heating, ventilation and lighting and is compensated by the use of renewable and energy saving technologies. SAP helps to show compliance with current building regulations requiring the conservation of fuel and power since 6th April 2006 (England & Wales: L1 Approved Document), 1st November 2006 (Northern Ireland Technical Booklet F1) and 1st May 2007 (Scotland Technical Handbook 6, Domestic). The Dwellings CO<sub>2</sub> Emission Rating (DER) is measured as an annual amount per unit of floor area (kg/m<sup>2</sup>/year).

#### **04.5 Energy Performance Certificates**

This is a simplified version (based on the RDSAPv3 procedure) of the SAP2005. It forms part of the Home Information Pack (HIP) now compulsory when selling any property in England and Wales. Energy Performance Certificates determine how energy efficient homes are on a scale of A-G. The most efficient homes, which should have the lowest fuel bills, are in band A. The certificate uses the same scale to define the impact a home has on the environment. Better-rated homes should have less impact through carbon dioxide (CO<sub>2</sub>) emissions.

#### **04.6 Code for Sustainable Homes**

The Code measures the sustainability of a new home against categories of sustainable design, rating the 'whole home' as a complete package. The Code uses a 1 to 6 star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level and, within England,

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replaces the EcoHomes scheme, developed by the Building Research Establishment (BRE).

The Code also gives new homebuyers better information about the environmental impact of their new home and its potential running costs, and offer builders a tool with which to differentiate themselves in sustainability terms. Since April 2007 the developer of any new home in England can choose to be assessed against the Code.

These methods have been designed to ensure new developments are complying with regional and national policies. They give a good indication as to whether we are on track to reduce our carbon emissions in the built environment in the UK. It is now important to assess the parties involved during the decision making process and their knowledge of the implementation of renewable technologies.

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## 05 DEVELOPMENT OF QUESTIONNAIRES

*“...good research cannot be built on poorly collected data.” (Bill Gillham, 2007)*

In order to fully assess the implementation of renewable technologies in the residential sector of the built environment on a local scale in the United Kingdom it will be important to analysis the current planning system and the parties involved. To fulfil this we can ask the question *What are the implications for the Residential Sector?* To establish whether national targets are being addressed across the country we will need to question as many planners as possible from as many geographical locations as possible. To achieve this practically and within the parameters of the thesis it is proposed a questionnaire would be best suited as it can be designed in a web based format and emailed to every council. We are proposing a second questionnaire for a local study. This will allow for consistency, and therefore, unbiased results.

During the development stages of this thesis other avenues for data collection were explored. For example, assessing every new ‘major’ residential development approved by Cambridge City Council since it adopted policy 8/16 in 2006. This could have been inputted into a database to note any trends i.e. between technologies, preference etc. However, this would have been very time consuming and would not have been possible within the time constraints of the thesis.

The first questionnaire was developed for national distribution, following on from Chapter 02 of this paper. It was distributed as a web based questionnaire available at the link below,

[http://www.surveymonkey.com/s.aspx?sm=cH8\\_2fSsB8WApbvXcfv4TFnQ\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=cH8_2fSsB8WApbvXcfv4TFnQ_3d_3d)

and was emailed to every council in the UK. The contact email addresses were obtained from the following website:

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[http://www.direct.gov.uk/en/DI1/Directories/Localcouncils/AToZOfLocalCouncils/DG\\_A-Z\\_LG](http://www.direct.gov.uk/en/DI1/Directories/Localcouncils/AToZOfLocalCouncils/DG_A-Z_LG)

and were sent out under the umbrella of my employer DPA Architects Ltd. from a dedicated email account –

[MscArchitecture@dpaarchitects.co.uk](mailto:MscArchitecture@dpaarchitects.co.uk)

A paper version can be found in Appendix A for reference.

The second questionnaire was developed for regional distribution, following on from Chapter 04 of this paper. It was distributed as a web based questionnaire available at the link below,

[http://www.surveymonkey.com/s.aspx?sm=xBzpGFSi34sQZQbthgMWJw\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=xBzpGFSi34sQZQbthgMWJw_3d_3d)

and was emailed to every architectural practice registered under bodies RIBA, available from:

<http://www.architecture.com/UseAnArchitect/FindAnArchitect/FindAnArchitect.aspx>

and CIAT, available from:

[http://www.ciat.org.uk/en/members/find\\_a\\_practice/](http://www.ciat.org.uk/en/members/find_a_practice/)

The questionnaire was also distributed to every planner within Cambridge City Council via a mailing list kindly provided by the council. A small group of developers were also targeted who work primarily on major developments (*as defined in Policy 8/16 of the Cambridge Local Plan*) within the city and were sent out under the umbrella of my employer DPA Architects Ltd. from a dedicated email account –

[MscArchitecture@dpaarchitects.co.uk](mailto:MscArchitecture@dpaarchitects.co.uk)

A paper version can be found in Appendix A for reference.

This chapter will give an insight into the aims, processes, development and structure of both questionnaires in turn, explaining why questions were included, sampling of the questionnaires and limitations associated with them

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### **05.1 National Survey 001:**

'Developing a Questionnaire' 2007, formed the foundations of both questionnaires. The step-by-step guide was adhered to and is referred to in the sub-headings that follow.

#### ***Preparation***

Chapter 03 researches current Government targets and national policies. It has provided the background material to the preparation of this questionnaire. The White Paper on Energy (p253: 2007) states that, "The planning system plays an important role in delivering the necessary energy infrastructure to meet our national needs." It was therefore felt that to answer the essay question, it would be essential to survey the UK's planning system.

The White Paper published by the Secretary of State for Transport stated (p2: 2006) "We propose to streamline further the process in the town and country planning system, improve the ability of local authorities to shape their local communities." This statement, along with Policy PPS22, highlights the importance of a planners' role in the decision making process of major developments.

To answer these points it was decided that the following 'topics' be covered:

#### Design

Planners have been given the responsibility of implementing Policy PPS22 along with any local policy their council may have in place. It is therefore important to understand at what stage they feel renewable technologies should form part of the design and the overall effect they feel renewable technologies have on design.

#### Legislation

To further understand how councils across the UK have interpreted the White Paper's aims, it is important to establish what local policies have been put in place to ensure the objectives set out by the Government are achieved on a local scale.

#### Training

Following on from the previous topic, it will be important to establish whether planners have been given adequate training, or have obtained relevant

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qualifications, in order to implement National Policy PPS22 or any other local policy on renewable technology.

### Cost

In the wider context, it is important to establish whether planners are fully aware of the cost implications and ramifications following any decisions they may make and the likelihood of a particular technology effecting the viability of a scheme.

## **05.2 Drafting questions**

Questions were derived from the background reading in Chapters 02 – 07 and placed under the relevant topics listed above. Gillham B. (p:26, 2007) suggests that questions usually fall into three categories:

- Questions of *fact*
- Questions of *opinions, beliefs, judgement*
- Questions about *behaviour*

This section will discuss the importance of each question and why its inclusion was felt necessary:

### General

**fact**

These questions will provide the basis for dividing up the group of respondents for cross comparison. They may also highlight any trends, for example geographical location etc.

*What is your job role within the Council?*

To ensure accidental participation is removed.

*What are your employment requirements?*

Levels of training by Councils may be affected by level of employment. This will highlight such a trend.

*Which region does your Council fall under?*

This will highlight National trends or geographical anomalies.

*Which Borough/District Council are you employed by?*

Urban/Suburban/Rural variations between Councils objectives, financing, training, employment criteria.

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*How many years have you been working in your profession?*

Professional experience may have an impact on Policy understand or training received.

Design

***opinion***

This section allows respondents to feel their opinions are required whilst keeping the question format closed. Planners have been given the responsibility to enforce policy: renewable technology. Their personal opinion or experience may have a bias effect on their decision. It is therefore important to establish what respondents believe appropriate within their professional and private environments.

*At what point should renewable technologies form part of the design?*

Broken down into the RIBA Stages of work with the addition of when a Local policy may then apply. Respondents can express their professional opinion.

*If the following technologies were to be installed in your property, which order of preference would you choose?*

An image has been included here in case participants are unaware of the technologies listed. This was also acknowledged as a stimulus during the sampling period which is covered later in the chapter. The four technologies listed here were chosen following reading of the 'London Renewables' and 'Sustainable Design and Construction: SPD, CCC'. Views expressed in these documents suggest that these technologies are the most popular and viable in general.

Legislation

***fact***

In order to answer the thesis proposition it will be important to establish whether councils have implemented local policies and what guidance has been made available for third parties in the decision making process.

*Are you aware of local policies in place to ensure renewable energy contributions are met in new residential developments?*

A closed question to allow simple comparisons. A comment box was included to list any Policies if they answered yes – not compulsory.

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*Are you aware of any planning supplement guidance provided by your Council to assist designers/general public etc in the implementation of renewable technologies?*

A closed question to allow simple comparisons. A comment box was included to list any documentation for further research – not compulsory.

Training

***behaviour, fact***

It is important to derive what steps councils have taken to support their staff in the implementation of PPS22 and any subsequent local policy. PPS22 can be taken as material consideration when determining an application, regardless of local policies in place, therefore training forms part of Continuing Professional Development (CPD).

*Please enter the highest qualification gained focusing wholly/partially on renewable energy?*

Respondents who have received qualifications prior to/during their employment with the council may have a better understanding of Renewable Technologies. It is important to identify these for any trends that may occur. It is also important to identify whether their council have financed these studies as additional steps to work towards PPS22.

*Have you received any training on the implementation of renewable technologies?*

As a cross comparison with the topic 'Legislation', Councils who have implemented a Local policy should have also provided adequate training for their staff.

Cost

***opinion, belief***

Planners experience, knowledge and understanding of the financial obligations associated with renewable technologies is essential. This section enables a closed question assessment of respondents' knowledge. A planners decision can have the final say on the viability of a scheme if the technologies requested have a serious financial implication to the project.

*Are you aware of the cost implications involved with implementing a renewable technology to a residential development?*

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A closed question which allows for some comparison without being too complicated.

*Please estimate the approximate cost implications involved with the following case study:*

As a final question this allows for a very open response. The case study used is dependant on many factors, but it is dependant on the participants own interpretation to derive an approximate answer. The 'NHBC Guide to Renewable Energy' Appendix B, page 16 will be used as a base line figure.

#### Personal Details

This section was included for respondents who agreed to a telephone interview at a later date if required, or following further research. Details have been kept confidential.

### **05.3 Regional Survey 001:**

#### **Preparation**

Cambridge City Council, falling under the East of England Region, have taken steps to ensure they are contributing to the Energy White Paper's objectives, following the guidance of papers such as the 'Sustainability Appraisal for the East of England'. This includes the addition of Policy 8/16 and 8/17 of the Cambridge Local Plan, requiring the need for sustainable development and the requirement that...

***"...major proposals above a threshold of 1,000 square metres or 10 dwellings will be required to provide at least 10% of the development's total predicted energy requirements on-site, from renewable energy sources. These requirements may be relaxed if it can be clearly demonstrated that to require full compliance would not be viable."***

(CCC LDF, 2006)

Policy 8/16 also outlines the requirement that...

***"Developers will be expected to use the renewable energy technology, or mix of technologies, that is most appropriate to the type of***

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***development proposed, its location and design...***” and that ***“Further guidance will be produced to support this policy...”***

(CCC LDF, 2006)

To ensure that the right training and guidance is in place to enforce the above policy it was decided that a local study be conducted alongside the national survey, aimed at the principal design makers in a typical ‘major’ development. This included architects, developers and planners.

Bearing the above comments in mind, the following topics have been developed to form the basis of the questionnaire:

### Design

Architects are employed to act on behalf of the client. It is important to understand their preference of renewable technology and the effect it has on the design process and overall concept. Developers bear the overall financial implication of renewable technologies in residential schemes (excluding grants etc.). However, the cheapest solution will not necessarily be the best answer when selling the ‘end product’. It will be important to gain an insight into their thought process when weighing up the pros and cons of renewable technologies and the effect they can have on design. Planners have been given the responsibility of implementing Policy PPS22 along with Policies 8/16 and 8/17 of the Cambridge Local Plan. It is, therefore, important to understand at what stage they feel renewable technologies should form part of the design and the overall effect they feel renewable technologies have on design.

### Cost

As architects are acting on behalf of the client it should be assumed that they look at all the implications renewable technologies will have on a schemes viability, including likelihood of planning consent, maintenance and livelihood of end user. However these are all dependant on financial constraints. If a scheme becomes unviable, regardless of its sustainability contributions, it simply will not be built. It will be important to gauge architects’ knowledge and understanding of the financial implications associated with each technology. Developers should also be aware of the financial implications associated with

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these technologies. This section will allow a broad overview into developers' understanding of the actual costs involved. The correct guidance should be available to planners if they are to implement national and local policy, and should include awareness of a schemes possible viability due to financial constraints associated with these technologies.

### Legislation

It is important to understand whether the respondents are aware of the renewable technology polices and the additional guidance CCC has provided in order for them to make the decisions they are expected to make on a professional level. This section seeks to gauge architects, developers and planners awareness of these policies and guidance.

## **05.4 Drafting the questions**

### General

### ***fact, belief, opinion***

These questions will provide the basis for dividing up the group of respondents for cross comparison. They may also highlight any trends, for example geographical location, etc. It will also allow for a brief insight into the respondents personal life, highlighting whether this differs from their professional opinion.

### *How old are you?*

Age may influence training/qualifications achieved and personal opinion. For example, renewable technology is a relatively new concept in the general public's eye, so older generations may have a biased opinion on its importance due to a lack of understanding.

### *What is your occupation?*

Basis for dividing up the respondents.

### *How many years have you been working in your profession?*

Again, this should highlight any trends in the older or younger generations. For example, people who have been in their profession for a number of years may be 'set in their ways' or younger people may be inexperienced.

### *How much of an environmental enthusiast ("greenie") are you?*

This is a slightly relaxed question in its format and is primarily meant to be a stimulus for respondents. However, it should also highlight their enthusiasm

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for the subject. This could lead to a cross comparison with training, for example, since respondents who are enthusiastic about renewable energy may be more likely to ask their employer for further training.

*Do you have any of the following renewable technologies installed in your home?*

In connection with the following question, it is meant to highlight respondents who feel there are benefits to be gained from renewable technology as an end user.

*Was this already installed when you moved in?*

As read.

Design

***judgement, opinion, fact***

Respondents personal opinion or experience may bias their decision. It is therefore important to establish what respondents believe appropriate within their professional and private environments.

*If the following technologies were to be installed in your property, which order of preference would you choose?*

An image has been included here in case participants are unaware of the technologies listed. This was also acknowledged as a stimulus during the sampling period which is covered later in the chapter. The four technologies listed here were chosen following reading of the 'London Renewables' and 'Sustainable Design and Construction: SPD, CCC'. Views expressed in these documents suggest that these technologies are the most popular and viable in general.

*What was your reason for selecting the most preferred technology in Q7*

An open question to evaluate their understanding. Gillham B. (p34: 2007) suggests that '...questions like these can be motivating for the respondent'.

*What was your reason for selecting the least preferred technology in Q7*

Also to evaluate their understanding.

*Please enter the highest qualification gained focusing wholly/partially on renewable energy*

Respondents with higher qualifications in the subject field are more likely to have a better understanding of renewable technologies and their implementation.

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*If you were to develop a site and a renewable technology had to be installed, which of these would you place as the most important.*

This question is to form a comparison with the question that follows. It should highlight whether respondents generally have a difference of opinion when specifying something professional or personally.

*If you were to purchase a new dwelling and a renewable technology was to be installed by the builder, which of these would you consider as most important.*

As read above.

### Cost

### **judgement**

This section will determine whether respondents are aware of the financial implications involved with each technology.

*What would you estimate the approximate supply & installation costs for the following technologies?*

Respondents should be aware of the financial implications associated with the technologies they are specifying/approving. This question should highlight any trends. A selection of costs have been listed for each technology for a single/ten units (major development). The case study has been left basic and is open to self interpretation. It was felt a more specific case study may put participants off if they did not know the answer.

### Legislation

### **fact**

Policies 8/16 and 8/17 of the Cambridge Local Plan can be used as material consideration when determining an application. It is important to first establish whether architects, developers and planners are aware of these policies and also whether they are aware of the guidance set in place in able to understand them.

*Are you aware of what policies 8/16 & 8/17 of the Cambridge Local Plan aim to achieve?*

It is important to understand whether respondents are aware of the renewable energy policies in place.

*Do developers have to provide renewable technology on site?*

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This was included as a test question. It was kept closed for ease of comparison but will establish whether respondents are fully aware of what the above policies imply.

*Are you aware of the Energy White Papers objectives?*

Respondents may be aware of local policies but it is also important to judge the responses against the wider environmental context.

*Are you aware of any planning supplement guidance provided by your Council to assist designers/general public etc in the implementation of renewable technologies*

Architects, developers and planners should be aware of the 'Sustainable Design and Construction: SPD, CCC' as it was published as an aid to assist the above policies and targeted at the users questioned in this questionnaire. Any response where they are not aware of any documents may highlight an area of communication break down between parties.

Closing Question

*opinion*

This section was included for respondents who agreed to a telephone interview at a later date if required or following further research. Details have been kept confidential.

*What is your view on the use of renewable technology in residential developments?*

It was felt an open question at the end of the questionnaire would give the chance for respondents to add anything else, as the majority of the questionnaire has been kept as a closed question survey for analysis. Gillham B. (p34: 2007) suggests that '... one or two questions of this type can be a good way of finishing a questionnaire, which can otherwise easily leave respondents with the impression that their personal opinions or experience have to fit the straightjacket of prescribed answers.'

### **05.5 Designing the questionnaire/structure**

Gillham B. suggests that the design of the questionnaire is as important as its content. In this chapter of his book, 'Developing a Questionnaire', he goes on to state that 'Design means two things:

- how things look – attractive, accessible

- 
- how things work – whether, in a robust sense, they do what they're supposed to do.'

A carefully worded covering letter was sent with the questionnaires, via email. This letter enabled the participant to fully familiarise themselves with the study being conducted and what role they were being asked to play in its research. The format was kept simple to avoid confusion and font style 'arial' pt12 was used for clarity.

The questionnaire displayed DPA Architects Ltd. logo, to reassure the participants that it was a legitimate study and under a corporate umbrella. The colour theme matched DPA Architects Ltd. for consistency.

It was decided during the design of the questionnaire that each topic would start on a new page. This would clearly present to the participant what was being asked in an uncluttered manner.

In order to allow for an unbiased distribution and maximum response rate, it was decided that every council within the UK would be sent the questionnaire. To reach such levels with hard copies would not be financially viable. It was, therefore, decided that a web-based questionnaire would most likely gain the highest feedback. Melissa Taylor from The Centre of Alternative Technology recommended SurveyMonkey.com and this was later used to host the questionnaire and monitor the results for download.

### **05.6 Sampling**

In any survey, it is important to use a representative sample of the target population. In order to fully answer the title question it would be necessary to include architects, developers and planners from various geographical locations around the UK. However, this would not be possible within the scope of the thesis. Instead, a 'convenience' sample was used. This meant contacting all known associates, including colleagues, friends and family and requesting that they pass on the questionnaire to their own circle of

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acquaintances, thus creating a 'snowball' effect. Gillham B. also suggests that English teachers are good at correcting the grammar, spelling and format of questions to make it more readable. Three English teachers were also asked to take part in the pilot study, their feedback has also been included. The pilot study was distributed in paper format, a copy is included in Appendix B for reference.

The comments received were as follows:

- 1.5 & 1.6 are hard to understand, need restructuring or omit part
- Change 1.6 to become 1.7
- Insert a separate 1.6 to read: What technology was installed? Have multiple choice answers for this.
- Questions 2.1, 2.2, 2.3, 2.4 start each question with 'Are you aware of.....'
- Start question 3.1 with 'Are you aware of..... and if so, could you estimate.....'
- 3.1 needs a check box for 'I don't know'
- 4.1 Majority like this one!!
- 4.1 Reorganise the question to read  
'If the following technologies were to be installed in your property, which order of preference would you choose? (Most preferred = 1 Least preferred = 4)'
- 4.3 reorganise to read  
'If you were to develop a site, which of these would you place as the most important. Please number. (Most important =1 Least important = 4)'
- 4.4 reorganise to read  
'If you were to buy a new house, which of these would you consider as most important. Please number (Most important =1 Least important = 4)'
- 4.4 needs rewording to emphasise the technology is ALREADY installed
- 5.1 needs a check box for 'I don't know'

- 
- 5.2 lines across the page so it is easier for me to see where the ticks go.

Layout...

- Section '4.0 Design' should move to front as an 'end user' might get bored with being unable to answer a lot of questions.

These comments were incorporated into the final revisions of the questionnaires.

### ***05.7 Limitations***

Some limitation has already been discussed regarding the representative nature of the sample. This could be overcome by carrying out further study based on a larger sample and targeting the necessary respondents to give a more balanced view.

The use of closed questions, by their very nature, restricts people's thinking on the subject and potentially prejudices the answers given. However this is unavoidable if statistical analysis is required.

It was important to keep the questionnaire as concise as possible and easy to complete, therefore, it was not appropriate to over complicate the questions to elicit exact answers from the respondents. Although it left some questions open to interpretation, it was felt that if an exact answer was required it may have put participants off, causing them to not finish the questionnaire, while not gaining a significant difference to that of a more relaxed response.

Despite the aim to lay out the questions clearly, some were overlooked by a significant number of respondents. These were mainly secondary questions which weren't crucial, though their answers would certainly have been valuable.

### ***Results from the questionnaire***

The results obtained from the samples are presented, in chart form, in Appendix B and in raw data form, in Appendix C and summarised in the next chapter.

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## 06 SUMMARY OF RESULTS

*“We owe it to future generations to design new developments in ways which reduce waste, flood risk and pollution, which minimize energy requirements, and which use local and renewable energy sources.” (Sian Reid, Executive Chancellor for Climate Change & Growth, 2007)*

We have now established the global objectives set out in the Kyoto Protocol, the targets set out by the EU-15 and the implications this has had on the UK. We have also studied the national targets and objectives set out by the Government and what these seek to achieve. This led to a study into the regional responses within the UK, particularly the East of England and the policies put in place by Cambridge City Council to ensure these are addressed. We have also studied the guidance available to the public and professionals to assist in the design process. We will now review the results obtained from both of the questionnaires to answer the question *What are the implications in the Residential Sector?*

During the national survey 193 responses were received. 149 were filtered to fit the criteria of the questionnaire. Some participants were passed on the questionnaire by mistake. These have been omitted from the analysis to avoid misinterpretation. During the regional survey only 30 responses were received, with only 27 fitting the criteria.

For simplicity we will review these under the sub-headings outlined in the previous Chapter.

### **06.1 Design**

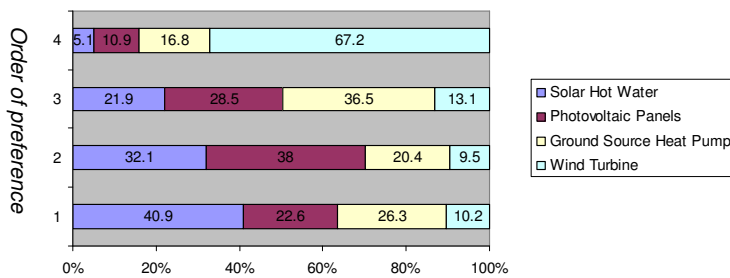
Design forms a very important part of this study. Architecture is the blueprint of the society we live in. Planners, developers and architects play very important roles in this and it is important to establish whether they fully understand the responsibilities on their shoulders. If renewable technology is

to become a part of everyday design, it should be good design and it should be done properly.

We can look at personal preferences to see whether this has any implications on design. People may specify something to make a profit or meet targets in one instance but when it is to be applied to their home, their opinions may be different.

Preferred technologies - National

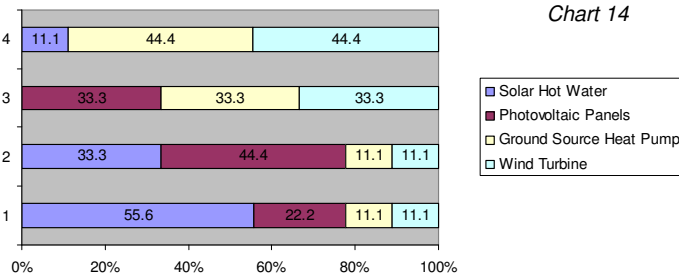
Chart 13



40.9% of planners choose SHW as a their preferred technology. Wind turbines were strongly objected with 67.2% against.

Preferred technologies - Regional, Planners

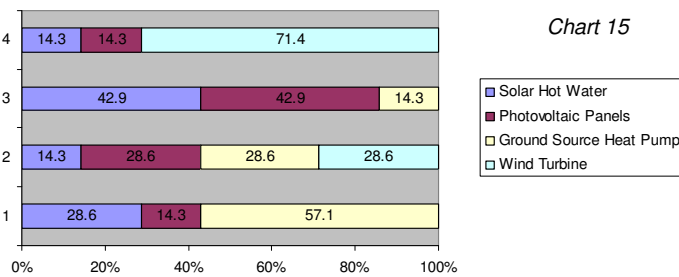
Chart 14



55.6% of Cambridge City Planners choose SHW as their preferred technology. GSHP and wind turbines were the least preferred option each with 44.4%.

Preferred technologies - Regional, Developers

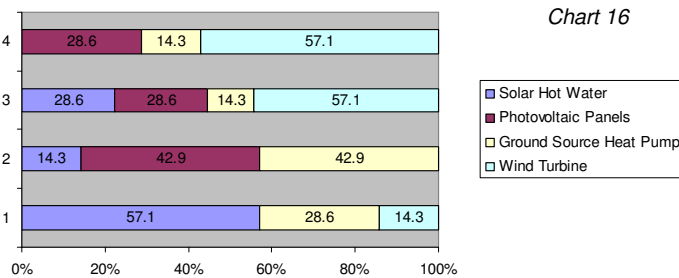
Chart 15



57.1% of developers choose GSHP as their preferred technology. Wind turbines were strongly objected to with 71.4% against.

Preferred technologies - Regional, Architects

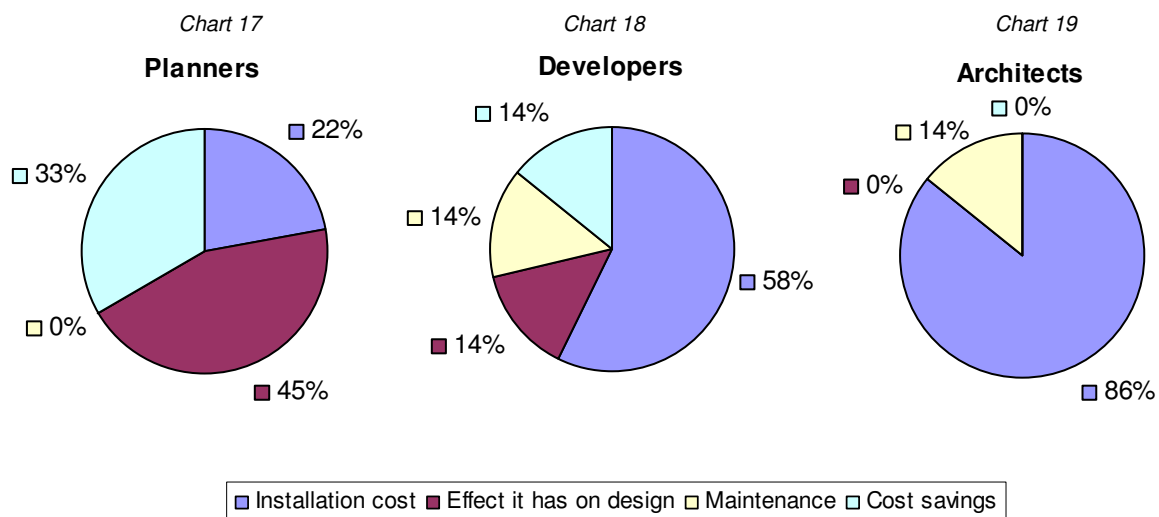
Chart 16



57.1% of architects choose SHW as their preferred technology. Wind turbines were the least preferred option with 57.1%.

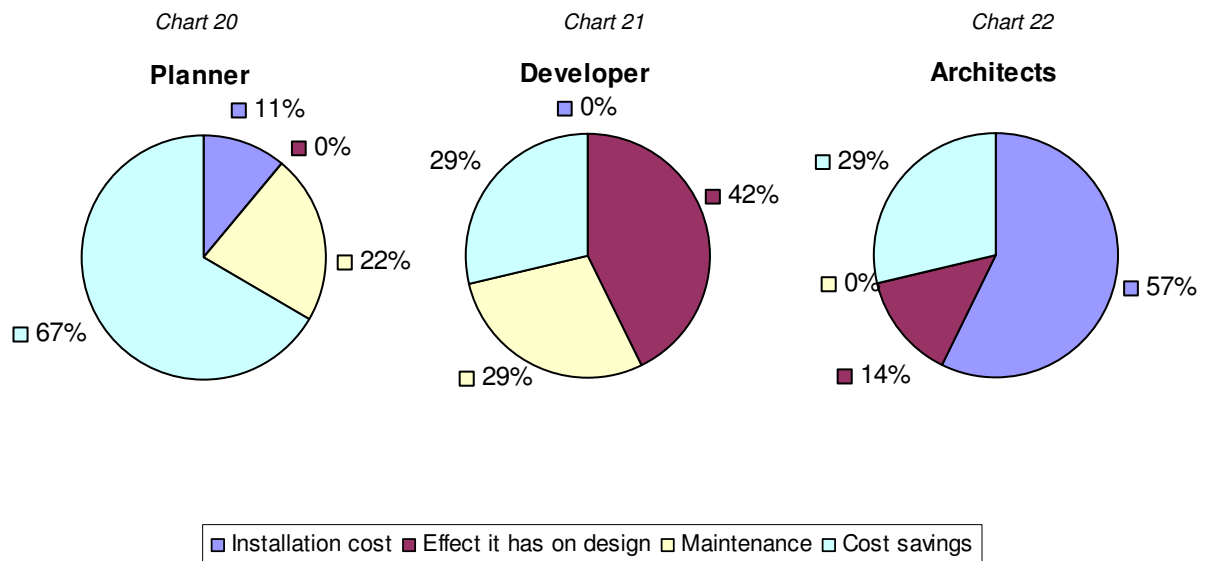
These results clearly show that wind turbines were the least preferred option in all cases. One respondent states that they are 'ugly', another states they are 'expensive and intrusive', another states they are 'noisy', with a 'poor return on cost', when in fact the London Renewables Toolkit (p33, 2004) states that 'Wind energy is one of the most cost effective methods of renewable power generation. Wind turbines can produce electricity without carbon dioxide emissions ranging from watts to megawatt outputs.' It is clear that in this instance '**design**' or personal preference take control over renewable energy generation. Until the benefits of wind turbines are fully understood we can only believe that peoples opinion is unlikely to change. This needs to be tackled through training and guidance, but more importantly, **example**. Good architecture will show how Wind Turbines can be successfully integrated into a design to become part of the concept, and not just another *energy making machine*. Wind energy is normally most efficient during the winter months, when more energy is needed for heating the home. SHW on the other hand is most efficient during the summer months when there is maximum daylight hours but general heating requirements are lower. It seems, however, that participants are happy to sacrifice a more efficient system for a less intrusive technology.

A question was put forward to participants placing them in the shoes of a developer in one instance and a buyer in the other. This was intended to reflect how people's preferences change depending on their own position. If participants were to develop a site, their order of preference was as follows:



Planners felt that the overall effect the technology had on design would be the most important factor, which reinforces the idea that renewable technologies should form part of the design process. Developers and architects stated that the more realistic factor of installation cost would take preference. These results could be expected as developers and architects are more likely to already be aware of the cost implications involved, whereas planners are not.

When the role was reversed and respondents were put in the shoes of a buyer, their order of preference was as follows:



Planners previous preference for the effect it has design was voted least important in this instance. Installation costs have become the most important factor. Developers have responded in a manner you might expect with the effect it has on design as the most important factor, followed by cost savings and maintenance. Architects gave a slightly unexpected response, voting Installation Costs as the most important factor again. However, this is followed by cost savings and the effect it has on design respectively.

To further answer the question *What are implications in the Residential Sector?* we can see that in terms of design there is a vast range of interpretation of what people believe to be appropriate. Developers have taken the most pragmatic approach whereas planners demonstrate a less informed view with disregard to the financial implications of renewable

technology. As an Architectural Technologist I believe the order of preference should be;

- **Effect it has on design**
- Cost savings/maintenance
- Installation costs

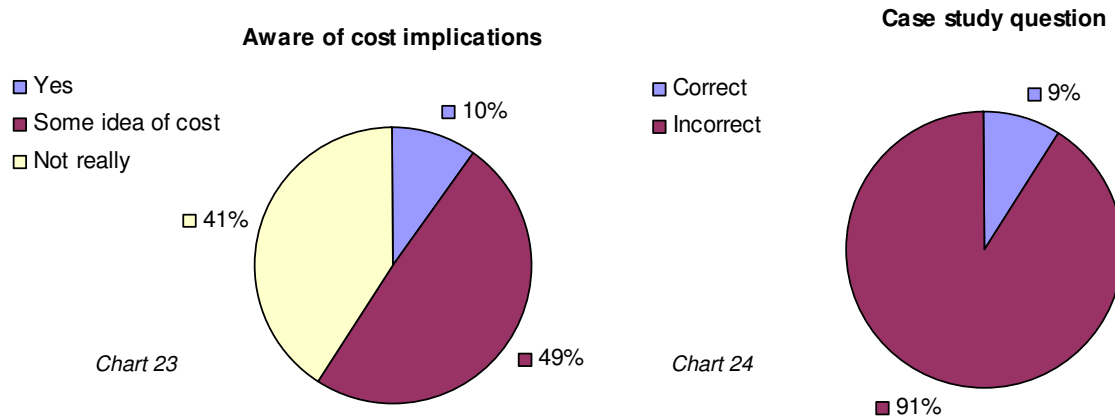
However I am fully aware of the additional costs developers incur when installing renewable technology. This *ideal* scenario will not work whilst certain technologies are so expensive or until **sufficient** financial aid is available. We could factor this into the Framework below for simplicity:

Table 8		D-P-S-I-R Framework
<b>Driving force</b>	Effect it has on design	
<b>Pressure</b>	To create good architecture	
<b>State</b>	Cheaper technologies are being used to satisfy Policy	
<b>Impact</b>	Poor architecture = negative impact on society, renewable technology seen as a hindrance	
<b>Response</b>	Financial support, better understanding, good examples required = renewable technology becomes normality in every design concept	

## 06.2 Cost

Following on from the previous section it seems sensible to now look at cost. Questions were asked in order to gauge respondents knowledge of the financial obligations associated with renewable technology. This was first put forward to planners across the UK. Planners are one of the most important parties involved in the design process. It is a planners duty to assess each application independently whilst having some idea of an overall masterplan. For example, if two identical sites were proposed, each with an identical scheme, one development specifying SHW panels on the front elevation, one development specifying GSHP. Is it the planners responsibility to show consistency? Or judge each on its own merit? One of the Developers may be working to a tighter budget, would a planner know which one?

Following on from The Energy Review Report, A White Paper on Energy (p9,2007) aimed to ‘bring about a step change in global investment to bring forward low carbon technologies. The private sector on its own may not invest adequately in research, development, demonstration and deployment of these technologies.’ A series of questions was asked to judge whether planners were aware of the basic costs associated with the renewable technologies. The results can be summarised as follows:



Only 10% of planners said they were aware of the cost implications associated with renewable technologies. A case study question was also put forward to confirm those who answered yes, 9% were correct. Therefore, it is safe to assume that only 9% of planners are aware of the costs associated with renewable technologies.

This was confirmed again in the regional study with planners showing a limited knowledge of cost. Developers and architects had a better understanding but there were still limits to their knowledge. The results for Q14 (*Regional Survey*) in Appendix B highlights this.

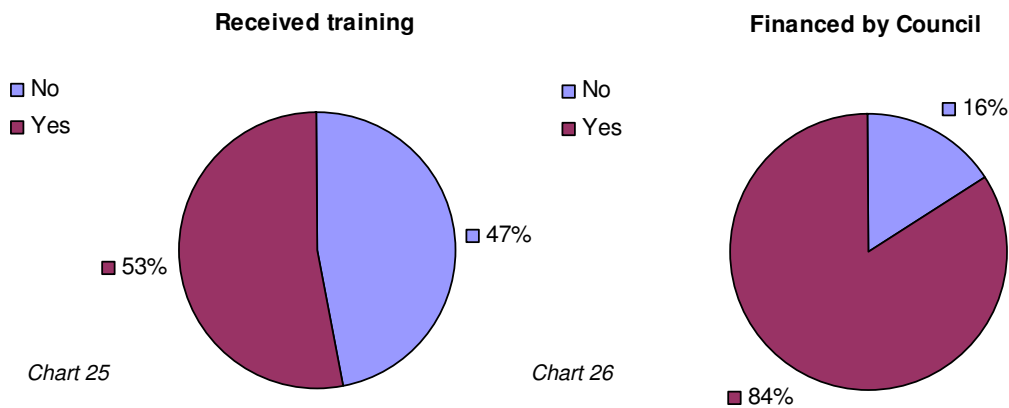
The following framework can summarise the effect that lack of knowledge is having on residential developments and the action that is required:

Table 9	D-P-S-I-R Framework
<b>Driving force</b>	Lack of cost awareness
<b>Pressure</b>	To fully understand the implications when specifying renewable technologies
<b>State</b>	Technologies specified are generally dependant on cost
<b>Impact</b>	The most efficient system is not always specified
<b>Response</b>	More resources required for professional use. Training required within the planning system

### 06.3 Training

65% of respondents (*Q8, National Survey*) were aware of local policies on renewable energy in their borough/district council. Therefore we can expect adequate training to be in place to assist planners when assessing renewable technology as a material consideration in determining a planning application.

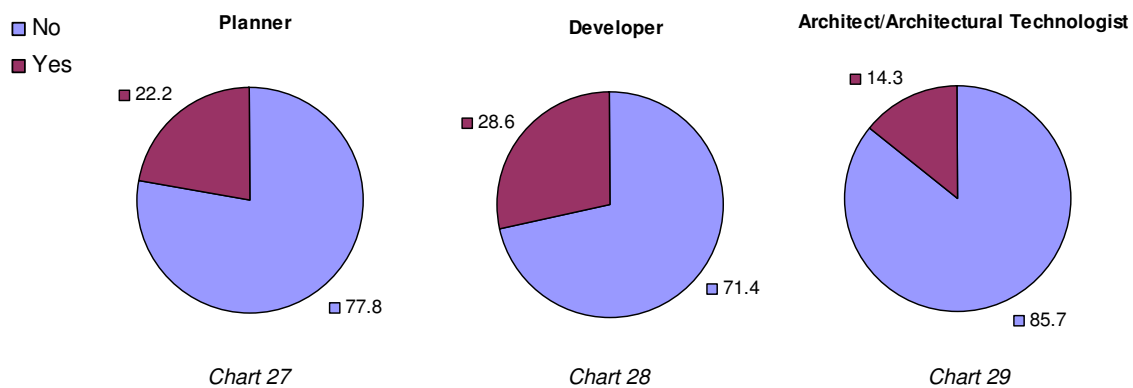
Planners were asked whether they had received any training on the implementation of renewable technology (*including any CPD's they may have attended*). Their response was as follows:



53% of respondents said they had received training and 84% of respondents who answered yes also stated that their employer had financed the training. This is a good indication that some councils are providing adequate support for their staff. However, if 65% of planners are aware of polices in place on renewable technology you might expect that at least the same percentage of participants should have received training as well.

It could also be argued that because PPS22 can be treated as material consideration when determining a planning application, every planner should be trained. Therefore, currently 47% of planners are not adequately qualified to make the decisions they are expected to make.

In the local study participants were asked for their highest qualification in renewable technology since PPS22 plays an important role in every application as well as any local policy that may be in place, it is safe to assume that the principal parties (*architects, planners & developers*) involved during the design/decision making process should be sufficiently qualified to make the decision they are increasingly being expected to make. Q10 (*Local Survey*) focussed on whether any qualification obtained, had a focus wholly or partially on renewable energy. This can be summarised below:

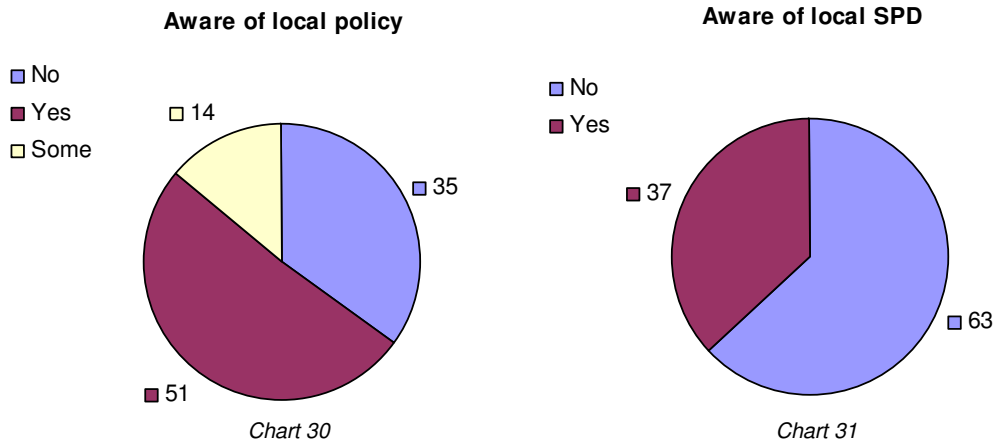


An average of 78.3% of respondents said they had no qualifications regarding renewable energy. This further enforces the argument that more training is required if legislation is to be adhered to effectively. The following action could be taken:

Table 10	D-P-S-I-R Framework
<b>Driving force</b>	Lack of training
<b>Pressure</b>	The effective implementation of renewable technology
<b>State</b>	Principal decision makers inadequately educated
<b>Impact</b>	Ill-advised information
<b>Response</b>	Additional training required for planners. Resources made available for developers and architects

## 06.4 Legislation

This final section looks at legislation and the resources made available by councils to assist decision makers in the use of renewable technology. The national survey asked what local policies had been put in place by their borough/district council and what guidance had been published by/on behalf of their borough/district council to guide professionals/the general public. Their responses can be summarised as follows:



Only 65% of respondents acknowledged their council as having a renewable energy policy in place, with only 37% aware of any supplementary planning document being available. This is very concerning as A White Paper on Energy states (p306,2007) that the national objective is ‘to put ourselves on a path to cutting the UK’s carbon dioxide emissions - the main contributor to global warming - by some 60% by about 2050, with real progress by 2020’ and that (p253: 2007) ‘the planning system plays an important role in delivering the necessary energy infrastructure to meet our national needs.’ Further action needs to be taken to ensure the planning system responds to this objective if we are to reduce our carbon needs in the residential sector.

Table 11	D-P-S-I-R Framework
<b>Driving force</b>	Legislation
<b>Pressure</b>	To meet national objectives
<b>State</b>	Many Councils still don’t have renewable policies in place
<b>Impact</b>	We are not committing fully to our aim to reduce carbon emissions
<b>Response</b>	Wider survey required, additional energy review suggested

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## 07 CONCLUSIONS

*“A doctor can bury his mistakes but an architect  
can only advise his client to plant vines”  
(Frank Lloyd Wright, 1867-1959)*

This thesis set out to ‘assess the implementation of renewable technologies in the residential sector of the built environment on a local scale in the United Kingdom’. To achieve this it was felt that a series of sub-questions would best summarise the data and research gathered. It looked, firstly, at the wider environmental context in order to explain the relevance of the subject and highlight the impact global targets are having on a local scale. The results can be summarised under the following question headings outlined in chapter 1:

### *What are the targets or objectives?*

**07.1** On a global scale, legally binding emissions targets for developed (Annex I) countries for the post-2000 period have been put in place in order to achieve the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The UK aim to put ourselves on a path to cutting the UK’s carbon dioxide emissions - the main contributor to global warming - by some 60% by about 2050, with real progress by 2020. Local policy of Cambridge City Council dictates that major proposals above a threshold of 1,000 square metres or 10 dwellings will be required to provide at least 10% of the development’s total predicted energy requirements on-site, from renewable energy sources.

### *How are countries performing?*

“The UK contributes about 2 per cent to global man-made emissions of CO<sub>2</sub>, the main greenhouse gas, which are currently estimated to range between 6.2 and 6.9 billion tonnes carbon per annum.” (The environment in your pocket, p23: 2007) A study published in the review predicts that if the UK stays on its

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current course, energy demand and carbon emissions are likely to grow past the 2020 targets, including emissions in the residential sector.

*Are the targets being implemented?*

The UNFCCC outlined its objectives in the Kyoto Protocol to address the global problem of climate change. This has been adopted by the UK and outlined in a publication A White Paper on Energy and supplementary document White Paper: Planning for a Sustainable Future.

*How are they being implemented?*

This led to the adoption of national policy PPS22 and local policies, such as policy 8/16 of the Cambridge Local Plan, to enforce renewable energy contributions in new residential developments.

*What are the implications for the Residential Sector?*

The questionnaires assessed the national planning system and a local case study to establish whether these targets are efficiently being met at a local level. The findings suggest that the following action plan be applied:

- **More funding is required to assist developers in implementing renewable technology in new residential developments.**
- **Good examples of renewable technology deployment is needed.**
- **More resources are needed for professional use.**
- **Additional training is urgently required within the planning system.**
- **A wider survey is required and an additional energy review suggested.**

This reiterates some of the concerns raised in The Energy Review Report (*reviewed in chapter 02 of this document*) which should have been addressed in the White Paper on Energy (*reviewed in chapter 02 of this document*) but was not.

The theoretical implications of this suggest that further study is required into A White Paper on Energy and the points it seeks to address in response to the White Paper (*reviewed in chapter 02 of this document*) and subsequent The Energy Review Report and whether these objectives are being met in the residential sector. If we look at revised Diagram 3 (*originally outlined in Chapter 1*) below, it is suggested that in order to meet global targets and objectives, the findings from this thesis needs to reinforce the targets and objectives set out by the UK on a national level.

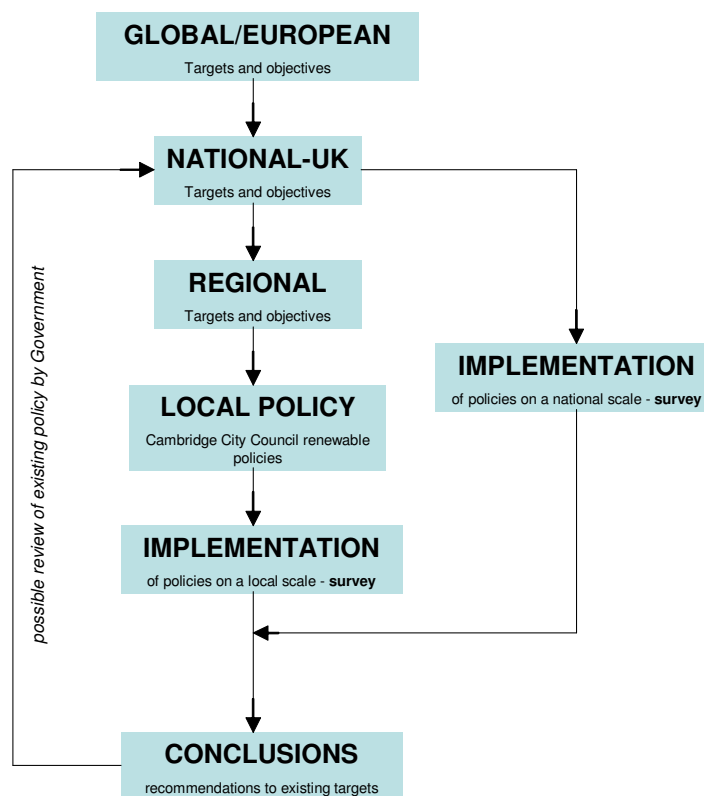


Diagram 3 – suggested chain of action

**07.2** Any unexpected findings in the local survey could be due to the sample size obtained. The amount of participants was restricted to the number of planners employed under the umbrella of Cambridge City Council. However, the majority of these results can be reinforced by the national survey sample where 193 responses were received across the UK.

The raw data in this paper was limited. To fully ‘assess the implementation of renewable technologies in the residential sector of the built environment on a

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local scale in the United Kingdom' it would require a 100% response rate from planners across the UK. This was not possible within the constraints of this thesis.

**07.3** Further research is required by government to fully assess planners knowledge and training. It is suggested that similarly populated cities be reviewed, looking at planners, developers and architects. It has already been suggested that an additional review of the A White Paper on Energy be conducted to determine whether the objectives set out are being addressed in the residential sector across the UK.

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## APPENDIX A

The questionnaires shown on the following pages are printed versions of the online questionnaires produced at <http://www.surveymonkey.com> through an account set up solely for the purpose of this study. These questionnaires were sent out under the umbrella of my employer DPA Architects Ltd. from a dedicated email account –

[MscArchitecture@dpaarchitects.co.uk](mailto:MscArchitecture@dpaarchitects.co.uk)

An online version of the national questionnaire can be found at:

[http://www.surveymonkey.com/s.aspx?sm=cH8\\_2fSsB8WApbvXcfv4TFnQ\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=cH8_2fSsB8WApbvXcfv4TFnQ_3d_3d)

An online version of the regional questionnaire can be found at:

[http://www.surveymonkey.com/s.aspx?sm=xBzpGFSi34sQZQbthgMWJw\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=xBzpGFSi34sQZQbthgMWJw_3d_3d)

## 1. General

1. What is your job role within the Council

Planning Officer

Environmental/Sustainability Consultant/Officer

Other

2. What are your employment requirements

Full time

Part time

3. Which region does your Council fall under

Region

Other (please specify)

4. Which Borough/District Council are you employed by

Council

Other (please specify)

5. How many years have you been working in your profession

Years

## 2. Design

6. At what point should renewable technologies form part of the design: (tick one)

- Concept / Feasibility
- Detail Design
- Construction
- As soon as it is established that the renewable policies 'kicks in'
- Always

7. If the following technologies were to be installed in your property, which order of preference would you choose?

(Most preferred = 1 Least preferred = 4)

	1	2	3	4
Solar Hot Water Panels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Photovoltaic Panels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ground Source Heat Pump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind turbine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(Source: BBC 2008)



## 3. Legislation

8. Are you aware of local policies in place to ensure renewable energy contributions are met in new residential developments

No

Yes

Some of them

If yes/some please list

9. Are you aware of any planning supplement guidance provided by your Council to assist designers/general public etc in the implementation of renewable technologies

Yes

No

If yes please list

## 4. Training

10. Please enter the highest qualification gained focusing wholly/partially on renewable energy

- this may not apply, please enter N/A

(it is important to state whether your Council financed your studies)

	Highest qualification obtained	Financed by Council
Qualifications	<input type="text"/>	<input type="text"/>

11. Have you received any training on the implementation of renewable technologies (including any CPD seminars attended)

(it is important to state whether your Council financed your further learning)

	Yes	No
Received training	<input type="text"/>	<input type="text"/>
Financed by Council	<input type="text"/>	<input type="text"/>

## 5. Cost

12. Are you aware of the cost implications involved with implementing a renewable technology to a residential development

Yes

Some idea of cost

Not really

13. Please estimate the approximate cost implications involved with the following case study:

"10No. 3bed semi-detached 2½ storey townhouses, each to be supplied and fitted with 4m<sup>2</sup> of Solar Hot Water Panels only (a total of 40m<sup>2</sup>)"

Approx. cost

Total supply and installation cost £

## 6. Personal Details

14. If further information is required and you are happy to assist in a telephone interview please leave you name and number below (your details are dealt with in the strictest of confidence)

# Regional Survey 001

## 1. General

\* 1. How old are you?

Age

\* 2. What is your occupation?

Architect/Architectural Technologist

Developer

Planner

Other...

\* 3. How many years have you been working in your profession

Years

\* 4. How much of an environmental enthusiast ("greenie") are you?

1 2 3 4 5

(1- Very, 5- Not very)

\* 5. Do you have any of the following renewable technologies installed in your home:

No

Ground Source Heat Pump

Photovoltaic Panels

Solar Hot Water

Wind turbine

Other...

\* 6. Was this already installed when you moved in:

N/A

Yes

No

## 2. Design

\* 7. If the following technologies were to be installed in your property, which order of preference would you choose?

(Most preferred = 1 Least preferred = 4)

	1	2	3	4
Solar Hot Water Panels (SHW)	jn	jn	jn	jn
Photovoltaic Panels (PV)	jn	jn	jn	jn
Ground Source Heat Pump	jn	jn	jn	jn
Wind turbine	jn	jn	jn	jn

(Source: BBC 2008)



8. What was your reason for selecting the most preferred technology in Q7:

9. What was your reason for selecting the least preferred technology in Q7:

\* 10. Please enter the highest qualification gained focusing wholly/partially on renewable energy

- this may not apply, please enter N/A

Highest qualification obtained

Qualifications

Any additional notes

# Regional Survey 001

\* 11. If you were to develop a site and a renewable technology had to be installed, which of these would you place as the most important.

(Most important = 1 Least important = 4)

	1	2	3	4
Installation Costs	jn	jn	jn	jn
Effect it has on design concept	jn	jn	jn	jn
Maintenance	jn	jn	jn	jn
Cost savings	jn	jn	jn	jn

\* 12. If you were to purchase a new dwelling and a renewable technology was to be installed by the builder, which of these would you consider as most important.

(Most important = 1 Least important = 4)

	1	2	3	4
Installation Costs	jn	jn	jn	jn
Effect it has on design concept	jn	jn	jn	jn
Maintenance	jn	jn	jn	jn
Cost savings	jn	jn	jn	jn

# Regional Survey 001

## 3. Cost

\* 13. What would you estimate the approximate supply & installation costs for the following technologies:

(if you are unsure please answer 'not sure' in the drop down boxes)

	1 unit	10 units
Solar Hot Water Panels	<input type="text"/>	<input type="text"/>
Photovoltaic Panels	<input type="text"/>	<input type="text"/>
Ground Source Heat Pump	<input type="text"/>	<input type="text"/>
Wind turbine	<input type="text"/>	<input type="text"/>

Any additional notes

## 4. Legislation

\* 14. Are you aware of what policies 8/16 & 8/17 of the Cambridge Local Plan aim to achieve?

Yes

No

If yes, please describe

\* 15. Do developers have to provide renewable technology on site?

Yes

No

If yes, please explain in which situation

\* 16. Are you aware of the Energy White Papers objectives?

Yes

No

If yes, please give a brief overview

\* 17. Are you aware of any planning supplement guidance provided by your Council to assist designers/general public etc in the implementation of renewable technologies

Yes

No

If yes please list

## 5. FINALLY...

18. What is your view on the use of renewable technology in residential developments:

19. If further information is required and you are happy to assist in a telephone interview please leave you name and number below (your details are dealt with in the strictest of confidence)

## APPENDIX B

The results of the questionnaires are given below together with comments on the questions asked

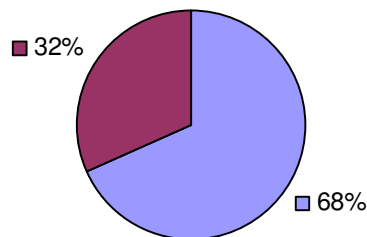
### NATIONAL QUESTIONNAIRE

#### 1.0 General

##### 1. *What is your job role within the Council?*

■ Planning Officer ■ Environmental/Sustainability Consultant/Officer

Chart 32



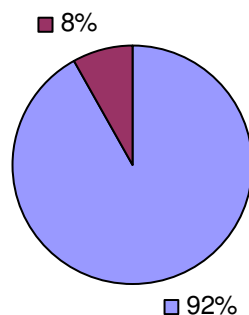
Out of 193 respondents 149 were filtered to fit the criteria of the questionnaire. Some participants were passed on the questionnaire by mistake. These have been omitted from the analysis to avoid misinterpretation. 102 respondents were planning officers and 47 respondents were environmental/sustainability consultant /officers.

Although planning officers have the authority to judge each application with the backing of their superiors, environmental/ sustainability consultants /officers are obliged to guide planners in areas of expertise. Therefore, they have been included in the sample collecting as they have as much responsibility as planners as far as this research is concerned.

##### 2. *What are your employment requirements?*

■ Full time ■ Part time

Chart 33

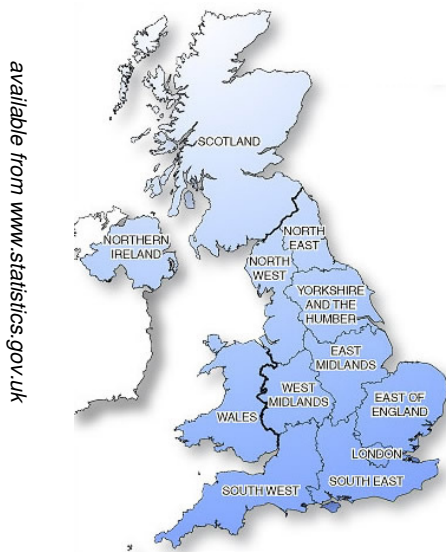


Out of 149 respondents 137 worked full time and 12 worked part time.

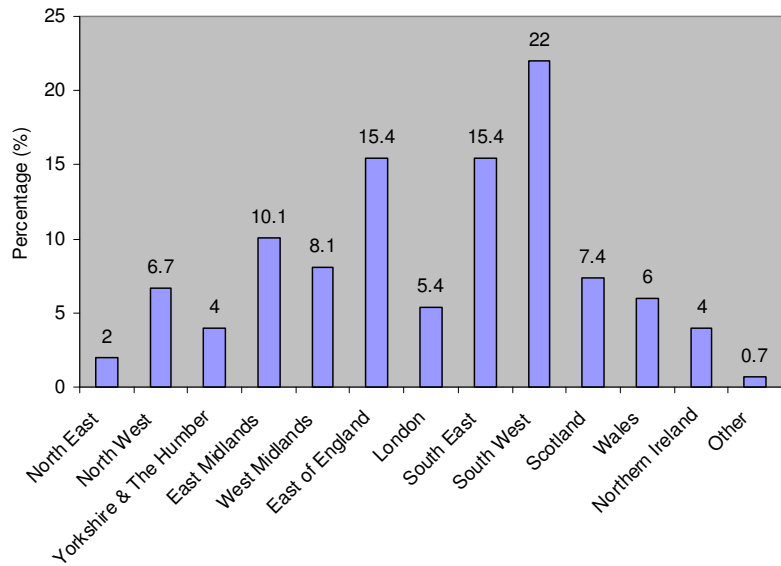
**This may have an implication on levels of training received.**

### 3. Which region does your Council fall under?

Chart 34



available from [www.statistics.gov.uk](http://www.statistics.gov.uk)



The majority of respondents were from the South West, closely followed by the South East and East of England. The lowest response area was the North East, followed by Yorkshire & The Humber and Northern Ireland.

#### 4. Which Borough/ District Council are you employed by?

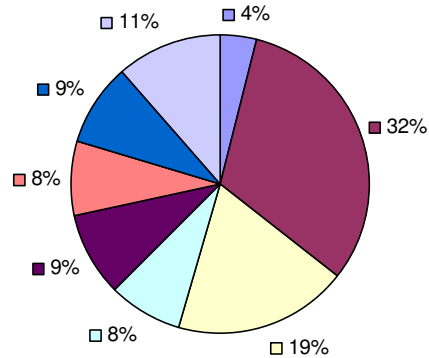
Table 12

Council	Response(%)	Council	Response(%)
Aberdeenshire Council	0.7	Oadby and Wigston Borough Council	1.3
Allerdale Borough Council	1.3	Oldham Metropolitan Borough Council	0.7
Barking and Dagenham London Borough Council	1.3	Orkney Islands Council	1.3
Basingstoke and Deane Borough Council	0.7	Orkney Islands Council	0.7
Bassetlaw District Council	1.3	Peterborough City Council	2
Bedford Borough Council	2.7	Poole Borough	2.7
Bedfordshire County Council	0.7	Portsmouth City Council	0.7
Blaby District Council	0.7	Redditch Borough Council	2.7
Bolsover District Council	0.7	Rossendale Borough Council	0.7
Boston Borough Council	0.7	Rother District Council	0.7
Brent London Borough Council	0.7	Rugby Borough Council	0.7
Cambridge City Council	4	Rushcliffe Borough Council	0.7
Chelmsford Borough Council	0.7	Sedgemoor District Council	0.7
Chorley Borough Council	0.7	Sefton Council	1.3
Christchurch Borough Council	1.3	Selby District Council	0.7
City of London	0.7	Sevenoaks District Council	0.7
Conwy County Borough Council	2	South Cambridgeshire District Council	0.7
Craigavon Borough Council	0.7	South Gloucestershire Council	0.7
Denbighshire County Council	2	South Hams District Council	0.7
Derbyshire Dales District Council	0.7	South Kesteven District Council	0.7
Dundee City Council	0.7	South Oxfordshire District Council	2
Dungannon and South Tyrone Borough Council	3.4	Southampton City Council	2
East Renfrewshire Council	1.3	Southend on Sea Borough Council	0.7
Eastbourne Borough Council	0.7	Stoke on Trent City Council	0.7
Flintshire County Council	0.7	Suffolk Coastal District Council	0.7
Forest Heath District Council	0.7	Sunderland City Council	2
Forest of Dean District Council	2	Surrey Heath Borough Council	0.7
Hambleton District Council	2.7	Swale Borough Council	0.7
Highland Council	1.3	Swindon Borough Council	1.3
Hull City Council	0.7	Tandridge District Council	0.7
King's Lynn and West Norfolk Borough Council	0.7	Tonbridge and Malling Borough Council	1.3
Lancaster City Council	2	Torbay Council	0.7
Leicestershire County Council	0.7	Torfaen County Borough Council	1.3
Lewisham London Borough Council	2	Uttlesford District Council	0.7
Lichfield District Council	0.7	Wandsworth Borough Council	0.7
Lincoln City Council	0.7	Wansbeck District Council	0.7
Merton London Borough Council	0.7	Warwickshire County Council	0.7
Mid Suffolk District Council	0.7	Watford Borough Council	0.7
Mid Sussex District Council	0.7	Waveney District Council	0.7
Mole Valley District Council	0.7	Wealden District Council	0.7
Neath Port Talbot County Borough Council	0.7	West Devon Borough Council	0.7
North Ayrshire Council	0.7	West Dorset District Council	0.7
North Cornwall District Council	0.7	West Wiltshire District Council	0.7
North Dorset District Council	0.7	Wirral Metropolitan Borough Council	0.7
North East Derbyshire District Council	0.7	Woking Borough Council	0.7
North Warwickshire Borough Council	1.3	Worthing Borough Council	0.7
North Wiltshire District Council	0.7	Wychavon District Council	0.7
Nottingham City Council	0.7	Other	1.3

## 5. How many years have you been working in your profession?

■ Under 1 year   
 ■ 1 - 4 years   
 ■ 5 - 9 years   
 ■ 10 - 14 years  
■ 15 - 19 years   
 ■ 20 - 24 years   
 ■ 25 - 29 years   
 ■ 30 years and over

Chart 35



The principal range for participants working in their profession is between 1-4 years. However, over 50% have only been working in their profession for **less than 10 years**.

**Age may have an influence on understanding of renewable technology and training received.**

## 2.0 Design

### 6. At what point should renewable technologies form part of the design?

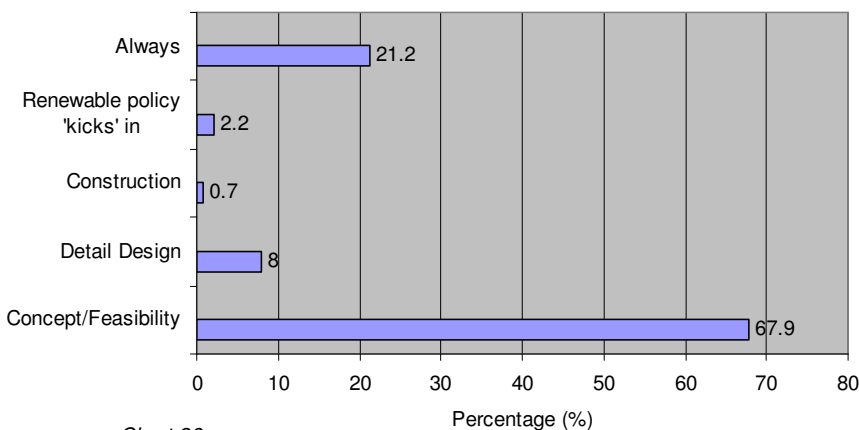


Chart 36

67.9% of participants agreed that renewable technologies should be considered during the **development** of a scheme. This was reinforced by 21.2% stating that it should **always** form part of the design.

**7. If the following technologies were to be installed in your property, which order of preference would you choose?**

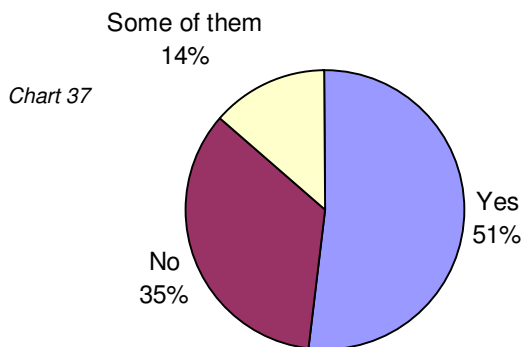
Table 13

	1	2	3	4
Solar Hot Water Panels	40.9% (56)	32.1% (44)	21.9% (30)	5.1% (7)
Photovoltaic Panels	22.6% (31)	38.0% (52)	28.5% (39)	10.9% (15)
Ground Source Heat Pump	26.3% (36)	20.4% (28)	36.5% (50)	16.8% (23)
Wind turbine	10.2% (14)	9.5% (13)	13.1% (18)	67.2% (92)

The majority of respondents would prefer solar hot water systems to be installed on their own home. This was followed by photovoltaic panels, ground source heat pumps and finally wind turbines.

**3.0 Legislation**

**8. Are you aware of local policies in place to ensure renewable energy contributions are met in new residential developments?**



“Local Plan policies 8/26 & 8/17 Cambridge East AAP policies CE/24 & CE/25 Draft North West Cambridge AAR policy NW24”

“Simply to layout buildings which prevent the need for artificial sources of heating and light.”

“Lincoln has no policies in place to ensure contributions are met”

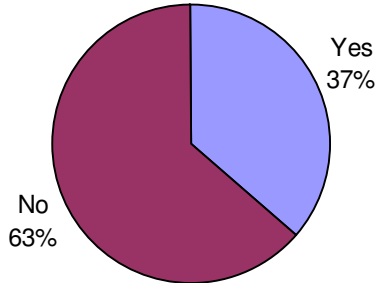
“The Torbay Local Plan is still in operation that encourages energy efficiency and renewable technology installation but does not set a mandatory requirement”

“No SPD as yet, it is being developed. Merton principles have been informally adopted for large housing and commercial development”

“Development plan policy allows for renewable energy, but policy does not require it. Although policy requires efficiency for 10 of more dwellings”

**9. Are you aware of any planning supplement guidance provided by your Council to assist designers/general public etc in the implementation of renewable technologies?**

Chart 38



“Provide Government circulars regarding sustainable development, renewable energy and the GPDO regarding renewable energy”

“Pre-application advice. Please note, there is very little residential property in the City of London”

- “Cambridge City Council (May 2007) – Sustainable Design and Construction”
- “PAN on sustainable design and construction (targets are now out of date)”
- “SPG – Planning for Renewable Energy Technology and Energy Efficiency”

**NOTE: All comments are available in Appendix C of this document.**

**4.0 Training**

**10. Please enter the highest qualification gained focusing wholly/partially on renewable energy?**

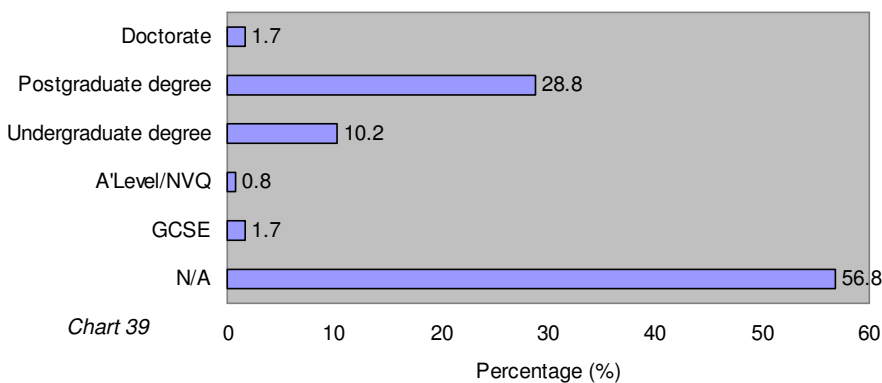


Chart 39

**Financed by Council**

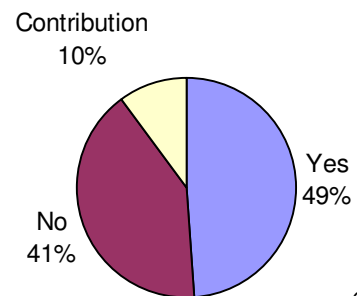
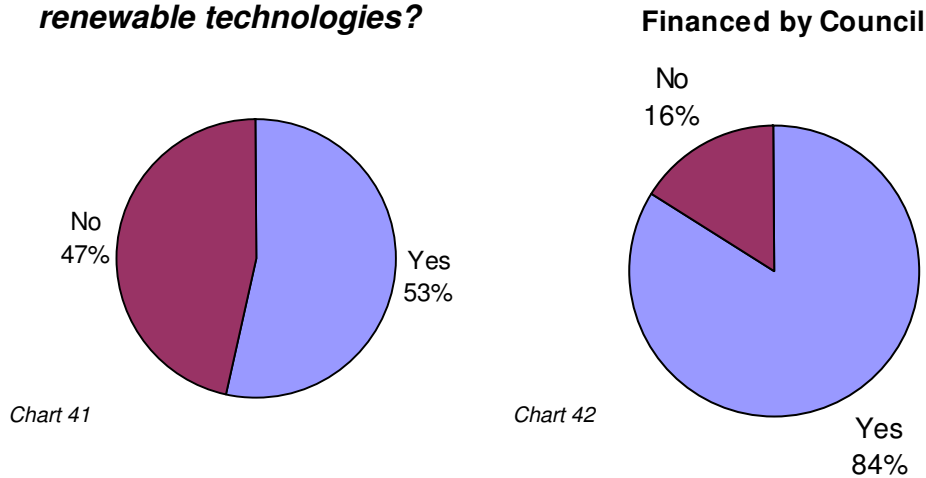


Chart 40

56.8% answered N/A leaving 51 respondents having some form of qualification in renewable energy. 28.8% stated that they had at least a **Postgraduate** degree that focused at least partially on renewable energy. This suggests that a good level of training has been made available. 59% of the 51 respondents also suggested that they had some form of **contribution by their employer** for their studies. This suggests that councils are providing further learning for their employees

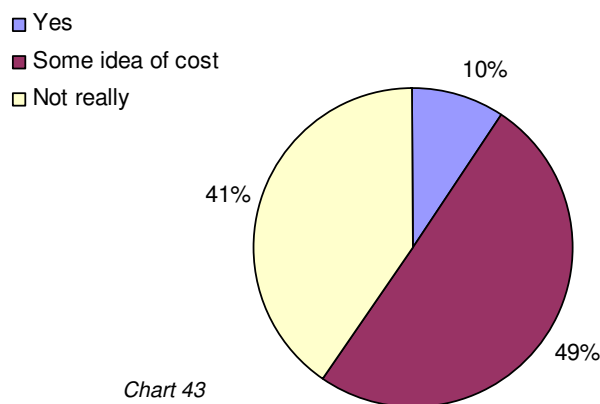
**11. Have you received any training on the implementation of renewable technologies?**



53% of respondents stated they had **received training** of some form in the implementation of renewable technologies. 84% of respondents who answered yes to the question also stated that their employer had **financed** the further training. This suggests that councils are giving employees the opportunity for further training.

**5.0 Cost**

**12. Are you aware of the cost implications involved with implementing a renewable technology to a residential development?**



49% of respondents said they had **some idea of cost**. This could be interpreted as a 'safe' response. The concerning figure is that 41% of respondents said **they didn't really have an idea** of the cost implications involved with the technologies that they are advising on.

**This could have implications on the viability of a scheme. It is concerning that such a large number of planners do not know the costs associated with renewable technologies – further training may be required.**

**13. Please estimate the approximate cost implications involved with the following case study:**

**“10No. 3bed semi detached townhouses 2 ½storey townhouses, each to be supply and fitted with 4m<sup>2</sup>of solar hot water panels only (a total of 40m<sup>2</sup>)”**

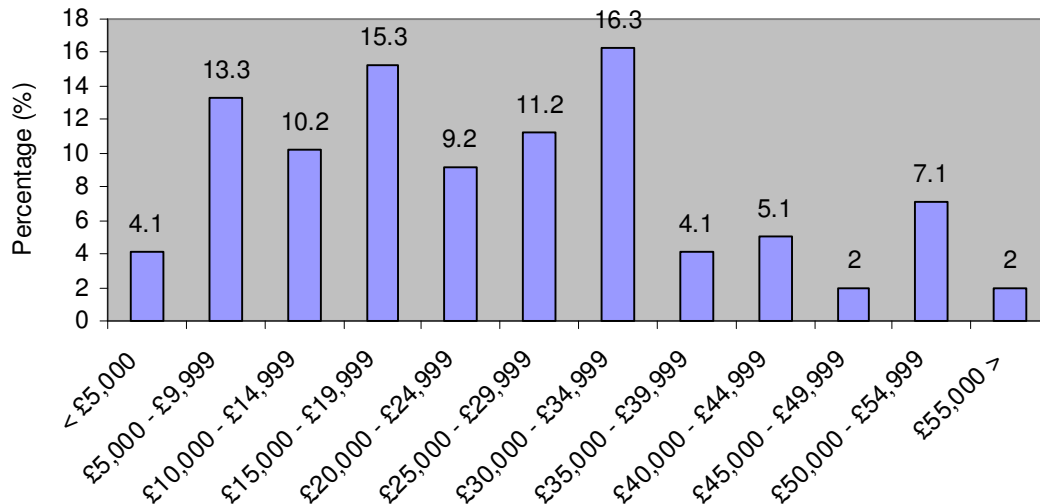


Chart 44

Using the table below and from professional experience we have estimated the cost to be **approximately £40,000**. The above table indicates only 9.2% were correct in assuming a figure between £35,000 - £44,999. A large majority estimated costs under £25,000. This reinforces results in question 12 that planners do not have the knowledge of the cost implications associated with renewable technology.

System Type	Typical System	Typical Installed Cost
Flat plate solar thermal	2.5m <sup>2</sup>	£1,750
Evacuated tube solar thermal	2m <sup>2</sup>	£2,000
Solar electric panels	2kW	£10,000
Ground-source heat pump	4kW	£7,000
Small scale wind turbine	400W	£2,000
Pellet boiler	6kW	£6,000
Pellet stove	3kW	£4,500 per kW

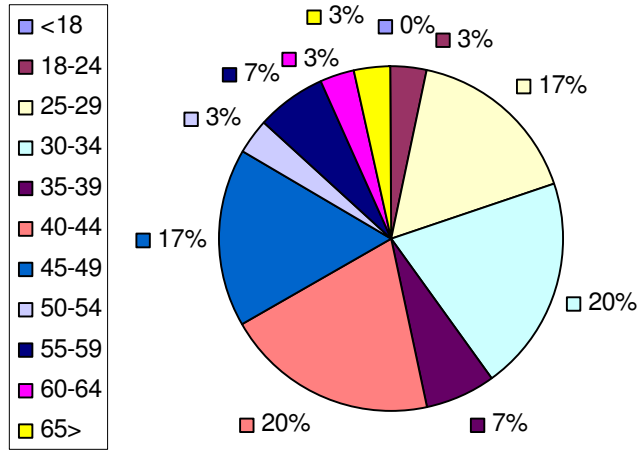
Source: BRE (based on figures from the Clear Skies and Low Carbon Buildings Programmes)

Table 14 available from NHBC Guide to Renewable Energy(2007)

## REGIONAL QUESTIONNAIRE

### 1.0 General

#### 1. How old are you?



The majority of participants are aged between **25 and 50 years** old. This can be subdivided into two main categories: 25-34 year olds and 40-49 year olds. There was only a small number of participants aged between 35-39. No one under the age of 18 took part and only 3% of respondents were aged 65 and over.

Chart 45

#### 2. What is your occupation?

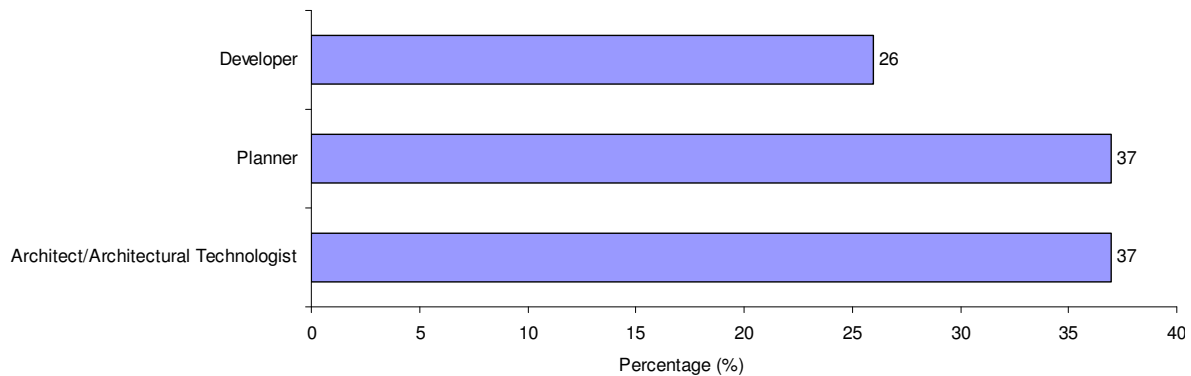
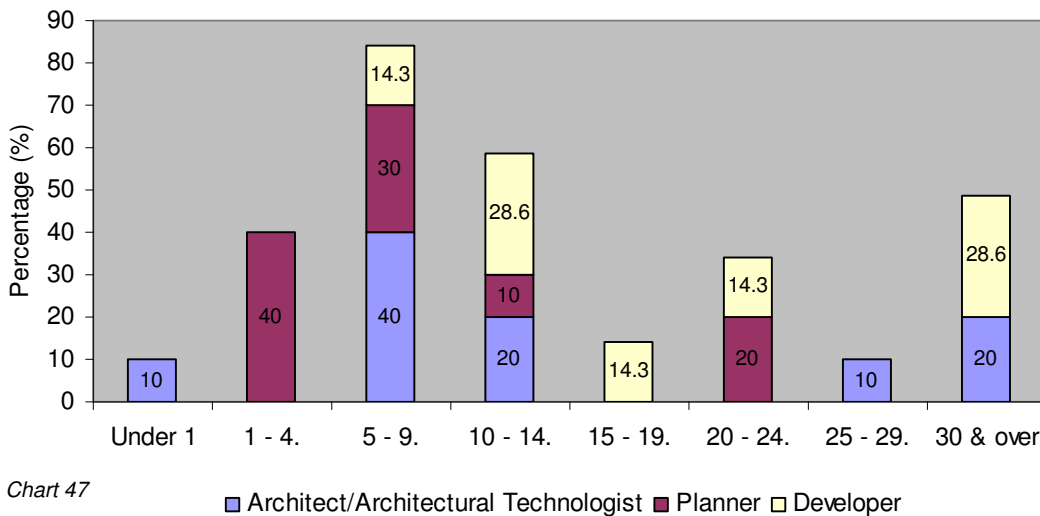


Chart 46

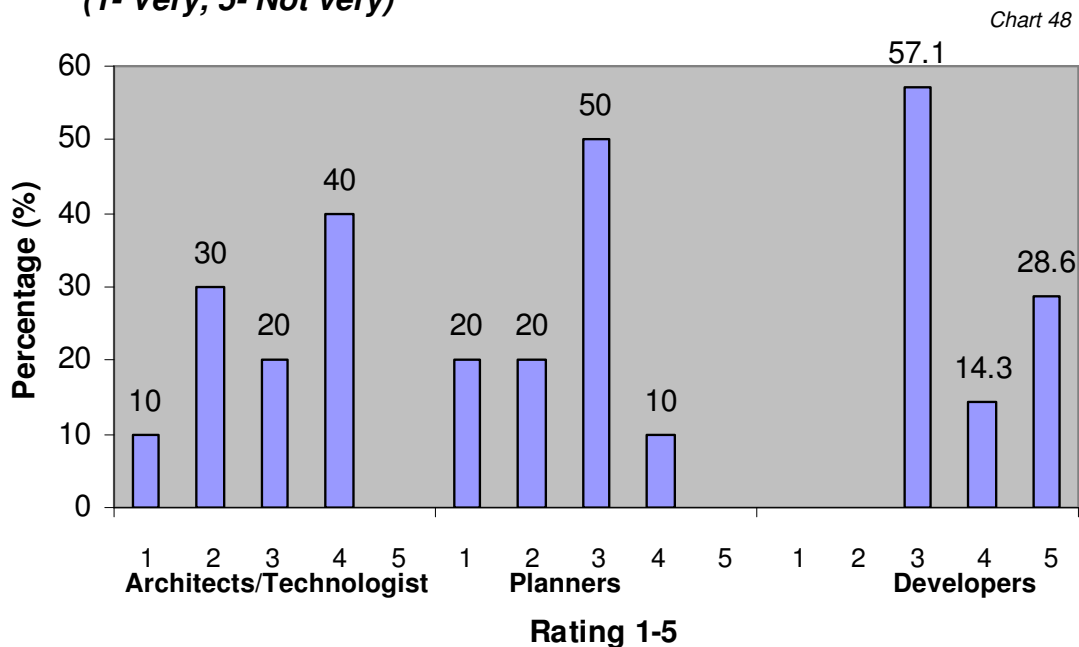
Approximately the same percentage of sample data was collected from each occupation studied. This should allow for an unbiased representation of each occupation.

**3. How many years have you been working in your profession?**



The majority have been working in their profession **between 1-14 years**. Planners indicate a relatively **higher turn over** with the majority of their staff being employed for under 14 years whilst developers and architects seem to have **longer careers** ranging up to 30 years and over in their profession.

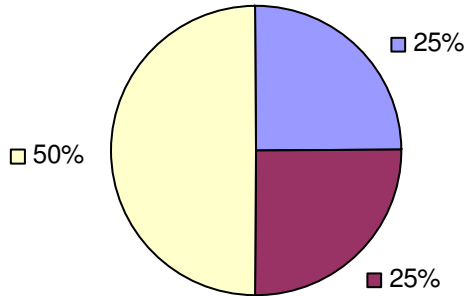
**4. How much of an environmental enthusiast (“greenie”) are you? (1- Very, 5- Not very)**



Architects and planners range in enthusiasm. The majority of responses seem to sit on the fence with their response being a 3. It is interesting to note that no developers categorised themselves as not very enthusiastic about environmental issues at all with 28.6% ranked at No.5.

**5. Do you have any of the following renewable technologies installed in your home?**

Chart 49



Architect/Architectural Technologist Planner Developer

**6. Was this already installed when you moved in? - 100% ANSWERED NO TO THIS QUESTION**

**2.0 Design**

**7. If the following technologies were to be installed in your property, which order of preference would you choose?**

**Architects**

Table 15

	1	2	3	4
Solar Hot Water Panels (SHW)	57.1% (4)	14.3% (1)	28.6% (2)	0.0% (0)
Photovoltaic Panels (PV)	0.0% (0)	42.9% (3)	28.6% (2)	28.6% (2)
Ground Source Heat Pump	28.6% (2)	42.9% (3)	14.3% (1)	14.3% (1)
Wind turbine	14.3% (1)	0.0% (0)	28.6% (2)	57.1% (4)

Architects would prefer solar hot water panels as their first choice. This is followed by photovoltaic and ground source heat pumps. wind turbines were the least favourite choice.

## Planners

Table 16

	1	2	3	4
Solar Hot Water Panels (SHW)	<b>55.6% (5)</b>	33.3% (3)	0.0% (0)	11.1% (1)
Photovoltaic Panels (PV)	22.2% (2)	<b>44.4% (4)</b>	33.3% (3)	0.0% (0)
Ground Source Heat Pump	11.1% (1)	11.1% (1)	33.3% (3)	<b>44.4% (4)</b>
Wind turbine	11.1% (1)	11.1% (1)	33.3% (3)	<b>44.4% (4)</b>

Planners would also prefer solar hot water panels as their first choice. This is followed by photovoltaic and ground source heat pumps. Wind turbines were again the least favourite choice.

## Developers

Table 17

	1	2	3	4
Solar Hot Water Panels (SHW)	28.6% (2)	14.3% (1)	<b>42.9% (3)</b>	14.3% (1)
Photovoltaic Panels (PV)	14.3% (1)	28.6% (2)	<b>42.9% (3)</b>	14.3% (1)
Ground Source Heat Pump	<b>57.1% (4)</b>	28.6% (2)	14.3% (1)	0.0% (0)
Wind turbine	0.0% (0)	28.6% (2)	0.0% (0)	<b>71.4% (5)</b>

Developers however, would prefer ground source heat pumps installed on their own home. This suggests that they have a different view of the benefits ground source heat pumps can have. This could possibly be down to cost savings or least visual impact as wind turbines were again the least favourite option.

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**8. What was your reason for selecting the most preferred technology in Q7?**

**Architect (SHW)** – “It works and has the best payback time. Our house doesn't have enough south facing roof to install ST and PV effectively. We couldn't for technical reasons install either a heat pump or a wind turbine.”

**Developer (GSHP)** – “Highly efficient and does not impact greatly on the appearance of the property.”

**Planner (SHW)** – “Most practical and cost effective. Note - we are in the process of getting quotations for SHW, and will definitely be installing them.”

**Architect (SHW)** – “Most efficient and practical to install.”

**Developer (GSHP)** – “I believe GSHP's replace the most expensive cost to a home owner; heating via oil or gas. Wind turbines, in the right location, can supply energy for a wide variety of uses, although size does matter! Solar panels need additional power to peak water temperatures. I have no experience of Photovoltaic panels.”

**9. What was your reason for selecting the least preferred technology in Q7?**

**Planner (SHW)** - “They do not represent a truly sustainable energy. The disposal of solar panels once their (relatively short) useful life expires is complicated, costly, and many are not able to be recycled.”

**Architect (PV)** - “The photovoltaic system is not very economical are efficient as the day light hours are very limited, hence the payback time is long.”

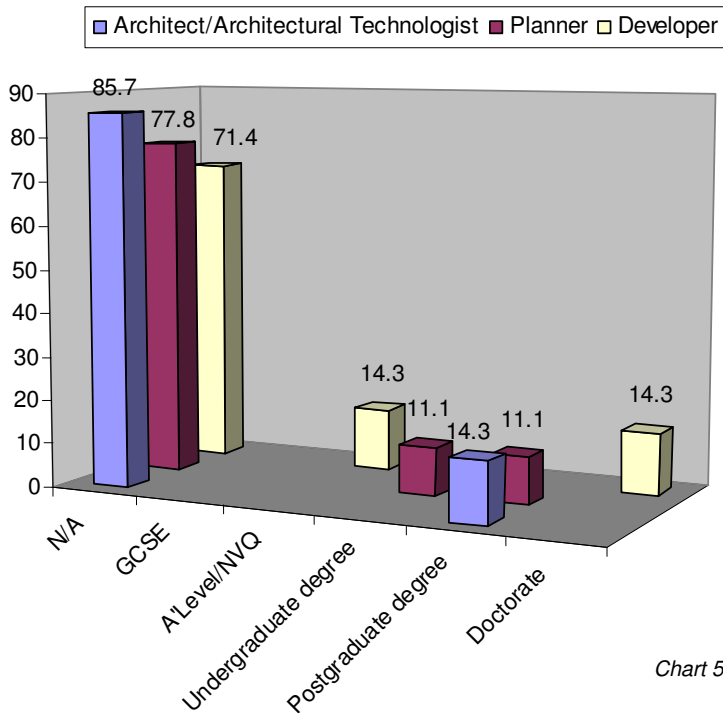
**Planner (Wind)** - “Location of house not suitable, conservation area issue, unlikely to be efficient, noise issues”

**Developer (Wind)** - “ugly - urban location (no wind)”

**Developer (SHW)** - “Solar panels are unsightly, expensive to install and have a short working life. Also are difficult and expensive to maintain making them environmentally unfriendly.”

**NOTE: All comments are available in Appendix C of this document.**

**10. Please enter the highest qualification gained focusing wholly/partially on renewable energy?**



This chart suggests that the majority of participants in all three categories are under qualified regarding the understanding and implementation of renewable technologies. It suggests that more funding and training should be made available if targets are to be met.

Chart 50

**11. If you were to develop a site and a renewable technology had to be installed, which of these would you place as the most important?**

**Architects**

Table 18

	1	2	3	4
Installation Costs	85.7% (6)	0.0% (0)	14.3% (1)	0.0% (0)
Effect it has on design concept	0.0% (0)	42.9% (3)	42.9% (3)	14.3% (1)
Maintenance	14.3% (1)	0.0% (0)	28.6% (2)	57.1% (4)
Cost savings	0.0% (0)	57.1% (4)	14.3% (1)	28.6% (2)

Architects feel installation costs would be the most important consideration if developing a site. Maintenance was ranked lowest. This leads to the assumption that **profit would dominate over satisfaction of the end user.**

## Planners

Table 19

	1	2	3	4
Installation Costs	22.2% (2)	<b>33.3% (3)</b>	<b>33.3% (3)</b>	11.1% (1)
Effect it has on design concept	<b>44.4% (4)</b>	0.0% (0)	22.2% (2)	33.3% (3)
Maintenance	0.0% (0)	<b>55.6% (5)</b>	22.2% (2)	22.2% (2)
Cost savings	<b>33.3% (3)</b>	11.1% (1)	22.2% (2)	<b>33.3% (3)</b>

Planners felt that the overall effect the technology has on design concept would be the most important factor. It is interesting to note that architects (*'the designers'*) did not feel the same way. They did however feel cost savings was the least important factor – again suggesting the **end user is not being considered**.

## Developers

Table 20

	1	2	3	4
Installation Costs	<b>57.1% (4)</b>	42.9% (3)	0.0% (0)	0.0% (0)
Effect it has on design concept	14.3% (1)	<b>42.9% (3)</b>	28.6% (2)	14.3% (1)
Maintenance	14.3% (1)	0.0% (0)	<b>42.9% (3)</b>	<b>42.9% (3)</b>
Cost savings	14.3% (1)	14.3% (1)	28.6% (2)	<b>42.9% (3)</b>

Developers stated installation costs are the most important factor. This is not surprising as they are the most likely to be aware of the financial implications associated with these technologies as discovered earlier in questions 12 & 13 of the national questionnaire. It is interesting to note that the **end user (cost savings) came last in all three scenarios**.

**12. If you were to purchase a new dwelling and a renewable technology was to be installed by the builder, which of these would you consider as most important?**

**Architects**

Table 21

	1	2	3	4
Installation Costs	<b>57.1% (4)</b>	0.0% (0)	0.0% (0)	42.9% (3)
Effect it has on design concept	14.3% (1)	<b>28.6% (2)</b>	<b>28.6% (2)</b>	<b>28.6% (2)</b>
Maintenance	0.0% (0)	14.3% (1)	<b>71.4% (5)</b>	14.3% (1)
Cost savings	28.6% (2)	<b>57.1% (4)</b>	0.0% (0)	14.3% (1)

Architects have again suggested that installation costs are the most important consideration, even when it is at the developer's expense. This may be a slightly biased result as architects may still be answering the question with the view of acting on the 'clients' behalf. However, they have stated that the **effect it has on the design is the least important**. Both of these results are slightly concerning as they do not portray the beliefs one might expect an architect to act upon.

**Planners**

Table 22

	1	2	3	4
Installation Costs	11.1% (1)	11.1% (1)	33.3% (3)	<b>44.4% (4)</b>
Effect it has on design concept	0.0% (0)	11.1% (1)	33.3% (3)	<b>55.6% (5)</b>
Maintenance	22.2% (2)	<b>44.4% (4)</b>	33.3% (3)	0.0% (0)
Cost savings	<b>66.7% (6)</b>	33.3% (3)	0.0% (0)	0.0% (0)

Planners have reversed their opinions since the previous question. They now feel cost savings would be the most important consideration and installation costs would be the least important. It would be interesting to see which 'hat' they wear when they are determining renewable energy use/viability in an application as their answers to Q11&12 are very different depending on their position.

**Developers**

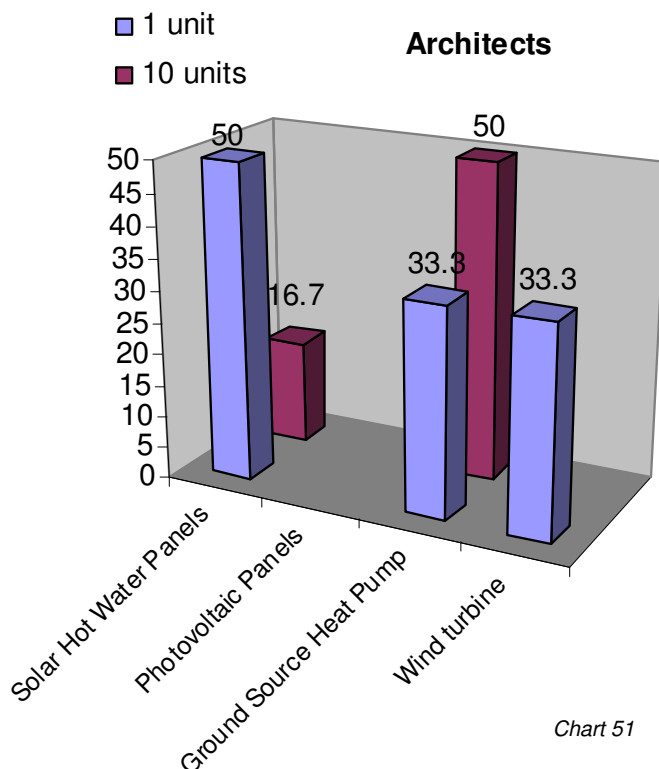
	1	2	3	4
Installation Costs	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (7)
Effect it has on design concept	42.9% (3)	0.0% (0)	57.1% (4)	0.0% (0)
Maintenance	28.6% (2)	42.9% (3)	28.6% (2)	0.0% (0)
Cost savings	28.6% (2)	57.1% (4)	14.3% (1)	0.0% (0)

Developers have answered the way we might expect with the end user benefits ranked top and the initial outlay ranked bottom suggesting they are fully aware of the costs associated with renewable technology installation.

**3.0 Cost**

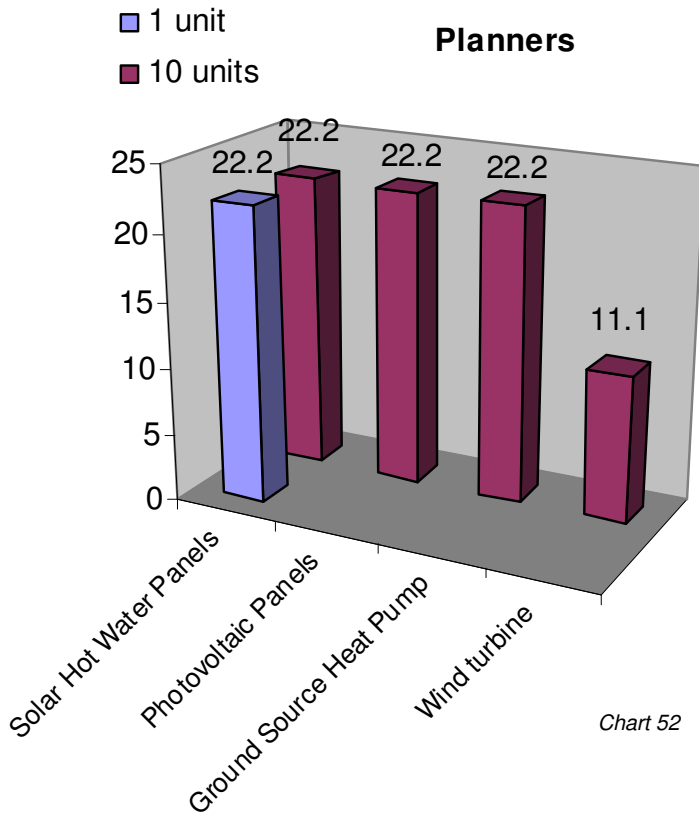
**13. What would you estimate the approximate supply & installation costs for the following technologies?**

**NOTE: The NHBC Guide to Renewable Energy (2007) and London Renewables (2004) were used to estimate the approximate installation costs for the following technologies.**



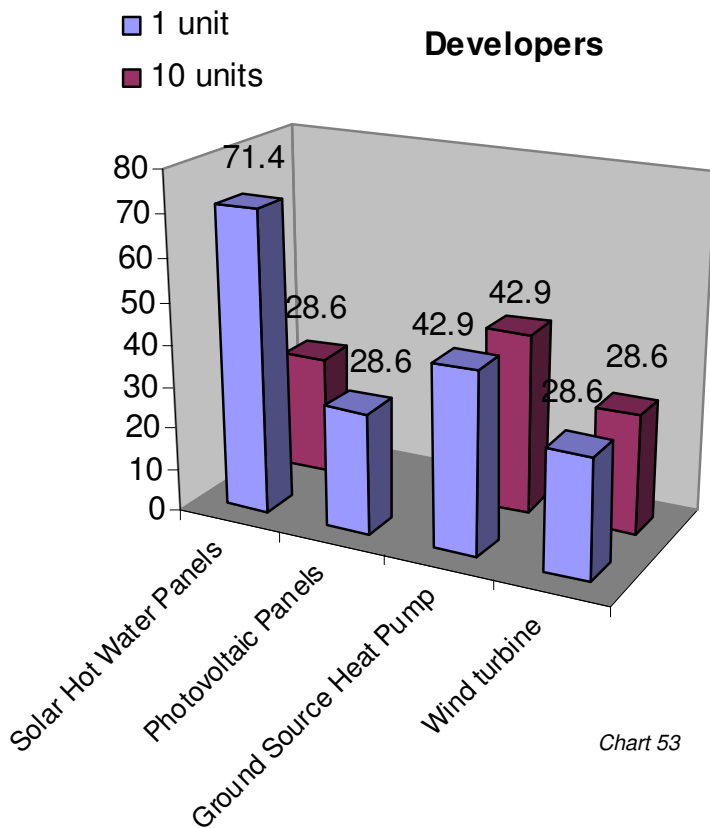
Architects generally had a good idea of cost for solar hot water panels and ground source heat pumps in both small and large scale developments. Their knowledge was limited however, of PV and wind turbines (major developments). These results could highlight trends in tradition – ie SHW may be specified more regularly, therefore they have more of an idea.

Chart 51



Planners had showed limited knowledge in cost for both small and large scale developments. This could be due to lack of training in this area or lack of experience.

Chart 52



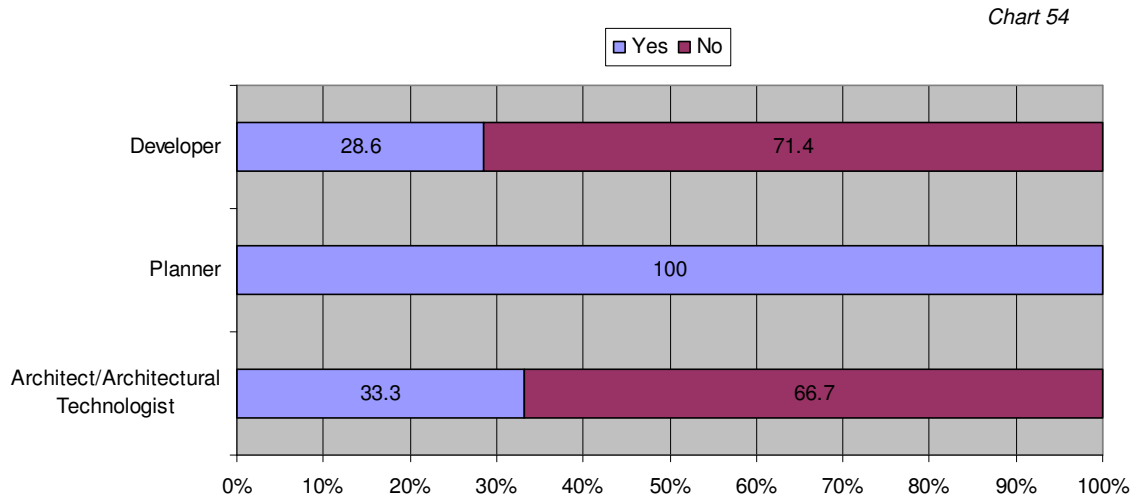
Developers showed a good idea of costs all round. This would be expected as developers deal with costs first hand.

**It is interesting to note that the majority of the participants estimated the costs of PV systems incorrectly.**

Chart 53

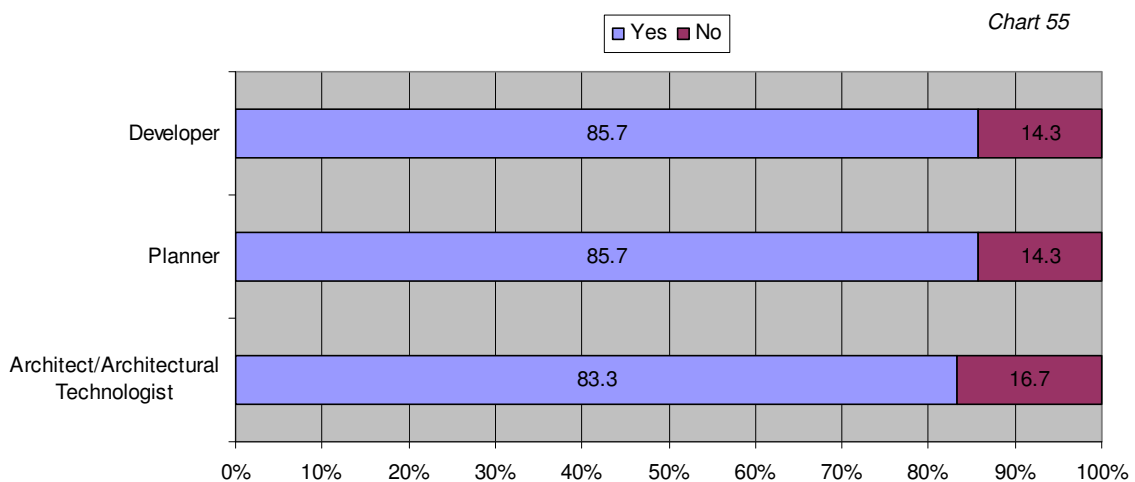
## 4.0 Legislation

### 14. Are you aware of what policies 8/16 & 8/17 of the Cambridge Local Plan aim to achieve?

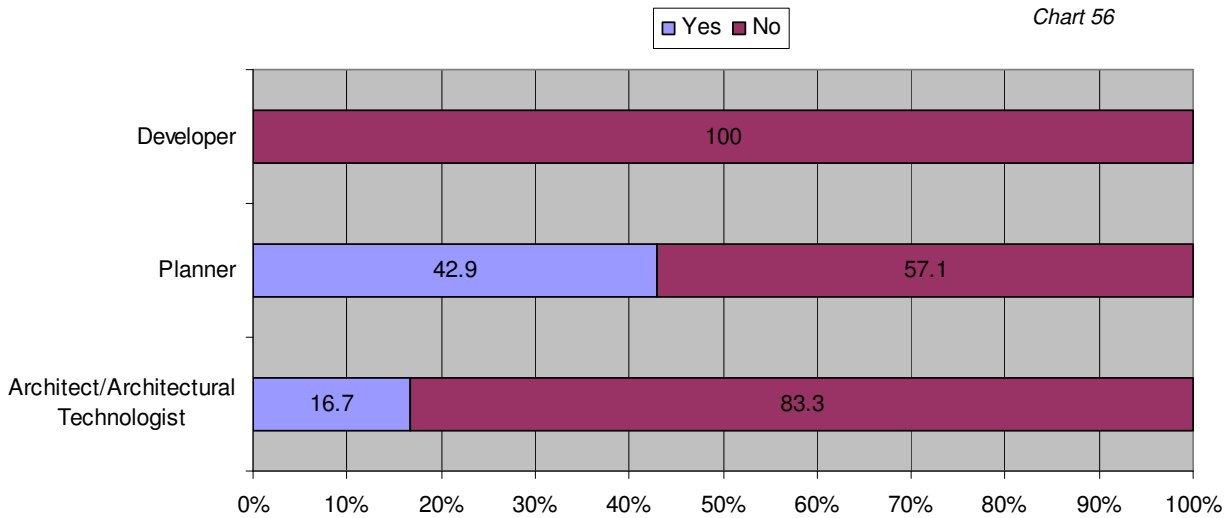


This chart highlights that whilst planners are fully aware of local policies on renewable technology set out by Cambridge City Council, developers and architects knowledge is severely limited with only 28.6% and 33.3% admitting some form of understanding.

### 15. Do developers have to provide renewable technology on site?

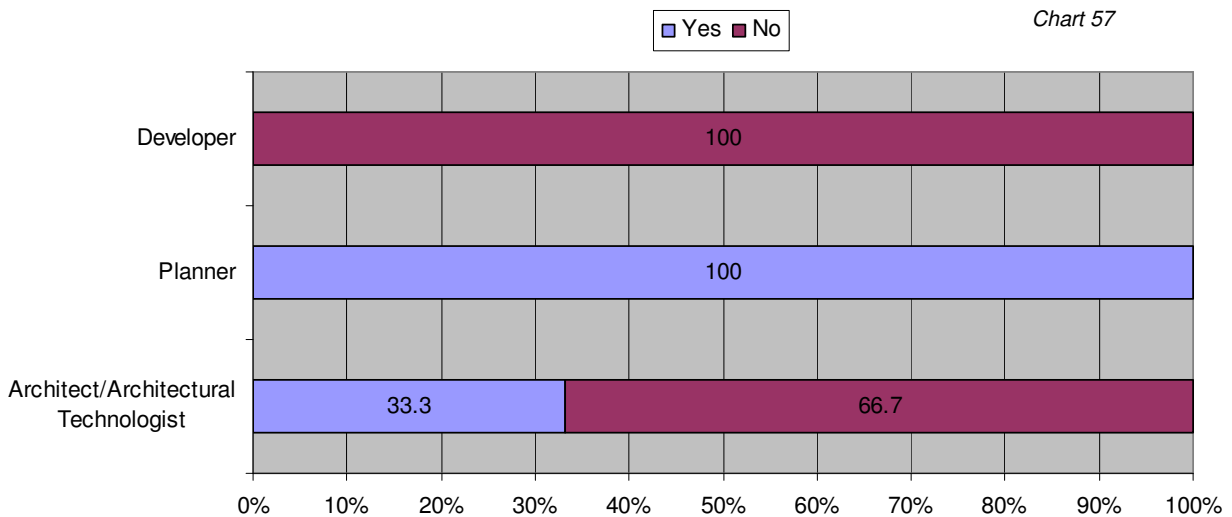


**16. Are you aware of the Energy White Papers objectives?**



It is concerning to note that 100% of developers questioned did not know the White Papers objectives. It is even more concerning that **57.1% of planners did not know the national objectives** set out by Government. Objectives they are implementing on a local scale.

**17. Are you aware of any planning supplement guidance provided by your Council to assist designers/general public etc in the implementation of renewable technologies**



100% of planners were aware of the SPD for Cambridge whilst 100% of developers were not. What is concerning is that only 66.7% of architects were aware of the **design tool** they are advised to use when preparing an application. **This may need to be made more readily available.**

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## **APPENDIX C**

The information displayed on the following pages represent the raw data collected from both questionnaires and is presented in a compressed format for practicality. Please note this is directly important from its raw format and may contain errors etc.



Question

1	2	3	4	5	6	7	8	9	10	11	12	13		
Response	Response	Region	Other (Council - Other (please specify))	Years -	Response	Solar Phot Grou Wind	Response	Response	Qualification	Qualification	Received	Financed	Response	Cost
Environmental/Sustainab	Full time	Scotland	Brent London Borough Council	5	Always	3 1 4 2	Yes	Yes	Postgraduat	No	Yes	Yes	Yes	40,000-44,999
Planning Officer	Part time	South East	Basingstoke and Deane Borough Council	1	Concept / Feasibility	2 1 3 4	Yes	No	N/A	No	No	No	Not really	
Planning Officer	Part time	North West	Chorley Borough Council	18	Concept / Feasibility	2 4 1 3	Yes	Yes	N/A	No	Yes	No	Yes	20,000-24,999
Planning Officer	Full time	South West	Poole Borough	4	Concept / Feasibility	1 2 3 4	Yes	No	Postgraduat	No	No	No	Not really	5,000-9,999
Environmental/Sustainab	Full time	Northern Ireland	Dungannon and South Tyrone Borough Council	20	Always	2 3 1 4	Yes	No	N/A	No	No	No	Not really	<5,000
Planning Officer	Full time	North West	Wirral Metropolitan Borough Council	30+	Concept / Feasibility	3 2 1 4	Yes	Yes	N/A	No	Yes	Yes	Some idea	40,000-44,999
Planning Officer	Full time	South West	Christchurch Borough Council	4	Concept / Feasibility	2 3 1 4	No	No	Undergradu	No	Yes	Yes	Some idea	15,000-19,999
Planning Officer	Full time	Yorkshire & The Ht.	Hambleton District Council	8	Always	3 2 1 4	Yes	Yes	Postgraduat	No	Yes	Yes	Some idea	5,000-9,999
Planning Officer	Part time	South East	Swale Borough Council	4	Concept / Feasibility	1 2 3 4	Yes	Yes	N/A	Yes	Yes	Yes	Some idea	5,000-9,999
Environmental/Sustainab	Full time	Yorkshire & The Ht.	Selby District Council	30	Concept / Feasibility	3 2 1 4	No	Yes	N/A	No	Yes	Yes	Yes	<5,000
Planning Officer	Full time	West Midlands	North Warwickshire Borough Council	2	Detail Design	2 1 3 4	Yes	No	N/A	No	No	No	Some idea	5,000-9,999
Planning Officer	Full time	South West	Poole Borough	3	Concept / Feasibility	2 1 3 4	Yes	No	N/A	Yes	No	No	Some idea	15,000-19,999
Environmental/Sustainab	Full time	Scotland	East Renfrewshire Council	27	Concept / Feasibility	1 2 4 3	No	No	N/A	No	No	No	Not really	15,000-19,999
Planning Officer	Full time	East of England	Other...	3	Concept / Feasibility	3 1 2 4	Yes	No	N/A	No	No	No	Some idea	30,000-34,999
Planning Officer	Part time	West Midlands	Lichfield District Council	15	Always	1 2 3 4	Yes	No	N/A	No	Yes	Yes	Some idea	20,000-24,999
Planning Officer	Full time	West Midlands	North Warwickshire Borough Council	5	Detail Design	1 2 3 4	Yes	No	Postgraduat	Yes	No	No	Some idea	25,000-29,999
Environmental/Sustainab	Full time	South West	South Hams District Council	12	Concept / Feasibility	1 2 3 4								
Planning Officer	Full time	North West	Allerdale Borough Council	20	Detail Design	4 3 2 1	No	No	N/A	No	No	No	Some idea	5,000-9,999
Planning Officer	Full time	East Midlands	Allerdale Borough Council	20										
Environmental/Sustainab	Full time	South West	Forest of Dean District Council	3	Concept / Feasibility	2 3 4 1	Some of them	No	Postgraduat	Yes	Yes	No	Not really	5,000-9,999
Planning Officer	Part time	South East	Tonbridge and Malling Borough Council	11	Concept / Feasibility	3 2 1 4	Yes	No	N/A	No	Yes	Yes	Some idea	of cost
Planning Officer	Full time	South West	Forest of Dean District Council	22	Concept / Feasibility	3 1 2 4								
Planning Officer	Full time	South East	Tonbridge and Malling Borough Council	5	Concept / Feasibility	1 2 3 4	Some of them	No	Undergradu	Yes	Yes	Yes	Some idea	35,000-39,999
Planning Officer	Full time	South East	Surrey Heath Borough Council	4	Concept / Feasibility	1 3 4 2	Yes	No	Postgraduat	Yes	No	No	Yes	30,000-34,999
Planning Officer	Full time	Wales	Neath Port Talbot County Borough Council	20	Always	2 4 1 3								
Planning Officer	Full time	Yorkshire & The Ht.	Hambleton District Council	19	Concept / Feasibility	1 3 2 4	Yes	Yes	N/A	No	Yes	Yes	Some idea	35,000-39,999
Environmental/Sustainab	Full time	South East	Sevenoaks District Council	30	Detail Design	2 1 3 4	No	No	N/A	No	No	No	Not really	10,000-14,999
Planning Officer	Full time	South West	West Dorset District Council	15	Concept / Feasibility	2 1 3 4	Yes	Yes	N/A	No	Yes	Yes	Yes	
Environmental/Sustainab	Full time	East Midlands	Blaby District Council	4										
Planning Officer	Full time	South West	Other... xx	15										
Planning Officer	Full time	South West	Poole Borough	8	Concept / Feasibility	3 4 2 1	Yes	No	GCSE	No	Yes	Yes	Some idea	50,000-54,999
Planning Officer	Full time	Wales	Conwy County Borough Council	5	Concept / Feasibility	1 4 3 2	Some of them	Yes	Undergradu	No	Yes	No	Yes	10,000-14,999
Planning Officer	Full time	East of England	Cambridge City Council	5	As soon as it is establ	3 1 2 4	No	Yes	N/A	No	No	No	Not really	
Environmental/Sustainab	Full time	South West	Sedgemoor District Council	8	Detail Design	4 3 2 1	No	No	N/A	No	No	No	Some idea	15,000-19,999
Environmental/Sustainab	Full time	Northern Ireland	Dungannon and South Tyrone Borough Council	20	Always	2 3 1 4	Yes	No						
Planning Officer	Full time	South East	South Oxfordshire District Council	1	Concept / Feasibility	2 1 3 4	Some of them	No	Undergradu	No	No	No	Some idea	30,000-34,999
Planning Officer	Full time	South East	Mole Valley District Council	30	Concept / Feasibility	1 2 3 4	Yes	No	N/A	Contribution	Yes	Yes	Not really	20,000-24,999
Environmental/Sustainab	Full time	London	Merton London Borough Council	25	Concept / Feasibility	2 1 3 4								
Environmental/Sustainab	Full time	Other...	Flintshire County Council	30+	Concept / Feasibility	1 2 3 4	No	No	N/A	Contribution	No	No	Not really	
Planning Officer	Full time	East Midlands	Bassetlaw District Council	5	Concept / Feasibility	4 3 1 2	No	No	N/A	No	No	No	Not really	30,000-34,999
Environmental/Sustainab	Full time	East Midlands	Derbyshire Dales District Council	22										
Planning Officer	Full time	Wales	Derbighshire County Council	5	Concept / Feasibility	2 3 4 1	Yes	No	N/A	No	Yes	Yes	Not really	15,000-19,999
Planning Officer	Full time	East of England	Mid Suffolk District Council	4	Concept / Feasibility	3 4 1 2	Yes	No	Postgraduat	Yes	No	No	Some idea	5,000-9,999
Planning Officer	Full time	East of England	Forest Heath District Council	<1	Concept / Feasibility	3 1 2 4	Some of them	No	N/A	Yes	No	No	Not really	40,000-44,999
Planning Officer	Full time	East Midlands	Rushcliffe Borough Council	18	Concept / Feasibility	2 3 4 1	No	No	N/A	No	No	No	Not really	
Environmental/Sustainab	Full time	North West	Sefton Council	25	Concept / Feasibility	3 2 1 4	Yes	Yes						
Planning Officer	Full time	London	Lewisham London Borough Council	30	Concept / Feasibility	2 1 3 4	Yes	No	N/A	No	Yes	Yes	Some idea	10,000-14,999
Planning Officer	Full time	Scotland	Dundee City Council	30+	Concept / Feasibility	2 3 1 4	Yes	No	N/A	No	No	No	Not really	
Planning Officer	Full time	East Midlands	Oadby and Wigston Borough Council	1	Detail Design	2 1 3 4	Some of them	Yes	N/A	No	No	No	Not really	
Planning Officer	Part time	East Midlands	Oadby and Wigston Borough Council	1	Detail Design	2 1 3 4	Some of them	Yes	N/A	No	No	No	Not really	
Planning Officer	Full time	London	Lewisham London Borough Council	3	Always	1 2 4 3	Yes	No	Postgraduat	No	Yes	Yes	Some idea	15,000-19,999
Planning Officer	Full time	South East	South Oxfordshire District Council	2	Always	1 3 2 4	No	No	Postgraduat	Yes	No	No	Not really	
Planning Officer	Full time	East Midlands	Bassetlaw District Council	2	Concept / Feasibility	3 2 4 1	No	No	Postgraduat	No	Yes	Yes	Some idea	10,000-14,999
Planning Officer	Full time	West Midlands	Redditch Borough Council	2	Concept / Feasibility	3 2 1 4	Yes	No	Postgraduat	Yes	Yes	Yes	Some idea	30,000-34,999
Planning Officer	Full time	South West	North Wiltshire District Council	30+	Concept / Feasibility	2 3 1 4								
Environmental/Sustainab	Full time	East of England	South Cambridgeshire District Council	16	Concept / Feasibility	3 1 4 2	No	No	N/A	No	No	No	Not really	10,000-14,999
Environmental/Sustainab	Full time	Scotland	Orkney Islands Council	15	Detail Design	3 1 2 4	No	No	N/A	No	No	No	Not really	
Planning Officer	Full time	East Midlands	South Kesteven District Council	2	Detail Design	4 3 1 2	No	No	Postgraduat	Yes	No	No	Not really	50,000-54,999
Planning Officer	Full time	Wales	Derbighshire County Council	5	Always	3 1 2 4	No	No	GCSE	No	Yes	No	Not really	15,000-19,999

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	
Response	Response	Region - Other	(Council - Other (please specify))	Years -	Response	Solar Phot Grou Wind	Response	Response	Response	Qualificatio	Received ti	Financed b	Response	Cost
Planning Officer	Full time	East of England	Watford Borough Council	15	Always	1 3 2 4	No	Yes	N/A	No	No	No	Not really	
Environmental/Sustainab	Part time	North West	Rossendale Borough Council	30+										
Environmental/Sustainab	Full time	South West	West Devon Borough Council	10	Concept / Feasibility	1 2 3 4	Yes	No	Undergradu	Contribution	No	No	Not really	25,000-29,999
Planning Officer	Full time	Wales	Derbighshire County Council	6										
Environmental/Sustainab	Part time	South East	Woking Borough Council	25										
Planning Officer	Full time	East Midlands	North East Derbyshire District Council	20										
Planning Officer	Full time	Yorkshire & The H.	Hull City Council	28	Concept / Feasibility	2 1 3 4	Yes	No	N/A	No	No	No	Some idea	10,000-14,999
Planning Officer	Full time	South East	Eastbourne Borough Council	<1	Concept / Feasibility	3 2 1 4	No	No						
Environmental/Sustainab	Full time	Scotland	Aberdeenshire Council	30+	Concept / Feasibility	2 3 1 4	No	No	N/A	No	No	No	Not really	5,000-9,999
Planning Officer	Full time	West Midlands	Hambleton District Council	10	Concept / Feasibility	1 4 2 3	Yes	Yes	N/A	No	No	No	Not really	15,000-19,999
Planning Officer	Full time	Yorkshire & The H.	Hambleton District Council	3	Concept / Feasibility	2 3 1 4	Yes	No	N/A	No	Yes	Yes	Not really	5,000-9,999
Environmental/Sustainab	Full time	Scotland	Orkney Islands Council	4	Concept / Feasibility	2 3 1 4	No	No	N/A	No	No	No	Not really	40,000-44,999
Planning Officer	Full time	Wales	Conwy County Borough Council	22	Concept / Feasibility	1 4 3 2								
Environmental/Sustainab	Full time	Scotland	Perth and Kinross Council	30+										
Planning Officer	Full time	South East	Mid Sussex District Council	8	Concept / Feasibility	2 1 3 4	Yes	Yes	N/A	No	Yes	No	Some idea	20,000-24,999
Environmental/Sustainab	Full time	South East	Worthing Borough Council	30	Always	3 2 4 1	Some of them	No	N/A	Yes	Yes	Yes	Not really	5,000-9,999
Planning Officer	Full time	West Midlands	Redditch Borough Council	3	Concept / Feasibility	3 2 1 4	No	Yes	Postgradual	Yes	No	No	Some idea	of cost
Planning Officer	Full time	West Midlands	Redditch Borough Council	4	Concept / Feasibility	1 2 3 4	Yes	No	Postgradual	Yes	Yes	Yes	Some idea	of cost
Planning Officer	Full time	West Midlands	Redditch Borough Council	8	Concept / Feasibility	2 4 1 3	No	No	N/A	No	Yes	Yes	Not really	15,000-19,999
Environmental/Sustainab	Full time	West Midlands	Wychevon District Council	10	Always	3 2 4 1	Yes	No	N/A	No	No	No	Some idea	50,000-54,999
Planning Officer	Full time	South East	Portsmouth City Council	2	Concept / Feasibility	3 2 4 1	No	No	N/A	No	Yes	Yes	Some idea	20,000-24,999
Planning Officer	Full time	South West	West Wiltshire District Council	3	Always	2 1 3 4	Some of them	No	Postgradual	Yes	Yes	Yes	Not really	20,000-24,999
Planning Officer	Full time	South West	North Dorset District Council	5	Concept / Feasibility	1 4 2 3	No	No	Postgradual	Yes	Yes	Yes	Yes	30,000-34,999
Environmental/Sustainab	Full time	East Midlands	Bolsover District Council	1	Construction	1 3 2 4	Yes	No	Postgradual	No	Yes	Yes	Yes	
Planning Officer	Full time	South East	Tandridge District Council	5	Concept / Feasibility	1 3 2 4	Yes	Yes	Postgradual	Yes	Yes	Yes	Some idea	25,000-29,999
Planning Officer	Full time	East of England	Chelmsford Borough Council	5	Concept / Feasibility	1 3 2 4	Yes	Yes	N/A	No	Yes	Yes	Some idea	35,000-39,999
Planning Officer	Full time	Wales	Conwy County Borough Council	4	Concept / Feasibility	2 3 1 4	Yes	Yes	Postgradual	Yes	No	No	Some idea	25,000-29,999
Planning Officer	Full time	East of England	Rother District Council	1	Always	2 4 1 3	Some of them	No	Postgradual	No	Yes	Yes	Yes	
Planning Officer	Part time	South West	Forest of Dean District Council	15	Concept / Feasibility	3 2 1 4								
Environmental/Sustainab	Full time	East of England	Waveney District Council	29	Concept / Feasibility	1 2 4 3	No	No	A'level/NVQ	No	No	No	Some idea	20,000-24,999
Planning Officer	Full time	North East	Wansbeck District Council	2	Always	1 2 3 4	Some of them	Yes	Postgradual	Yes	Yes	Yes	Some idea	25,000-29,999

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# RESULTS FROM NATIONAL QUESTIONNAIRE

## – RAW DATA, Q8 WRITTEN COMMENTS

- Core Strategy policy CP26
  - UDP policy NR3.3
  - East of England Plan/RSS
  - 10% onsite renewables
  - I am aware of London-wide policies and of our borough's local policies.
  - I am aware of London-wide policies and of policies implemented in our borough.
  - The Torbay Local Plan is still in operation that encourages energy efficiency and renewable energy installation but does not set a mandatory requirement
  - Adopted Local Plan contains renewable energy targets - Policy GP4
  - Regional Planning Guidance – RSS
  - merton style
  - Local Plan policies 8/16 and 8/17
  - Policy IS2 of the LDF Core Strategy
  - Cambridge local plan (2006) Policy 8/16 East of England Plan (2008) Policy SS1
  - policy 8/16 of the Cambridge local Plan 2006
  - Lincoln has no policies in place to ensure contributions are met in new schemes. If you mean, local policies in other places, I am aware other council's have policies in place.
  - RSS Policy LPA Policies not yet adopted
  - Version of Merton Rule-10% renewable energy in properties over size 1000sqm
  - CP26 in Core Strategy requires decentralised renewable/low carbon energy on sites over 50 dwellings
  - LDF Core Strategy
  - No SPD as yet, it is being developed. Merton principles have been informally adopted for large housing and commercial development.
  - Version of the Merton Rules for large developments - but no SPG as yet
  - Use the London Plan
  - These are listed in our Local Plan /Core Strategy. Some are PD.
  - Structure Plan policy G2 -Design for Sustainability
  - NE RSS policy which requires 10% renewables in new major development
  - SPG 19, LDF, Air Quality Action Plan
  - Sustainable Resources Development Plan Document- SR1 and 2.
  - Local Planning Policies
  - 10% on-site renewable energy generation on schemes of 1,000 sqm or 10 dwellings or more.
  - ENV10 - 10 dwellings or more/non residential of 1000sq m or more require 10% energy from on site renewables
  - BE11 OF LOCAL PLAN
  - West Mids RSS policies
  - ENV10 - energy generation and conservation in the local plan
  - CP1 of the Tonbridge and Malling Borough Core Strategy 2007
  - CP1 of core strategy
  - Policy SE2 of current Surrey Structure Plan Upcoming Policy NRM11 of South East Plan Proposed policies in Surrey Heath LDF
  - RSS draft. Current adopted policy SU1 looks more broadly at sustainable construction
  - Simply to layout buildings which prevent the need for artificial sources of heating and lighting
  - Local Plan policies 8/6 & 8/17 Cambridge East AAP policies CE/24 & CE/25 Draft North West Cambridge AAR policy NW24
  - Schemes for more than 9 units should meet Code for sustainable homes, level 3.
  - SE2
  - General strategic policies supporting sustainability
  - ENG1 of the East of England Plan 2008 CS3 of the MSDC LDF Core Strat 2008
  - passive heating
  - London Plan policies on renewable energy
  - Conservation Proposal 8
  - Aware that some exist but not sure of detail
  - regional spatial strategy
  - Only generic policies requiring developers to have regard to sustainable construction. Policy G2 of Local Plan and DEV1 Structure Plan.
  - There are none currently
  - sustainable surface water drainage
  - Development plan policy allows for renewable energy, but policy does not require it. Although policy requires efficiency for 10 or more dwellings.
  - At this time, there are no such policies in Portsmouth. However we are addressing the issue through a core strategy policy.
  - Policy CSP14-Sustainable Construction in the recently adopted Tandridge District Core Strategy
  - Policy DC24 of our Core Strategy and Development Control Policies Document requires all new developments of 5 dwellings or more or 1000 sq m or more for non-residential developments to incorporate renewable energy technologies to offset 10% of the predicted carbon emissions
  - As local Development plan is out of date standard national policies are relied upon
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# RESULTS FROM NATIONAL QUESTIONNAIRE

## – RAW DATA, Q9 WRITTEN COMMENTS

- Climate Change and Pollution SPD
  - SPD
  - South Oxfordshire Design Guide 2008
  - Uttlesford Energy Efficiency and Renewable Energy SPD
  - Sustainable Design and Construction SPD
  - PAN on sustainable design and construction (targets are now out of date); PAN on green roofs.
  - PAN on sustainable design and construction (targets are out of date); PAN on green roofs.
  - Torbay Council Urban Design Guide
  - Pre-application advice. Please note, there is very little residential property in the City of London
  - New SPD to be produced in line with Core Strategy production
  - SPD on Sustainable Design and Construction
  - Cambridge City Council (May 2007) – Sustainable Design and Construction (SPD)
  - Sustainable Design and Construction SPD
  - Swindon Sustainable Building Design and Construction Supplementary Planning Document
  - There is a sustainable developer guide for Nottinghamshire advisory and supplementary guidance Re the renewable energy requirement
  - SPD on Climate Change and pollution
  - London Plan SPG - Sustainable Design and Construction
  - Provide Government circulars regarding sustainable developmen, renewable energy and the GPDO regarding renewable energy.
  - Developers Guide to Sustainability
  - ETSU guidance for wind turbines
  - Council's sustainable design policy guidelines
  - UDP (adopted 2006) Policy DQ2 see [www.sefton.gov.uk/udp](http://www.sefton.gov.uk/udp), chapter 16 - but only for non-residential development Design SPG Part 4, see [www.sefton.gov.uk/spg](http://www.sefton.gov.uk/spg) Renewable Energy Information Note, see [www.sefton.gov.uk/spg](http://www.sefton.gov.uk/spg) Sustainable design information note, soon to go on web
  - SPG19
  - Draft Sustainable Resources SPD
  - Designers Guide in draft
  - Sustainable Development SPD – Draft
  - Currently being formed
  - But we are working on this at present
  - But Sustainable Design SPD will be forthcoming to support Core Strategy/Development Management Policies.
  - Should adopt Feb09
  - Sustainable Design and Construction SPD
  - Planning for renewable energy technology and energy efficiency
  - SPG - Planning for Renewable Energy Technology and Energy Efficiency
  - SPD on Sustainable Construction
  - Under construction!
  - See detailed answer to Q8
  - <http://www.tandridge.gov.uk/Planning/PlanningApplications/Renewableenergy.htm>
  - Sustainable Development Supplementary Planning Document
  - proposed IPG wind energy
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Question	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17																				
	Age	Title	Yrs	1-5.	GSHP	PV	SHW	Wind	Resp	SHW	PV	GSHP	Wind	Qual	Ins	Eff	Main Cost	Ins	Eff	Main Cost	SHW	SHW	PV	PV	GSHP	GSHP	Wind	Wind	Resp	Resp	Resp	Resp			
45-49	Architect/A	30	2	No					N/A	3	2	1	4	N/A	1	3	4	2	1	4	3	2	not sure	not sure	£1000-4	£10,000-	not sure	not sure	not sure	not sure	not sure	Yes	Yes	No	Yes
30-34	Architect/A	5	2	No					N/A	2	3	1	4	N/A	1	2	3	4	4	3	2	1	£1000-4	£10,000-	£1000-4	£30,000-	£20,000	£40,000	£1000-4	£10,000	No	No	No	No	
25-29	Architect/A	8	4	No					No																										
30-34	Planner	10	3	No					No	2	3	1	4	N/A	4	1	3	2	4	2	3	1	not sure	not sure	not sure	not sure	not sure	not sure	not sure	not sure	Yes	Yes	No	Yes	
25-29	Planner	3	2	No					N/A	1	2	4	3	Under	2	1	4	3	4	3	1	2	<£500	£10,000-	<£500	£10,000-	not sure	not sure	not sure	not sure	not sure	Yes	Yes	No	Yes
45-49	Planner	21	1	No					N/A	1	3	4	2	N/A	2	3	4	1	4	3	2	1	£5000-£	£5000-£	not sure	not sure	not sure	not sure	not sure	not sure	Yes	No	No	Yes	
55-59	Developer	30	3	No					N/A	4	3	1	2	A'leve	2	3	1	4	4	3	1	2	£1000-4	£1000-4	not sure	not sure	not sure	not sure	not sure	not sure	No	Yes	No	No	
30-34	Planner	8	2	No					N/A																										
40-44	Planner	3	4	No					N/A	4	3	2	1	N/A	3	1	2	4	4	3	2	1	£1000-4	£20,000-	£1000-4	£30,000-	£10,000	£50,000	<£500	£1000-4999					
45-49	Developer	15	5	No					N/A	1	3	2	4	N/A	1	2	3	4	4	1	3	2	£1000-4	£30,000-	£5000-£	£40,000-	£5000-£	£50,000	£10,000	£40,000	No	Yes	No	No	
45-49	Developer	10	3	No					N/A	3	2	1	4	N/A	2	1	4	3	4	1	2	3	£5000-£	£40,000-	£5000-£	£40,000-	£5000-£	£30,000	£1000-4	£20,000	No	Yes	No	No	
35-39	Developer	8	3	No					N/A	2	1	3	4	N/A	2	3	4	1	4	3	1	2	not sure	not sure	not sure	not sure	not sure	not sure	not sure	not sure	not sure	No	Yes	No	No
40-44	Developer	10	5	No					N/A	1	3	2	4	Doctc	1	2	4	3	4	1	3	2	£1000-4	£10,000-	not sure	not sure	not sure	not sure	not sure	not sure	not sure	Yes	Yes	No	No
50-54	Developer	30	4	No					N/A	3	2	1	4	N/A	1	2	3	4	4	3	2	1	£1000-4	£10,000-	£1000-4	£10,000-	£10,000	£50,000	£1000-4	£10,000	No	Yes	No	No	
40-44	Developer	20	3		1				No	3	4	1	2	N/A	1	4	3	2	4	3	2	1	£1000-4	£40,000-	not sure	not sure	£5000-£	£50,000	£10,000	£50,000	Yes	No	No	No	
40-44	Architect/A	12	2	No					N/A	1	4	2	3	N/A	1	2	4	3	4	2	3	1	£1000-4	£20,000-	£1000-4	£30,000-	£10,000	£50,000	£5000-£	£40,000	Yes	Yes	No	Yes	
25-29	Architect/A	7	3	No					No	1	4	2	3	Postg	1	4	3	2	1	4	3	2	£500-£9	£1000-4	£1000-4	£5000-£	£5000-£	£10,000	£5000-£	£30,000	No	Yes	No	No	
30-34	Planner	3	3						No	2	1	4	3	N/A	1	3	2	4	1	4	3	2	£500-£9	£5000-£	£1000-4	£50,000-	£10,000	£20,000	£500-£9	£1000-4	Yes	Yes	Yes	Yes	
25-29	Planner	4	3	No					N/A	1	2	3	4	N/A	3	4	2	1	3	4	2	1	£500-£9	£20,000-	£500-£9	£20,000-	£1000-4	£30,000	£500-£9	£20,000	Yes	Yes	Yes	Yes	
30-34	Planner	9	3	No					N/A	2	1	4	3	N/A	3	1	2	4	2	4	3	1	£1000-4	£40,000-	£5000-£	£50,000-	£10,000	£50,000	£5000-£	£40,000	Yes	Yes	Yes	Yes	
40-44	Planner	20	3	No					N/A	1	2	3	4	Postg	2	4	3	1	3	4	2	1	£500-£9	£1000-4	£1000-4	£5000-£	not sure	not sure	not sure	not sure	Yes	Yes	No	Yes	
55-59	Planner	5	1	No					No	1	2	3	4	N/A	1	4	2	3	3	4	1	2	not sure	not sure	not sure	not sure	not sure	not sure	not sure	not sure	Yes	Yes	No	Yes	
18-24	Architect/A	<1	4	No					N/A																										
30-34	Architect/A	6	4	No					N/A	1	3	2	4	N/A	1	3	4	2	4	1	3	2	£500-£9	£5000-£	£500-£9	£5000-£	£5000-£	£50,000	not sure	not sure	No	Yes	Yes	No	
65 and >	Architect/A	10	1						No	1	2	3	4	N/A	3	2	1	4	1	2	3	4													
45-49	Architect/A	28	3	No					N/A																										
60-64	Architect/A	30	4	No					N/A	3	2	4	1	N/A	1	3	4	2	1	3	4	2	£1000-4	£5000-£	£1000-4	£10,000-	£10,000	£50,000	£1000-4	£10,000	No	Yes	No	No	

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## RESULTS FROM REGIONAL QUESTIONNAIRE – RAW DATA, Q8 WRITTEN COMMENTS

- Most unobtrusive and works simply
  - I believe this will provide a high level of energy for little visual impact...although the cost is considerably more than SHW
  - Least visually obtrusive
  - cost to gain
  - Most practical and cost effective (Note - we are in the process of getting quotations for SHW, and will definitely be installing them)
  - In my view most likely to produce a return on the installation investment and not obtrusive.
  - Visual Impact, and ability to restore property to original format in event of technology removal
  - Works at a reasonable cost. Wind turbines intrusive.
  - Least visual impact
  - Aesthetics, the practicality and maintenance of the installation. Without really looking into costs and the benefits of the alternative supply it is really a bit of a shot in the dark.
  - The one I know most about
  - Highly efficient and does not impact greatly on the appearance of the property
  - I believe GSHP's replace the most expensive cost to a home owner; heating via oil or gas. Wind turbines, in the right location, can supply energy for a wide variety of uses, although size does matter! Solar panels need additional power to peak water temperatures. I have no experience of Photovoltaic panels.
  - Easy to fit to existing house and relatively low cost.
  - quickest payback
  - This is where the most amount of energy in the household is used so to try and minimise this would be the starting point.
  - Because gas is very expensive as is heating water
  - Easy to install and probably not as expensive as the others, although solar panels may be cheaper but not as effective in the long term.
  - Most suitable for size and orientation of house and size and nature of curtilage, no noise issues, quickest return on investment
  - We have a young daughter and therefore a reasonably high hot water demand.
  - It works and has the best payback time. Our house doesn't have enough south facing roof to install ST and PV effectively. We couldn't for technical reasons install either a heat pump or a wind turbine.
  - Most efficient and practical to install.
  - Cost-effectiveness
-

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## RESULTS FROM REGIONAL QUESTIONNAIRE – RAW DATA, Q9 WRITTEN COMMENTS

- would not sit well on a housing estate
  - In reality I believe there will be a small amount of energy provided
  - most visually intrusive & probably least effective
  - as above
  - Difficult to retrofit for existing dwellings
  - Solar panels are unsightly, expensive to install and have a short working life. Also are difficult and expensive to maintain making them environmentally unfriendly.
  - They do not represent a truly sustainable energy. The disposal of solar panels once their (relatively short) useful life expires is complicated, costly, and many are not able to be recycled.
  - Noise, poor return on cost.
  - Unsightly --particularly in urban areas
  - The one i know least about and the ugliest!
  - Obtrusive
  - See above
  - Assumed not to be suitable fo sheltered town environment
  - longest payback
  - This ia a cumbersome installation and would not benefit single person but whole estates.
  - Wind turbines do not generate much power and are expensive and intrusive
  - Cost
  - Location of house not suitable, conservation area issue, unlikely to be efficient, noise issues
  - I am not convinced that wind turbines are a good source of renewable energy in a single house setting.
  - Structural and unproven.
  - Not practical to install. dependant on weather. generated electricity needs to be stored.
  - Unreliability and inadequacy of supply
-

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## **RESULTS FROM REGIONAL QUESTIONNAIRE – RAW DATA, Q10 WRITTEN COMMENTS**

- module of above course
- Sustainability issues have been around since I was studying for my GCSE's circa 1998. So whilst I have no formal qualification these issues have been covered in my Geography and planning degrees
- I have a PhD in physics.
- I have extensive experience of ecological and energy efficient construction

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## RESULTS FROM REGIONAL QUESTIONNAIRE – RAW DATA, Q13 WRITTEN COMMENTS

- what type/size of wind turbine?
  - Highly dependent on specification!
  - Depends on size of unit and other heat sources. As Solar panels cannot supply all energy needed in a home, the additional costs of installation and maintenance are extra over costs to running a home. In my view, better insulation is more cost efficient than on site energy provision.
  - I would expect the cost to vary depending on unit size and site conditions. Some ground conditions would not be suitable for Ground Source Heat pumps and also depths could vary.
-

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## RESULTS FROM REGIONAL QUESTIONNAIRE – RAW DATA, Q14 WRITTEN COMMENTS

- Viewed on web site
  - 10% of energy requirements from renewable sources to reduce carbon dioxide emissions & minimise potential impacts to environment or local amenity by careful site selection, choice of technologies & mitigation measures.
  - Installation of renewable energy technology on site and to serve wider area
  - My architect has told me but cant remember!
  - More or less!
  - Reduction in CO2 emissions to comply with EU directive.
  - To help reduce the carbon footpring of new developments as well as contributing towards the government targets.
  - provision of at least 10% of the develop's total predicted energy requirements on-ste from renewable energy sources. Renewable energy technology will be permitted provided they do not have an adverse impact on the environment or amenity.
  - 8/16 - 10% of energy used to be provided by renewable sources. 8/17 - well designed renewable energy schemes.
  - Reduce carbon emissions
  - Don't have a copy to hand
-

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## RESULTS FROM REGIONAL QUESTIONNAIRE – RAW DATA, Q15 WRITTEN COMMENTS

- Depends on size of development
  - Development above 1,000 square meters or 10 dwellings
  - The anomaly in the system is that PLANNERS impose conditions to do so when we are NOT required to do so under Building Regulations. Planners are not qualified to decide Building Regulation issues. Heating and insulation should purely be a matter for Building Regulations nationally and not adhoc planners wishes.
  - on schemes of 10 Or more units or over 1000m sq.
  - on sites of more than 10 units
  - Not 100% sure but i beleive CCC require 10% renewables which may vary from different authorities.
  - Is it 10%of the whole site?
  - On developments of 10 units or more, or larger than 1000sq m,
  - normal at least 10% needs to be demonstrated at planning stage
  - Only on major schemes. 10 or more dwellings and 1000 Sq m or larger.
  - For all Major developments or over 1000m2 or more than 10 dwellings
  - Required for major development and encouraged for all other development
  - If major application
  - Usually 10%
  - Major developments
-

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## **RESULTS FROM REGIONAL QUESTIONNAIRE**

### **– RAW DATA, Q16 WRITTEN COMMENTS**

- to cutting CO2 emissions by some 60% by about 2050, with real progress by 2020; to maintain the reliability of energy supplies; to promote competitive markets in the UK and beyond; to ensure that every home is adequately and affordably heated.
  - vaguely aware of need to make new buildings carbon neutral by 2020
  - Reduction of UK carbon emissions
-

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## **RESULTS FROM REGIONAL QUESTIONNAIRE – RAW DATA, Q17 WRITTEN COMMENTS**

- as viewed on web site
- Sustainable Design & Construction SPD June 2007 Cambridge Climate Change Strategy & Action Plan
- Sustainable Design & Construction SPD
- Sustainability Design & Construction Guide 2007
- We have an Sustainable Construction SPD, that spells out to public and developers as to what is expected of them in new development.
- SPD on sustainable design and construction
- Sustainable Design and Construction SPD
- Sustainable Design and Construction SPD

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# RESULTS FROM REGIONAL QUESTIONNAIRE

## – RAW DATA, Q18 WRITTEN COMMENTS

- Should be cheaper
  - very important, should be utilised in every development
  - essential to achieve in new sites particularly on the growth sites.
  - Should be encouraged as much as possible
  - Happy to use it if it is cost effective for installation, and maintenance. In my view, because it is currently expensive and because we have to have a basic normal energy supply, current alternatives are not cost effective. Surely, it would be better to follow the European lead to provide cost effective renewable energy in bulk and not rely on coal fired power stations. The problem in the UK is that politicians are tickling the surface but placing the burden on builders of new homes and not tackling energy waste in offices, i.e. air conditioning, lights on all night etc., particularly in government buildings. Until that is tackled, they will not have my support for the minor role we as house builders play.
  - It could be very good, but the government should provide grants to reduce the cost dramatically. If it was cheap to install but saved money in running costs then everyone would be interested in doing it.
  - We are still at a stage of development where the installation costs are far too high to be used commercially by developers. In my experience over the past 10 years the majority of buyers still do not care enough to pay beyond standard value for renewable options. Until installation/hardware costs are reduced it will be a continuing battle to implement change. The annual cost savings are minute in relation to capital cost and it is at present only buyers that can afford to care about the environment that are buying eco-homes.
  - The technology is still quite new and developing all the time however I believe that it will become more prominent in development. As well as achieving government targets the general public will prefer to purchase a greener property and in the current and future market place developers will be looking for that something different to promote their product. Saying this it has also got to be feasible with regards to design, installation and maintenance costs to be attractive to both the developer and end user which I am sure it will as the market place for renewables becomes more competitive.
  - I think it is something that we need to learn more about and if it can be fairly cost effective it will be beneficial to both the developer and home owner.
  - More needs to be done by the government and other regulatory bodies such as NHBC to educate people as to the benefits of renewable energy and new technology aimed at reducing carbon emissions. Grants should be available to developers and certain other individuals to encourage the use of new technology in residential developments.
  - Currently the installation costs are too high and I question whether, when looked on as a whole, they offer any reduction in emissions, especially in smaller units. A good example is a one bed flat; to supply heating and hot water you require one condensing combination boiler. For use with Policy 8/16 you need a boiler, a cylinder, expansion vessel, control valves, insulated pipe to roof and the solar panels themselves. You would need to use a lot of warm water to offset the energy from manufacture, delivery and maintenance.
  - Solar panels for domestic hot water seem to be the most cost effective solution at present. However, GSHP's seem to be a better long term solution and have less visual impact
  - For it, but not enough support (particularly financial) from local and national authorities for residents
  - I think that these technologies are still in their infancy and as time and more R and D goes into them they will become better understood and efficient.
  - It is very easy to deal with this by a planning condition, although thought needs to go to the design and appearance of the technology at an early stage. In addition, officers do not always have the practical experience of assessing viability of renewable technologies. It can often be confusing bringing together different initiatives eg building for life, code for sustainable homes, Breeam, Eco homes, life time homes etc.
  - Good idea, but the benefits will not be known for a few years yet as to whether the carbon footprint has been reduced, and thus how effective they really are. Maintenance is also a big issue. If they are not maintained, how would we know if they are working to their optimum level? Downside is cost in the short term.
  - Absolutely essential on new development if we are to deal with the consequences of climate change.
  - Desirable. Must be appropriate to site.
  - Good in principle. Energy efficient building fabric needs to be first consideration, supported by renewables, however this is not always practical to achieve on site.
  - It is not a substitute for sensible energy-saving measures in construction, where permanent, cost-effective energy and carbon reduction is easily possible
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## APPENDIX D

The questionnaires shown on the following pages were distributed as part of the pilot study. They have been included for reference only and did **not** form part of the national or regional studies.

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# NATIONAL - DRAFT QUESTIONNAIRE

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## 1.0 General

- 1.1 Which Borough Council are you employed by:
- 1.2 What is your job role within the Council: Planning Officer  Environmental Health Officer
- 1.3 Full time  Part time
- 1.4 How many years have you been working in your profession:

## 2.0 Legislation

- 2.1 List the local policies in place to ensure renewable energy contributions are met in new residential developments, giving a brief description:

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- 2.2 List any planning supplement guidance provided by your Borough Council for designers and the general public and what it sets out to achieve:

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## 3.0 Training

- 3.1 What qualifications have you obtained relating to renewable technologies:  
(include any courses you feel are relevant)

*(it is important to state year qualifications were **obtained** and whether your Borough Council **financed** your studies)*

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Qualification	Started	Completed
Finance contribution		

**3.2** What training have you received to increase your awareness and understanding of renewable technologies: **(include any CPD seminars attended)**

*(it is important to state when you received the training and whether your Borough Council **financed** your further learning)*

Training	Received
Finance contribution	

**4.0 Design**

**4.1** At what point should renewable technologies form part of the design: **(tick one)**

- Concept / Feasibility
- Detail Design
- Construction

- 
- \_\_\_ As soon as it is established that the renewable policies 'kicks in'
- \_\_\_ Always

## 5.0 Cost

5.1 Are you aware of the cost implications involved with implementing a renewable technology to a residential development: Yes  No

5.2 What would you estimate the cost implications involved with the following case study:

***“10No. 3bed semi detached townhouses 2 ½ storeys are to be supplied and fitted with 4m<sup>2</sup> of Solar Hot Water Panels and upgraded gas fired condensing combination boiler, cylinder ”***

Total supply and installation cost £ \_\_\_\_\_

## Finally...

What is your view on the use of renewable technology in residential developments:

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If further information is required and you are happy to assist in a telephone interview please leave you name and number below (**your details are dealt with in the strictest of confidence**)

Name: \_\_\_\_\_

Number: \_\_\_\_\_

**Thank you for your help!**

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# REGIONAL - DRAFT QUESTIONNAIRE

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## 1.0 General

1.5 Age:

1.6 Occupation:

1.7 How many years have you been working in your profession: 

1	2	3	4	5
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Green                      Not so green

1.8 On a scale of 1-5 how much of an environmentalist (“greenie”) would you say you are:

1.9 Do you have any of the following renewable technologies installed in your home:

\_\_\_ Ground Source Heat Pump

\_\_\_ Photovoltaic Panels

\_\_\_ Solar Hot Water

\_\_\_ Wind turbine

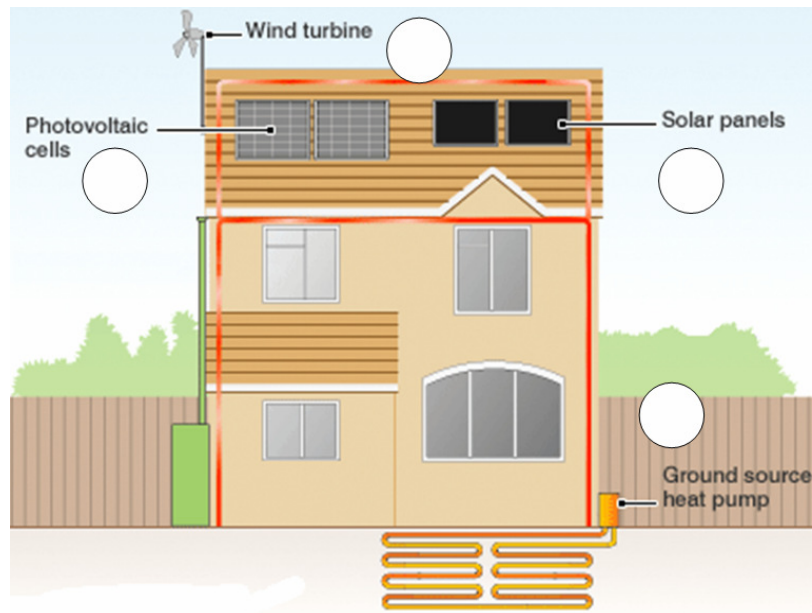
\_\_\_ Other - Please state

1.10 Was this already installed when you moved in or did you install it:

Already installed  We installed it

## 2.0 Design

2.1 If the following technologies were to be installed in your property, which order of preference would you choose? (Most preferred = 1 Least preferred = 4)



Source: BBC, 2008

Why did you select number 1:

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Why did you select number 4:

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**2.2** Have you received any training on the implementation of renewable technologies Yes  No

If **yes** please list your qualifications or training:

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**2.3** If you were to develop a site, which of these would you place as the most important.

Please number. (Most important =1 Least important = 4)

- 
- \_\_\_ Installation Costs
  - \_\_\_ Effect it has on design concept
  - \_\_\_ Maintenance
  - \_\_\_ Cost savings

**2.4** If you were to buy a new house, which of these would you consider as most important.

Please number (Most important =1 Least important = 4)

- \_\_\_ Installation Costs
- \_\_\_ Effect it has on design concept
- \_\_\_ Maintenance
- \_\_\_ Cost savings

### 3.0 Maintenance

What would you estimate the annual maintenance costs on a single dwelling to be for the following technologies: (**assume a typical semi-detached 3 Bed house**)

- Solar Hot Water Panels                      £
- Photovoltaic Panels                              £
- Ground Source Heat Pump                      £
- Wind turbine    £
- \_\_\_ I don't know

**3.1** How do you think the following would compare to traditional maintenance costs:

	(tick)	More	Same	Less
Solar Hot Water Panels				
Photovoltaic Panels				
Ground Source Heat Pump				
Wind turbine				

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## 3.0 Cost

3.2 What are the approximate supply & installation costs for the following technologies:

	for: <b>1 dwelling</b>	<b>10 dwellings</b>
Solar Hot Water Panels	£	£
Photovoltaic Panels	£	£
Ground Source Heat Pump	£	£
Wind turbine	£	£

## 4.0 Legislation

4.1 Are you aware of what policy 8/16 & 8/17 of the Cambridge Local Plan aim to achieve: Yes  No

If **yes** please describe:

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4.2 Are you aware of whether developers have to provide renewable technology on site: Yes  No

If **yes** please explain in which situation:

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4.3 Give a brief description of the Energy White Papers objectives:

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4.4 Give a brief description of what the Supplementary Planning Document provided by Cambridge City Council aims to achieve:

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## Finally...

What is your view on the use of renewable technology in residential developments:

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If further information is required and you are happy to assist in a telephone interview please leave you name and number below (**your details are dealt with in the strictest of confidence**)

Name: \_\_\_\_\_

Number: \_\_\_\_\_

**Thank you for your help!**

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## APPENDIX E

The CD attached to the inside back cover, contains the 'assessing the implementation of Renewable Technologies in the Residential Sector of the Built Environment on a Local Scale in the United Kingdom' thesis in Adobe Acrobat format. Download the latest version of Adobe Acrobat Reader 7.0 from the CD and then open the file "MScThesis2009.pdf"

For copies or more details contact:

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### **Web Sites**

Centre for Architecture and the Built Environment (CABE): [www.cabe.org.uk](http://www.cabe.org.uk)

Building Research Establishment (BRE): [www.bre.co.uk](http://www.bre.co.uk)

Office of Deputy Prime Minister (ODPM): [www.odpm.gov.uk](http://www.odpm.gov.uk)

Cambridge County Council (CCC): <http://www.cambridge.gov.uk>

Policy Planning Statement 22: <http://www.communities.gov.uk>

A Companion Guide to PPS22: <http://www.communities.gov.uk>

Energy White Paper: <http://www.berr.gov.uk/energy/whitepaper/>

Regional Spatial Strategy: <http://goe-consult.limehouse.co.uk>

Kyoto Protocol: <http://unfccc.int/resource/docs/convkp/kpeng.pdf>

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Cambridge Sustainable Design & Construction SPD:

<http://www.cambridge.gov.uk>

East Regional Spatial Strategy: <http://www.eera.gov.uk>

London Renewables Toolkit:

[www.london.gov.uk/mayor/environment/energy/london\\_renew.jsp](http://www.london.gov.uk/mayor/environment/energy/london_renew.jsp)

UNFCCC Handbook:

<http://unfccc.int/resource/docs/publications/handbook.pdf>

Strategic Environmental Assessment

<http://www.sea-info.net/>

Environment Report

<http://www.environmentreport.org/>

Local development frameworks guidance on Sustainability Appraisal

<http://www.pas.gov.uk>

Code for Sustainable Homes

<http://www.planningportal.gov.uk/england/professionals/en/1115314116927.html>

Survey Monkey questionnaires

<http://www.surveymonkey.com>

Contact email addresses for Councils in the UK:

[http://www.direct.gov.uk/en/DI1/Directories/Localcouncils/AToZOfLocalCouncils/DG\\_A-Z\\_LG](http://www.direct.gov.uk/en/DI1/Directories/Localcouncils/AToZOfLocalCouncils/DG_A-Z_LG)

Contact email addresses for RIBA registered practices:

<http://www.architecture.com/UseAnArchitect/FindAnArchitect/FindAnArchitect.aspx>

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Contact email addresses for CIAT registered practices:

[http://www.ciat.org.uk/en/members/find\\_a\\_practice/](http://www.ciat.org.uk/en/members/find_a_practice/)

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