The role of local government to support community carbon reduction: an analysis of capacity to act and climate change governance

Thesis submitted in fulfilment of the degree of **Doctor of Philosophy** to the

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by

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13 October 2011

Declaration

I certify that the thesis entitled -

The role of local government to support community carbon reduction: an analysis of capacity to act and climate change governance

Submitted for the degree of

Doctor of Philosophy

does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge it does not contain materials previously published or written by another person, except where due reference is made in the text.

Signed…….

Cathryn M Hamilton

Dated: 13 October 2011

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Glossary of Measures, Terms and Abbreviations

Measures

CO_2-e	Carbon dioxide equivalent
Kg	kilogram
kW, MW, GW	kiloWatt (1,000 Watts), megaWatt (1,000,000 Watts), gigaWatt (1,000,000,000 Watts)
kWh, GWh	kiloWatt-hour (1,000 Watt-hours), gigaWatt-hour (1,000,000,000 Watt-hours)
MJ, GJ, PJ	megaJoule (1,000,000 Joules), gigaJoule (1,000,000,000 Joules), petaJoule (1,000,000,000,000 Joules)
m/s	metres per second
ppm	parts per million
t	tonne
Mt	megatonne (1,000,000 tonne)
W/sq m	Watts per square metre
yr	year
%	per cent

Conversion Factors Used

1 GJ = 277.8 kWh

1 kWh = 3.6 MJ

Terms

Climate change

A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods

Greenhouse gases

Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation

Glossary (continued)

Terms (continued)

Global warming potential
: An index representing the combined effect of the differing times greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation

Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
AGO	Australian Greenhouse Office
ARC	Australian Research Council
AU	Australia
CCP	Cities for Climate Protection (a program of ICLEI)
CNC	Carbon Neutral Communities
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia's national science agency)
DE	Germany
DP	Development Plan
EU	European Union
GHG	Greenhouse Gases
GWP	Global Warming Potential
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
LDF	Local Development Framework
LG	Local Government
MEPS	Mandatory Energy Performance Standards
NAEEEP	National Appliance and Equipment Energy Efficiency Program
NFEE	National Framework for Energy Efficiency

Glossary (continued)

Abbreviations (continued)

REC	Renewable Energy Credit
SA	South Australia (a State of Australia)
SAP	Standard Assessment Procedure (a UK home energy rating scheme)
SPV	Solar Photo-voltaic
SWH	Solar Water Heater or Solar Water Heating
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environment Program
US	United States of America
Vic	Victoria (a State of Australia)

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Publications

Parts of this thesis have been accepted for publication in the following peer reviewed book chapter:

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Hamilton, C 2009, 'The power of rooftops in a carbon neutral future', RICS Oceania Best Research Paper 2009, Royal Institution of Chartered Surveyors.

Hamilton, C, Kellett, J & Moore, T 2008, 'Resourcing a low carbon future', in *Proceedings of the 3rd International Solar Energy Society Conference – Asia Pacific Region, Incorporating the 46th ANZSES Conference*, Australia & New Zealand Solar Energy Society, Sydney.

Hamilton, C, Kellett, J & Yuan, X 2008, 'Carbon profiling: An analysis of methods for establishing the local emissions baseline', in *Proceedings of the 3rd International Solar Cities Congress*, Adelaide, pp. 331-340.

Kellett, J & Hamilton, C 2009, 'Carbon Reduction at the Local Level', *International Journal of Social, Economic, Cultural and Environmental Sustainability*, vol. 5 no. 1, pp. 115-126.

Kellett, J & Hamilton, C 2009, 'Decarbonising the local economy: Planning for renewable energy in urban areas' in *Proceedings of the State of Australian Cities* (SOAC 2009), Perth, Western Australia.

And in the following working papers and reports:

Hamilton, C 2007, 'Carbon assessment methods and methodologies for carbon assessment at LGA scale'. Working Paper for the Carbon Neutral Communities – Making the Transition Project. RMIT University and University of South Australia.

Hamilton, C 2008, 'Renewable energy resource assessment methods and methodologies for assessment at LGA scale – a study of the City of Playford', Working Paper for the Carbon Neutral Communities – Making the Transition Project, RMIT University and University of South Australia.

Hamilton, C 2009, 'Energy efficiency potential for Playford LGA', Working Paper for the Carbon Neutral Communities – Making the Transition Project, RMIT University and University of South Australia.

Kellett, J & Hamilton, C 2009, 'Energy & Carbon Estimates for the City of Onkaparinga', School of Natural and Built Environments, University of South Australia.

Abstract

The absence of coordinated action and leadership from the international community to establish agreed targets for carbon reduction, together with a lack of policy direction from the Australia government, provides the opportunity for local government (LG) in Australia to take the lead in mitigating climate change across its community. While LG has been taking action through the International Council for Local Environmental Initiatives (ICLEI) program Cities for Climate Protection (CCP) since 1997, according to Bulkeley and Betsill (2003) the focus of LG action in Australia has been on LG's own operations rather than on programs that directly support its community to reduce carbon emissions. This research seeks answers to questions about the mechanisms that LG uses to support its community to reduce carbon emissions and its capacity to take action on energy systems that contribute to carbon emissions at the local level. It analyses the ideal action that LG thinks it should be taking to address climate change, seeks to understand the barriers and opportunities that it faces in taking this ideal action and, finally, explores the concept of community governance of climate change and whether increasing community involvement in decision-making enables LG to implement more innovative local action for carbon reduction.

Qualitative research methods, in the main, are used to collect and analyse data from LG cases in two Phases. In the first Phase, data is collected through a postal survey of metropolitan LG in two states of Australia (18 LG in South Australia - 90% response rate; 19 LG in Victoria - 70% response rate). Analysis shows that, while LG generally acknowledges the importance of climate change, there is variation across LG in its commitment to take action to address climate change, and to assist households to mitigate climate change at the local level. The focus of LG tends toward corporate activities which is consistent with Bulkeley and Betsill's findings, however the purpose for this corporate focus is described as setting an example to its community. While planning policy to address climate change is mentioned, the political willingness of higher levels of government is cited as a major barrier. Indeed for Victorian LG it is as significant a barrier as the lack of funding.

In the second Phase, a multiple case study approach is adopted to compare data from eight LG cases across three countries. Three LG are from Australia (from the Phase 1 cohort), three from the UK and two from Germany. In addition to collecting data using the same set

of questions used in Phase 1, interviews with LG staff in each case enable a deeper exploration of the role of LG to assist households to reduce carbon emissions. Data is presented about best practice being demonstrated by LG peers and leadership in reducing carbon emissions being demonstrated by elected members, staff and citizens. Using multiple methods of qualitative analysis, the findings show that LG demonstrates a willingness to adopt a leadership role as a 'trusted entity' which pursues innovative approaches on behalf of its community to mitigate climate change, to overcome barriers and create opportunities for local action. This study identifies that gathering and disseminating information about local energy use, carbon emissions and potential renewable energy resources is important to local action to mitigate climate change. It also identifies examples of LG adopting new planning policy mechanisms including renewable energy resource plans, energy efficiency standards for passive houses, minimum targets for renewable energy for new developments and integrating public transport into new developments from the outset. This research identifies that, while it may have limited capacity to act on systems and is only one actor, LG builds its capacity to act with support from and participation of its community in decision-making about carbon reduction initiatives and then proceeds to influence industry sectors and higher levels of government. These findings are relevant to all levels of government which seek carbon reduction at the community level, both in Australia and elsewhere.

Chapter 1. Introduction

> We use climate protection as the overall umbrella for many environment and all the energy issues. So the target is to cut down CO_2 emissions by 40% until 2030. That is of course the challenge.
>
> (DE09001 Participant 1)

In 1992, the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro adopted *Agenda 21*, a comprehensive plan of action to be taken globally, nationally and locally to minimise human impacts on the environment and to ensure intra- and inter-generational equity (United Nations 1997). The responsibility of each community to protect natural resources is a fundamental principle of international agreements including the *Ramsar Convention* (1971), the *London Convention* (1972), the *Montreal Protocol* (1989), the *Kyoto Protocol* (1997) and of international plans such as *Agenda 21* (United Nations 1997) and the more recent *Millennium Development Goals* adopted in 2005 (United Nations 2008). The *Millennium Development Goals* include indicators by which environmental sustainability is to be measured. There are measures to monitor the reversal of loss of environmental resources such as proportions of land covered with forest and ratios of land protected for biodiversity compared to that unprotected as well as measures to monitor pressures such as the use of chlorofluorocarbons (CFCs), energy use per dollar of gross domestic product ($GDP) and carbon dioxide (CO_2) emissions per capita (United Nations 2008). The latter relates to greenhouse gases (GHGs) which have been linked to the concepts of global warming and climate change. The Intergovernmental Panel on Climate Change (IPCC) reported that the observed increase in global average temperatures since the mid-20th century (global warming) is very likely due to the observed increase in anthropogenic GHG concentrations and that discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns (IPCC 2007). The research

of Rosenzweig et al (2008), published in the journal *Nature*, endorsed the view of the IPCC, reporting a discernible anthropogenic influence in changes in natural systems, particularly in Asia and North America, and marginally in Europe.

Projections of climate change have been made by the IPCC, based on modelling scenarios for the future that provide probabilities of: increases in temperature; changes in rainfall patterns; increases in extreme weather events, such as storms and heat waves; and resultant increases in bushfire threats in some areas (IPCC 2001; IPCC 2007). In Australia, the revelations from the international scientific community about the impacts of climate change and its probable link to anthropogenic sources of GHG emissions have been reinforced by publications from notable Australian scientists. For instance, Tim Flannery's *The Weather Makers* (Flannery 2005) and Ian Lowe's *The Big Fix* (Lowe 2005) have attempted to explain the evidence for climate change, the need for urgent action to reduce GHG emissions, and the type of action which should be taken.

The predictions of adverse impacts of climate change on natural ecosystems have led non-government organisations (NGOs) with an environmental conservation focus to call for urgent action to address climate change (e.g. McKibben and Step-It-Up-Team 2007; Greenpeace & EREC 2007). NGOs with a social focus have also engaged with the climate change issue to ensure that action takes place equitably (e.g. ACOSS, Choice & ACF 2008). Access and equity are important principles of the *Millennium Development Goals* which acknowledge the need to provide adequate supplies of potable water for communities and appropriate standards for housing (United Nations 2008). Recent studies, including those of the IPCC (2007) and those presented at the World Bank's *5th Urban Research Symposium* in June 2009 (e.g. Bartlett et al 2009; Yuen & Kong 2009) have highlighted the environmental, economic and social aspects of climate change, expressing concern about the impacts on vulnerable communities and calling for urgent action from policy makers to address the causes of climate change whilst also preparing communities for a changing climate. In an article in *Nature*, authors Moss et al (2010) - from five different countries - together state that:

> The implications of climate change for the environment and society will depend not only on the response of the Earth system to changes in radiative forcings, but also on how humankind responds through changes in technology, economies, lifestyle and policy (Moss et al 2010).

Climate change is variously described as a battle (Droege 2006), a hot topic (Walker and King 2008), an inconvenient truth (Gore 2006), an irrefutable reality (Girardet 2008), and a

problem unlike any other (Giddens 2009). Climate change has also been described as an issue to be tackled (Government of South Australia 2007a; Vincent 2008). Since the United Nations Framework Convention on Climate Change (UNFCCC) was established in the 1990's to lead a global response to climate change, a rational, scientific (environmental) approach to developing inventories and setting targets for reducing the emissions of GHGs from anthropological activities to the atmosphere has been adopted (UNFCCC 2004). This approach, frequently referred to as climate change mitigation, continues to be a challenge for communities in developed countries, including Australia, which rely heavily on fossil fuel sources of energy both directly (e.g. petroleum products and natural gas) and indirectly, through the consumption of electricity which is produced from burning coal or, to a lesser extent, oil and gas (Pears 2007).

In this Chapter the context for community action on climate change is established, beginning with a discussion of GHGs and climate change and the key focus of climate change mitigation which is reducing emissions of GHGs. The Chapter proceeds to a justification for LG to engage with the continued battle to mitigate climate change and for conducting research on the role of LG to support community carbon reduction. The researcher is located in Australia and has been financially supported by an Australian Research Council Linkage Project with partners from LG in South Australia and Victoria as well as Victorian State government and community groups. Hence the research undertaken has focused mainly on these jurisdictions. However, as will become apparent in this thesis, the actions of Australian LG is being compared to actions by LG in other countries and the research extends to include LG in other countries.

1.1 Definitions of key terms

Throughout this thesis, some key terms associated with climate change and carbon reduction are used. In this section, some background information about these key terms is provided. Definitions of other terms are listed in the Glossary.

1.1.1 What are greenhouse gases?

The greenhouse effect is a natural effect and has been described as one of the most important physical processes operating in the climate system (Zillman, McKibbin & Kellow 2005) as it maintains the earth's temperature at the surface at a level suitable for human existence. The effect is due to radiation from the earth's surface being absorbed by trace gases in the atmosphere and re-emitted. These trace gases known as GHGs consist of

water vapour, carbon dioxide (CO_2), methane, ozone, nitrous oxide, perfluorocarbons, hydrofluorocarbons and sulphur hexafluoride. It is known that GHGs are emitted directly to the atmosphere during the combustion of fuels as well as being generated from agricultural activities (e.g. grazing animals produce methane), landfill activities (e.g. landfill gases contain methane), wastewater treatment processes (e.g. methane is produced during wastewater treatment), some industrial processes, and land use changes where land is cleared of natural vegetation (AGO 2006). The GHGs differ in their ability to re-emit radiation and in the time that they remain in the atmosphere, which contribute to differences in their Global Warming Potential (GWP) (UNFCCC 2007). When considering a 100 year time horizon, methane has 21 times and nitrous oxide has 310 times the GWP of CO_2. To enable a standard way of measuring the emissions of GHGs, all GHGs are converted to an equivalent amount of CO_2 based on their GWP. Hence reports of GHGs emitted are sometimes expressed in terms of the equivalent CO_2 emission (CO_2-e) and are reported as kilograms (kg) or tonnes (t) of CO_2-e.

1.1.2 Why do we use the term 'carbon' instead of GHG emissions?

The use of the term 'carbon' relates to the natural and human influenced carbon cycle as explained by the IPCC (2001). As the basis of reporting emissions is linked to CO_2 in the atmosphere, the terms 'carbon emissions' and 'carbon reduction' are used in this study to refer to the GHGs emitted and reduction of GHGs emitted, respectively. This practice also gives rise to terms such as the 'carbon economy', 'carbon accounting', 'carbon pollution', 'carbon neutral' and 'low carbon'. While it is acknowledged that GHGs are wider than just CO_2 emissions, from here-on, where the term carbon is used, it is interchangeable with the term greenhouse gases, unless otherwise stated.

1.1.3 What is a community?

In the current research, the use of the term community is consistent in scale and scope with that used by the ICLEI CCP program which established a mechanism for LG to plan for and monitor progress of carbon reduction at both corporate (LG operations) and community levels. At that scale, a community consists of the residential, commercial and industrial sectors that operate within the boundary of each LG authority.

1.1.4 What is local government?

Local government (LG) is the level of government that makes decisions at the local spatial area level and is afforded authority by central government or state government through

legislation that defines boundaries and establishes the roles and responsibilities of each LG authority. LG focuses on 'community level management and decision-making that is undertaken by, with, or on behalf of a community, by a group of community stakeholders' (Totikidis, Armstrong & Francis 2005). In the current research, LG is the organisation that makes decisions across a specific spatial area and is led by a group of community stakeholders (usually a council).

1.1.5 What is community carbon reduction?

In this research, the term community carbon reduction is consistent with the ICLEI CCP program use of community which includes the residential, commercial and industrial sectors that operate within the boundary of each LG authority. As will become evident in this research thesis, the main focus is on the residential sector within each community.

1.1.6 What is community governance?

In the current research, the term 'community governance' has been adopted to be consistent with the decision-making role of LG defined by Totikidis et al. (2005).

1.2 The science supporting climate change

The level of scientific understanding of the contribution that carbon emissions make to climate change has continued to deepen in recent reports (Whetton et al 2005; Suppiah et al 2006; Steffen 2006; IPCC 2007, Hansen et al 2009). Air movement and weather patterns move carbon emissions from their source and in essence cause widespread change in the composition of atmospheric gases – a global effect. Where concentrations of carbon emissions increase, the amount of re-emitted radiation is higher and the temperature at the surface of the earth is higher. Over the last century the temperature of the earth's surface has been estimated to have increased by 0.6 ºC (IPCC 2007). The IPCC publications are readily available (IPCC 2001; IPCC 2007) and have been used to develop projections of climate change impacts for developed countries including Australia (McInnes et al 2003; Whetton et al 2005; Suppiah et al 2006; Steffen et al 2006). In the southern part of Australia, where this researcher is based, Australia's peak research institution, the CSIRO, predicts that climate change impacts, particularly drought and increased temperatures, will be significant (Steffen et al 2006). Extreme weather events are reported in the popular media and calls for action to address climate change have progressively gained momentum along with increased understanding of the long lag time between cause and effect. The

IPCC science modelling indicates that past emissions will continue to persist in the atmosphere causing between 2 and 6 degrees Celsius (ºC) of temperature change on land surfaces by the middle of the 21st century unless significant mitigation takes place (IPCC 2007). The higher temperature increases, however, have been challenged by scientists Nel and Cooper (2009) who consider that fossil fuels will be depleted prior to the temperatures increasing 2 ºC.

In March 2009, James Hansen, a noted climate modeller, presented data on climate forcing caused by carbon emissions to the Climate Change Congress in Copenhagen, Denmark, concluding with a recommendation that the atmospheric CO_2 levels should be stabilised at 350 parts per million (ppm) to restore the planet's energy balance rather than the previous target of 450 ppm (Hansen et al 2009). Hansen advised that, at the time of his presentation, CO_2 levels were already in excess of 350 ppm and that the trend was upward rather than downward. Such advice adds to the pressure on decision-makers to take action to reverse the trends in atmospheric CO_2 levels. While it is not proposed to undertake a scientific study of carbon emissions or seek to verify reports of climate change impacts at any level, the current research is based on a fundamental assumption that the scientific view of human induced climate change is a driver for governments to act in the public interest and give priority to actions to reduce the impact of climate change including mitigating the anthropogenic causes of climate change, the carbon emissions associated with human activity.

1.3 Pressure on high energy consumers

All countries have a responsibility to monitor and report on their progress in achieving the *Millennium Development Goals* including indicators for energy use and CO_2 emissions per capita. The United Nations consider that provision of energy is essential to economic and social development and improved quality of life (United Nations 1997). Therefore the sustainable production, distribution and use of energy are crucial to the sustainable development of communities. The term 'sustainability' incorporates the concept of sustainable development which was defined by Gro Harlem Brundtland as:

> Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs (Brundtland 1987).

Assuming that sustainable development is a state to be achieved, three aspects must be considered and assessed when determining whether an activity, project or development is sustainable. These are its effects on the environment, on society, or on the economy. The concepts of sustainable development and sustainability are highly contested (Gleeson & Low 2000; Gunder 2006; Adger & Jordan 2009). Gunder (2006) considers sustainability to be a catch all term for environmental concern. Adger and Jordan (2009) state that sustainable development 'commands wide, almost universal support', but challenges humans to articulate and act on values that are inherent with their relationship with nature (the environmental) and with each other (the social). In spite of the difficulties in interpreting or defining sustainable development and sustainability, these concepts have become the 'mantra' for governments in planning the future form and function of communities, particularly in cities (Jenks & Dempsey 2005).

In the fifteen European countries making up the EU-15, the average per capita carbon emissions were 10.3 t CO_2-e, which was a decrease of 0.4 t CO_2-e compared to 2006, or 1.3 t CO_2-e compared to 1990 (EU 2009). By contrast, in 2007, the per capita emissions from Australia were reported to be 28.3 t CO_2-e (ABS 2010), a reduction of 3.8 t CO_2-e since 1990. Carbon emissions from the energy sector in Australia which comprises stationary energy facilities, transportation (mobile combustion) and fugitive emissions from the handling of fuels together accounted for 408.2 Mt CO_2-e or 75 per cent (%) of Australia's carbon emissions in 2007 (Commonwealth of Australia 2009). The transport sector in Australia contributed 15% of total carbon emissions and had increased by 27% between 1990 and 2007. The agriculture sector contributed 16%, with relatively minor emissions from industrial processes (6%) and waste (3%). For the EU-15 countries, energy (supply, use) and transport were the most important sectors, accounting for 80% of total emissions in 2007 (EU 2009). For the EU-15, transport was responsible for 21% of total carbon emissions, agriculture for 9%, industrial processes for 8% and waste for 3%. The EU (2009) reported that Germany and the United Kingdom were the two countries with the largest carbon emissions in the EU. Both of these countries have achieved significant reductions in carbon emissions, estimated to be 394 Mt CO_2-e, since 1990 (EU 2009). In percentage terms, Germany has achieved a 21% reduction of CO_2-e between 1990 and 2007, while the United Kingdom has achieved a 17% reduction over the same period. Over the same time period, Australia has increased its annual emissions from 547.7 Mt CO_2-e to

597.2 Mt CO_2-e, which was in excess of the 591.2 Mt CO_2-e *Kyoto Protocol* annual emissions target established for the five year commitment period from 2008 to 2012.

The focus of national and international action has been the carbon reduction targets established within the *Kyoto Protocol* which ceases in 2012. Australia was one of two developed countries that did not sign the *Kyoto Protocol* in its early stages, having only made this commitment in December 2007 (Rudd 2007). Recent discussions at the international level at meetings in Bali, Indonesia in 2008 and at Posnan, Poland and Copenhagen, Denmark during 2009, failed to reach agreement on new targets for carbon emissions to apply beyond 2012 (post Kyoto). While there has been high expectation of cooperation at international meetings due to the urgency of climate change, negotiations stall over details of the wording, the target numbers, the levels of assistance to developing nations and issues of global justice and equity (UNFCCC 2009).

Moriarty and Honnery (2010) contend that meeting basic human needs should be the focus of setting lower resource use and carbon emissions quotas and that a business as usual approach by countries such as Australia is not appropriate. In reviewing climate change for the development of an emissions trading scheme (ETS), economist Ross Garnaut considered that 'Australians need to face the energy-intensive nature of their economy; their dependence on the car for transport; the dominance of coal for generating electricity, and their preference for population growth' (Garnaut 2008). As one of the highest per capita carbon emitting countries globally, the decisions of Australian governments will influence the society in which Australians will live in the future and their contributions to the global battle to mitigate climate change and develop sustainably. Surveys on the public perception of climate change show that people in Australia accept that global warming is causing climate change (Ipsos 2009; 1st Executive & Neco 2009) and almost 70% of participants in one survey stated that they were already committed to taking action to reduce GHG emissions (1st Executive & Neco 2009). If the science is accepted, then human activity that contributes to carbon emissions should be the focus of attention to mitigate climate change. Ipsos (2009) reported, however, that for the almost 60% of respondents in their survey who thought they were 'fairly green', 26% still did not take any action to reduce carbon emissions.

1.4 Government responses to the science

A societal response may be to rely on central governments to establish targets and legislation to control carbon emissions. In spite of the scientific uncertainties, the projections of climate change impacts for countries including Australia have been used by governments at the national and state levels to justify the setting of targets to reduce carbon emissions and increase generation of energy from renewable sources. Wong (2008) stated that 'the first pillar – reducing Australia's greenhouse gas reductions – is marked by our existing commitment to a target of reducing emissions by 60% of 2000 levels by 2050' although at the time of writing this had yet to be translated into a short term target at the national level. At the state level, in Australia, South Australia was the first state to implement legislation for reducing carbon emissions (Climate Change and Greenhouse Reductions Act 2007) which set targets for: the reduction of GHG emissions by 60% from 1990 levels by 2050, and 20% of electricity consumed in the state to be generated from renewable sources by 2014. Thus it can be concluded that governments in Australia are heeding the opinions of scientists and are taking action to develop frameworks for reducing carbon emissions.

Economic studies including those conducted by Stern (2006) and Garnaut (2008) have reassured governments that mechanisms for reducing carbon emissions exist and that they are cost effective. Stern (2008) stated that:

> The technological transformations and flows of funds required across countries and sectors will be large, the institutional and implementation challenges significant, but the costs of action are affordable and entirely consistent with sustainable growth and development.

Mechanisms such as taxes on carbon emissions (a carbon tax) or a cap and trade system such as the ETS where a cap on carbon emissions is established and the allowable emissions are traded amongst polluters are possible responses. These are market based mechanisms and have been developed and implemented in various countries at either regional (e.g. EU), national (e.g. New Zealand) or state level (e.g. New South Wales, Australia; and in some US states). The Australian government has encountered barriers in its recent attempts to pass legislation for a national ETS (the Carbon Pollution Reduction Scheme) although it has been more successful in establishing a target for renewable energy ensuring 45,000 gigawatt hours (GWh), approximately 20%, of Australia's electricity supply comes from renewable energy by 2020 (ORER 2010).

Time passes and densely populated countries, such as Bangladesh which has been identified as particularly vulnerable to sea level rise, are beginning to experience extreme weather events which have been linked to climate change (Alam & Rabbani 2007). While the least cost approach advocated by Stern has been supported by the insurance industry, the latter also state that 'as well as preventing future emissions, we must also provide the financial means for adapting to those effects that can no longer be avoided' (MunichRE 2007). Munich Re states that it 'regards climate change as a major issue' and 'is devising appropriate insurance based tools'. The insurance industry is concerned at the risk of loss due to extreme weather events being linked to climate change and the potential for increased claims against insurance policies (Crompton & McAneney 2008; Knutti & Hegerl 2008; Knutti 2009). In the absence of global action or, in countries such as Australia, effective national action for mitigation, ad hoc action may take place, with individuals turning to others within their community for solutions and grassroots action (e.g. Hepburn Wind 2010; Carbon Action Newcastle 2010; Transition Towns Australia 2010). Within this space, however, there is also an opportunity for LG to take an active role to mitigate climate change within its community.

1.5 The context for local government action

In a submission to the House of Representatives' Standing Committee on Environment and Heritage concerning Sustainable Cities, the Planning Institute of Australia stated:

> We now know that the impacts of our present fossil fuel based, centralised energy supply systems are unsustainable. We need to rethink the way we supply and use energy: and, since most of our energy use is either in or for cities, they must be a key focus of our attention (Commonwealth of Australia 2005).

As far back as 1992, following the adoption of *Agenda 21* in Rio de Janeiro, LG was called upon to consult with its communities and develop and implement a local plan for sustainability - a *'Local Agenda 21'* (Cotter & Hannan 1999). In Australia, a national *Local Agenda 21* program was established in 1997. Its aim was to build upon existing LG strategies and resources (such as corporate plans, vegetation management plans, and transport strategies) to better integrate environmental, economic and social goals (Cotter & Hannan 1999). In preparing the *State of the Regions Report for 2008*, the Australian Local Government Association (ALGA) incorporated case studies that highlighted a range of areas where LG can play a key role in Australia's response to climate change, including (ALGA 2008):

- adaptation strategies which require that buildings and land planning are regulated to the highest possible environmental protection standards;
- close attention to building regulations and building efficiency regulations which can bring big benefits in reducing carbon emissions; and
- mitigation strategies which are an important component of government action to address climate change.

Thus, at the national level in Australia, LG has been identified as having an important role to play in achieving an effective response to climate change, in adaptation to an altered climatic future, and also in mitigating the human impacts on global warming. England (2007) explained that for LG, taking action on climate change was in response to potential legal liability for decisions of LG that result in increased risk or vulnerability within the community. She explains that, in Australia, risk of litigation in relation to climate change may be in two areas: one concerns decisions that LG makes to allow development (e.g. a new coal fired power station) that contributes to global warming through increasing the emissions of greenhouse gas emissions; the second relates to LG not taking the impacts of climate change into account when making decisions.

It is widely acknowledged that focusing on reducing electricity consumption, switching to renewable or lower carbon sources of electricity, and reducing the intensity of carbon emissions associated with transport, offer opportunities for communities to reduce carbon emissions (Beatley 2000; Lowe 2005, UNFCCC 2007; Pears 2007; ICLEI CCP 2007; Newman & Jennings 2008; Beatley & Newman 2009). Within these broad categories of activities, the rules for new development (urban or town planning), enforcement of building standards and codes of practice, the provision of appropriate community facilities and means to access these facilities (via transport infrastructure), and responsibility for activities that affect local air quality, stormwater quality, heritage and amenity usually fall within the responsibility of LG. In discussing mitigation strategies, the ALGA (2008) also highlighted the role of LG in facilitating effective engagement with communities at the local level. However, higher levels of government at national and state level generally influence the authority by which LG operates.

State governments in Australia have committed to reducing greenhouse gas emissions through various mandatory and voluntary mechanisms which have implications for the actions of LG. For example in South Australia, the South Australian State Strategic Plan (SASSP) includes numerous actions to address climate change aspects of sustainability

(Government of South Australia, 2007b), one of which is to implement legislation to reduce GHG emissions by 60% of 1990 levels by 2050 (Climate Change and Greenhouse Emissions Reduction Act 2007). The legislation also underpins efforts to increase the generation of renewable electricity to 20% of all electricity generated in the state by 2014, and increase the state's consumption of renewable electricity to 20% of the total by 2014. The SASSP resulted in a 'feed-in' law which rewarded households that install solar panels by paying them for the electricity they feed back to the grid, and the adoption of a greenhouse strategy - *Tackling Climate Change Strategy 2007 to 2020* (Government of South Australia 2007a). The greenhouse strategy also identified a number of areas which the state government needs to address in order to reduce carbon emissions within a community. These areas range from demand management such as establishing performance standards for water heaters installed in new and existing dwellings, to efficient and effective approval processes to support green development, demonstrating leadership with sustainable outcomes in government land development projects to support the SASSP target to increase the energy efficiency of dwellings by 10% by 2014. The greenhouse strategy envisages South Australia as Australia's centre for micro wind turbines, and focuses on a skills development program to provide training for trades and professionals in energy management, to support local industry to develop and deliver products and services that reduce GHGs (e.g. renewable energy). The greenhouse strategy also focuses on reducing carbon emissions from motor vehicles, relying on land use planning, locating industry close to road and rail corridors, encouraging co-location of complementary industries, and expanding behaviour change programs. The Development Act 1993 (SA Dev Act) and its regulations (Development Regulations 2008) control new development in South Australia. The SA Dev Act also sets out the requirements for development and review of the State's planning strategies and councils' development plans. The more recent *30 Year Plan for Greater Adelaide* (Government of South Australia 2010) assists in delivering the land use planning objectives of the greenhouse strategy through a focus on Transit Oriented Developments (TODs) and ensuring that the majority of new development is within the urban growth boundary. Thus the state government relies on policy, plans and decisions of LG to achieve its own state level objectives, acknowledging that *The 30-Year Plan for Greater Adelaide* will be delivered 'in partnership with local government' (Government of South Australia 2010, p. 15).

In understanding the role of LG to address carbon reduction at the community level, it is acknowledged that national and sub-national systems of government may provide the formal structural base from which local policy action on climate change may be developed and implemented. The following sections explores the context for LG action, focusing first on LG in Australia and then comparing this context with that of LG in other countries. As the United Kingdom (specifically England) and Germany are large carbon emitters in the EU, and are liberal democracies with a connection to Australia's history of settlement and political systems, they have been used for this comparison.

1.5.1 Local government in Australia

A federal system of government operates in Australia. Local government in Australia currently operates under the jurisdiction of state government legislation. Prior to the federation of Australia in 1901, the states of Australia operated in isolation as colonies of the British Commonwealth and LG was variously in place within South Australia, Victoria, Western Australia and to a lesser extent in Tasmania (Balmer 1989). Devolution of self-reliance consisted of the provision of roads, the means of crossing rivers, and the provision of wharves and jetties. When the colonial government was unable to afford payment, LG was given the ability to raise revenue from rating properties, with the money raised being spent on property services rather than services to people. Health services consisting of drainage, sewage disposal and provision of clean water were also services that devolved to LG as well as inspection of building practices and health related issues. Public transport was also a service provided initially by LG however Balmer (1989) reported that there was difficulty in providing this service economically or efficiently and there was a reluctance to provide a coordinated regional service. Special purpose authorities were set up at colonial or later state level for services such as public transport, water, sewerage and drainage, and gas and electricity supply however these services have gradually been removed from LG (Balmer 1989).

Since 1988, reform including the restructure of LG boundaries and wholesale amalgamation has been undertaken in most states, ostensibly to achieve economies of scale; more efficient infrastructure delivery; more skilled staff; and improved financial governance and standards implementation (Dollery, Byrnes & Crase 2008). Dollery, Wallace and Allan (Dollery et al 2006) observed that the composition of Australian LG service provision since the mid-1980s has moved from relatively capital-intensive 'services to property' to comparatively labour-intensive 'services to people'. Dollery et al (2008)

contend that increasing the population size of local authorities may result in greater resources being needed to provide services to an increased number of people, particularly if the population is dispersed over an increased spatial area and questions the economies of scale that could be achieved across the broad range of services.

While the states have progressively recognised LG in their Constitutions since 1980 (Saunders 2005), LG is not yet recognised in the Australian Constitution and relies on state legislation and their respective Constitutions for definition of its role. The services for which LG is given power and responsibility vary from state to state based on historical service provision and more recent shifting of responsibility either towards or away from local authorities. Each LG elects a Council whose role is defined by the state. The Municipal Association of Victoria (MAV 2008) list the following as assets and services provided by LG in Victoria, Australia:

> Road assets: local roads, drains, bridges, foot and bike paths, public street lighting, litter bins, school crossings, bus shelters, parking spaces.
>
> Community assets: libraries, internet services, sporting facilities, community halls, parks and gardens, swimming pools, playgrounds, animal shelters, public toilets, public art, cemeteries.
>
> Community services: community banking, public tips, removal of dumped rubbish, youth and family counselling, baby capsule hire, childcare programs, playgroup, preschools and kindergartens, school holiday programs, head lice and immunisations, food safety inspections, and use planning advice and approvals, street cleaning.
>
> In-home services: Family day care, parenting and baby health advice by maternal and child health nurses, multilingual telephone services, recycling and hard waste collections, home maintenance, meals on wheels, gardening services and respite care. (MAV 2008)

In South Australian (SA), the role of the Council is set out in Section 6 of the *Local Government Act 1999* (SA LG Act). The Council is to provide and manage at the local level and to act as a representative, informed and responsible decision-maker in the interests of its community. In addition, the SA LG Act states that the Council is to provide and co-ordinate various public services and facilities, and develop its community and resources in a socially just and ecologically sustainable manner. The Council is to encourage and develop initiatives within its community for improving the quality of life of the community; represent the interests of its community to the wider community; and to exercise, perform and discharge the powers, functions and duties of LG under this and other Acts in relation to the area for which it is constituted (SA LG Act). Funding is provided by rates on residential and business property as well as state grants for various

responsibilities devolved to local level. Federal grants provide additional funding for LG in Australia and are variously administered by the states.

In reviewing the role of LG in Australia and the moves to recognise LG within the Australian Constitution, Saunders (2005) concludes that the underlying strength of LG in Australia lies in its potential to enrich democracy by enabling the engagement of voters and by demonstrating the responsiveness of public institutions at a time of significant cynicism about representative government.

To enable a comparison of the context for Australian LG with LG in other countries, the following sections describe the context in which LG operates in the two largest carbon emitters in the EU, the UK (specifically England) and Germany.

1.5.2 Local government in England (UK)

This section describes the structure of LG in England, where the individual LG organisations are referred to as local authorities. Other countries in the United Kingdom - Scotland, Wales and Northern Ireland - have their own devolved parliaments. In England, LG is an instrument of the central Government and has statutory duties which are set by the central Government. The structure of LG varies across the country. In some parts there is a single authority - a unitary council, while in other parts there are two tiers – a district council and a county council. In the Greater London area there are boroughs which are similar to district councils. The unitary and upper tier (district) councils have multiple roles which may include delivering all or some of the following services: education, health, land use planning, urban regeneration, waste management and transport.

With the change of central Government in 1997 and the adoption of the doctrine of subsidiarity through signing the European Charter of Local Self-Government there has been a trend in England to devolve more power to the local level and to reduce the prescription of central Government (Bovaird et al 2007; Lyons 2007). Sir Michael Lyons, in his report on the modern role of LG in the UK, stated:

> …while local government has an important role in delivering major public services such as education and social services, that role is a development of, and in addition to, its initial purpose and origins in the need and desire of communities to govern themselves, to regulate behaviour, and to deal with conflicts. (Lyons 2007)

More recently there has been a focus on well-being and place shaping as roles for LG in the UK (Lyons 2007) with a responsibility to promote or improve the economic, social or

environmental well-being of their area (ODPM 2004) and to involve the community and other partners in meeting local needs and in planning local futures (Bulkeley and Kern 2006).

Another recent review of the balance of power between central and LG in England concluded that 'Local authorities should have the freedom to shape the development of their communities and the scope to unlock the full potential of local innovation' (HCCLGC 2009). However, Lyons (2007) was of the opinion that local government already had wide legal powers, extended significantly by the introduction of the power of well-being in section 2 of the Local Government Act 2000 which enables authorities to do anything which promotes or improves the economic, social and environmental well-being of their area. The real issue, according to Lyons, was the need for greater awareness of these powers and how these powers should be exercised (Lyons 2007, p. 13).

Central Government in England has implemented a number of policies to drive the devolution of power to local authorities accompanied by an expectation of increased accountability and public confidence in LG. The policies that had been implemented up to 2006 were reviewed by the Cardiff Business School through a survey of council officers in 2004 and in 2006 (Cowell et al 2008) with the most significant impact on accountability and public confidence relating to the Comprehensive Performance Assessment. More recently a new policy has been introduced, that of Local Area Agreements (LAA) (DCLG 2009). The LAA between central and local government requires all unitary and upper-tier local authorities to select 35 indicators from a common list of 188 indicators by which LG performance is assessed. These indicators are in addition to 16 mandatory indicators relating to education, for which LG has responsibility. The National Indicators (NIs) address four broad areas: stronger and safer communities; children and young people; adult health and well-being and tackling exclusion and promoting equality; and lastly, local economy and environmental sustainability (DCLG 2009). Each local authority then develops a plan of action including targets and milestones for each of the 35 indicators against which it will report to central Government. The performance against these milestone targets is tracked and reported regularly through the committees of council. Accountability for various actions is documented in the plan. Bovaird et al (2007) observed that LG may be required, or empowered, and financed to deliver services on behalf of the central Government, and that it may be required to outsource some of these services

through arm's length management organizations such as social landlords, however the political function of LG cannot be outsourced.

1.5.3 Local government in Germany

In Germany, LG is the third tier of government. The first level is the German parliament (*Bundestag).* The second tier are the *Länder*, of which there are 16 with each having an elected regional parliament (*Landtag*). In all but one *Länder*, there is a system of councils, generally elected in a five year term (City Mayors 2009). In 2004, there were 12,477 municipalities (*Gemeinden*) in the 16 *Länder* (Kramer 2005). In addition there are 300 units of local administration known as *Kreise* or districts which are overseen by a district council (City Mayors 2009). Municipalities are charged with certain tasks by the federal government or the *Länder*, however the cities organise themselves and pay for their own activities from their budgets. German municipalities have a right to self-government over cultural matters (e.g. museums, theatres, sports facilities and schools) and public services (e.g. provision of water and power, waste disposal, abattoirs, cemeteries and hospitals), as well as the maintenance of public roads and streets within the municipality (Kramer 2005; Bulkeley and Kern 2006). They generally have a degree of independence from the higher tiers of government and are able to outsource activities to private businesses at their own discretion, a practice which increased after the mid-1990s to meet expectations of increased efficiency and service delivery (Bulkeley and Kern 2006). An increase in the outsourcing of energy and transport and a reduction in the activities which might be undertaken voluntarily rather than municipalities being obligated to do so, has been observed in the years leading up to the recent global financial crisis (Bulkeley and Kern 2006). Kramer (2005) observed that supervision of the municipalities is exclusively the task of the *Land* authorities. Municipalities are also reliant on the *Länder* for a compensatory redistribution of funds which Kramer contends is responsible for the 'constant complaint by municipal officials about a structural financial crisis' (p.85). The lack of available funds has reduced LG's capacity for voluntary action in Germany and has led to the development of a more 'enabling' local state (Bulkeley and Kern 2006).

1.5.4 Summary of local government context

The review of LG across these three countries demonstrates that it has considerable powers, although it is variously under the control of central or state government who establish its responsibilities and degree of independence. Importantly, it is being

increasingly acknowledged that through its planning role it has a major influence in shaping the future of development in municipalities and for the well-being of its community, particularly its residents.

1.6 Summary of Chapter

The lack of coordinated action and leadership from the international community, to establish targets for carbon reduction, and from national governments, particularly in Australia, has provided an opportunity for LG to be proactive in leading its community forward to address climate change. The role that LG plays in addressing climate change, however, depends on a number of factors including its acceptance of the importance of local action to address climate change and its understanding of the types of actions which could be undertaken locally to reduce its community's use of energy. Australia has been identified as a high per capita carbon emitting country. As the stationary and transport sectors comprise a large proportion of carbon emissions for Australia, community action to reduce carbon emissions may be expected to focus on actions of the residential sector within LG boundaries, ie households. In particular, three main areas that influence a household's impact on climate change seem to be emerging from national and state strategies, namely the:

- efficiency of energy used in homes;
- use of renewable energy sources by households; and
- the use of low carbon transport modes and energy efficient transport by residents within households.

Exploring the actual and potential initiatives of LG to support its community in other high carbon emitting countries as well as in Australia may identify new opportunities for local carbon reduction and the mechanisms by which this potential may be realised. The important role of LG to enable its community, and particularly its residents, to transition to a new low carbon age has been highlighted in the brief introduction to LG across three countries.

1.7 Research aims and objectives

This research aims to add to the body of literature about the role of LG to mitigate climate change within its community, its capacity to act and aspects of governance which may

affect LG action on climate change. In doing so, this research seeks to achieve a number of objectives, including to:

- understand the types of initiatives which Australian LG employs to assist the community, particularly its residents, to reduce carbon emissions;
- compare the types of initiatives employed by Australian LG with those being used by LG in other countries;
- identify whether there are differences which suggest innovations or new approaches being employed by LG to build its capacity to act on community carbon emissions; and
- add to the understanding of the importance of the urban planning role of LG to a low carbon future.

While a multi-disciplinary approach addressing urban planning, political science and sociological aspects of LG action to reduce community carbon emissions has been employed, this thesis has a considerable focus on urban planning, which will become apparent through the review of literature.

1.8 Structure of the thesis

Chapter 2 outlines the current knowledge from the literature about LG actions in response to a call to reduce greenhouse gas emissions. It particularly reviews the literature related to the role of LG to act on climate change, the capacity of LG to act and aspects of governance of climate change. The gap in the research is explained and the questions which are to be addressed in the research are outlined.

Chapter 3 discusses the methodology for the research undertaken, the theoretical concepts on which the research design and analysis are based and why a case study approach has been employed.

Chapter 4 presents and discusses the results of the first Phase of the research, exploring actions of metropolitan LG in South Australia and Victoria, Australia.

Chapter 5 provides an overview of each of the eight LG cases which were studied in depth in the second Phase of the research, and presents the key issues identified by participants,

and the results of the analysis of corporate documents for reference to climate change mitigation in planning policy and governance.

Chapter 6 presents the findings of the cross case analysis of capacity to act, barriers and opportunities identified by research participants and community governance, highlighting the similarities and differences across the eight cases drawn from three countries – Australia, England (UK) and Germany.

Chapter 7 provides a discussion of the findings from both Phases of research and how these findings extend existing knowledge of capacity to act, barriers, opportunities and governance of climate change which affect LG's role for supporting carbon reduction in its local community.

Chapter 8 concludes the thesis with a summary of the study, the main conclusions and some recommendations for further research.

The Appendices and References are listed after Chapter 8. The Appendices include the questionnaires used in each Phase.

Chapter 2. Literature Review

> I think that we've seen over the time that I've been in local government more reactive processes taking place which is not about long term planning; it's reacting to particular crises.
>
> (UK09003 Participant 2)

The concepts of global warming and climate change have become increasingly important for society, requiring responses at both global and local scales. International agreement for commitments to reduce carbon emissions commenced with the *Kyoto Protocol* in 1997 (UNFCCC 2004). Since then commitments at national and state (or sub-national) levels have provided a top down approach to enable action at the local level or site of generation of carbon emissions. However, as stated in Chapter 1, there has been considerable difficulty in obtaining agreement on targets for carbon reduction at international level (witness the outcome in the more recent *Copenhagen Accord* in 2009 (UNFCCC 2009)) and at national levels (witness the defeat of the *CPRS* legislation in Australia). The absence of mechanisms to deliver a uniform and coordinated top down approach creates a space in which LG can and has been taking action since the establishment of the ICLEI CCP program in 1997 (Bulkeley & Betsill 2003).

This chapter reviews research in the fields of LG action on climate change mitigation and their capacity to act on energy systems to reduce the carbon emissions associated with energy use. It commences with a review of literature about carbon reduction solutions and social issues related to implementing technological solutions. It then reviews literature about LG action for carbon reduction focusing on cities and urban areas and urban planning policy to support carbon reduction. It then discusses the findings of research related to barriers to LG taking action, LG's capacity to act and the emerging area of

climate change governance. The specific research questions are framed within these fields of research.

2.1 Low carbon energy solutions

To achieve a target for stabilisation of atmospheric CO_2 levels to 450 to 500 ppm as advocated by Stern (2008), climate change mitigation which translates to a per capita carbon budget of 2 t CO_2-e per year is needed. Potential economic benefits of addressing climate change have been quantified in studies for various governments (e.g. Stern 2006; Garnaut 2008) indicating that early action is preferred as a least cost approach. Numerous scientific studies list the rational actions and potential technologies required for carbon reduction related to fuel switching (to renewable energy sources) or reconfiguring services (e.g. Saddler, Diesendorf & Denniss 2004; Droege 2006). Giddens (2009) argues for the need for technological innovation together with economic and political convergence. The potential technologies and design of carbon reduction options for cities and buildings have been widely researched (e.g. Roaf, Crichton & Nicol 2005; Roaf, Horsley & Gupta 2004, Hamnett & Perkins 2005a/b; Goldie, Douglas & Furnass 2005; Jenks & Dempsey 2005) and form a key aspect of sustainability for the built form of urban environments. The focus on finding energy related solutions to reduce carbon emissions has created markets for new services and products, including: energy efficiency audits, energy efficient appliances or equipment, renewable energy technology, 'green' energy or carbon offset schemes. The market systems that develop variously in liberal democratic societies may respond directly or indirectly to new economic policy such as incentives to adopt new low carbon technology and / or disincentives to use current high carbon technology (Weber 2006).

Within an urban environment, solar water heating (SWH) or solar photovoltaic (SPV) systems are examples of proven technology to reduce the draw from current systems (mainly electricity and to a lesser extent gas) that result in carbon emissions. Recent data indicates that the installed capacity of SPV systems reached just over 7 GW worldwide in 2009, a sevenfold increase from five years earlier (Pernick et al 2010). SWH installations in Europe increased by 50 percent in 2006, to more than 2 GWh, mostly in Austria, France, Germany, Greece, Italy, and Spain (REN21 2008). Popp, Hascic and Medhi (2010) reviewed patents for new renewable energy technology in OECD countries, finding that ratifying the Kyoto Protocol was a key contributor to research and development of renewable energy technology. They concluded that policy such as the *Kyoto Protocol* was

an important signal to develop renewable energy technology. Similarly, Lund (2009) states that energy policies can significantly contribute to the expansion of domestic industrial activities in sustainable energy. Carbon emission reductions at the local level can be achieved through investment in infrastructure that provides energy from renewable sources such as the sun, wind, hydro, waves, tidal movements and biomass (Grant & Kellett 2002; Shaw 2004; Hatfield- Dodds & Denniss 2008; Hamilton, Kellett & Moore 2008a; Sunter, Hamilton & Kellett 2010). Hamilton et al (2008a) found that subsidies in the form of rebates from government (often at national or state level) or fixed cost through schemes such as the Solar Cities program in Australia assist in reducing the pay-back period for SPV systems and are important for the rapid uptake of such technology in a community.

There are also significant gains to be made by increasing energy efficiency through using more efficient appliances and equipment and addressing the use of power by appliances in standby mode (Wilkenfeld 1998; Pears 2007; Harrington, Brown & Ryan 2008). Gupta (2008) considered that external wall insulation was an essential focus for energy efficiency in the United Kingdom. Schneider (2006) stated that 'energy efficiency … is a largely untapped source of real energy savings and real costs savings' but that realising these gains requires rules such as performance standards for materials and appliances used in homes. McKinsey and Company (2008) identified opportunities for a 30% reduction in emissions from 1990 levels by 2020 in the residential sector in Australia. The mechanisms that McKinsey and Company costed included switching to renewable energy as well as energy efficiency improvements. They concluded that major technological breakthroughs or lifestyle changes were not needed to achieve the 30% reduction and that the cost to each household would be less than AU$300 per year. Moore, Morrissey and Horne (2010) have recently assessed the cost benefit pathways for zero emission housing in Australia and have identified an upfront capital cost increase of 7% for an '8 star zero energy home' over the industry standard. This increase translates to an NPV across 25 years of AU$3,073. Moore et al (2010) argue for inclusion of renewable energy technology into future housing policy and the benefits of building zero energy houses sooner rather than later. Research by Arman et al (2009) has argued that the challenges associated with affordable and sustainable housing should be the focal point of debate. They consider that a greater understanding of what sustainable development means for affordable housing, at conceptual, public policy and construction levels, is required.

Hajer (1996) states that, in 'ecological modernization theory' (EMT) discourse, environmental pollution is framed as a matter of inefficiency, and it is argued that producing 'clean technologies' (clean cars, waste incinerators, new combustion processes) and 'environmentally sound' technical systems (traffic management, road pricing, cyclical product management, etc.), will stimulate innovation in the methods of industrial production and distribution. The EMT theory argues for the potential of attaining sustainability from within — a greening of business as usual — and has been widely criticised (see York & Rosa 2003) for avoiding challenging alternatives such as radical structural or value changes in society. Moriarty and Honnery (2007) consider that, for transport emissions, technical fixes might reduce world fleet CO_2-e emissions per passenger-km by a factor of 2-2.5 by the year 2030, which they considered to be insufficient for 'global green mobility'.

Theories of technology dynamics that explore technological change and innovation for climate protection have been researched in Europe (Arentsen, Kemp & Luiten 2003). Fundamental assumptions of such theories include the co-evolution of technical change and the social environment. Arentsen et al (2003) postulate that technical change is being shaped by human needs and the exercise of human agency while at the same time the social environment is shaped by technology. The social acceptance of the use of technology for carbon reduction at the local level and the co-benefits of economic development appear to converge at this point.

2.1.1 Social factors in addressing climate change

Reducing energy use and hence reducing carbon emissions at the local level requires individuals and households to acquire knowledge, tools, skills and motivation to make changes. A number of researchers have concluded that these intrinsic motivation and action competencies are the only drivers found to be statistically reliable influences on sustainable behaviour (Brewer & Stern 2005; Stern 2000; de Young 1996). There has been significant attention given to researching the motivators for pro-environmental action, social change and behaviour change often focusing on the individual. Brown and Pitcher (2005) observed that knowledge development was a key tool for negotiating a social change. Shipworth (2000), however, observed that simply feeding information to home energy users (imparting knowledge) usually had little impact on their actions and that the actions of a home energy user are influenced by their personalities, attitudes, previous actions, their income, the attitudes and actions of their friends and associates, and by the

community and culture(s) they belong to. Delivering an education and information program as a sole action to address climate change, expecting the community (of individuals) to make a rational decision to reduce energy use and thereby carbon emissions within households, is insufficient for changes of the extent needed to reduce carbon emissions across a whole community of households (Shipworth 2000; Chess & Johnson 2007; Moser & Dilling 2007). Other researchers conclude that programs that target energy efficiency through a focus on auditing energy use and wastage in homes and retrofitting energy efficient technology such as compact fluorescent light bulbs, water efficient shower-heads or draught-stoppers, also assume that the information from an auditor or the change of light bulbs or shower head will lead to changes in behaviour at an individual level (Moloney, Horne & Fien 2009).

The communications, campaigning, social marketing and innovation diffusion literature is replete with articles that research the success or otherwise of marketing campaigns to raise the profile of environmental, sustainability and more recently climate change action causes (McKenzie-Mohr & Smith 1999; Rogers 2005; ACF 2007; McKibben & The Step it up Team 2007; Moser & Dilling 2007; Rose, Dade & Scott 2007). Psychologists have developed mechanisms such as the New Ecological Paradigm to survey the environmental attitudes of groups of individuals and relate these attitudes to behaviours such as transport choices (Dunlap et al 2000; Lundmark 2007; Vikan et al 2007). Cialdini (1987) identified a number of principles of psychological influence which are thought to increase the compliance of individuals targeted by requests, namely: repaying favours, valuing scarce resources, listening to authority, behaving consistently, having someone they like make the request, and taking heed of the actions of similar others. McKenzie-Mohr and Smith (1999) identified three key ideas within their view of behaviour change: that people naturally gravitate to actions that have few barriers but high benefits; that barriers vary and are linked to perceptions; and behaviours compete with other behaviours – choosing one behaviour means another is not chosen.

Research in the United Kingdom has segmented populations into seven categories based on their environmental attitudes and pro-environmental behaviours (COI & DEFRA 2006). These seven categories are: greens; consumers with conscience; wastage focused; currently constrained; long-term restricted; basic contributors; and disinterested. Platt and Retallack (2009) used qualitative deliberative workshops to research shopping practices and intentions of UK residents classified as ‘Now People’, a segment of the UK population that

'seek psychological rewards in status, fashion, success, and the esteem and recognition of others' (p. 4). Platt and Retallack consider that climate change related communications, products and policies have not been designed with 'Now People' in mind. With the needs of this segment of the population unmet, the "Now People' are unengaged or 'switched off' from the issues, and act as a brake on the adoption of lower-carbon behaviour across society (2009, p. 4). They concluded that:

> …success will lie in our collective ability to persuade mainstream consumers that in adopting lower-carbon lifestyles they can save money and have fun, they can have control in a chaotic world, they can do the right thing and look good without being an environmentalist, and they can still be themselves (Platt & Retallack 2009, p. 9).

In their review of programs that have attempted to encourage or require energy efficiency in the US, Dilling and Farhar (2007) conclude that they fall into three general categories - incentives, labelling and mandatory standards. They also concluded that 'making it easy' for the community to make energy-wise choices is actually 'hard work' and requires involvement of many stakeholders such as manufacturers, builders, politicians, consumers, utility companies, advocates and businesses. From their research of social marketing techniques such as pledge schemes (McKenzie-Mohr & Smith 1999) and social based learning approaches, Moloney et al (2009) consider that the latter are the most appropriate for ongoing behaviour change. Their finding is similar to that of Dilling and Moser (2007) who talk about creating a climate for change and that it begins with conversations and enabling a space for these conversations. Similarly, Sarkissian et al (2009) advocate a conversational approach as the most appropriate way to embed change in a community. They refer to 'kitchen table' sustainability, where the round kitchen table is the earth and those seated at the table are engaging in conversations about planning the future for the earth, advocating for a reconnection with nature (Sarkissian et al 2009).

A focus on social practices which produce and reproduce the structure of society in which people interact, is also advocated as an approach for carbon reduction related to energy use (Shove & Walker 2007). Social practices which embed and lock in increased energy use and reduce the potential for improved efficiencies, should be the focus of carbon reduction programs to challenge the norms that have become accepted in society as social practices (Shove 2003; Shove & Walker 2007). Examples of norms that Shove considers should be challenged include the increased use of air conditioning to achieve 'standards' for a comfortable living environment in houses, rather than accepting a broader range of temperatures (lower or higher than the 'standard'), that requires less heating or cooling

energy, or (re)designing the house to use less energy. Shove (2003) considers that understanding the changes that have taken place which have led to a development of these energy hungry norms may assist in identifying the systems on which societal action is needed to reduce energy consumption. Droege (2006) commented on an 'energy blind spot' in urban literature due to 'fossil fuels having an overwhelming role in defining and determining virtually all aspects of contemporary social, technological and cultural reality'.

Other issues including social justice, global justice, double realities, socially organised denial and the social implications of not mitigating climate change have been raised and discussed by Norgaard (2006) who studied denial within a Norwegian community in 2001. Weber (2006) contended that protective or mitigating actions against global warming require the sacrifice of concrete, immediate benefits for the sake of abstract, distant goals. Weber explains that there is a strong negative effect associated with the concrete, immediate costs and sacrifices that addressing climate change is said to demand but that there is an absence of feelings of worry about possible abstract and distant consequences of global warming.

Recently, Burch has argued that:

> Global problems such as climate change represent challenges to the entire gamut of socio-cultural patterns, economic and political structures and technical capacities. Thus, while social movements that serve to redefine the nature of the human relationship with the physical environment may find some resonance in other cultures, it is unlikely that movements that contain specific prescriptions about what is proper action will find the same success at diffusion. The current climate regime, with specific framings of blame attribution, greenhouse gas emissions targets and preferred solutions, is one such movement. It is possible, however, that a movement based more around the principles of sustainable development or sustainability, left vaguely defined, might see more success in diffusion than a strictly climate-based social movement (Burch 2009).

While Beck (2009) contends that contemporary society and its subsystems are incapable of coping with their most urgent, self-generated problems, Giddens (2009) concludes that the traditional approaches to addressing such problems based on the opinions of experts and development of legislation to effect policy change are proving difficult. He states that humans may know that action needs to be undertaken to address climate change but that putting action into practice is problematic (Giddens 2009). When exploring this issue at the LG level, Bai (2007) observed that city managers struggled with the global framing of the climate change issue and potential policy responses. She also contends that the causes, impacts, and responses at the local level are more important than the overall global issue.

Thus there is an identified need for diffuse action to reduce carbon emissions from energy use and that LG may have a key role to play in developing and implementing policy that addresses the social issues at the local level. The following section reviews the literature about the actions of LG to reduce community carbon emissions and the roles which LG is required to adopt.

2.2 Local government action for carbon reduction

According to Newman and Jennings (2008), the trend towards globalisation has resulted in cities drawing in resources from across the globe and exporting wastes beyond their boundaries, having a disproportionate impact on natural ecosystems and the biosphere as a whole. The environmental benefits of sustainable and wise use of resources and the need for continuous and reliable energy supply often described as energy security are reported to be key motivators for taking action to mitigate climate change at the local level (Gallego-Carrera & Mack 2010). While it is acknowledged that cities are major users of energy and other resources, research such as that undertaken by Gilbert et al (1996) concluded that cities also have many environmental advantages. These advantages include: lower costs of service provision for water, waste collection, telecommunications, health and emergency services; opportunities for recycling and material reclamation; reduced demand for land for housing; opportunities for district heating of buildings – both residential and commercial; reduced use of motor vehicles through opportunities for walking, cycling or use of public transport to access destinations; and greater opportunity to focus discussion and consensus on action to protect the environment.

For LG in the UK, Marsden and Rye (2009) identified that the main policies for local carbon reduction in relation to transport are for those areas over which it has control. They noted examples such as: parking allocations for new development, smarter choices and improvements to walking, cycling and public transport (bus) infrastructure. Marsden and Rye (2009) considered that the first of these policy areas would be an influence in the longer term while the latter requires demand restraint to achieve changes in travel patterns. They stated that no country in the world had brought about a large scale mode shift at a national scale except in times of war and that demand restraint was fraught with political difficulties at an industry level. Marsden and Rye (2009) also commented on the powers that LG would need to pass up to sub-regional bodies to enable action on transport

emissions at that level. However, they concluded that LG would be unlikely to pass their powers upward, citing Pangbourne's argument about the Scottish experience as evidence.

In reviewing the role that local authorities in The Netherlands would be required to play to support a transition towards carbon neutrality, Coenen and Menkveld (2002) noted that the liberalisation of the energy sector, the trend to decentralisation and changes in local democracy have pointed to a greater (more active) role for LG in climate policy. They highlighted the influence of societal changes, and that there was higher expectation from the public for local services and less reliance on national government. An important point that arose from Coenen and Menkveld's review was that the role of LG was changing, requiring it to become more active in supporting carbon reduction initiatives. Coenen and Menkveld (2002) identified two paths for LG action. The first relied on expanding the competence and playing field of the LG, and in particular to solve problems which may be a barrier to taking action to reducing carbon emissions. The second path was to better use the existing playing field. They observed that options for climate reduction were at times not used although municipalities had the competence to use them. They identified roles for LG including regulation, spatial planning, sustainable housing and sustainable production and consumption.

The issues of scale and readiness were highlighted by Bai (2007) and that as cities grow richer there is a progression from focusing on environmental issues that are poverty-related through industrial pollution-related issues towards lifestyle-related issues. One potential role for LG is to monitor aspects of the sustainability of housing, such as standards that describe a 'decent home' which in the UK address the issue of 'cold homes'. According to Alafat (2008), 'Section 3 of the (Housing) Act (2004) requires local housing authorities to keep housing conditions under review so as to identify any action that may need to be taken under the listed provisions (including assistance)'. However, Alafat (2008) concluded that 'Local Authorities are not always using the Housing Health and Safety Rating System to best effect'. Thus, while UK LG is provided a system in which it can act on housing standards, it may not have the capacity to use the tools provided to achieve the best outcomes.

Parker and Rowlands (2007) reviewed the action of LG in Canada following the federal government's decision to cancel the 'EnerGuide for Houses Program', a home energy auditing program delivered through a range of partnerships across the country. They stated that cities could maintain the delivery of climate action programs such as 'EnerGuide for

Houses' due to their capacity to take action, although they considered the financial constraints of LG to be a severe limitation. The financial constraints were in some cases overcome by partnering with utilities keen to encourage energy conservation in the communities that they served. Parker and Rowlands (2007) considered that for local climate action to be effective, partnerships are required among municipalities, utilities and other interested parties to share the costs and increase local awareness. They used participation rates and emissions reductions to indicate the effectiveness of such action.

A landmark study of the ICLEI CCP program across a number of countries was published by Bulkeley and Betsill (2003). The ICLEI CCP program (ICLEI CCP 1995) is described as a five step process for acting on climate change at the local level and follows a political commitment by each LG that participates. The ICLEI CCP program provides assistance and tools to LG agencies to identify opportunities to reduce greenhouse gas emissions in areas of LG operations and provides software to assess the various contributions of greenhouse gas (GHG) emissions from the residential, industrial and commercial sectors within the LG's area together with an assessment of the GHG contributions from waste and transport use. The ICLEI CCP program also established a mechanism for LG to establish plans for carbon reduction at both corporate and community levels for which progress could be monitored and reported. Bulkeley and Betsill (2003, p. 3) contend that LG has not just responded to predefined policy goals addressing carbon emission reductions which have been set within national frameworks (a top down approach), it has become a site of governance of global issues in its own right. They attributed this to the development of transnational networks of LG authorities such as the ICLEI CCP program which have provided a means of spreading policy programs across nations. Such networks were seen to provide opportunities to exchange examples of best practice and enable LG lobbying at the national and transnational level.

At about the same time, Kousky and Schneider (2003) published the findings of their research of the motivations of LG authorities in the United States of America (USA) to take action to reduce carbon emissions at the local level. They identified the importance of co-benefits, altruism and citizen pressure as key motivators and concluded that perceived barriers such as a lack of direct economic benefit did not prevent local action taking place. The political benefit for elected members to support action was seen to outweigh the lack of direct economic benefit when citizen pressure was evident. Their research suggests that there is a link between the actions of elected members within LG and community support

for action on climate change, perhaps also suggesting that a lack of community pressure on elected members to act may be reflected in a poor or low key response to climate change at the local level. This area deserves attention in light of the results of surveys that show a high level of concern in the community (see 1st Executive & NECO 2009). Other researchers such as York and Rosa (2003) contend that societies may implement institutional structures that convey the impression of solving environmental problems, perhaps in an effort to be seen to be doing something. Hence there is concern that local action may be politically motivated but not address the underlying social norms that lock in carbon emissions.

Top politicians and administrators in four municipalities in southwestern Sweden were interviewed by Lundqvist and von Borstede (2008) to understand their views about climate change being a social dilemma. Their study identified that scalar politics and scalar framing of allocation of responsibility for managing climate change responses were key to LG responses to climate change. They considered that LG enlarges its space of engagement through regional cooperation to improve its future capacity to mobilise resources. Their study identified problems in gaining citizen support for rapid climate change action, indicating that there are limits to the economic 'pain' that communities will bear. The potential for saving money on energy at an individual level was identified as the main motivator for individual action, with LG seeing its main role as informing, communicating and counselling people to understand the social dilemma of climate change. Lundqvist and von Borstede (2008) observed that while rational choices toward 'development and having plenty of jobs' tended to occur, the city of Gothenburg in Sweden was able to steer sectors of energy, industry and transportation if it decided to do so, and had environmental competence to do this. While they noted that there was capacity for decision making within the city, their study also noted an under-utilization of competence in strategic environmental planning. Resources in the form of a coordinator had been appointed by the city to 'spearhead' attention towards longer term climate issues as decisions within the city were being made on short term rather than longer term priorities.

Zahran et al (2008) studied metropolitan area commitments to the CCP program in the USA concluding that cities with high 'civic capacity' were more likely to commit to policy initiatives while cities with high 'climate stressors' were least likely to do so. The concept of 'civic capacity' was defined in terms of variables labelled *environmental cause, non-*

profit environmental groups, *college educated* and *income* and summarised as human capital and environmental concern. The concept of 'climate stress' was defined in terms of variables *population density*, *carbon employment*, *travel alone*, and *solar energy use*. Zahran et al (2008) also reviewed the concept of 'climate risk' which they defined in terms of variables *precipitation, eco-sensitive area* and *coastal area*. They found that there was no statistically significant link between a city's commitment to policy initiatives and climate risk. They also concluded that there are many indicators of stress, risk and civic capacity and that further study into 'mapping' other indicators was warranted. Of some concern was their use of quantifiable data as a surrogate for environmental concern rather than attitudes or opinions, and they did not seek to understand the socio-technical aspects which may motivate a city's decision-makers. The mechanisms they recommended for boosting 'civic capacity' included raising awareness about recycling, energy conservation programs and public transportation activities. While the study referred to increased participation of citizens in events to increase ownership by citizens, there was no discussion of the benefits of community involvement in LG decision-making, such as addressing climate change through urban planning.

The frequent reference in literature (Newman and Kenworthy 1999; Beatley 2000) to cities such as Freiburg in Germany as examples of the widespread capture of solar energy at the household level indicates that LG in Germany may potentially provide a comparison for programs within Australian LG. Germany has been widely recognised as a leader in the national adoption of feed-in tariffs to promote the uptake of renewable energy which has resulted in significant installations of solar renewable energy technology. There are also historical links between Australia and both the UK and Germany. From early European settlement, Australia's history has been linked to Western Europe, particularly to England and, in the case of South Australia, to Germany. Australia's politics of liberal democracy can also be traced back through this lineage (Parkin 2009).

While these studies confirm that LG action for carbon reduction is possible if there is an appropriate system in which LG action can take place, local politicians need to demonstrate willingness to act; and LG needs competent staff; adequate funding and a supportive community. One area in which LG has responsibility and competence to build upon is the local planning system. Policy decisions about new development can be made and incorporated into local planning documents which may also lead to programs for

improving energy efficiency and sustainability of existing dwellings and transport services. The following section reviews research relating to planning for climate change.

2.2.1 Planning for climate change at the local level

According to Thompson (2007), urban planning is ultimately about hope for a 'good' future and planners have a responsibility for delivery of the future form of communities. Planning policy provides guidance on decision-making for new developments and is often spatially based. The objectives for the future use of spatial areas are often linked to a planning strategy encompassing economic, environmental and social outcomes for a community. Hence planning policy has potential to integrate the three key aspects of sustainable development – environmental, economic and social objectives.

Jenks and Dempsey (2005, p. 287) consider that the density of development has dominated the search for more sustainable urban forms, with concepts such as urban containment, compact forms, efficient use of land, a mix of building types, and proximity to facilities, transport and work being promoted in the 1990s. They also contend that the focus on increasing density forces the selection of the form of residential development, whether it is to flats and apartments for high density or 2- to 3- storey development for relatively low density. The spatial configuration of cities and towns and the ways in which land is used and developed have significant implications for the reduction of carbon emissions (Davoudi, Crawford & Mehmood 2009). However the levels of carbon emissions are influenced by many complex factors which are relevant to urban planning, including: available building technologies, land and property markets, the investment strategies of public and private institutions, public policies, institutional traditions, social norms and cultures, and individual lifestyle choices and behaviour.

Spatial planning should not only address climate change mitigation according to Pizarro (2009) but also adaptation to a changing climate. He argues that, while the most appropriate urban form for climate change mitigation embraces transit oriented designs in compact urban areas of multi-storey buildings, this urban form may not be appropriate for adapting to increased temperature and humidity. The form of urban development has also been identified as a key influence to recycling rates in studies undertaken in Ireland (Kurz, Linden & Sheehy 2007). Kurz et al (2007) identified that recycling rates were higher amongst households living in semi-detached housing compared to more dense housing estates. Waste recycling has been a focus for carbon emission reduction for programs such

as ICLEI-CCP, particularly in Australia, where ICLEI CCP (2007) indicated that 85% of community carbon abatement was attributed to waste recycling.

Hammer (2008) considered that, at the LG level, significant policymaking powers relate to those determinants of urban form known as zoning rules and building codes. Through these mechanisms, Hammer considered that local officials give policymakers the capacity to determine building density and size in different neighbourhoods, and the energy-related standards of buildings including whether renewable energy must be harnessed for on-site use. Davoudi et al (2009) considered that aspirations to achieve low or zero carbon emissions can drive innovation, new partnerships and competitive advantages for areas. They also consider that sub-national innovation and leadership are essential to the delivery of mitigation policies. Davoudi et al (2009) highlight the importance of new standards for materials, construction and management of buildings and infrastructure, as well as new approaches to waste and water management and infrastructure. They conclude that the purpose of mitigation is to harness the low-energy and closed-loop processes which cut the materials and energy intensity of development. Thus planning should acknowledge the opportunities that local areas have for harnessing renewable energy and enable development of this potential. However, Bulkeley describes planning for climate change as taking place in a fragmented landscape, in which 'central dictat and grassroots innovation sometimes sit uncomfortably', and compromise leads to lowest common denominator solutions (Bulkeley 2009).

Ideally, for new buildings and developments, renewable energy technology, energy efficient equipment and low carbon transport should be incorporated from the outset. The statutory processes at both local and state government level are therefore influential in achieving an effective implementation of carbon reduction initiatives, particularly those that may seek to achieve rapid action and early adoption of alternative technology within the built form. The translation of national targets to city scale targets and spatial policy is considered by Troy et al (2003) to be an essential role of planning and if not undertaken, leads to uncertainty, confusion and ambiguity amongst citizens and developers. A recent approach advocated by Hamilton et al (2008a), to assess renewable energy potential, considered renewable energy to be a finite resource which exists within a finite spatial area, such as a LG area. Kellett and Hamilton (2009b) took this approach further by exploring the concept of renewable energy resource plans for local areas, which could sit alongside development plans to assist LG in the development of renewable energy

resources within their area. The linking of local energy plans with familiar planning tools was considered to assist in overcoming a potential barrier that Kellett (2003) had previously identified – that local planners had little experience of dealing with renewable energy developments.

Planning for climate change mitigation at the local level is reliant on the planning system operating in each country. In order to identify differences that may be country related, the following sections review literature that has researched urban planning policy in Australia and in two European countries identified as high carbon emitters - England and Germany. A comparison of these three planning systems may be useful in identifying issues related to Australia's planning system that may affect carbon reduction initiatives.

2.2.1.1 Planning in Australia

The 1990s was described by Hamnett (2000) as a decade of strategic planning in Australia with each state developing a state planning strategy that attempts to integrate the environment, people and the economy – a response to the demand for sustainable development. In Australian cities, the existence of multiple LG authorities has the potential for different local objectives or principles to be incorporated into local development plans creating tension between councils with adjoining boundaries. According to the SA LG Act, each Council is required to have a Strategic Management Plan which covers a period of four years. It is also required to maintain long-term (10 year) financial and infrastructure and asset management plans. The Strategic Management Plan is required to be consistent with the State's Planning Strategy and the respective Council Development Plan or Plans for the area. The types of services that urban local authorities in Australia provide are varied: for instance one council in South Australia provided a long list of 21 services as justification for residents and businesses paying annual council rates (City of West Torrens 2009). In reviewing this list, it became clear that there was no mention of development assessment or strategic planning activities in the long list of services for which citizens pay LG. A question may be asked about how LG can gain support from their community to take action on climate change through planning policy, if citizens are not informed of the strategic planning and development assessment role of LG.

Research into energy policy in Australia makes statements such as 'the design and implementation of government policies targeting the reduction of greenhouse emissions is one of the most important and difficult challenges facing modern society' (Passey, MacGill

& Outhred 2008). According to the Australian Local Government Association (ALGA 2008), land use planning in Australia is attempting to respond to challenges of climate change through various mechanisms from state or regional planning strategies, structure planning of new urban development and development of consistent planning policies which may be implemented at the local level by local planning authorities. Gurran and Phibbs (2008) reviewed Australian local planning schemes to identify the emerging planning approaches for sustainable urban form and biodiversity conservation. Their study also reviewed the planning provisions for mitigating climate change (reducing reliance on non-renewable energy sources) and strengthening the capacity of communities to adapt to climate change. In their study, a sample size of 129 local authorities across Australia completed an internet postal survey, which was 20% of the total number of local authorities. Their findings indicated that only a quarter of these plans included requirements for passive energy utilisation or energy savings in the design of buildings (Gurran and Phibbs 2008, p.143). Only 25 plans - less than 20% of the sample of plans reviewed - included requirements for water conservation and less again required waste minimisation in construction and operation of new development. The responses from LG indicated that these aspects are controlled by state government policy. The review of broader planning provisions for climate change mitigation noted 'limited evidence of tangible planning requirements to achieve these goals', with 'only three local plans referring to climate change mitigation or adaptation as a consideration when assessing development' (Gurran and Phibbs 2008, p. 147).

Climate change mitigation in the South East Queensland (SEQ) area of north-eastern Australia, which is one of the fastest growing urban regions in Australia, was evaluated by Burton (2007). He argued that 'the majority of greenhouse gas emissions occur at the local level' and that, therefore, LG 'is an important scale to target reduction efforts' (Burton 2007, p. 1). His study critically examined the approach taken to mitigating climate change by interviewing planning staff from eighteen LG authorities across the region and compared the strategies in documents to 'identified best practice'. The best practice that Burton identified included: clear greenhouse gas baseline data, targets and monitoring; an acknowledgment of the problem; community and government education; reduced reliance on fossil fuels; appropriate urban and rural land use planning; statutory support; integration across all levels of governance; and the application of the precautionary principle. Burton found that 16 councils had planning schemes and of these, only seven mentioned climate

change mitigation. He found that there were no substantive provisions in the planning schemes or the SEQ Regional Plan (SEQRP) for climate change mitigation. A similarity in strategies undertaken to mitigate climate change at the local level was observed across the region with the main focus on energy efficiency through building design or orientation. Burton observed that there were no attempts to adopt renewable energy targets and become less reliant from the main coal-powered electricity grid, due mainly to economic reasons. He noted that more than 60% of transport funds for SEQ infrastructure was being allocated to building roads and tunnels which he stated 'do little to reduce vehicle kilometres travelled' (Burton 2007, p. 10). Other observations were that planners and environmental staff struggled to convince key decision makers to undertake emissions reduction strategies based on ethical responsibilities to the global common, and that key decision-makers had a poor understanding of the science associated with climate change (Burton 2007). He commented that there was little institutional knowledge of climate change at the local (SEQ) and State level (Queensland) and that education of government staff (and the general community) was required. The lack of action and leadership at the State level was considered to provide an opportunity for LG to 'take ownership of the problem' (2007, p. 13), however, Burton concluded that the region's planners needed to acknowledge that climate change is one of the 'most serious risks of this century' and that the establishment of 'accurate regional baseline data with emissions targets that coincide with world's best practice' was needed (2007, p. 13).

Aspects of housing in two LG areas of southern Australia were reviewed by Hamilton (2009) who noted differences in roof styles and complexity over the decades, concluding that the potential for harnessing solar renewable energy on rooftops is influenced by the rooftop styles of the housing stock. Forster (2007) stated that the housing stock in each major city in Australia is a mixture of age, style, building materials, tenure and cost and that this historical legacy was inherited in particular from periods of rapid growth and strong demand for new housing particularly from the 1950s and 1960s. A summary of housing through the years (Anon 2008) identified trends such as using bricks rather than wood from the 1960s onwards, modest homes on large allotments with widespread use of brick veneer in the 1970s, the increasing size of homes with additional family areas in the 1980s, the increasing diversity in housing and an increasing popularity of opulent and two storey dwellings in the 1990s, while the 2000s has seen a greater focus on energy efficiency and orientation on smaller allotments with overall size of homes apparently

decreasing. Similarly, Forster observed that the 1990s were a watershed decade when the traditional low-density nature of new residential development began to change (Forster 2007). One aspect of these changes which Hamilton (2009) identified was the number of north facing roof (NFR) facets per dwelling. Planning policy has a role to address these issues to ensure the effectiveness of incorporating renewable energy and achieve carbon reduction.

Scholars in Australia express conflicting opinions about the contribution that the form of urban settlement makes to energy consumption through travel mode choices. Newman and Kenworthy (2003) advocate for higher density development and multi-centred mixed use urban form to reduce the need for travel. Following their recommendations and those of Calthorpe in the US (see Calthorpe 1993), in recent years the concept of 'new urbanism' has become popular in South Australia for planning urban areas (LMC 2010). Gleeson (2007) referred to 'sprawl-angst' as masking aesthetic complaint with the suburban form and quoted Christoff and Low (2000) stating 'it has never been established that higher residential densities *per se* reduce the consumption of energy or greenhouse gas emissions resulting from travel behaviour'. Troy et al (2003) observed that little effort was made in Australian urban policy frameworks to capture the full energy impacts of different built forms. Concern about urban consolidation includes issues such as the urban heat island effect which may exacerbate temperature increases in urban areas during certain meteorological (synoptic) conditions (Morris & Simmonds 2000). Thus in Australia there is still debate over urban planning and appropriate urban form to integrate aspects of sustainability and how these factors affect carbon emissions.

2.2.1.2 Planning in England (UK)

The land use planning system in England consists of a Planning Policy Framework at the central Government level which develops Planning Policy Statements (PPS) and Planning Policy Guidelines for implementation at the local level (DCLG 2010a). PPS set out the central Government's national policies on different aspects of spatial planning in England. In 2006, Barker produced her final report recommending changes to the UK land use planning system. The focus of Barker's review (Baker 2006) has been on economic issues. However, the review states that recommendations have also sought to advance environmental goals. The Stern Review (Stern 2006) made a clear case for early action to reduce the future economic costs of climate change, and for further steps to be taken to ensure adaptation. Barker's review (2006) laid the foundation for tackling climate change

through planning, building regulations and the Code for Sustainable Homes. The objectives of suggested reform were to ensure that the planning system is more responsive to the market while delivering sustainable development; managing growing demand for development land, both by ensuring more efficient use of urban land and ensuring that the environment is protected and enhanced within the context of more land being required. Barker notes a need for effective delivery of necessary infrastructure while protecting the need for democratic accountability; streamlining the planning system to increase certainty, reduce complexity and cut costs for the private and public sectors while ensuring that systems support effective community involvement. She singles out the need for both speed and quality of local authority decision-making to provide firms and other applicants with appropriate levels of service. Barker (2006) also recommended improving incentives, including fiscal, to support a more responsive land use planning system.

At the local level, each local authority is required to develop a Local Development Framework (LDF) in accordance with the *Planning and Compulsory Purchase Act 2004*. The LDF is a suite of development plan documents (DPDs) incorporating both mandatory and optional documents. The mandatory documents are the Core Strategy, Site Specific Allocations document and an Adopted Proposals Map. The optional documents include Area Action Plans and other development plan documents which may be concerned with themes such as housing, employment, retail development etc. Other documents include Local Development Orders which extend permitted development rights for certain forms of development, Supplementary Planning Documents and Simplified Planning Zones. In addition the LDF includes the Local Development Scheme, the Statement of Community Involvement and the Annual Monitoring Report. Up to July 2010, the Development Plan for a local area comprised the RSS and the DPDs. With the revocation of the RSS, the LDF now comprises the DPDs which are replacing the previous Unitary Development Plan for each LG area.

Barker (2006) flagged the need for considerations about emissions to be given greater weight in decisions about where to accommodate the development needs of expected population growth. She noted that long-term flooding risks will also need to be given careful consideration. Since Barker's review, local action for mitigation and adaptation has been mandated, enabling planning authorities to take climate change into account in their decision-making (Bulkeley et al 2009). However, regional issues such as transport infrastructure planning and spatial planning cross local authority boundaries. Up to July

2010, these regional issues were directed from central Government through regional spatial strategies (RSS). In July 2010, these RSS were revoked (DCLG 2010b) and the LG authorities have been given back the authority to reflect 'local people's aspirations and decisions on important issues such as climate change, housing and economic development' (DCLG 2010b).

2.2.1.3 Planning in Germany

The review of the framework in which land use planning is undertaken in Germany draws primarily on the analyses of the German planning system undertaken by two authors: Stephan Schmidt of the Department of City and Regional Planning, Cornell University (Schmidt 2009) and Claus Wiegandt of Geographisches Institut der Rheinischen, Friedrich-Wilhelms Universität (Wiegandt 2004).

Schmidt (2009) contends that the German planning framework was conceived in the post-World War II period at a time of stable and strong growth and was centred on four principles: first, the equitable distribution of public services and infrastructure and balanced distribution of land uses; second, a legally grounded framework emphasising consensus and mediation; third, a system of plan compliance through an extensive approval process; and fourth, a careful balancing of powers and federal division of government predicated on the Basic Law (*Grundgesetz*) of 1949. The ability of municipalities to determine their own development is enshrined within the *Grundgesetz*, which states that 'the municipalities shall be guaranteed the right to manage all the affairs of the local community on their own responsibility. . .' (Article 28 (2)), something commonly referred to as the municipal planning priority (*Kommunale Planungshoheit*) (Schmidt 2009).

The federal government in Germany provides planning and building legislation, the *Building Planning Law* and *Federal Building Code*, which outlines in general form the objectives and guiding principles of urban development. The local municipalities are responsible for specifying details to meet specific local conditions (Wiegandt 2004). An increase in inter-governmental relationships across Europe both at supra-national and sub-national levels has resulted in a European Spatial Development Perspective (ESDP) which advocates the development of a balanced and polycentric urban system, and identified regional and local authorities as the appropriate scale through which spatial problems and issues should be addressed and mediated (Schmidt 2009).

The state governments (*Länder)* do not have their own statutory responsibilities for local planning, but the individual *Länder* with their respective *Land* ministries support the municipalities with their own programs for urban development. In addition, the *Länder* generally provide one third of the funds for urban renewal, and they shape urban renewal with their *Land* programs. They regulate on the criteria of eligibility for subsidies, the focus of the fiscal support and the more specific selection criteria for the rehabilitation of buildings and for development measures in the municipalities; hence they control the implementation of financial assistance for urban renewal (Wiegandt 2004).

The primary planning tool at the regional and state level is the central place system, in which regions and states allocate infrastructure, services and land uses across the territory however the manner in which planning is organised differs from state to state (Schmidt 2009). In implementing the state plan, some *Länder* are divided into administrative districts (*Regierungsbezirke*), which fulfill and carry out administrative tasks on behalf of the *Land*. Specialised sectors (i.e. ministries for transportation, water and energy) provide input through sectoral plans (*Fachplane*), which are formulated independently from the state plan and then integrated (Schmidt 2009). At the regional level, however, planning only identifies areas in which development may not take place. Actual development, in particular the assignment of building rights, is still in the hands of the municipalities.

Master plans are the main planning instrument used by municipalities. The *Federal Building Code* stipulates that master plans must guarantee a sustainable urban development and a use of land which is compatible with social values and which serves the good of the general public; it should contribute to securing a human environment and protecting and developing the natural necessities of life.

Wiegandt (2004) describes German planning legislation as follows:

> German planning law distinguishes two levels of land-use planning (*Bauleitplanung*) – preparatory land-use planning *(Flächennutzungsplanung)* and legally binding land-use planning (*Bebauungsplanung*). It also distinguishes three different legal categories of areas those with a legally binding land-use plan, continuously built-up areas (*Innenbereich*), and white land (*Außenbereich*).
> Municipalities must set up urban land-use plans (*Bauleitpläne*), if they deem it necessary for urban development. These plans regulate on construction and other claims on the use of the municipal territory. Urban land-use plans must be adjusted to spatial planning goals of the larger territory; these are specified in regional planning regulations.
> The preparatory land-use plan covers the entire municipal territory. It outlines the intended development and the types of land use resulting from it. The legally binding land-use plan is based on the preparatory land-use plan. It stipulates with a final and

> binding effect that the land of a specifically marked can be used for construction purposes.
> Another major category is constituted by municipal territories that are (at least traditionally) continuously built-up or that still undergo construction without requiring a building plan - apart from the application of certain planning control regulations. A development project in this area is only permissible if it blends in with the immediate environment in type and extent of construction, its size and characteristics, a decisive factor being the kind of the existing construction.

The *Bebauungsplanung* (BBP) is a specific site development plan for a parcel of land drawn up by the municipality to which the developer or property owner is legally bound. It is through the BBP that an owner receives building permission from the municipality, which is granted once the plan is approved by the municipality (Schmidt 2009). Due to the legalised framework in which planning occurs, planning issues and tensions often revolve around procedural concerns over rights, responsibilities and enforcement (Schmidt 2009). The use of urban development contracts and other mechanisms which allow greater involvement of the private sector in the development process has become more widespread since 1998 (Schmidt 2009) in an effort to speed up the development process.

2.2.1.4 Summary - planning systems in Australia, England and Germany

While planning systems are developed at higher levels of government in each of these three countries, urban planning remains a key responsibility of LG. The involvement of state government, the community and private sector developers in broader master planning of communities is becoming increasingly common to each country and complicates the responsibility and role for LG. This review now turns to focus on literature which has explored the barriers to LG action to mitigate climate change.

2.3 Barriers to local government action on carbon reduction

While not focusing specifically on climate change, Pillora, Blackburn and Artist (2009) recently reported on a study to identify drivers and barriers to achieving sustainability in LG in New South Wales, Australia. The barriers reported by Pillora et al (2009) in their study included: too much theory and not enough practice; inadequate systems for managing information; competing priorities; internal and external funding; staff capacity and turnover; research and development challenges in finding new ways of doing things; the language of sustainability; dealing with other government agencies; and legislation not keeping up with best practice. The drivers they identified were: general manager and senior management support; mayor and councillor leadership; media coverage of global and local issues; an active and engaged community; dedicated sustainability staff; sympathetic

organisational culture; effective management systems; external funding; legislation; and partnerships and external agency support.

Bulkeley and Betsill (2003) identified a number of potential barriers to local action on climate change. These included: the scope of LG activity; coordination between LG and state government; and conflicts of interest between economic and environmental objectives (Bulkeley & Betsill 2003, p. 167). Their study also identified various strategies which they considered to be important to overcome barriers to taking action on climate change. These strategies included: developing political champions; accessing financial resources; developing LG competencies and capacity; local issue framing; and willing politicians (Bulkeley & Betsill 2003). Barriers to action on climate change identified by Lowe (2005) related to the dominance of short-term thinking, together with incomplete knowledge, technical hubris, econo-mysticism, and the role of the mass media. However, rather than outline strategies to overcome these barriers, he stated that the strategies are dependent on the type of barriers that exist and may vary from community to community. Involving the community in moving forward on local carbon reduction has been advocated by Kellett (2007) who recommended carrying out local energy studies, establishing local community-based energy service providers, providing incentives for investment in local renewable energy schemes and involving local communities in deciding the appropriate mix of energy solutions.

The local estimation of carbon profiles required for the setting of carbon reduction targets has been raised as a potential problem by a number of researchers (Burton 2007; Gupta 2008; Hamilton, Kellett & Yuan 2008b). In reviewing methods used for determining the baseline carbon profiles of LG areas in Australia, Hamilton et al (2008b) encountered problems in collecting actual energy use and waste generation data for sectors of two LG areas. In the various studies in Australia and the United Kingdom that Hamilton et al (2008b) reviewed, and in their own case studies, the main barriers that were identified included gaining access to confidential energy consumption data and the considerable time required to collect and validate the data. They compared three methods for assessing the carbon profile of two LG areas in Australia and found that in addition to the lack of local data on energy use needed for a bottom-up approach, the allocation of industry and transport sector data from national or state level to a local community level, a so-called top-down approach, is also problematic, and that none of the three approaches that they trialled could be used with certainty for estimating carbon emissions and setting targets at

the local level. More recently in the UK, DECC have developed energy consumption data on regional and local authority scales, releasing annual gas, electricity and transportation energy consumption and related carbon emissions, which is useful for developing community carbon profiles (DECC 2009a).

Other researchers have focused on estimating the carbon emissions associated with the consumption of goods and services which is sometimes described as a 'carbon footprint' approach. Browne, O'Regan and Moles (2008) reviewed mechanisms for determining carbon footprints for countries and local areas such as a city region. Various models were reviewed that rely on quantifying the energy associated with inputs and outputs (in terms of useful product and wastes) seeking to understand and quantify the operational and embodied energy along the processes taking place in consumption. They concluded that the 'ecological footprint' approach of Rees and Wackernagel (1996) was useful in indicating 'hot spots' but may not be the optimal methodology to measure urban or regional sustainability. The data including direct energy consumed by residents for residential, commercial or public services use and private travel, energy associated with water provision or consumption or the land required for residential, commercial, public, and transport infrastructure, were generally unavailable at the local level (Browne et al 2008). Their study identified top down national data and expenditure patterns as the most effective way of comparing areas within a country. Studies have also identified other local information which may be needed to determine carbon emissions associated with energy use and consumption at the local level. Local information may relate to: per capita income, population density and compactness, modes of transport, and electricity and power supply sources (Sovacool & Brown 2010); household size in terms of the number of people living in each dwelling and physical area of dwellings (Oliphant 2003); and the embodied energy in buildings and roads within neighbourhoods (Moriarty 2002; Perkins 2002; Troy et al 2003; Holloway & Bunker 2006; Perkins et al 2007).

Hammer (2008) contends that LG may be limited in its ability to develop a city-specific building code, as such codes are generally developed at the state or national level and these tiers of government will dictate whether localities can impose their own version on local building projects. Kellett (2003) researched the role of planning to support renewable energy in the UK and concluded that the majority of local authority planners in the UK had little or no experience of dealing with renewable energy developments. Kellett also expressed concern about conflicting statements from the UK central government in respect

to the role of planning to support the wider adoption of renewable energy. More recently, Howard (2009) stated that the failure for mitigation planning to gain traction at the local level should be blamed on local decision-makers, which seems to contradict Kellett, exposing differences in opinion about the level of influence of local planning authorities, ie LG, and the role that they may be expected to take.

While rational responses to the knowledge of the causes of climate change and the identification of technological solutions may be expected, research indicates that LG's actual response may be influenced by 'non-rational' local (community or social) factors, a lack of information on which to make decisions, the will of politicians at all levels of government and LG's capacity to take action. The last of these, capacity to act, has been the subject of research in recent years which spans both sustainability and climate change. This research is discussed in the following section.

2.4 Capacity to act

According to Easton (cited in Evans et al 2005), society in democratic countries is accustomed to the fact that there are formal institutions to take care of the allocation of values, resources and rules. Strategies for increased action on climate change mitigation proposed by Bulkeley and Betsill (2003) included capacity building as well as financing and making commitments. The institutional capacity that was identified by Evans et al (2005) in their study of best practice sustainable development by local authorities across Europe consisted of six factors: committed officers, political will, training for sustainable development, mainstreaming into working practices, national and international networks and activities, and province level support and networks.

Five factors - namely: structures; situations; actors; strategies; and time - were found to interact and are important to understand the success of policies to address environmental issues, according to Janicke and Weidner (cited in Evans et al 2005). The *structures* are described as the political, economic and cultural framework conditions in which policy is enacted. The *situations* are specific and trigger or steer the change in policy direction. The *actors* include both the proponents and opponents of the policy action. The *strategies* detail the capacities for planned and oriented policy action and *time* is considered to be important for investment and processes. Evans et al (2005) concluded that a certain level of institutional capacity must exist to be able to act accordingly to changes in the trigger and that competence, staff and material resources are essential for decision-making. Bulkeley

et al (2009) also identified municipal competencies and resources as two key factors which shape local capacity to address climate change, but added leadership and urban political economies. Leadership was discussed in terms of: the role of individuals as leaders within a municipality such as a champion or a policy entrepreneur; and the opportunities available for municipalities to perform leadership roles with respect to their peer communities (Bulkeley et al 2009). The competencies of LG related to their powers and duties in the key sectors of energy, transport, planning and waste. The resources of LG referred to their financial and human resources which LG deploy to address climate change. The urban political economies related to political will and the priority with which it is accorded locally.

Capacity has both vertical and horizontal dimensions (Weber, Lovrich & Gaffney 2007). They describe the vertical dimension as hierarchical and focused on legal authority and the goals of government programs implemented by managers. The horizontal dimension was expressed as reliance on others through sustained interaction with empowered, community-based partners for problem solving and problem management. Weber et al (2007) suggested two principal features of horizontal capacity that could be measured: social capital; and institutional commitment to pre-existing "vertical" programmatic goals. They argued for durable collaborative governance institutions to tackle complex public problems and highlighted the limits of a fragmented, top-down approach. Providing assistance to support individual action requires LG to acquire new skills that may draw on governance and networking with institutions outside of public management and uses mechanisms of partnering, cooperation and interchange (Garson 2008). Local government has usually been afforded power by a higher level of government to make decisions on certain activities within its boundary, and may also have some capacity to influence decisions made in adjoining LG areas. Hence it operates within a hierarchical and spatial structure of government, legislation and policy setting. While LG may be able to make decisions on aspects such as the energy system or transport infrastructure, some cities have multiple LG authorities. Such is the case for most Australian state capital cities including Melbourne and Adelaide and for some cities in Europe such as London which has multiple Boroughs. Decisions of state or national government may have also led to the privatisation of energy and transport services. Hence decision-making may be quite complex and the ability of individual LG authorities to influence the actions of contracted or privately owned operators of networks to meet local objectives may be problematic. While LG may have

the capacity to act on its own corporate activities, it may have a reduced capacity to act to assist households in its community to reduce carbon emissions related to energy (and water used by the households) and through transport mode choices (Hammer 2008).

Local government itself may be considered to be an institution which March and Olsen cited by Peters (1999) defined as 'a collection of values or rules, largely normative rather than cognitive in the way in which they impact institutional members, as well as the routines that are developed to implement and enforce those values'. Research on LG actions may adopt the principles of new institutionalism, also known as neo-institutionalism, which Ingram and Silverman explain as 'Actors pursue their interests by making choices within institutional constraints' (Ingram & Silverman 2002). In this context, the actors, the choices they make and the institutional constraints are all therefore important to conducting research on LG action to address climate change. This concept has been used to develop methods to analyse LG's capacity to action carbon reduction by Hammer (2009) which is discussed in the following section.

2.4.1 Assessing capacity to act

Hammer (2009) considered a local authority's 'capacity to act' to be a critical determinant of local energy planning and program implementation and reviewed three alternative approaches to assessing capacity to act across cities. The first was a quantitative approach which Hammer described as the sum of the city's ability to influence the level of energy use or carbon emissions in various policy silos multiplied by the relative contribution of each silo to the city's overall energy use or emissions profile. The policy silos were electricity supply, distribution and use; land use planning; transportation; district energy and on-site thermal energy; building design and codes; waste and other forms of embodied energy; water delivery and treatment; energy-related economic development; and general energy governance practices. Three flaws in this approach were noted by Hammer: firstly, the lack of accurate accounting of carbon use or carbon emissions in a city. The other flaws noted by Hammer were the need for an arbitrary assessment of what a city may accomplish in terms of affecting local energy use or carbon emissions and that the scope of energy and climate plans often vary widely across cities. The latter was considered to be of major importance to researchers who are trying to compare apples with apples (Hammer 2009).

The second approach described by Hammer (2009) used a qualitative Capacity to Act Matrix (CTAM) which identifies the stakeholders with decision-making power about

energy issues and to whom the Mayor may be able to apply leverage. The stakeholders included the local authority itself; the provincial or state government; the central government; the private sector; households and individuals; and non-government organisations (NGOs) or other lobby groups. The exercise then proceeded with a review of the type of Mayoral levers that can be used. These levers were grouped into five categories: rulemaking; regulatory oversight; direct expenditures or procurement; financial incentives; and information gathering and dissemination, convening / facilitation and advocacy. Hammer (2009) considered that a local authority should assess each policy silo (electricity supply, distribution and use; land use planning; transportation; district energy and on-site thermal energy; building design and codes; waste and other forms of embodied energy; water delivery and treatment; energy-related economic development; and general energy governance practices) for each sector (e.g. residential).

The third approach reviewed by Hammer was a linguistic approach whereby information about a city's capacity to act is derived from a simple numerical accounting process and then presented as a plot of levers employed as documented in the city's energy or action plan (Hammer 2009). The same five categories of levers as for the CTAM previously described in the second of Hammer's approaches are applied in this approach. A five pointed plot is then developed which allows trends to be quickly displayed and provides an easy comparison with other cities. Weaknesses of this approach noted by Hammer (2009) were that it weighs all levers equally and may capture policy preferences rather than reflect a real capacity to act, and that the language used by a local authority in its energy or action plans may not be specific, requiring interpretation by the researcher.

Hammer (2009) considered that when a limited number of cases is to be studied, either the quantitative approach or qualitative approach using the CTAM is preferable, however these are said to be time consuming processes. Where the sample of cities for comparison is large, a useful starting point, argues Hammer (2009), may be to simply and rapidly assess the levers included in plans through the linguistic approach which may provide an understanding of the focus of action proposed at the local level and a summary of each city's capacity to act. The plans however are the final outcome of the decision-making processes within each LG and may not reflect the tensions within the organisation itself or the attitudes towards the actual or potential role of LG to support community carbon reduction.

2.5 Local governance of climate change

Before commencing a review of research on climate change governance, it is useful to review the history of research on the governance of 'sustainability'. Gilbert et al (1996) advocated for 'good governance', recommending a participatory and inclusive approach and consensus building within the community, as well as building capacity for action and taking action towards 'urban sustainability'. They listed six basic imperatives that they stated LG believe must be stressed: recognition of the fundamental role of LG in moving towards urban sustainability; achievement of good governance through leadership of all sectors of the community by elected officials; broad approach to environmental, social and economic sustainability; partnership approach within urban areas and externally; support for LG capacity including powers and resources; and support from international agencies and national governments for cross municipality cooperation. After reviewing the action of a number of cities to move towards sustainability, Gilbert et al (1996) concluded that each city's methods of governing, their policy commitments, and their specific actions will influence their contribution to sustainability regardless of an appropriate jurisdictional framework and sufficient fiscal and technical capacity. Nearly a decade later, Evans et al (2005) recommended that an agenda for action on sustainability focuses on the institution itself, its demonstration of leadership and its networking. They stated that the focus should be on: LG as a learning organisation; links established between departments; alliances with external agencies; creative policy making; LG facilitation and leadership; communication with civil society; using environmental awareness as a catalyst; developing a vision; strength and courage of LG; networks between local authorities; and multi-level governing.

Governance and sustainability in the development of metropolitan strategies for five Australian cities was reviewed by Gleeson, Darbas and Lawson (2004), who concluded that the more effective strategies adopted explicit political oversight and coordination of urban policy. They considered that 'some measure of traditional "blueprint" control is crucial if cities are to be restructured to protect natural resources and achieve a more sustainable morphology' (p. 363). They observed a consensus that car dependency was unsustainable, and had resulted in a 'sprawling' morphology of capital cities. They recommended that financial and planning levers be established, and that sectoral responses were ineffectual (p. 364), preferring systemic interventions. Gleeson et al (2004) recommended that connections be made between patterns of urban development and indicators of environmental sustainability such as water and air quality, and patterns of

public consumption. They identified a move towards integrated policy, regulation and assessment anchored in inter-agency deliberations and a whole of government approach. An openness towards non-government perspectives and participation was also observed and that broad public input into strategy was being used to address civic protest about urban change and to progress sustainability, with the latter reasserting the strategic understanding of planning. The idea of 'sustainable communities' is born out of an understanding of the importance of individual human behaviour and the local governance context in which that behaviour takes place (Portney 2005).

A summary of the checklist for improving governance for sustainable development which had been published by the OECD in 2002 was used by Adger and Jordan (2009). They identified five key areas which may be used to evaluate efforts to improve governance for sustainable development:

- a common understanding of sustainable development;
- clear commitment and leadership;
- specific institutional mechanisms to steer integration;
- effective stakeholder involvement; and
- efficient knowledge management.

In their review of governance of European cities, Evans et al (2005) focused on social governance, which they defined as :

> .. the totality of interactions, in which public as well as private actors participate, aimed at solving societal problems or creating societal opportunities; attending to the institutions as contexts for these governing institutions; and establishing a normative foundation for all those activities (Kooiman cited in Evans et al 2005).

Their findings included identification of key themes and crucial factors, such as:

- LG autonomy;
- the role of the individual;
- institutional capacity for sustainable development;
- stakeholder engagement and social capacity;
- trust, consent and informal links;

- LG as the driver of sustainable development;
- the importance of incremental and pragmatic action;
- outward looking LG;
- interaction with other levels of government; and
- capacity building for sustainable development.

These factors and those summarised by Adger and Jordan (2009) appear to provide a useful starting point for examining governance for climate change mitigation.

Key researchers in the field of local governance of climate change are Bulkeley and Betsill. The focus of their initial research (Bulkeley & Betsill 2003) was identifying deficiencies in top down policy to enable climate change action at the community level. According to Bulkeley and Betsill (2003), a transition from government to governance at national and sub-national (local) levels in western democracies has been taking place. Through this transition, the roles of the public, private and voluntary sector are being redefined and restructured (Bulkeley & Betsill 2003). The role of the state is said to be changing from an old government model of the public sector (providing, commanding and controlling) to a new government model where its role is one of steering, enabling, facilitating, collaborating and bargaining (Bulkeley & Betsill 2003, p. 17).

While the ICLEI CCP project has operated for a number of years and the progression to community wide action on climate change was its ultimate objective, Bulkeley and Betsill (2003) concluded that the focus to that point had been on corporate activities and that achieving community wide change had been problematic. Bulkeley and Betsill (2003) contended that the development of new public management (NPM) which advocates corporate methods of governance may have contributed to LG's focus on its internal activities. Rhodes (1996) described corporate methods of governance as the systems by which organisations are directed and controlled. He used the term 'steering' to describe governance in respect of policy decisions and 'rowing' to describe delivery of services which he also describes as government. Rhodes considered that NPM encouraged more 'steering' by governments and less 'rowing' and that three problems may result from the NPM approach: fragmentation of action through multiple agencies; problems in steering complex sets of organisations; and the obscuring of accountability, particularly public

accountability. He also analysed markets, bureaucracies and networks as forms of governance. Rhodes developed a definition of governance as 'self-organising, inter-organisational networks' which is broader than government, covering non-state actors, including the public, private and voluntary sectors.

Bulkeley and Betsill found that non-state institutions and actors which operate at different scales share responsibility with the state for defining problems and implementing solutions to address climate change (Bulkeley & Betsill 2003). They identified varying roles for international, national, state (sub-national) and local government, for business, which may be local, national or international in ownership, and for civil society which incorporates actors from the public, private and voluntary sectors working through networks such as ICLEI CCP and partnerships. Their later research (Betsill and Bulkeley 2007) identified gaps between the policy discourse of the relevance and importance of local action for climate protection and the reality on the ground, concluding that the cross-cutting nature of climate change governance poses problems for the institutional make up of LG, resulting in a lack of 'fit' between the nature of the problem to be governed and the institutions undertaking governance. Betsill and Bulkeley (2007) concluded that 'one of the most important contributions of the academic research on cities and climate change has been to highlight the dispersed nature of climate change governance'. Bulkeley and Betsill (2003 p.191) observed that the ICLEI CCP program is based largely on the assumption that (local) government has primary responsibility for climate protection at the local level and is independent of processes taking place at other scales. They criticised the ICLEI CCP program for not acknowledging that (local) government has moved from government of climate change to governance of climate change and recommended that the program needed to engage with the business and voluntary sectors to effect policy changes, particularly in the transport, energy and planning sectors (p. 191).

Governance at the local level in Australia has been researched by O'Toole (2005) using an examination of LG annual reports of in the state of Victoria, Australia (Vic). He described corporate governance as internal governance which related to the structure of LG, ie the mayor, councillors and the bureaucracy or services provided (O'Toole 2005) rather than to the processes for decision-making. O'Toole described external governance as 'community governance' and concluded that it was reported in terms of participation mechanisms such as neighbourhood forums and consultation processes or participation in local community groups. He found that, while some Vic LG authorities reported on participation in the

community through different council and community committees, they did not associate this action with external (community) governance, leading O'Toole to comment on a potential lack of understanding of the concept of community governance within LG. While his study found that the corporate discourse was still dominant in LG, the concept of 'engagement' had started to appear which put emphasis on community participation. O'Toole (2005) considered that the purpose of 'engagement' however was to 'reconnect' LG to its community, which may indicate that LG makes decisions in isolation from its community.

Steffen et al (2009) studied governance in managing natural resources during climate change. They concluded that sub-state regional approaches which integrated management, education and governance were preferred to ensure that biodiversity is managed during climate change. Their research observed the development of a more complex institutional architecture at the sub-state level. Key players with environmental management roles identified by Steffen et al (2009) included LG, natural resource management groups and land-care groups. Hence LG was seen to have a key role in environmental management related to climate change adaptation within a broader community based governance framework. Steffen et al (2009) considered that local ownership and cooperation were crucial for building trust and legitimacy. These aspects, together with building 'subsidiarity' and 'polycentricity' into regionally oriented governance structures, were said to be essential for developing integrated solutions that address local knowledge, preferences, capacities, socio-economic trends and biophysical characteristics of a region (Steffen et al 2009). Newman and Jennings (2008) also refer to polycentric scales of governance as essential in moving cities towards sustainability, advocating visions, empowerment and partnerships at all scales, which they state will provide 'a wellspring of hope for the future' (p. 217).

Six categories of regional governance mechanisms were used by Feiock (2009) to describe institutional collective action: regional authorities; managed or coordinated networks; regional organisations; contract networks; collaborative groups and councils; and policy networks. Feiock (2009) cited research by Coleman; Putnam; Granovetter; and Lubell et al to support the observation that networks that facilitate collective action rely on trust, mutuality, and reputations. The ultimate objective of research into institutional collective action was stated to be the development of a theory of regional governance. However Feiock (2009) contended that little is known about the capabilities and dynamics of self-

organising mechanisms that actors develop to cope with institutional collective action problems which span multiple policy fields. Carbon reduction at the local level may be considered such a problem.

More recently Gleeson, Dodson and Spiller (2010) proposed that regional planning authorities or 'Commissions' be established in Australian cities with clear responsibility for places and issues of metropolitan significance. Their list of places and issues included: principal activity centres; public transport corridors; economic drivers including key employment nodes; airport zones; and development proposals meeting a defined threshold size or value. They considered that outside of these areas or issues, LG should have greater independence and discretion to pursue localised planning solutions. However, they acknowledged that this model adds another layer within the multi-level government system operating in Australia and that garnering community enthusiasm for electing another layer of government may be problematic. Gleeson et al (2010) mention that special attention must be given to the establishment of regional participatory forums to address democratic deficits, and that these regional governing bodies would nurture and lead popular debate at the regional level. They also identified 'subsidiarity' as a principle to be applied in relation to planning governance indicating that at the local level, appropriate activities or decision making responsibilities for LG would be: neighbourhood structure planning; regulating housing development and redevelopment within State and regional guidelines; and regulating development in all lower order activity centres. While they placed decision-making and responsibility for action to protect environmental and cultural assets at the regional or metropolitan level, climate change governance was not discussed.

Thus the research on climate change governance indicates that governance takes place within structures established at the regional or city wide level and may be focused more broadly on sustainability rather than specifically on climate change, particularly in Australia. Local government is clearly responsible for some aspects of governance for sustainable development. Research shows that identifying and including key stakeholders in decision-making is necessary for improving governance for sustainable development. In a focus on carbon reduction at the community level as one aspect of sustainable development, the community is a key stakeholder. Further research to collect information about how LG - the representative body for the community – involves the community in decision-making for climate change action is lacking, particularly in Australia.

2.6 The gap in the research

In concluding this review of research, a number of gaps have been identified. Firstly, there is a need to better understand the perspective of LG towards acting on climate change in its community, particularly to assisting the residential sector to reduce carbon emissions. There is also a need to understand the types of barriers that LG expects to face in taking action, its capacity to act, how planning policy supports or enables LG to take action and the nature of new governance structures (who governs and how) which may need to be developed to address climate change mitigation.

2.6.1 Key research questions

These gaps have informed the development of the following key research questions:

1. How does the action of local government reflect its capacity to act to support carbon reduction within its community?
2. How are the barriers and opportunities in addressing carbon reduction reflected in the structures and systems being produced and reproduced by local government actions?
3. Does a focus on community governance support local government action to address carbon reduction at the local level?
4. What differences can be identified by comparing Australian LG actions with LG actions in other countries?

The methodology and methods to address these research questions are described in Chapter 3.

Chapter 3. Research Methodology

The purpose of research is to answer the research questions posed by the researcher (Crotty 1998). The research methods and methodologies relate to the purpose of the research. While the purpose of the research was broadly outlined in the aims and objectives in Chapter 1 (see section 1.7), the literature review has identified gaps in the research to date (see section 2.6) resulting in the development of four specific or key research questions, namely:

1. How does the action of local government reflect its capacity to act to support carbon reduction within its community?

2. How are the barriers and opportunities in addressing carbon reduction reflected in the structures and systems being produced and reproduced by local government actions?

3. Does a focus on community governance support local government action to address carbon reduction at the local level?

4. What differences and opportunities for innovation can be identified by comparing Australian LG actions with actions by LG in other countries?

According to Babbie (1995) research can be exploratory, explanatory or descriptive. The current research is mainly explanatory as it focuses on the causes of, or the reasons for LG taking (or perhaps not taking) action to assist households in its community to reduce carbon emissions. The research also focuses on identifying and understanding the characteristics or regularities in LG's capacity to act and what social, political, economic and technological factors may influence its capacity to act. To a lesser extent this research is exploratory, as it seeks an improved understanding of the role of local government (LG)

in addressing community carbon reduction, and is descriptive as it identifies some key aspects about each LG case such as its carbon profile as well as the types of action that LG is taking to assist its households to reduce carbon emissions. Research may also be concerned with bringing about change, with practical outcomes and intervention (Blaikie 2000). While not a main objective of this research, its findings may ultimately lead to the development of policy at the LG level or by higher levels of government which better defines the role of LG to drive community carbon reduction. As such the objectives to identify whether there are differences which suggest innovations or new approaches being employed by LG to build its capacity to act on community carbon emissions; and to add to the understanding of the importance of the urban planning role of LG to a low carbon future may result in more rapid policy development.

In this Chapter, the research methodology, including the theoretical conceptual framework, and the rationale for the selection of research methods to answer the research questions and fulfil the research objectives are explained.

3.1 Theoretical or conceptual framework

This research postulates that society, its communities and LG each have a purpose or goal to which they work and which guide their respective decision-making. For LG, as the level of government closest to its community, goals may include representing its community, providing services for the good of its community (public good) which is here defined as the economic, social or environmental benefit of the community and protecting its community from threats to the public good. As previously discussed in Chapter 1 (see section 1.3), sustainable development considers economic, social and environmental aspects of activities, projects or development. Within the current research, climate change may be considered to be a significant threat to the public good or ‘sustainability’ of a community. Action to mitigate climate change, including to reduce carbon emissions in the community may therefore be seen as action to address a threat to the public good. Hence, action to support community carbon reduction is an essential role for LG.

Studying a community requires a definition of what a community is. How does a community become defined? What factors are used to place a boundary around a community? Is a boundary determined spatially, culturally or economically? Is a community bounded by age or special interests? Defining a community reveals both complexity (Healey 2007) and the existence of political, social and economic structures,

particularly when boundaries are placed around communities. In keeping with planning traditions, which have long been focused on integrating areas of knowledge and practices about places (Healey 2007, p. 13), the current research uses geographical spatial boundaries of LG and its socio-spatial dynamics to define 'community'. This decision is consistent with LG being the lowest level of government at which formal policy decisions related to planning of urban areas and allocation of resources for programs at the 'community' level are made. The use of LG cases to study climate change programs has been commonly accepted since the ICLEI CCP program is targeted towards this level of government (see Bulkeley & Betsill 2003). Demographic and economic characteristics of the broad community are also regularly described at this level using census data collected at regular intervals by national governments. Reports and records of LG decisions and programs are also more likely to be in the public domain and therefore accessible to the researcher.

However, LG is not a homogeneous collective. LG consists of individual organisations each of which is a public institution. Each LG is comprised of groups or teams of individuals, both elected and appointed officers, who are part of the wider community and wider society. These individuals have differing political ideologies and persuasions, are situated within differing physical environments, managed within differing legal and organisational structures and with varying levels of resources. It is acknowledged that these structural factors may affect their capacity to act, the power of actors within LG and the systems of governance by which decisions are made. The current research is underpinned by theories of structure and agency which are explained in the following sections.

3.1.1 Giddens' theory of structuration

According to Giddens (1981), both the conditions and consequences of social action are important in understanding social structures. The rules and resources that social actors draw on as they engage in social interaction exist in memory traces and are embodied in social practices (Held & Thompson cited in Blaikie 2007). Giddens' theory of structuration explains that 'society only has form, and that form only has effects on people, in so far as structure is produced and reproduced in what people do' (Giddens & Pierson 1998, p. 77). According to Giddens (1993, p. 134), the structure of society is the 'systems of generative rules and resources'. These 'exist as the reproduced conduct of situated actors with definite intentions and interests' (Giddens 1993, p. 134). Giddens explains that this perspective

applies to social change as well as to stable society. He states that 'every act which contributes to the reproduction of structure is also an act of production, a novel enterprise, and as such may initiate change by altering that structure at the same time as it reproduces it – as the meanings of words change in and through their use' (Giddens 1993, p. 134). Within the theory of structuration, there is a focus on language and the meaning that words develop through actions and structure.

Giddens (1993, p. 133) explains that three elements of the production of forms of interaction can be distinguished: all interaction involves (attempted) communication, the operation of power, and moral relations. Hence the structure of society can be explained in three ways: through the interpretation of language; through societal norms which legitimise action; and through domination or exercise of power, represented by the capacity of the agent to mobilise resources to constitute those means to achieve outcomes (p. 117). The 'creation of frames of meaning occurs *as the mediation of practical activities* and in terms of differentials of power which actors are able to bring to bear' (p. 120, emphasis by original author). Imbalances in power may result from superior linguistic skills of one person in conversation with another, the possession of technical knowledge, and use of authority or force. This theory provides an important analytical tool in this research.

3.1.2 New institutionalism and capacity to act

As discussed in Chapter 2 (Section 2.4), in providing assistance to support individual climate change action within a community, LG (an institution of public management) needs to acquire new skills that may draw on governance and networking with institutions outside of public management and uses mechanisms of partnering, cooperation and interchange (Garson 2008). New institutionalism as a theory dates back to the late 1970s when the first research was published that provided a new perspective of how institutions gain legitimacy within society (see Meyer & Rowan 1977). The principles of 'new institutionalism' underpin the current research: change is seen as a necessary institutional process in pursuit of legitimacy through socio-cultural construction of 'realms of meaning'. In addressing social norms related to energy use, a key factor relates to the power afforded the institution of LG which can be explored through an analysis of LG's capacity to act. Hence identifying the actors, the choices they make and the institutional constraints are all important aspects of this research.

Recent research into capacity to act on local energy systems (Hammer 2009) draws on the theory of new institutionalism. The approaches that Hammer (2009) used to analyse capacity to act were discussed in Chapter 2 (see section 2.4.1). One of these, the qualitative Capacity to Act Matrix (CTAM), takes each LG (institution) as an individual case and identifies the stakeholders with decision-making power about energy issues at the local level. The levers that the Mayor (or Council in the Australian cases) of a LG may be able to apply are then reviewed. In applying the method, Hammer (2009) considered that LG uses levers applicable to each policy silo. As discussed in section 2.4.1, the policy silos are: electricity supply, distribution and use; land use planning; transportation; district energy and on-site thermal energy; building design and codes; waste and other forms of embodied energy; water delivery and treatment; energy-related economic development; and general energy governance practices. Each of these policy silos were considered by Hammer to be relevant policies to reduce carbon emissions. The levers able to be applied by LG on each policy silo are then reviewed for each sector of interest. While, in this research, the focus is on initiatives of LG to support households to reduce carbon emissions, actions undertaken by LG may be directed towards other sectors, hence all policy silos have been considered in the analysis of capacity to act.

3.1.3 Governance of climate change

Related to the capacity of LG to act is the issue of local governance of climate change. From the research of Bulkeley and Betsill (2003), Bulkeley and Kern (2006) and Evans et al (2005), a number of key factors were identified against which the governance of climate change can be assessed. These were outlined in Chapter 2 (see Section 2.5). Totikidis et al. (2005) commented that:

> Community governance is sometimes used to refer to community participation, engagement and decision making in public matters and is related to terms such as local governance, social governance, network governance and participatory governance.

In the evaluation of LG initiatives in the current research, evidence of community involvement in decision-making about climate change actions has been sought from LG cases. An assessment of mechanisms that LG cases used to strengthen community governance may provide an insight into the means by which action on systems that control and lock in high carbon energy use within a community may take place.

3.1.4 Research framework

The approach taken in this research can be summarised in a framework which draws on Giddens' theory of structuration, and new institutionalism. The theoretical or conceptual framework within which this research is undertaken relies on the paradigm that policies and programs define LG's capacity to act. Deliberate action must be taken by LG on the structure of systems in its community to enable low carbon citizen action. Communities are currently locked into systems that use carbon intensive energy sources. Citizens within communities may be unaware of these systems and LG may need to act on the system on behalf of its community to enable a collective transition of the community towards a low carbon sustainable future. This framework is summarised in Figure 3.1. The mechanisms that are available to LG include formal policy mechanisms such as those used for urban planning purposes, eg. zoning or specifying standards of development. Processes and measures may also be informal, such as providing education, awareness, assistance or incentives to facilitate changes. While some changes may be within the sphere of influence of LG, other changes may require advocacy to higher levels of government or to private interests that have control of key aspects of systems. Hence, LG may need to adopt specific roles to enable change towards a more sustainable low carbon future for its community. The sum total of actions of LG on systems then enables society to collectively move towards a low carbon future regionally, nationally and globally.

Yin explains that case studies are appropriate research strategies where the topic lends itself to explaining a concept or phenomenon, such as the role of LG to act on climate change, and which is difficult to control through an experiment or able to be understood by analysing historical records (Yin 1989). Eisenhardt (cited in Huberman and Miles 2002), explains that the case study is a research strategy which focuses on understanding the dynamics present within single settings. A case study may combine various methods for collecting data such as through interviews, questionnaires, archives and observations and it allows the incorporation of both qualitative data (words) and quantitative data (numbers) (Eisenhardt 2002). Stake (2006:3) discussed the importance of describing the situation and experience of a case and that a case does not exist in isolation but has an inside and an outside, with some features lying within the boundary of the case and other features external to the case. The context within which LG acts may be partly defined by these external factors. Stake also refers to the meaningfulness of single cases and considers that a single case is of interest as it belongs to a collection of cases. In this research each LG

authority becomes the case, it has working parts and a purpose (Stake 2006:2). The activity of the case is important as well as the context and situation in which it does its activities (Stake 2006:2). By using multiple cases, the dynamics present within different settings, and their contexts and situations, are able to be captured, potentially allowing for comparative analysis of research findings between the case studies. Within this research framework, the types of initiatives being implemented or being planned are the activities. Context specific issues such as how these initiatives have been developed and implemented or the influence of institutional governance, at the national or state / provincial government level and/or at the local level can be explored.

The rationale for the selection of LG cases is described in the next section.

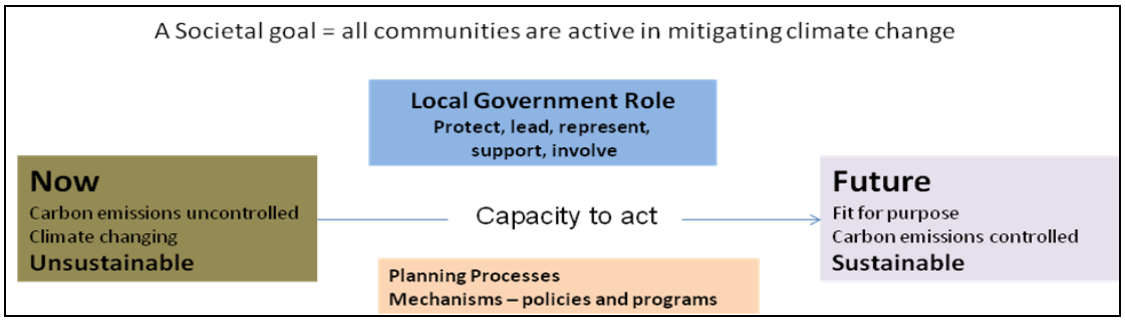


Figure 3.1 Summary of theoretical framework for the current research

3.2 Issues of representation and selection of local government cases

The unit of analysis in this study is the LG organisation itself. Hence the population for this study is all LG. A dilemma immediately presents itself - how to select LG cases for this study that could be deemed to represent the population. There are many thousands of LG authorities worldwide. In the Asia Pacific region alone, there are more than 7,000 LG authorities (UCLG Asia Pacific 2010). A resolution was found by separating the study into two phases. The first phase would adopt a broad approach to obtain a snapshot of LG action, while the second phase would explore the actions and attitudes of a small sample of LG cases in greater depth. Local government, however, is not homogenous and neither are the political, social and economic systems and structures in which each LG authority operates. As these factors may influence the types of actions taken, the roles that LG adopt

in addressing carbon reduction and the types of barriers that are seen by LG, a decision was made to explore these concepts more broadly than just in Australia where the researcher is located. In their study of climate change governance, Bulkeley and Betsill (2003) analysed the ICLEI CCP program using LG cases from multiple countries including Australia, Germany and the UK. Bulkeley and Betsill (2003) concluded that Australian LG was not as advanced in addressing climate change and carbon reduction at the community level as LG in other countries, particularly in Europe. Bulkeley and Kern (2006) had also researched climate change governance in Europe comparing the UK and Germany. Hence there was thought to be opportunity to learn from LG in Europe. As discussed in Chapters 1 and 2, the UK and Germany have both been identified as major contributors of carbon emissions across the EU. Exploring the similarities and differences between LG action for community carbon reduction in these countries with LG in Australia may reveal whether progress in Australian LG action has taken place since the previous findings of Bulkeley and Betsill (2003) were published. Based on the relevance of comparing LG from these three countries and following discussion with other researchers from the CNC project who had prior connections to LG in the UK and who were also familiar with German LG actions to reduce carbon emissions, a decision was made to recruit a small number of LG cases from both the United Kingdom (UK) and Germany (DE). Schofield (cited in Huberman and Miles 2002) explains that a small number of cases explored in depth may provide a rich and informative picture of each case and its setting.

The rationale for the selection of LG cases in each Phase is explained in the following sections.

3.2.1 Phase 1

The research was undertaken as part of a broader research project (Carbon Neutral Communities or CNC) that included LG partners from two states of Australia - South Australia and Victoria. It was resolved to focus on LG authorities in these two jurisdictions for the first phase. A decision was made to confine the study to LG in the urban/metropolitan areas – which was defined by the urban growth boundary for the Adelaide metropolitan area in South Australia, and the central map of metropolitan councils in Victoria accessed from the Municipal Association of Victoria. This decision was justified on the assumption that the greatest potential total reduction in carbon emissions from households may arise from the geographical areas where the population and dwellings are concentrated. More than 75% of Australia's population live in cities of

more than 100,000 (Commonwealth of Australia 2010). The LG sample used for the survey in Phase 1 was 20 councils from the greater Adelaide metropolitan area in South Australia and 28 councils from the Melbourne metropolitan area in Victoria.

3.2.2 Phase 2

For the second phase which would explore LG cases in depth and seek to identify differences between Australian LG and LG in other countries, eight LG cases in total were selected. Three LG cases from Phase 1 were selected as cases in Phase 2. Two of the cases were the LG partners from the CNC project, selected on the basis of their prior commitment to research on carbon emissions profiling and renewable energy resource assessments. The Vic LG case was considered to be demonstrating many aspects of 'best practice' at the community level. However, the SA case associated with the CNC project was less active across its community and its contact person had indicated that another SA LG authority was exhibiting 'best practice' in SA for action on climate change and sustainability. Following a review of data from Phase 1, a decision was made to include the additional SA case in Phase 2.

A snowball method was used to obtain three LG cases from the UK. In the snowballing method, contact was established via electronic mail with an officer in one LG in Yorkshire, England which led to recommendations of another two LG cases which had 'some interesting initiatives planned' for addressing climate change (UK09001 Participant 1, April 2009). An email to the mayor of Freiburg in Germany resulted in agreement to interview one of their staff, while permission from a second German LG was facilitated through the network of the officer from the first UK LG. Hence the selection of LG cases was undertaken by the knowledge of peers from within LG itself and active networks within the UK and more broadly across Europe. This approach for recruiting cases was appropriate as the researcher had not developed personal relationships with staff through prior visits to any of these LG areas. On reflection, the sampling logic mirrors replication as described by Yin (2003).

3.2.3 Selection of participants from each local government case

Having resolved the selection of LG cases, there was a need to resolve the dilemma of how many staff participants would need to be questioned to provide information, how this information would be obtained, and at what point sufficient information about the organisation and its actions had been obtained. In Phase 1, the method used left this

decision to each LG. In Phase 2, this decision remained with the researcher, who resolved to adopt an ongoing assessment of the completeness of the responses obtained, how much information was being provided, and the knowledge of the participant about initiatives undertaken. The researcher provided the questionnaire to the initial contact person at each LG before the interview using electronic mail. The contact person was able to review the questions, the type of data and responses sought and decide who within their LG should respond. This approach resulted in some recommendations prior to the field visits / interviews about other staff who should be interviewed. Prior arrangements for interview times and locations were then made by the researcher using electronic mail.

3.3 Qualitative vs quantitative research methods and methodologies

Traditionally, social research adopted a positivist, rationalistic approach based on an empirical scientific perspective. In the positivist approach, explanation is based on the results of experiments seeking to understand relationships between cause and effect, with research subjects being exposed to some stimulus or treatment, and the outcomes or effect being measured (quantified) and compared to a control group (Bryman 1988). This approach, which is solely quantitative, has been criticised for treating people like objects in nature and not acknowledging the differences in people and societies (Bryman 1988). Psychologists and social scientists studying human populations have concluded that people have diverse characteristics and their behaviour, including how they make choices, is not consistently rational and therefore difficult to predict (van Krieken et al 2006). Hence a positivist approach to understand the role of LG and the reasons why it takes actions within its community has not been adopted for this research.

Stake (2010) observes that researchers rely on human perception and understanding, and that these are key features of qualitative research. This type of research has been described as naturalistic rather than rationalistic (Guba 1978). Examples of qualitative research methods include: participant observation; semi structured or unstructured interviews; questionnaires where written responses are sought; focus groups; qualitative examination of texts, interview transcripts, and conversations; and discourse analysis (Bryman 1992). While methods of undertaking research and collecting and analysing data may be either quantitative or qualitative, some researchers have also used a combination of both which has become known as a mixed methods approach (Bryman 1988; Brannen 1995). There has been debate over the last half century about the merits of quantitative or qualitative

research, with various methodologies used for qualitative research themselves being subject to research and discussion. The general consensus is that conducting qualitative research and using qualitative research methods is valid (Bryman 1988; Bullock, Little and Millham 1992; Denzin and Lincoln 1998; Stake 2010).

In the current research, qualitative research methods have predominantly been used as they offer the opportunity to obtain rich language based data which can be used to identify differences in the meanings of language used, and how this contributes to an understanding of normative behaviour and differential power structures in communities. Some quantitative data such as census statistics or frequency of responses have also been collected and are used to provide the broad community context in which LG acts. Similarities and differences in the spatial scale of communities and urban form can also be envisaged through descriptors such as area, population and population density. The social, cultural and environmental uniqueness of communities in each LG area however may be masked by the use of numbers as descriptors, and they are used sparingly in this research.

3.4 Research Rationale

While the methodology and methods have been outlined in the previous sections of this Chapter, this section more formally describes the epistemological, ontological and axiological basis for this research. Garman (1996, p.20) states that research rationale involves basic questions such as ‘How is truth to be defined?’; ‘What is the nature of social reality?’; ‘What is the relationship of the researcher to the researched?’ and ‘What values are embedded in the approach?’ The first of these questions deals with the concept of epistemology. The second two questions deal with the concept of ontology, and the last deals with the concept of axiology. The way in which these concepts are addressed in the current research will be briefly discussed in the following sections.

3.4.1 Epistemology

‘How is truth to be defined?’ is a loaded question. The epistemological rationale for this study is that the ‘truth’ or ‘what we can agree about what we know’ about the actions of local government to assist households to reduce carbon emissions can be found in the revelations within verbal and written responses of staff of local government about the actions and activities of ‘their local government’ and ‘their community’. Hence the epistemological position (methodology) may be described as interpretivist which Bryman (2008, p. 366) stresses is understanding the social world through an examination of the

interpretation of that world by its participants who must be part of that social world and be interacting with that social world (Crotty 1998).

The opinions of staff about various aspects of how climate change is being addressed by their LG have been sought. These aspects relate to commitments to address climate change, commitments to reducing carbon emissions, the effectiveness of current initiatives and information about proposed initiatives. Their opinion about the role of LG in assisting households to reduce carbon emissions has also been sought. In selecting staff, those in decision-making or climate change related roles within LG cases may have greater knowledge of the disagreements or barriers that have been experienced in their organisations and reveal these through their responses. Their opinions may not align with an official position of the LG which is what would be expected to be published on an organisation's official website or from official reports. The latter have only been used to obtain data of a statistical or official nature. Exposing the tensions or struggles within an organisation may reveal barriers to LG taking action to support their communities to make the type and pace of transition to a low carbon future being called for by scientists. The current research may also reveal innovative approaches and opportunities which have been or are being pursued and add to the body of knowledge about LG actions.

3.4.2 Ontology

Ontology is a branch of philosophy that is concerned with the nature of what exists (Blaikie 2007, p. 13). Local government authorities are organisations that operate at the economic, social, cultural and environmental levels within their respective communities. Each is charged with representing its community and acting in the public interest, for the 'public good'. However at the same time LG exists within a structure of government and is influenced by global, national, regional, state or provincial and local politics which, with advances in technology, result in local socio-economic and socio-technical priorities. . Studying 'LG' may imply studying the organisation, which comprises a hierarchy of people, both elected and employed. In the current research each LG authority is defined as that organisation which was operating at the time that the data was gathered from staff participants. The characteristics of a community are continually changing and any discussion of a community must be defined in terms of the context of the particular period in time at which data is collected and the spatial boundary that is drawn around each community. In identifying the structures and systems which may be produced and reproduced by actions of LG and how these structures and systems may enable or prevent

carbon reduction in the community, it is necessary to gather information about the LG organisation, its partners, community organisations and the environment in which they operate.

The questionnaire has incorporated a core set of open-ended questions designed to draw out both factual information and opinions which become data analysed for answering the research questions. Social realities vary from community to community, even within the same city as is revealed by indices of disadvantage and vulnerability. Staff of LG may hold differing opinions about the community (in effect their social world) which may affect their perspective. For example, the LG staff may view the attitudes that residents in each community have towards their household and transport energy use as a potential barrier to effective LG action and hence may influence the type of initiatives that the LG staff propose or support. In determining 'how we know what we know' this research provided opportunity for the voice of staff to be revealed. Thus this research thesis becomes one version of the reality that exists and combines the reality as expressed by the participants and the interpretation of that reality by the researcher.

The verbal or written responses of the staff have been analysed in a number of ways. The first Phase of the analysis involves assessing, through quantitative analysis, the similarities and differences in the ways LG cases have demonstrated their commitment to act on climate change and in the types of initiatives they have used to assist households to act to reduce carbon emissions. In analysing these responses, key issues have been identified which are then compared to the in depth analysis of actions by LG cases conducted in the second Phase. Conclusions are drawn about the similarities and differences of one LG case's approach compared to its peers in the sample of LG cases studied in this research. In addition, an understanding of the context of LG action has been developed through the identification of local factors which may be barriers or opportunities affecting the success or otherwise of initiatives implemented. Case study research methods were considered to be useful in elucidating structural factors and organisational, political, social, economic and technological issues affecting each LG authorities ability to influence households to reduce their carbon emissions. While the participants in this research are knowledgeable about action within the community and may be considered to be social actors, change agents or even activists, LG's capacity to act may be limited by structural factors of which the participants may or may not be aware or be able to articulate.

Held and Thompson explained that the rules and resources that social actors draw on as they engage in social interaction exist in memory traces and are embodied in social practices (Blaikie 2007). An understanding of the social practices in a community would be ideal. Visiting each locality and using transport services and information services provided to the public, has provided the researcher with some experience of the local context in which actions are taken at the community level and enabled some understanding of social practices. However, the researcher was only able to visit each LG area for a short period of time and would not be able to match the lived experience of those who reside in the area across all seasons or deliver services to residents on behalf of the LG. Hence the opinions expressed by participants are predominantly taken at face value and supported by the researcher's limited personal knowledge of each community and LG organisation. National and local reports or other sources of information such as of statistics and other research have been used where possible to verify claims of participants.

3.4.3 Axiology

Axiology refers to the values associated with methodological approaches. The interpretivist approach taken in this study acknowledges that local values and culture influence the outcome of research. Indeed the study attempts to understand and interpret different contexts in which LG cases operate. These differences span national and local identity, historical significance and pride, statutory obligations, changing socio-political leadership, individual and collective organisational behaviour, cultural backgrounds of staff and communities, changing physical environments, dynamic social environments and economic prosperity or hardship. It is acknowledged that these factors may be influenced by or influence the values of decisions makers, actors and agents and consequently the responses to questions posed, as well as their interpretation by both participant and researcher. This researcher seeks to understand the nature of the reality for practitioners inside the LG organisation and the underlying factors which these practitioners consider affect LG's capacity to act. While the replication of the findings of this research in other LG cases is not necessarily the subject of this research, the context in which other LG authorities operate may be similar to the cases studied in this research, and the findings may be of potentially greater relevance. The transferability of the findings of this research is also acknowledged to be affected by issues of power, resources and the different institutional arrangements from one place to another.

The approach taken in the selection of data collection and analytical methods reflects the need for local in-depth knowledge and understanding about LG action, while tapping into the researcher's own experience and understanding of scientific research, environmental management, behaviour change programs for environmental protection, hierarchical government organisations and community governance mechanisms for natural resources management within Australia. The following sections detail the research methods adopted in this research.

3.5 Research methods

As previously outlined, the research was conducted in two Phases. In this section, the rationale for the selection of research methods and the description of these methods is discussed for each Phase.

3.5.1 Phase 1

There were a number of purposes to conducting Phase 1. Firstly, it sought to gain a broad understanding of the types of commitments that LG had undertaken to address climate change, including whether these were for taking action across its community or were focused on its corporate operations. Secondly, Phase 1 aimed to build a picture of the types of action undertaken or proposed to specifically support households to reduce carbon emissions. Thirdly, this research aimed to reveal the views of each LG about the ideal actions they could be taking to address climate change and the barriers that they thought they would encounter in implementing these ideal actions. Fourthly, it sought to determine whether there were jurisdictional specific factors that might influence the actions of LG. An analysis of the differences between responses from LG in each of two states of Australia - South Australia and Victoria would assist in establishing the broader context for Phase 2. Finally Phase 1 would provide an opportunity to test the suitability of the questions used in the questionnaire for obtaining data and whether any changes may be needed before using these questions with other LG cases in Phase 2.

A self-completion questionnaire was chosen for Phase 1 of the research as it provided a number of advantages over conducting an interview. The advantages included: the speed of administration and capture of data if returned promptly; the assurance that the questions were the same for each LG; convenience for participants in that they could complete it in their own time; and an ability to read all of the questions before responding. These advantages are similar to those discussed by Bryman (2008) in evaluating the self-

completion questionnaire in relation to a structured interview. Disadvantages of the self-completion questionnaire, according to Bryman (2008), are that response rates may be lower; there is a greater risk of data being missing; additional data cannot be collected; and responses cannot be probed. As further data collection was to take place in Phase 2, these potential problems were of low risk for the overall data collection.

3.5.1.1 Questions

The advice of research colleagues was sought in developing the questionnaire for this phase. The questionnaire was structured to commence with some general statistical information about the LG. It sought data on the area, population, number of dwellings and annual average rates or taxes paid by the residential sector. This information was potentially useful for calculating and comparing densities, household size and residential rates across the sample. Each LG was also asked to record the targets that they had set for reducing carbon emissions both corporate and for the community.

Each LG was asked to provide information about the type of formal commitment they had made to addressing climate change. For this question and for questions about initiatives each had undertaken or proposed to undertake to support households to reduce carbon emissions, a list of actions was provided which required a 'tick the box' response. Instructions were provided to tick all that applied, hence multiple responses could be recorded. In addition a space was provided for writing any other actions that were not included in the list or comments. The development of the lists used in the survey included a review of the types of actions being recommended by state or federal government in Australia to address climate change or were variously being discussed or researched by others (e.g. Gurran 2007; Kousky and Schneider 2003; Bulkeley and Betsill 2003). The particular types of actions to assist households to reduce carbon emissions were chosen to reflect the types of actions that federal and state governments or non-government organisations (NGOs) in Australia were recommending as appropriate actions that individually or collectively would lead to reduced energy use in the residential sector and had been listed on various organisations' websites (e.g. Australian Conservation Foundation, Australian Greenhouse Office). Hence the lists were designed to be comprehensive of the types of actions that LG were taking at that time or were proposing to take. In reflecting on the responses to the questions where lists were provided, the following observations are made: many participants used the extra space to record comments or to express their action in their own words rather than to fit their actions to the

language used by the researcher; however where additional actions were markedly different from those listed, the frequency of each type of additional action was very low.

The questionnaire concluded with open-ended questions about ideal actions (which were defined as processes or measures) that LG could take to make a positive impact on climate change and the barriers that would prevent them from implementing these ideal actions. A copy of the questionnaire for Phase 1 is included in Appendix 1.

3.5.1.2 Distribution of the Phase 1 questionnaire

The size of the sample for Phase 1 (20 SA and 28 Vic LG) enabled the questionnaire to be posted to the Chief Executive, accompanied by a participant information sheet explaining the purpose of the research and a consent form required to be completed and returned for the ethics. This approach relied on organisational procedures for handling written correspondence within LG and allocation to the person the organisation considered to be the most appropriate for responding and also enabled follow-up if required. In April 2008, a questionnaire pack was posted to each Chief Executive. A reply-paid addressed envelope was included for return of the completed questionnaire to ensure that the cost of postage was not a barrier to the LG completing and returning the questionnaire.

3.5.1.3 Follow up with South Australian metropolitan local government

Two rounds of follow-up phone calls and electronic mail messages were made to SA LG to seek further responses. The CNC project contact officer from the SA LG partner agreed to encourage their SA LG network members to complete and return the questionnaire. After obtaining responses from 14 of the 20 LG, an opportunity arose to speak face to face with some LG network members (environmental or sustainability planners) who attended a SA LG conference addressing carbon reduction and peak oil in June 2008. An additional four questionnaires were subsequently completed and returned, resulting in a total of 18 responses from SA LG.

3.5.1.4 Follow up with Victorian metropolitan local government

The follow-up with Vic LG used the electronic mail system and the network of the contact officer of the Vic LG partner of the CNC project. No further appeals were made beyond the end of June 2008.

3.5.2 Phase 2

There were multiple purposes for conducting the second phase of this research. Firstly, it sought to provide greater understanding about the role of LG to assist communities to reduce carbon emissions and how this may be influenced by the political, legal, economic and social context in which LG operates. Secondly, it sought to identify the types of action LG takes to support households to reduce carbon emissions, the structures being produced and reproduced by these actions, and how these might affect and be affected by LG's capacity to act. Thirdly, this research sought to identify differences and similarities between and across the cases in respect to the mechanisms that LG uses to build its capacity to act, which may indicate innovation and best practice.

Various qualitative research methods were considered for Phase 2. These methods included surveys, interviews, focus groups, action research, participant observation and case studies. The selection of the methods reinforces the epistemological position for this study. Hence, while gathering data using a self-completion questionnaire may provide answers to questions, on its own it does not allow for further exploration of responses or provide additional experiential, practical or contextual information.

As stated previously, there are precedents for using LG authorities as case studies in climate change research and in researching sustainable cities. Bulkeley and Betsill (2003) and Bulkeley and Kern (2006) used LG case studies across different countries in researching climate change governance. Evans et al (2005) used a case study approach to identify factors leading to the success or otherwise of various programs to develop sustainable cities across Europe. In Australia, this researcher has been involved in the CNC project which has used LG case studies to research methods for carbon profiling and assessing potential for renewable resources at the local level (Hamilton et al 2008a; Hamilton et al 2008b; Kellett and Hamilton 2009a). Hence the use of an LG case study approach is established practice for studies of local carbon reduction, climate change governance and the broader field of sustainability governance. It is acknowledged, however, that undertaking international comparative studies raises difficulties which a researcher should be cognisant of and consider in designing and asking questions and interpreting responses, actions, roles and responsibilities.

3.5.2.1 Questions

For Phase 2, the gathering of data was by completion of a questionnaire which could be completed independently or during an interview using questions based on the questionnaire. The design of the questionnaire incorporated both open ended questions which allowed responses in the participants own words and the questions about commitments and initiatives used in Phase 1. Achieving a balance of depth of knowledge and utility of research findings is important (Garman 1996) and the ability to compare responses about initiatives across all LG cases was taken into consideration.

While in Phase 1, questions about the importance of climate change to LG focused on the formal acknowledgement of its importance and how that was demonstrated, in Phase 2, questions required the participant to indicate the scale of importance of both climate change and reducing greenhouse gas emissions to their LG. The scale was 1 to 4 where 1 was not important while 4 was very important. The questions in Phase 2 also provided an opportunity to further explain their numerical responses, thereby allowing them to express their opinions in their own words in addition to the numerical response.

In Phase 1, there were no questions specifically about the role of LG other than through the types of initiatives which LG had or planned to undertake. In Phase 2, questions sought the participants' opinions about the role that LG had to support households to reduce carbon emissions associated with both their energy use in their homes and also for their transport choices. For these questions, a numerical scale of 1 to 4 was also used, where 1 was no role while 4 was a major role. The responses were further qualified by seeking an explanation for selecting a number.

While in Phase 1, questions did not explore the leadership aspects in addressing carbon reduction, the responses to the question about ideal actions for LG highlighted leading by example as significant. In Phase 2, questions were included to seek the participant's opinions about leadership that was demonstrated by elected members, staff of the LG or by citizens. In addition in Phase 2, each participant was asked about other LG authorities which exhibit best practice in assisting residents to reduce carbon emissions and how they knew about the action of other LG in this area. In Phase 2, there was also a section of the questionnaire designed to allow each participant to evaluate initiatives that their LG had undertaken to assist households to reduce carbon emissions. This section asked questions about the purpose, drivers and cost of each initiative, who from their LG and from the

community was involved. Within this section, there were also questions relating to the findings of any formal evaluation of each initiative, and their opinion about whether the initiative was effective or not, and if not, what could have been done to make the initiative more effective.

During the development of the questionnaire, a draft was provided to a peer group of PhD scholars at the researcher's university prior to being finalised. Valuable comments led to the questions to gather data about leadership being demonstrated by citizens.

3.5.2.2 Distribution of questionnaire

Staff participants at two of the Australian LG cases elected to complete their questionnaires independently and returned them via post together with their completed consent forms. A postage-paid envelope was provided for this purpose to ensure that postage was not a barrier to participation. Prior to staff in each of the three Australian LG cases receiving their questionnaires, a presentation to staff and or elected members was made explaining some of the findings of the CNC project. This presentation was made by either this researcher or by another researcher from the CNC project. Hence the questions had been preceded for some participants by this contextual information about the broader research being undertaken by the CNC project. In each Australian case, a small number of staff who attended the presentations completed questionnaires while for two cases, at least one staff member who did not attend also completed the questionnaire. No attempt to link the presentations made to the responses provided in the questionnaire has been made as each presentation was different and LG specific.

3.5.2.3 Interviews

For the five cases in Europe, and the third Australian case, the data was collected during face to face interviews with staff between July and December 2009. For the cases in the UK and in Germany, the interviews took place during field study visits to Europe. Prior to conducting interviews in each country, electronic mail communication with each person to be interviewed took place. Appointments for interview times were made by the researcher using electronic mail systems and confirmed prior to the interview. While the purpose of the electronic mail communication was to establish a suitable time and location for the interview, a copy of the questionnaire, participant information sheet and consent form was also provided to each participant. The communication of this information prior to the

interview resulted in the provision of some background information on initiatives ahead of the interview in some instances.

The interviews were conducted either at the staff participant's office or at a place of their choosing. The interviews were structured and followed the order of the questions in the questionnaire. Each interview commenced with a brief explanation of the context in which the research was being undertaken and allowed questions of clarification to be asked by both participant and researcher. During the interview additional questions were asked for clarification of responses and prompts were used to bring the participant back on track. Each interview was recorded using a SONY brand electronic voice recorder which enabled electronic files of each interview to be stored on a computer and transcribed at a later date. The researcher also made notes on a paper copy of the questionnaire which allowed some questions requiring tick the box responses to be completed by each participant. In two cases, the participant had partially completed the questionnaire prior to the interview with the participant providing the responses to the remaining questions at the interview. In one of the German cases, the participant was encouraged to speak in German for the response to one question due to their difficulty in expressing themselves adequately in spoken English. The response was transcribed and translated into English by a relative of a PhD colleague, at the researcher's university, who was fluent in German.

Where the participant did not provide statistical information the name of the agency that collected and reported statistics at LG level (official census records) was obtained and statistical data sought from that agency's web-site. In the absence of any other direct referral, the LG or city year book or annual report was used as a source of statistical data.

3.5.2.4 Case study planning documents

To undertake a review of planning policy and governance, data was collected from publicly available documents obtained from the corporate web-sites of each LG case.

3.5.2.5 Follow-up

For two of the Australian cases, some participants delegated the completion of the section about evaluating the initiatives to their respective contact officer to respond, although there were some attempts to provide information where the participant had that knowledge. The researcher followed up with the contact officer through email, telephone conversations or a face to face meeting. For the UK and German cases, follow up was undertaken through emails.

3.5.3 Researcher participation and observation

In conducting the research in each of the case study areas, personal visits were made by the researcher to each area and to offices of the respective LG. The field study visits enabled her to gain first-hand experience of the community context, such as the urban form, scale of development, ways of living, climate, and provision of services that are potentially relevant to energy consumption within the residential sector and for transport modes within each community. The researcher used regional and local public transport systems and private transport on occasion. Hence she became a visitor or temporary citizen in each community, obtaining a personal experience of the use of train, bus and walking infrastructure that the LG or other agencies provided to the community. The visit to each locality provided her with an opportunity to personally observe the urban form and types of housing provided for citizens. While the researcher used temporary accommodation in the UK and Germany, in one UK LG area, she had use of kitchen facilities within a shared house, which required shopping and other interactions within the community. Casual conversations took place while visiting various places, including, in one case in the UK, a typical semi-detached private family home where lifestyle that might influence energy use in the home and for transport could be casually observed. The complexity or ease of access to services and the links between housing and service centres was noted. A photographic record of various aspects of each locality was made and a selection of some of the promotional material for programs discussed by the participants was collected if publicly available or if provided by them. A daily journal was maintained including notes of meetings, various activities undertaken and observations made. This journal has been useful for reference during the analysis of data, and has deepened the understanding of the participants' responses and the development of findings from Phase 2. The exposure of the researcher to the local community within each case study area is not purported to be ethnographic but has allowed her to develop a deeper understanding of the contexts in which each LG case is implementing initiatives.

3.6 Analytical methods

Babbie (1995) warns that there is a large gap between understanding the skills of qualitative data analysis and actually using those skills effectively. Determining the analytical methods to use after the data has been collected poses a problem, hence the analytical methods should ideally be resolved prior to collecting the data. In this research it was resolved that a thematic analysis of written textual based responses would be

undertaken. While quantitative analytical methods have been used sparingly, a decision was made to undertake a frequency analysis of responses to the listed commitments to act on climate change, the listed initiatives implemented by LG, and the written responses to the questions about 'ideal' actions for LG to take and barriers to taking 'ideal' action.

3.6.1 Phase 1

The questionnaire for Phase 1 was designed to enable ease of coding of responses. Each questionnaire issued was also given a unique participant identification number to enable the responses to be separated from the details of the staff participants thereby ensuring privacy. The completed questionnaires were logged on receipt. The responses to tick the box questions were coded then entered into SPSS using SPSSv15.0. All text based written responses to questions were recorded in Microsoft Excel spreadsheets. The original questionnaires were kept for future reference and stored according to the policies of the researcher's university.

3.6.2 Phase 2

All face to face interviews with staff were recorded and transcribed into Microsoft Word documents. Following a recommendation from a research colleague, line numbers were included on all transcribed documents to aid in the annotation of relevant passages for documenting findings and discussion in the thesis. The transcription process was undertaken by the researcher and provided an excellent opportunity for the researcher to immerse herself in the data and understand the issues being raised by participants from each LG. Immersion in the data aids in the thematic analysis of the data and has been recommended by other researchers (e.g. Braun and Clarke 2006).

Qualitative data consisting of written responses on the questionnaires and transcribed interviews were analysed in three ways. The methods are discussed in the following sections.

3.6.2.1 Analysing capacity to act

The approaches reviewed by Hammer (2009) were discussed in Chapter 2. The second of Hammer's approaches, the Capacity to Act Matrix (CTAM) has been adopted for this analysis. The actions being undertaken or proposed and the action considered to be ideal were categorised according to the policy silos used by Hammer (2009) with each then subjected to a qualitative analysis of their LG's capacity to undertake such action within

the residential and transport sectors. The policy silos are: electricity supply, distribution and use; land use planning; transportation; district energy and on-site thermal energy; building design and codes; waste and other forms of embodied energy; water delivery and treatment; energy-related economic development; and general energy governance practices. The capacity to act relates to the mayoral levers from Hammer's Capacity to Act Matrix (Hammer 2009). The Mayoral levers were grouped by Hammer into five categories: rulemaking; regulatory oversight; direct expenditures or procurement; financial incentives; and information gathering and dissemination, convening / facilitation and advocacy.

Rule-making relates to the regulatory powers of LG, such as the ability to establish land use controls that influence transport-related energy use (Owens cited by Hammer 2009) and the siting of renewable energy installations. *Regulatory oversight* is related but is linked to LG's role in enforcing standards set by other governmental entities. Examples include building codes established by state or federal authorities.

Direct expenditures and procurement of LG can influence types of goods and services, and energy used for LG operations. LG can require energy providers to supply electricity from certain fuel sources such as renewables or certain types of fuels for its vehicle fleet. LG may also make direct investments in facilities and technology designed to serve the public in a more energy efficient manner or promote energy efficient behaviour. Examples include investments in public transport, energy efficient street-lighting or energy efficient retrofit of community buildings. *Financial incentives* include rebates to promote energy efficient behaviour, or congestion pricing schemes to promote reduced vehicular use in certain sections of cities (Richardson and Chang-Hee cited in Hammer 2009).

Information gathering and dissemination includes information dissemination about energy/climate concerns, to more targeted efforts aimed at ensuring that specific populations or business sectors are aware of certain energy subsidies or services. LG leaders are increasingly expected to play an *advocacy* role on behalf of their constituents, speaking up for the energy needs or interests of the community before state or national level authorities. *Convening/facilitation* includes working with local stakeholders to aggregate information about greenhouse gas emissions from a number of businesses to gain eligibility for participation in carbon markets, or helping energy businesses access the necessary state or central government operating approvals.

Hammer (2008) argues that such categories provide a helpful framing device for cities seeking to craft comprehensive energy strategies by clarifying both opportunities and limitations in the city's capacity to act. By listing these instruments on one axis and all relevant stakeholders (e.g., the local authority, city/provincial/regional officials, central government, the private sector, households and NGOs) on a second axis, the Capacity to Act Matrix (CTAM) makes clear the local authority's policy and program powers. Within each box, key facts about energy policies, programs and services are noted that are relevant to each stakeholder.

The matrix which has been adapted from Hammer (2009) is presented in Figure 3.2 and forms a key part of the framework by which the role of LG can be explained.

Policy silo	Mayoral lever				
	Rulemaking	**Regulatory oversight**	**Direct expenditures /procurement**	**Financial incentives**	**Information gathering and dissemination, convening / facilitation and advocacy**
Electricity supply, distribution and use					
Land use planning					
Transportation					
District energy and on-site thermal energy					
Building design and codes					
Waste and other forms of embodied energy					
Water delivery and treatment					
Energy-related economic development					
General energy governance practices					

Figure 3.2 Capacity to act matrix
(adapted from Hammer 2009)

3.6.2.2 Multiple Case Study Analysis

Robert Stake, a case study researcher of educational programs in the United States of America (USA), has trialled and developed methods of analysing case studies within and across multiple cases (Stake 2006). Stake explains that there is a binding concept – a theme, an issue, phenomenon, or functional relationship - that strings cases together, and

that the researcher therefore has an obligation to not only explain the themes, issues or phenomenon as it manifests itself in each case but to provide interpretation across cases (Stake 2006:39). The multiple case study analysis not only allows the researcher to focus on what is common across cases, it also allows differences to be identified, and overcomes the potential for similarities to dominate research findings from such an analysis.

Stake refers to terms such as Cases, Findings, Factors, Themes, Assertions, the Quintain, and the Analyst and capitalises each to highlight that each has a technical role in the cross-case analysis (Stake 2006:39). The Themes originate with the people (researcher or researchers) who study the Quintain. The Findings originate with people studying the Cases, and the Analyst (may be the researcher or may be another) writes Assertions in a final report, keeping both Themes and Findings in mind. The Quintain is described as a program or phenomenon which is being studied across all Cases. In this research program the Quintain is defined as the actions of LG to assist households/residents to reduce carbon emissions. The Cases are the LG cases themselves. The Themes are the research questions and within Stake's method any quantitative data analysed is termed a Factor. The Themes included questions about the role of LG to assist households to improve energy efficiency in homes; the role of LG to assist households to implement renewable energy technology; and the role of LG to assist households to use low carbon transport modes. The Themes also cover questions of leadership and how this is demonstrated by elected members, LG staff and citizens to reduce carbon emissions.

Various worksheets have been developed by Stake (2006) to be used in the Multiple Case Study Analysis. In the current study, five of these worksheets have been used for documenting the process and findings for each Case and across all eight Cases. The first worksheet summarises the design of the Case and the sources of information. The template for this worksheet is included as Figure 3.3 and one of these diagrams was developed for each case.

For each Case, planning documents were obtained from corporate web portals. Word search techniques were used to identify references to energy efficiency, renewable energy and transport modes such as public transport, walking and cycling. A summary was prepared and included in information for each LG Case (see Chapter 5).

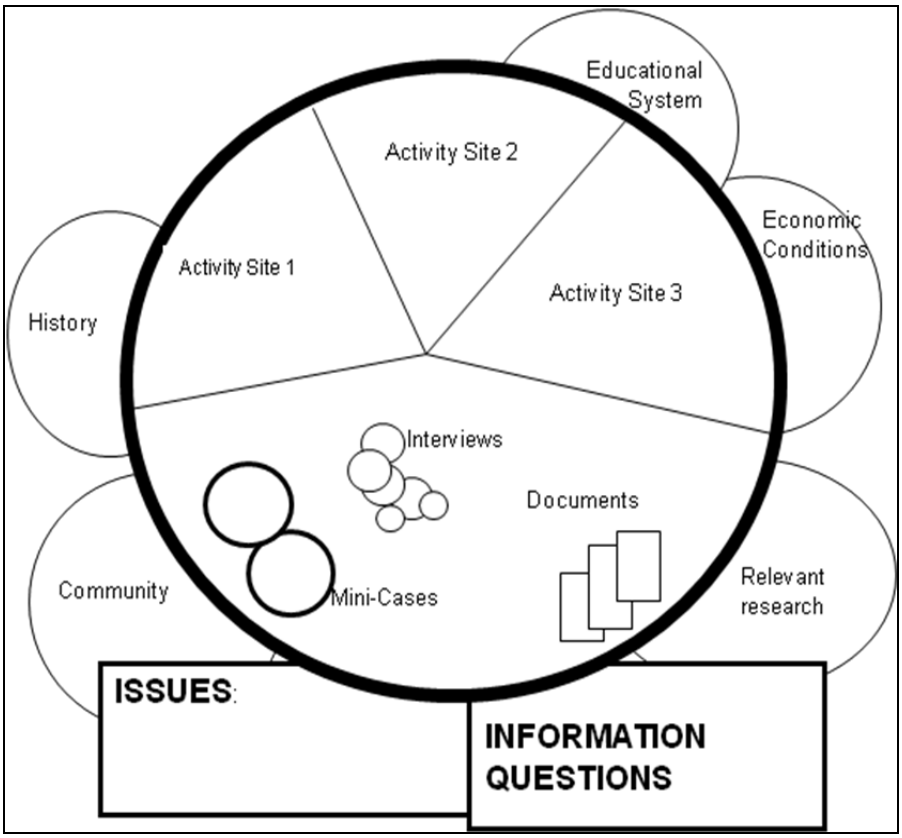
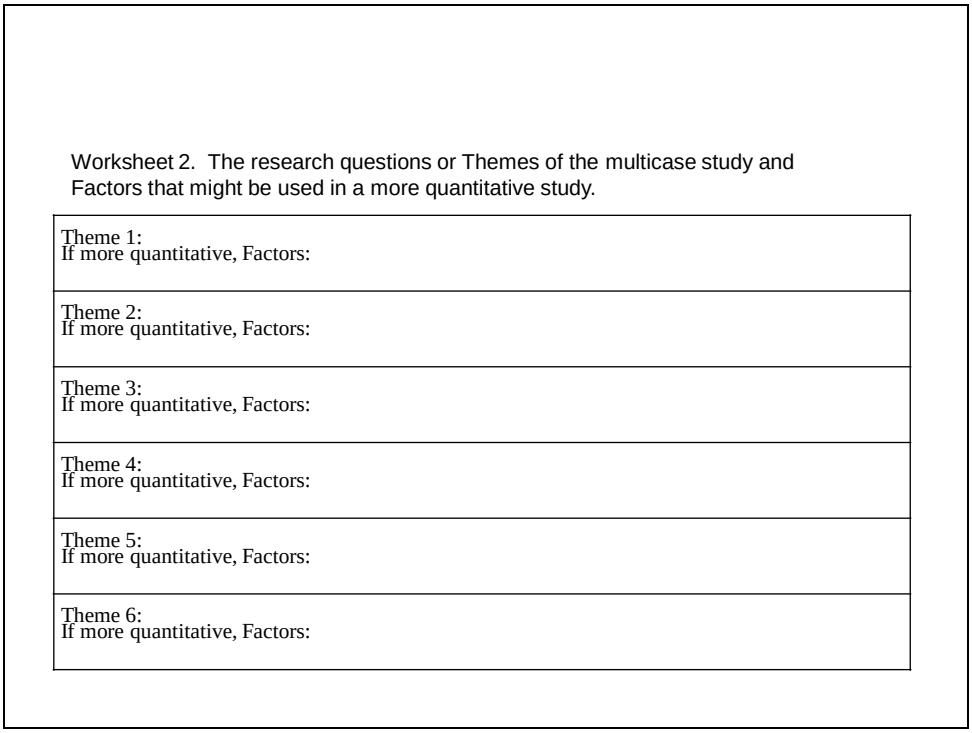


Figure 3.3 Worksheet 1 template for the graphic design of a Case study (after Stake 2006)

The second worksheet summarises the Themes for the analysis of the Cases in the Quintain. The template for this worksheet is included as Figure 3.4. While only one of these worksheets is produced across all cases, Themes may be added to this worksheet throughout the analysis. Eight Themes were initially developed relating to some of the research questions and areas of particular interest. By the time the data had been analysed there were nine Themes in total.



Worksheet 2. The research questions or Themes of the multicase study and Factors that might be used in a more quantitative study.

Theme 1: If more quantitative, Factors:
Theme 2: If more quantitative, Factors:
Theme 3: If more quantitative, Factors:
Theme 4: If more quantitative, Factors:
Theme 5: If more quantitative, Factors:
Theme 6: If more quantitative, Factors:

Figure 3.4 Worksheet 2 template from Stake's Multiple Case Study analysis (after Stake 2006)

The third worksheet is useful for listing the Findings for each case. The template for this worksheet is included as Figure 3.5. A worksheet is prepared for each Case, on reading the Case material/report the Findings are listed and the Themes that the Case addresses are noted. In addition, this worksheet records the references to possible excerpts from the interview transcripts or completed questionnaires that may be used to support a discussion of the Findings for the Case when developing Assertions for the final report. Worksheet 4 combines all Cases and summarises the ordinariness of each Case and how each Theme is manifested within each Case. Stake explains that a high manifestation (M) means that the Theme is prominent in this particular case study. A highly unusual situation (far from ordinary) indicated by W is one that is expected to challenge the generality of themes. As indicated, the original themes can be augmented by additional themes even as late as the beginning of the cross-case analysis. The paragraphs on each Theme should be attached to the matrix so that the basis for estimates can be readily examined. The worksheet is included as Figure 3.6. Worksheet 5 also combines all Cases but takes each Case in turn and maps the Findings to each Theme. The strength of the Finding in responding to a Theme is also mapped and this provides evidence for the Assertions in the final report. The template for this worksheet is reproduced here as Figure 3.7.

Worksheet 3. Analyst's Notes while reading a case report
Case ID _____

Synopsis of case:	Case Findings: I. II. III.
Uniqueness of case situation for program/phenomenon:	IV.
Relevance of case for cross-case Themes: Theme 1_____ Theme 2_____ Theme 3_____ Theme 4_____ Theme 5_____ Theme 6_____	Possible excerpts for cross-case report: Page Page Page
Factors (optional):	
Commentary:	

Figure 3.5 Worksheet 3 template from Stake's Multiple Case Study analysis (after Stake 2006)

Worksheet 4. Estimates of Ordinariness of the Situation of Each Case and Estimates of Manifestation of Multicase Themes in Each Case
W = highly unusual situation, u = somewhat unusual situation, blank = ordinary situation
M = high manifestation, m = some manifestation, blank = almost no manifestation

	Case A	Case B	Case C	Case D	Case E
Ordinariness of this Case's situation:					
Original Multicase Themes					
Theme 1					
Theme 2					
Theme 3					
Theme 4					
Theme 5					
Theme 6					
Added Multicase Themes					
Theme 7					
Theme 8					

High manifestation means that the Theme is prominent in this particular case study.
A highly unusual situation (far from ordinary) is one that is expected to challenge the generality of themes.
As indicated, the original themes can be augmented by additional themes even as late as the beginning of the cross-case analysis. The paragraphs on each Theme should be attached to the matrix so that the basis for estimates can be readily examined.

Figure 3.6 Worksheet 4 template from Stake's Multiple Case Study analysis (after Stake 2006)

Worksheet 5. A Map on which to make Assertions for the Final Report
A High mark means that the Theme is an important part of this particular case study and relevant to the theme.

	Themes							
Case A	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Finding I								
Finding II								
Finding III								
Finding IV								
Case B								
Finding I								
Finding II								
Finding III								
Case C								
Finding I								
Finding II								
Finding III								
Finding IV								
Finding V								
And so on for the remaining Cases								

Figure 3.7 Worksheet 5 template from Stake's Multiple Case Study analysis (after Stake 2006)

3.6.2.3 Thematic analysis

While thematic analysis has been identified as a useful and flexible method for qualitative research, often used in the field of psychology, Braun and Clarke (2006), they considered it to be a method that lent itself to use beyond that discipline, a view supported by Bryman (2008). In the current research, two approaches have been used to conduct a thematic analysis of the qualitative data collected in Phase 2. The first is a more traditional approach from research in the field of psychology described by Braun and Clarke (2006). The responses to questions about the targets for carbon reduction, the ideal measures and barriers were listed in Excel spreadsheets. The responses and the transcribed interviews for each case were independently subjected to thematic analysis. The key themes (or concepts) were highlighted and a note of the theme or concept, using words or a phrase from within the text, was written in the margin of the document. These were then listed in a table for each case.

The second approach was developed and tested by the researcher and incorporated a cross case analysis whereby responses from all cases to each question were analysed for the revelations or signs emerging from the responses. Three lenses were used relating to the actions of LG to support: energy efficiency, renewable energy or low carbon transport

modes. The revelations or signs in each response were noted in a column in each table and then combined together, each revelation/sign having a code for the case, the participant and the question. In developing this second approach to conducting a thematic analysis, the advice of a group of three peer researchers was sought. These peer researchers participated as a group in a trial to provide some feedback on the value and validity of this approach. For this trial, the responses from the UK and German cases to two questions were used. The feedback from the peer researchers was encouraging and comments related to the richness of the data and the power of this approach to reveal dominant signs and similarities/differences across and between the cases. The tables of revelation/signs were then cut into strips, each strip having one revelation/sign. These strips were then grouped into themes. Discussion of the five themes that emerged using extracts of the case interviews has been undertaken in Chapter 6.

3.6.2.4 Cross case review of governance

Governance of climate change is an area that has received increased attention since the landmark study of Bulkeley and Betsill published in 2003. They considered that governments needed to engage with the broader community, specifically the business and voluntary sectors to effect policy change. In addition, the key aspects of community based governance of sustainability that were identified by Evans et al (2005) in reviewing sustainable cities across Europe, offer a framework for evaluating aspects of community governance of climate change. A decision was made to combine the criteria used by Evans et al (2005) with Bulkeley and Betsill's criteria to provide the framework for analysing the participant responses, both verbal and written, and official documents of each LG case. In view of the widespread use of web portals for communicating information to the community, plans and reports were obtained from each LG case's web portal. Any publications which were provided by research participants were also reviewed for reference to aspects of community governance. A description of community governance has been included in the case summary for each LG case (see Chapter 5). In determining the extent to which the aspects of community governance were explicit in the language used by participants and in corporate documents a decision was made to use a simple scale of 1 to 4 where 1 is little or no manifestation and 4 is a high manifestation. It is acknowledged that this assessment is subjective, and indicative of the knowledge gained by the researcher from the analysis of publicly available documents supplemented by the

knowledge gained from the Multiple Case Study analysis process (see 3.6.2.2) and the Thematic analysis (see 3.6.2.3).

3.7 Continuous review of academic literature, websites and media reports

A review of relevant literature continued throughout the research program, updating the body of knowledge about motivators for household energy use and LG action to reduce carbon emissions. Barriers to the adoption of new technology have been identified through a review of reports on the uptake of new technology specifically designed to reduce carbon emissions, while non-technical barriers have been identified through a review of literature assessing the effectiveness of initiatives to motivate behaviour change. The electronic search engines of the world wide web together with electronic mail systems and electronic newsletter services have been used to keep abreast of international and local activities in this highly dynamic field of research.

3.8 Limitations of the data

Melissa Freeman, Kathleen deMarrais, Judith Preissle, Kathryn Roulston and Elizabeth A. St. Pierre summarised their views about the limitations of data collected for research as follows:

> Although in the 21st century, people are better equipped to record information almost everywhere about almost everyone, misunderstandings, alternative understandings, and conflicting standpoints continue to complicate the generation of knowledge, and most scholars recognize that the multiple layers of meaning in human experience can be inconsistent, incoherent, and even incomprehensible as well as sometimes consistent, coherent, and comprehensible. The material that constitutes data and the constituting of the data are limited and fallible, and the scholar's task is to identify the limitations and faults of information along with its value (Freeman et al 2007).

This succinct summary highlights many of the issues that this researcher has also grappled with. The multiple meanings, the complications of language barriers, accents and ways of expressing opinions, as well as cultures and histories of each country and locality, their currencies, the expectations of LG service provision, varying processes of governing and governance, and local, regional, national, and international obligations have all been significant challenges for this research. The interpretations and assumptions of both the researcher and participants underpin each question and responses. Hence the data generated in this research and its interpretation are both limited and enhanced by the human experience of both the researcher and the many participants. It is acknowledged that conducting international comparative studies raises issues of powers, resources and

institutional arrangements which differ from place to place, however the existence of regional and global networks for LG enables LG to learn from its peers in spite of these differences. While unique geographical and political structures influence the actions of each LG authority and complicate the generalisation of findings, the inclusion of more than one case from each country and conducting Phase 1 of the research to obtain a broader context for the Australian cases, assists in maximising the validity of the findings in spite of these limitations. While the current research has not directly surveyed residents in each LG community about their attitudes towards their energy use due to the scale of such research and time constraints, it is acknowledged that community attitudes are important to the types of initiatives which LG develops and implements.

3.9 Methods to ensure the quality of qualitative research

In a discussion about judging the quality of qualitative research, Garman (1996) listed eight criteria she considered to be important. These are verite, integrity, rigor, utility, vitality, aesthetics, ethics and verisimilitude. Three relate to the truth of the work undertaken. These are verite, ethics and verisimilitude. Verite refers to whether the research is intellectually honest and authentic and consistent with accepted knowledge in the field. Ethics refers to the care taken to ensure the research was conducted honestly, that data has been stored and transcribed faithfully and that the identity of participants is protected. The verisimilitude of the study refers to whether it could be truly conceivable in reality, in the lived-in world, representing human experiences.

Throughout the study, the researcher has been conscious of the criteria that may affect the quality of the findings of the research and has acted to ensure a high standard of quality. In developing questionnaires, interview questions and in analysing data, this researcher has discussed drafts with peers through a thesis writing group that meets regularly, seeking feedback to the types of questions being posed and the language to use. Drafts have been discussed with the researcher's supervisor and advice has been sought from social planning academics within the planning research discipline of the researcher's university. Presentations have been made verbally, using PowerPoint slides and using posters to present initial findings and obtain feedback which has been used to enhance the analysis, and the explanations of the importance and limitations of the research findings.

Both Phases of the research, including the questionnaires used in each Phase, were approved by the Human Research Ethics Committee of the University of South Australia prior to conducting the research.

Chapter 4. Phase 1 – Climate change and metropolitan local government in South Australia and Victoria, Australia

> Local Government is positioned well to work with people on local actions that will positively affect climate change (SA08007).

As outlined in Chapter 3, there were a number of purposes to conducting Phase 1 of the research. Firstly, the survey sought to gain a broad understanding of the types of commitments that LG in each jurisdiction had undertaken to address climate change, including whether these were for taking action across their community or were more focused towards their corporate operations. Secondly, the survey aimed to build a picture of the types of actions being undertaken or proposed to specifically support households to reduce carbon emissions. Thirdly, Phase 1 aimed to reveal the views of each LG about the ideal actions they could be taking to address climate change and the barriers that they thought they would encounter in implementing these ideal actions. Fourthly, the survey sought to determine, from an analysis of the differences between LG in each jurisdiction, whether there were specific factors that influence the actions of LG in each jurisdiction. The findings were expected to assist in establishing the broader context for Phase 2 – where LG actions to address climate change would be explored in greater depth. Lastly, Phase 1 would provide an opportunity to test the suitability of the questions for obtaining data from LG and whether any changes may be needed before conducting Phase 2 of the research.

The findings of Phase 1 are presented and discussed in this chapter. The chapter commences with a summary of the response to the questionnaire and who within each LG completed the questionnaire.

4.1 Responses and participants

Of the surveys sent out by post to chief executives of 28 metropolitan Victorian LG, 19 completed surveys were returned - a response rate of 68%. The initial response from metropolitan South Australian LG was similar – 14 of the surveys posted to chief executives of 20 LG were completed and returned, a response rate of 70%. As explained in the research methods, an opportunity arose for a personal appeal to environmental and sustainability planning officers attending a LG conference in South Australia which resulted in the return of an additional four surveys raising the total returned to 18, a response rate of 90%. In comparison to the internet survey of local government in Australia conducted by Gurran and Phibbs (2008), which resulted in a 20% response rate, the rates of response for the current research were very high, even before follow-up.

The staff participant who completed the questionnaire on behalf of each LG was requested to provide their title of office. An analysis of the completed questionnaires (see Table 4.1) indicates that, while the questionnaire was addressed to the chief executive of each LG, only one questionnaire, from a Victorian LG, was actually completed by the chief executive. In general, the questionnaire was completed by a manager or an officer, with the latter being predominant for the Victorian LG. The completion of a questionnaire by a chief executive personally was atypical for this sample of LG, particularly as analysis of responses to a later question indicated that this particular LG had appointed a climate change officer.

Table 4.1 Staff participant completing the questionnaire - position within the structure of their LG organisation

Jurisdiction	Chief Executive	Manager	Officer
Victoria	1	7	11
South Australia	0	9	9

Further analysis of the title of office of each staff participant has been used to provide an indication of where climate change responsibility might be predominantly situated within each LG. The findings of this analysis have been summarised in Table 4.2. For Victorian LG, the climate change responsibility appeared to be located predominantly within a sustainability function, while for South Australian LG, the climate change responsibility

appeared to predominantly reside within an environmental function. For five LG authorities in each jurisdiction the staff participant had a title within a planning function, although the focus varied, being either environmental (2 Vic and 2 SA LG), sustainability (2 Vic and 1 SA LG) or strategic (1 Vic and 2 SA LG). Of the LG surveyed, only two returned questionnaires that had been completed by a climate change or greenhouse officer. Both LG were from Victoria. It may be concluded from this analysis that Victorian LG has framed climate change within a sustainability agenda while South Australian LG are still to make this transition, predominantly considering climate change to be an environmental issue.

Table 4.2 Functional area of staff participant completing the questionnaire

Jurisdiction	Chief Executive	Environment	Sustainability	Climate Change / Greenhouse	Planning	Engineering & Construction
Victoria	1	3	8	2	5	0
South Australia	0	8	4	0	5	1

4.2 The importance of climate change to local government

A decision to act on an issue such as climate change may be expected to follow formal procedures for decision-making by each LG council, as discussed in Chapter 1. Proposals would be prepared by appropriate staff and submitted to a meeting of decision-makers. The proposal may outline the reasons for taking action, the type of action being proposed and the cost implications for the LG. For each SA LG, the proposal would likely be assessed in relation to its Strategic Management Plan and the *State Strategic Plan* (Government of South Australia 2007b). Discussion would ensue and, if supported, the key decision-makers would endorse the proposal to enable resources to be allocated to implement the actions. It may also be assumed that if climate change was a key issue in the Strategic Management Plan, it would receive funding and resources. In order to ascertain whether each LG has made such a formal commitment, the following question was asked: 'Has your local government formally acknowledged that climate change is an issue?' Evidence of how the importance of climate change had been acknowledged was requested from each LG. A list of possible actions was provided together with a space for recording any additional actions that each LG may have taken to acknowledge its commitment. An additional question sought information about targets which LG had set for reducing GHG

emissions. This section summarises and discusses the responses to these questions related to LG commitments to act on climate change.

The majority – 95% of Vic LG and 89% of SA LG who responded - had formally acknowledged the importance of climate change with only two SA and one Vic LG not indicating that such an acknowledgement had been made. Hence it can be assumed that there has been widespread acceptance by LG in both jurisdictions that climate change is an important issue for LG to address. Table 4.3 summarises the way that each Vic LG had then demonstrated the importance of climate change. It is clear from this table that Vic LG were quite active in demonstrating their commitment to address climate change, particularly in engaging their community in seminars and supporting both community groups and business to reduce carbon emissions. In contrast, the responses from SA LG which are summarised in Table 4.4 show less evidence of action to engage with the community to address climate change. One notable exception is that seven SA LG (39%) indicated that they had modified their development plan or planning policy guidance documents to address climate change compared to five of the Vic LG (26%) indicating such action. Hence, there is some potential for LG to use planning documents as a mechanism to address climate change in each state. Mechanisms such as those reviewed by Hamin and Gurran (2009) could be explored. Kellett and Hamilton (2009b) proposed renewable energy resource plans as a new planning related mechanism which may also provide an opportunity to reduce carbon emissions in the future.

The most frequently mentioned actions for LG in each jurisdiction was participation in the International Council of Local Environmental Initiatives Cities for Climate Protection (ICLEI CCP) program and implementing water and energy conservation measures within corporate operations. The latter is an action within the ICLEI-CCP program, as is the inclusion of climate change as a key issue in the strategic plan and action to estimate and report energy use within corporate operations as well as across the community. While undertaking Phase 2 of this research in July 2009, the Australian Government ceased funding the ICLEI CCP program. The impact of this change on LG is an area for further research particularly as ICLEI CCP was providing a GHG inventory service to LG members.

A greater proportion of Vic LG indicated that they estimated GHG emissions at the community level compared to SA LG. For the latter, only 50% indicated that they actually reported GHG emissions to the community compared to almost 80% of Vic LG. The

public reporting of GHG emissions within sectors in each LG is another mechanism that LG in SA could use to engage its community in action to reduce carbon emissions.

The appointment of a climate change officer was more common for Vic LG (63%) than for SA LG (17%). Two Vic LG authorities indicated that they were members of a greenhouse alliance with other authorities still to develop and implement such programs. Two SA LG authorities indicated that they were undertaking climate change risk assessments at the time of the survey to identify the risk that climate change posed to their LG.

Table 4.3 Ways in which Victorian LG acknowledged the importance of climate change

LG ID	Key issue Strategic Plan	Member ICLEI CCP	Energy & water conservation measures corporate	Estimate energy, water & GHG emissions community	Report energy, water & GHG emissions	Appoint climate change officer	Support community groups to adapt to climate change	Support businesses to adapt to climate change	Support community groups to reduce GHG emissions	Support business to reduce GHG emissions	Conduct climate change seminars	Modified development plan to address climate change	Modified planning policy guidance to address climate change	Other	Set target to reduce GHGs **
V08002	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓
V08004	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓				✓✓
V08005	✓	✓	✓	✓		✓	✓		✓				✓	✓	
V08006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓✓
V08007		✓	✓	✓	✓	✓			✓	✓					✓✓
V08008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
V08009	✓	✓	✓	✓	✓	✓		✓		✓					✓
V08012	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
V08013	✓	✓	✓	✓	✓				✓	✓	✓				
V08014	✓	✓	✓	✓	✓						✓				✓
V08015		✓	✓	✓	✓				✓	✓	✓			✓	✓✓
V08016		✓		✓					✓	✓	✓			✓	✓✓
V08017		✓	✓	✓	✓				✓	✓					✓✓
V08020	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
V08021	✓	✓	✓	✓							✓				✓
V08022						✓	✓		✓	✓	✓			✓	✓✓
V08025	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓✓
V08026	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓
V08027		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓✓

** ✓ for corporate target; ✓✓ indicates both corporate and community targets set

Table 4.4 Ways in which South Australian LG acknowledged the importance of climate change

LG ID	Key issue Strategic Plan	Member ICLEI CCP	Energy & water conservation measures corporate	Estimate energy, water & GHG emissions community	Report energy, water & GHG emissions	Appoint climate change officer	Support community groups to adapt to climate change	Support businesses to adapt to climate change	Support community groups to reduce GHG emissions	Support business to reduce GHG emissions	Conduct climate change seminars	Modified development plan to address climate change	Modified planning policy guidance to address climate change	Other	Set target to reduce GHGs **
SA08001		✓	✓	✓	✓				✓		✓				✓
SA08003	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
SA08004		✓	✓	✓	✓					✓					✓✓
SA08005	✓											✓	✓		
SA08006	✓	✓	✓	✓	✓				✓						✓✓
SA08007	✓	✓	✓	✓	✓		✓		✓			✓			✓
SA08008	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
SA08009		✓	✓	✓											✓✓
SA08010	✓	✓	✓	✓	✓				✓	✓		✓			✓
SA08011	✓	✓	✓	✓					✓					✓	
SA08012 *															
SA08014	✓	✓	✓							✓		✓			
SA08015		✓	✓						✓						✓
SA08016	✓	✓	✓	✓							✓	✓			✓✓
SA08017	✓	✓	✓	✓			✓	✓	✓	✓					✓
SA08018		✓	✓	✓	✓			✓	✓	✓	✓				✓✓
SA08019		✓	✓			✓								✓	
SA08020	✓	✓	✓	✓	✓				✓	✓	✓			✓	✓

*SA08012 indicated that they had not formally acknowledged that climate change was important

** ✓ for corporate target; ✓✓ indicates both corporate and community targets set

4.2.1 Setting targets for carbon reduction

Targets for carbon reduction which were nominated by Vic and SA LG are summarised in Table 4.5. Targets had been set at the corporate level for 17 of the Vic LG (89%) and for 14 of the SA LG (78%). It is clear from reviewing the data in Table 4.5 that the existence and the level of both corporate targets and community targets varies. Corporate targets ranged from 10% reduction in GHG emissions (2 Vic and 3 SA LG) from varying baseline years mostly in the mid-1990s to zero net emissions / carbon neutrality nominated by 3 Vic and 2 SA LG. Nine (9) Vic and 5 SA LG had set a 20% GHG reduction target for corporate carbon emissions. The year by which each LG was to achieve its targets also varied although 15 Vic and 9 SA LG were to achieve their targets by 2010. The year by which each LG was to reach carbon neutrality also varied with one nominating 2015, two nominating 2020 while a third nominated 2050.

Relatively fewer LG had set targets at the community level (47% for Vic LG and 28% of SA LG) which likely reflects the lack of assessment of community carbon emissions. The targets set by LG for community carbon reduction ranged from zero growth of GHG emissions from 1994/95 levels to 20% reduction by 2010 from 1996 levels. Some LG indicated that their community targets were set or would be set as part of their ICLEI CCP program. One SA LG (SA08006) indicated that neither of their community or corporate targets were likely to be met, while one Vic LG indicated that the activity at the community level was hard to measure as they ‘can’t get localised data on green energy purchasing’ (V08025).The effect of the cessation of Australian Government funding for the ICLEI CCP program on target setting and monitoring of GHG emissions by LG has not been undertaken in this research.

What is clear from this analysis of responses is that the focus of target setting has been at the corporate level, with clearly less effort towards setting targets for reducing carbon emissions within the community. There is also little consistency in targets set at either level. Only one LG (SA08018) indicated differential targets at the community level, requiring 10% reduction from each of the residential, commercial and transport sectors while requiring 25% reduction from the industrial sector. In the next section, the actions that LG had taken to support residents to reduce carbon emissions are presented and discussed.

Table 4.5 Targets for carbon reduction

Participant ID	Corporate Base Year	Corporate Target Year	Corporate Target (%)	Community Base Year	Community Target Year	Community Target (%)	Additional comments
SA08001	1994	2010	20				
SA08003		2013	Carbon Neutral				(AU09003 in Phase 2)
SA08004	2000/01	2012/13	20	1998	2012	20	
SA08005							
SA08006	1999	2010	25	1996	2010	20	
SA08007	1999/2000	2010/2011	30				
SA08008		2020	Carbon Neutral				
SA08009	1997/98	2010	20	1994/95	2010	zero GHG growth	(AU09001 in Phase 2)
SA08010	ns	2010	20				
SA08011							Additional Corporate Target - Carbon neutral by 2030
SA08012							
SA08014							
SA08015	1997/98	2010	20	ns	ns	ns	
SA08016	1994	2010	25	1996	2010	20	
SA08017	1994/1995	ns	zero growth of GHG				investigating carbon neutral organisation
SA08018	1997/98	2010	25	1997/98	2010	10 residential, commercial and transport 25 industrial	
SA08019							
SA08020	1996	2010	30				review to carbon neutrality
V08002	1998	2010	30				
V08004	1996	2010	20	1996	2010	20	
V08005	ns	ns	ns	ns	ns	ns	
V08006		2010	20		2010	20	Additional Corporate target Carbon Neutral by 2015
V08007	1999	2010/11	25	1998	2010/11	Back to 1998 levels	
V08008		2020	zero net				
V08009	2000	2010	10				
V08012	1996	2010	20				(AU09002in Phase 2)
V08013	ns	ns	ns	ns	ns	ns	
V08014		2010	20				
V08015	1995	2010	20	1995	2010	10	
V08016	2003	2010	15	2001	2010	10	
V08017	2001	2010	10	1996	2010	10	
V08020	1995	2010	25				Additional corporate target Carbon Neutral 2050
V08021	1995	2010	20				
V08022	ns	2010	20	ns	2010	20	
V08025	1990	2012	20	1990	2012	20	
V08026	2001	2010	20				
V08027	1996/97	2010	30	1996/97	2010	20	

ns = not stated

The shaded rows indicate the LG used as cases in Phase 2 of this research

4.3 Initiatives to reduce carbon emissions in the residential sector

Metropolitan LG in each jurisdiction was asked about the initiatives that it had undertaken or proposed to undertake to assist residents to reduce carbon emissions. The questionnaire provided a list of potential initiatives and asked participants to tick the box to indicate which of these they had undertaken. There was also space provided on the questionnaire to record any other initiatives that they had undertaken or were proposing to undertake.

While one Vic respondent and two SA respondents indicated that they had not formally committed to taking action on climate change, all of the respondents indicated that they had implemented initiatives specifically to assist residents to reduce carbon emissions or were planning to do so. These responses are summarised in Table 4.6 and Table 4.7 for Vic LG and SA LG respectively. Two SA respondents and four Vic respondents indicated that they were developing or updating their action plans at the time of the survey which would detail their new initiatives and hence were unable to provide details of their new initiatives.

From an analysis of the types of initiatives that were implemented across each state, those most frequently implemented were providing recycling services for residents, providing information to households, conducting forums for community groups, and improving walking and cycling tracks. A small number of respondents in each state were also proposing to provide assistance for installing energy conservation measures in homes and improving access to public transport. Responses about proposed initiatives indicated an ongoing focus towards improving walking and cycling tracks in residential areas across each jurisdiction. Some also proposed increased support for recycling of organic waste. One Vic respondent (V08025) had estimated that a 6% reduction in GHG emissions from the household sector could be achieved by diverting green and food waste from landfill.

Some significant differences can be noted from this data. Only one Vic respondent indicated that they provided an incentive for water conservation, while none indicated that they provided an incentive for energy conservation. While some SA respondents indicated that they had provided incentives in the past for water conservation, only two were currently doing so. The focus on water conservation may relate to federal or state government supporting LG to provide rebates for installing rainwater tanks and upgrading showerheads, toilets and water using appliances such as dishwashers and washing machines to more water efficient technology. Three of the SA respondents were proposing

to provide interest free loans for SWH system installations. In addition, some SA respondents indicated that they were aiming to provide low flow showerheads in partnership with SA Water. Hence there was evidence of LG working with external partners to undertake these initiatives.

Four (4) of the SA LG proposed to implement a shop-front or drop-in centre to provide information to residents whereas this action was not being proposed by any of the Vic LG. The Vic LG was more active in providing home energy audits whereas SA LG was focusing on providing energy audit kits whereby the resident could measure their own energy use. The success or otherwise of these different approaches to measuring and monitoring energy use in homes is worthy of further research, particularly in light of research on social learning (Moloney et al 2009). One Vic council indicated that they were pursuing bulk purchasing of solar photo-voltaic systems on behalf of residents. Similar action has been undertaken in regional LG in South Australia but at the time of data collection for Phase 1 none of the metropolitan SA LG had initiated or indicated that they proposed this type of action.

In summary, there is a large variation in actions being undertaken by LG beyond providing recycling services to residents, which is part of their waste management role, and providing information. Based on these findings, Vic LG appears to have progressed further than SA LG in providing assistance to households to reduce carbon emissions. The reason for these differences requires further exploration particularly as South Australia was the first state in Australia to introduce legislation for climate change and greenhouse gas reduction and leads the country on installation of wind farms for renewable energy. The next section analyses the capacity for LG in each jurisdiction to take action based on the initiatives mentioned by LG, highlighting capacity to act which appears to be under-utilised.

Table 4.6 Initiatives of Victorian LG to assist households to reduce carbon emissions

LG ID	Information Reduce GHG emissions	Forums community groups – residents GHG reduction	Shop front or drop in centre - residents	Home energy audits	Provide energy audit kits	Rebates energy conservation	Rebates water conservation	Physical or technical assistance – install energy efficient measures	Recycling services	Improve access to public transport	Improve walking & cycling tracks	Other	Average residential rates $/dwelling	Dwellings
V08002	C	C					C		C			C	837	51,048
V08004	C	C		C					C		C		1,308	63,000
V08005	C	C	C	C	C			C	C		C	C	1,134	54,964
V08006	C	C							C	C	C	C	1,100	27,832
V08007	C	C			C			C	C	C	C	C	930	42,550
V08008	C	C		C				C	C	C	C	C	2,075	45,417
V08009	C								C	C			937	51,239
V08012	C	C		C				C	C	C	C	C	1,403	38,305
V08013	C	C						C	C		C		899	44,961
V08014	C	C						P	C		C		1,000	50,000
V08015	C	C							C	P	C	C	1,000	75,000
V08016	C							P	C		C	C	1,000	60,000
V08017	C	P						C	C		C		1,049	41,833
V08020	C	C		P				C	C	C	P	C	930	48,949
V08021	C	C							C	P	C		1,000	38,000
V08022	C	C		C	C			C	C		C		1,260	41,000
V08025	C	C		C	C			P	C	C	C		1,300	25,000
V08026	C	C							C		C	C	1,100	42,514
V08027	C	C		C	C				C	P	P		930	43,489

Note: C = current initiative P= initiative proposed in next two years

Table 4.7 Initiatives of South Australian LG to assist households to reduce carbon emissions

LG ID	Information Reduce GHG emissions	Forums community groups – residents GHG reduction	Shop front or drop in centre - residents	Home energy audits	Provide energy audit kits	Rebates energy conservation	Rebates water conservation	Physical or technical assistance – install energy efficient measures	Recycling services	Improve access to public transport	Improve walking & cycling tracks	Other	Average residential rates $/dwelling	Dwellings
SA08001		C			C				C		C	C	920	32,427
SA08003	C	C							C	C	C		936	61,169
SA08004	C				C				C			C	940	16,719
SA08005	C	P			P				C		P		1,244	3,138
SA08006	P	P			C				C				1,089	15,247
SA08007	C	C			C	P	C		C	C	C		1,117	8,624
SA08008	C		P		C		C	C	C	P	C	C	3,000	9,186
SA08009				C	C		In past		C	P	P	C	804	27,243
SA08010	C	C		C	C	P	P	P	C	C	C		1,032	25,651
SA08011	C	C	P		C	In past	In past		C	P	C	C	1,100	18,340
SA08012	P				C								954	7,647
SA08014									C		C	P	917	46,183
SA08015	C	C	P		C			C	C			P	1,065	35,883
SA08016	P	C		In past	C				C		C	C	999	20,200
SA08017	P	P	P	C	C			P	C	C	C		838	47,272
SA08018	C	C	C		C	P	P		C			C	750	25,162
SA08019	P				C				C	P	P		1,195	13,230
SA08020	C	C			C				C	C	C	C	720	41,477

Note: C = current initiative P= initiative proposed in next two years

4.3.1 Analysis of capacity to act

Hammer's Capacity to Act Matrix (CTAM) was used to analyse the types of initiatives of each LG – both current and proposed – to assist households to reduce carbon emissions. These initiatives are policies and programs when considering a LG's capacity to act. The initiatives were categorised under nine policy silos headings (Hammer 2009) and mapped against the five mayoral levers proposed by Hammer (2009). The results are presented in Table 4.8 for the Vic LG and Table 4.9 for the SA LG. The findings are discussed for initiatives related to three focus areas – household energy efficiency, renewable energy and low carbon transport.

4.3.1.1 Household energy efficiency (H)

From Table 4.8, it is clear that, for the Vic LG, the programs that were used to address household energy efficiency predominantly mapped to informing the community (100% of Vic LG) and facilitating forums (89%). Developing planning policy which maps to rulemaking was rarely mentioned (only one LG) as was undertaking community level behaviour change programs such as the challenge to change and sustainability street programs. The latter also map to levers of facilitation and information gathering and dissemination. More than half (58%) of Vic LG indicated they had implemented programs that provide services to households to install energy efficient equipment while 42% of LG also provided home energy audits. These programs map to the CTAM mayoral levers of procurement of auditing services and providing financial incentives.

For the SA LG, Table 4.9 indicates that LG's capacity to support home energy audits manifested itself in making home energy audit kits available (89% of LG) followed by providing information (83%) and conducting forums (67%). Assistance in fitting energy efficient equipment was mentioned by 28% of SA LG while rebates for energy and water conservation were indicated by 22% and 17% of the SA LG respectively. While the latter programs map to the financial incentive mayoral lever, most programs map to the lever of providing information or convening forums for the community. From the comparison of the analysis of programs to support household energy efficiency in each jurisdiction, the SA LG appeared to lean towards self-help programs with 'do-it-yourself' energy audit kits while the Vic LG' programs appeared to be directed to providing assistance to retrofit equipment or technology for improving energy efficiency.

Formal mechanisms such as rulemaking or using regulation for improving the energy efficiency of housing were rarely mentioned. There is therefore potential to use mechanisms such as reporting the assessment of household energy use on sale or change of tenant as has been trialled in the Australian Capital Territory (ACT) in Australia, or rebates on council rates or taxes following implementation of energy efficient measures in houses.

4.3.1.2 Renewable energy (R)

The policies and programs for Vic LG relating to switching to renewable energy mapped mainly to the regulatory oversight for recycling of wastes and use of biomass wastes rather than on solar or wind as renewable sources of energy for households. One Vic LG, however, was facilitating the bulk purchase of SPV panels and SWH systems for residents. Other programs related mainly to information sharing and facilitating forums for the community to learn more about options to increase the uptake of renewable energy technology. Local government financing may be required to implement a shop-front for information or to set up an eco-house. Only one Vic LG mentioned the use of planning policy relating to renewable energy or sustainable development which maps to rules and regulations. There appears to be great potential for Vic LG to be using more formal mechanisms such as planning policy to increase the uptake of renewable energy in urban areas.

For the SA LG, programs that related to information sharing may have included renewable energy technologies although this aspect of the programs was not specifically indicated. Three SA LG were providing financial incentives in the form of interest free loans to residents to install SWH systems while one SA LG was providing interest free loans for solar photo-voltaic systems. A number of SA LG were proposing a shop-front or drop in centre and while the type of information was not specified, this type of initiative may allow the demonstration of technology for using renewable sources of energy. Planning policy was not specifically mentioned by any SA LG in relation to renewable energy or building designs. As for the Vic LG, there also appears to be significant opportunity for SA LG to be using more formal mechanisms to enhance the uptake of renewable energy in their community. While some SA LG had indicated previously that they had modified their development plans and planning policy to address climate change, it may be assumed from their responses to this question that the objective of modifying their development plan was not to enhance the uptake of renewable energy at the household level.

There are existing structures that enable LG to engage contractors to provide recycling services to households. The expansion of recycling services to collect organic wastes including food and green wastes is an extension of existing services already provided by LG. Reports on the achievement of the ICLEI CCP program in Australia have highlighted the high levels of recycling of domestic wastes which have been achieved in Australia. Waste recycling maps to the rules and regulatory oversight for waste management which clearly enables LG in both jurisdictions to develop and implement waste recycling policy and programs relatively easily.

4.3.1.3 Low carbon transport (T)

Addressing the need for low carbon transport modes as a means to reduce household carbon emissions may present problems for LG. From the findings of this analysis of capacity to act, the main focus of LG in both jurisdictions is on investing in improvements to walking and cycling tracks (17 Vic and 13 SA LG) and providing improved access to public transport (10 Vic and 9 SA LG). The capacity for such investment, however, is likely to be limited by the infrastructure funds available to LG. For Vic LG, planning policy to achieve sustainable urban design seeks to incorporate low carbon transport choices. The other programs mentioned by LG that might address transport modes, however, mapped mainly to levers of information and education, and advocacy to higher levels of government. Hence the structures of government in each jurisdiction and actions of LG and state government become increasingly important to achieving carbon reduction through low carbon transport choices.

4.3.2 Summary of analysis of capacity to undertake actions

In summary, while LG has rulemaking mechanisms such as planning policy available to it, very few LG indicated that they were using rulemaking mechanisms to assist households to reduce carbon emissions. In the main, they were relying on information and education programs to address energy efficiency, renewable energy and low carbon transport choices. Services to assist residents to understand their energy use such as conducting energy audits were provided by more LG in Victoria than in SA, although the latter focused on providing energy audit kits through libraries. Where LG had some authority to undertake actions, such as providing or upgrading local transport related infrastructure and waste recycling services, these mechanisms were being used to support carbon reduction. In the next section, the actions which LG considered ideal for addressing climate change are explored.

Table 4.8 Ways in which Victorian LG assist or propose to assist households to reduce carbon emissions – analysis of capacity to act

		Mayoral levers				
Policy Silos / Initiatives	**No of LG**	**Rulemaking**	**Regulatory oversight**	**Direct expenditure procurement**	**Financial incentives**	**Information gathering & dissemination; convening / facilitation; advocacy**
Electricity supply, distribution and use						
Home energy audits	8			H		H
Energy audit kits	5			H		H
Rebates / subsidies for energy conservation						
Land use planning						
Develop planning policy	1	H,R,T				
ESD assessment tool (STEPS)	1	H,R,T				
Transportation						
Improved walking and cycling tracks	17			T		
Walking school bus	1					T
Improved access to public transport	10			T		
Advocate for public transport improvements	1					T
District energy and on-site thermal energy						
Facilitate bulk purchase of SPVs	1					R
Building design and codes						
Develop an eco-house	1			H,R		H,R
Waste and other forms of embodied energy						
Recycling services	19		R	R		R
Organic waste	2	R	R	R		R
Sell worm farms & compost bins	1					R
Water delivery and treatment						
Rebates for water conservation	1				H	
Water efficient showerhead exchange program	1				H	
Energy-related economic development						
Physical or technical assistance -installation	11			H	H	
CFL light bulbs	1				H	
General energy governance practices						
Reviewing greenhouse action plan	2					
Impacts and adaptation study	1					
Sustainability strategy	1					
Sustainability Street	1					H,R,T
Zero net emissions review	1					H,R
Information - reduce GHGs	19					H,R,T
Promote rebate opportunities and new technologies	1					H,R
Challenge to change program	1					H,R,T
Forums for community groups	17					H,R,T
Schools program	1					H,R,T
Shop-front or drop in centre	1			H,R		H,R

H = Household energy efficiency focus; R = Renewable energy focus; T = Transport focus

Table 4.9 Ways in which South Australian LG assist or propose to assist households to reduce carbon emissions – analysis of capacity to act

		Mayoral levers				
Policy Silos / Initiatives	**No of LG**	**Rulemaking**	**Regulatory oversight**	**Direct expenditure procurement**	**Financial incentives**	**Information gathering & dissemination; convening / facilitation; advocacy**
Electricity supply, distribution and use						
Home energy audits	3			H		H
Energy audit kits	16			H		H
Rebates / subsidies for energy conservation	3				H	
Land use planning						
Transportation						
Improved walking and cycling tracks	13			T		
Support walking school bus	1					T
Improved access to public transport	9					T
Advocate for public transport improvements	1					T
District energy and on-site thermal energy						
Interest free loans for SPV systems	1				R	
Interest free loans SWH systems	3				R	
Building design and codes						
Waste and other forms of embodied energy						
Recycling services	17		R	R		R
Pilot recycling food waste	1	R	R	R		R
Water delivery and treatment						
Rebates for water conservation	4				H	
Assist new developers – integrate energy and water efficiency/conservation	1			H		
Shower head exchange program	1			H	H	
Energy-related economic development						
Physical or technical assistance -installation	5			H		
General energy governance practices						
Associated with Solar Cities	1					R
Waste and energy action plan	1					
Information - reduce GHGs	15					H,R,T
Forums for community groups	12					H,R,T
Shop-front or drop in centre	4			H,R		H,R,T

H = Household energy efficiency focus; R = Renewable energy focus; T = Transport focus

4.4 Ideal actions to address climate change

In an open-ended question, each LG was asked to nominate the process or measure that, in an ideal world, LG would need to implement to have a positive impact on climate change. The responses have been summarised and categorised as either community focused or corporate focused actions and appear in Table 4.10. There were some key differences noted in the responses from LG in each state. For Vic LG, the responses indicate a greater focus on LG taking action which is community based, such as planning policy, water management, renewable energy and building design. In addressing water management, water sensitive urban design and recycling were considered to be ideal actions to address climate change.

Table 4.10 Categories of ideal actions nominated by Victorian and South Australian LG

Focus	Vic LG	SA LG
Community	Planning policy (37%)	
	Information and education (32%) Water Management (32%)	
	Renewable energy (21%) Building design (21%)	
	Transport infrastructure and access (16%)	Information and education (17%) Advocacy to higher levels of government (17%) Mobilise community (17%)
	Mobilise community (11%) Industry assistance (11%)	
	Household energy efficiency (5%) Planting trees / street trees / retain trees (5%) Divert green waste / organic waste from landfill (5%) Stricter targets (5%) Monitoring and feedback on energy use (5%)	Planning policy (5%) Household energy efficiency (5%) Renewable energy (5%) Monitoring and feedback on energy use (5%)
Corporate	Leadership by example (26%)	Leadership by example (33%)
	Street lighting (16%)	Street-lighting (28%)
	Vehicle fuel efficiency (11%) Purchase green power (11%) Implement action plan (11%)	Vehicle fuel efficiency (11%) Develop policy position and action plan (11%)

Note: the percentage of LG in each state is in brackets

For the SA LG the responses mainly related to corporate responses to climate change such as councils leading by example, followed by addressing street-lighting. This was borne out by actions such as ‘ensure that Council buildings and staff practices are making a positive impact on climate change - ie set an example to community’ (SA08005). The actions ‘information and education’ and ‘advocacy to higher levels of government’ which address community aspects of climate change were each mentioned by only three SA LG while

'mobilising the community' also rated a mention by three LG. The nature of SA LG' actions may be summarised by the following comment: 'LG is ideally suited as an info(rmation) portal and disseminator of information and to an extent - programs. It is NOT well placed to develop info(rmation) and is cumbersome for establishing programs across boundaries' (SA08016 original emphasis in written response on questionnaire). There was much less emphasis on the actions that would require rules and regulations associated with the responses from SA LG.

From the responses that were provided, the SA LG seemed to have a stronger focus on corporate action while Vic LG sought a greater capacity to act on community aspects of addressing climate change.

4.4.1 Analysis of capacity to act

The results of an analysis of capacity to act (mayoral levers) for the ideal actions (policies and programs) of Vic LG and SA LG are presented in Tables 4.11 and 4.12 respectively.

Table 4.11 Ideal actions nominated by Victorian LG to address climate change – analysis of capacity to act

		Mayoral levers				
Policy Silos / Initiatives	**No of LG**	**Rulemaking**	**Regulatory oversight**	**Direct expenditure procurement**	**Financial incentives**	**Information gathering & dissemination; convening / facilitation; advocacy**
Electricity supply, distribution and use						
Street-lighting	3					
Monitoring and feedback energy use	1					H
Household energy efficiency	1	H	H			H
Purchase green power	2			R		R
Land use planning						
Planning policy	7	H,R,T	H,R,T			
Transportation						
Improved access to public transport	3			T		T
Vehicle fuel efficiency	2			T		
District energy and on-site thermal energy						
Renewable energy	4	R	R	R		
Building design and codes	4	H,R	H,R			
Waste and other forms of embodied energy						
Divert green / organic waste	1	R	R	R		R
Water delivery and treatment						
Water management	6	H	H	H		H
Energy-related economic development						
General energy governance practices						
Implement action plan	2					
Stricter targets	1					
Leadership – by example	5			H,R,T		
Information - reduce GHGs	6					H,R,T
Mobilise community	2					H,R,T
Industry assistance	2					E,R,T
Planting trees / street trees	1					

H = Household energy efficiency focus; R = Renewable energy focus; T = Transport focus; E=Energy efficiency - business

Table 4.12 Ideal actions nominated by South Australian LG to address climate change – analysis of capacity to act

	Mayoral levers					
Policy Silos / Initiatives	**No of LG**	**Rulemaking**	**Regulatory oversight**	**Direct expenditure procurement**	**Financial incentives**	**Information gathering & dissemination; convening / facilitation; advocacy**
Electricity supply, distribution and use						
Street-lighting	5					
Household Energy Efficiency	1	H	H			H
Land use planning						
Planning policy	1	H,R,T	H,R,T			
Transportation						
Vehicle Fuel Efficiency	2			T		T
District energy and on-site thermal energy						
Renewable Energy	1	R	R	R		R
Building design and codes						
Waste and other forms of embodied energy						
Water delivery and treatment						
Energy-related economic development						
General energy governance practices						
Develop policy position and action plan	2					
Advocacy to higher levels of government	3					R,T
Leadership – by example	6			H,R,T		
Implement adaptation programs	2					
Monitoring and Feedback - energy use	1					H
Information - reduce GHGs	3					H,R,T
Mobilise Community	2					H,R,T

H = Household energy efficiency focus; R = Renewable energy focus; T = Transport focus

The analysis of capacity to act is presented under three headings related to the three key areas for carbon reduction at the household level: household energy efficiency, renewable energy and low carbon transport mode choices. The similarities and differences between each jurisdiction are discussed within these three areas.

4.4.1.1 Household energy efficiency (H)

From the analysis, the policies and programs nominated by Vic LG indicate that, ideally, rules in respect of planning policy are required to facilitate an uptake of energy efficient building design. The response from LG V08009 stated that 'planning restrictions on new and existing buildings/renovations to incorporate sustainable design and operation' were ideally needed, a statement supported by other LG (V08002, V08005, V08015, V08017, V08025, and V08027) who called for stricter planning controls, ESD (an acronym for ecologically sustainable development), and energy efficient buildings. Hence action in Vic LG appears to be leaning towards rules and regulations rather than information and education to enable these types of actions. Only one SA LG mentioned household energy efficiency as a means to address climate change. The planning controls of SA LG,

however, potentially provide a greater opportunity to address household energy efficiency and should be explored further. It should be noted that studies in the UK have found that, although rules are in place for reducing energy use in housing, there has been a lack of correlation between targets and as built construction (Bell, Smith & Palmer 2010). Hence simply making rules does not necessarily deliver energy efficiency.

4.4.1.2 Renewable energy (R)

Four Vic LG indicated that, ideally, an uptake of renewable energy is needed, while only one SA LG mentioned renewable energy as an ideal action to address climate change. Similar to energy efficiency, there is potential to develop planning policy rules and regulations that require renewable energy to be incorporated into new developments. The purchasing of green power was also mentioned by two Vic LG as a corporate measure which would require financial capacity to procure.

4.4.1.3 Low carbon transport (T)

Transport infrastructure was an area for LG action in an ideal world for only three LG, all from Victoria. As discussed previously there is limited capacity for LG to act other than to provide walking and cycling infrastructure, access to public transport and information and advocacy roles. For SA LG, transport was mentioned by only two LG and related to the energy efficiency of vehicles used by the LG itself. Hence transport issues for the community do not appear to be important for SA LG in acting on climate change.

These results indicate the need for further research on the attitudes of LG towards their role to assist their community to reduce transport related carbon emissions for mitigating climate change, and in Phase 2 of the research, this aspect is explored in more detail with a small number of LG.

4.5 Barriers to ideal action

An analysis of the types of barriers mentioned by LG to taking this ideal action is presented in Table 4.13. While financial issues and insufficient funds were frequently mentioned by LG from both states, many Vic LG also mentioned the lack of political will at higher levels of government and processes of decision making about developments at state government level as key barriers to taking action on climate change. There appear to be stronger political factors in emerging in the responses from Vic LG compared to responses from SA LG. The evidence of greater intention to act on carbon emissions at the

community level by Vic LG as indicated in this survey, may be exposing structures that have been and continue to be produced by actions of various actors in dominant positions within these structures. Evidence of this could be found in comments such as "we have little authority over residential and private sector emissions except through planning controls and education" (V08015) while another barrier was 'getting State and Federal Governments agreeing to work collaboratively with LG and community on joint initiatives' (V08020). These LG see the structures of government as limiting their agency or capacity to act. At state level in Victoria, legislation related to planning was seen to block implementation of some programs (V08026).

While technology itself was not a barrier, the lack of information about technologies (11% of Vic LG) and the availability of regional data on climate change (17% of SA LG) were mentioned. Of significant interest and potential importance was the frequency with which SA LG mentioned the lack of priority given to the importance of climate change in the community (28%) and the lack of awareness or commitment by councillors (22%) or senior management (28%) to taking action on climate change. In contrast, only one of the Victorian LG (V08004) mentioned that there was a lack of concern in the community.

Understanding the reasons for these differences requires further research to explore the attitude of LG and their community towards acting on climate change and the role LG that they have to assist households to reduce carbon emissions.

Table 4.13 The barriers to taking ideal action nominated by Victorian and South Australian LG

Category	Vic LG	SA LG
Financial / Economic	Insufficient funding (63%)	Insufficient funding (67%)
Political	Lack of political will / support at higher levels of Govt (68%) Vic Civil & Admin Tribunal (11%) Privatisation of electricity generators (11%) Jurisdictional & institutional barriers (5%)	Jurisdictional & institutional barriers (28%) Lack of political will / support at higher levels of Govt (22%)
Organisational	Limited people resources (16%) Councillor lack of knowledge (11%)	Senior Management not committed (28%) Councillor lack of knowledge (22%) Better networks and partnerships needed (11%) GHG seen as an environmental issue (5%)
Social	Not a priority in community (5%)	Not a priority in community (28%)
Technological	Lack of information on alternative technologies (11%)	Lack of data at regional level (17%)

Note: the percentage of LG in each state is in brackets

As financial issues and having insufficient funds to take action on climate change at the local level were frequently raised by LG in both jurisdictions, a brief analysis of the rates charged to residents in each LG and the total residential rates per hectare of land across each LG has been undertaken. This is discussed in the following section.

4.5.1 Local government funding

The data about rates and the number of dwellings in each LG was provided by LG participants via the survey and is presented in Table 4.14. A plot of the average residential rates per dwelling against the total rates from residential properties per hectare of land area in the LG is presented in Figure 4.1. The data has been disaggregated by state (Vic or SA) and by whether cost or lack of funds was a barrier to taking action (Yes or No). From Figure 4.1, it appears that regardless of the area of land within an LG boundary, average rates are relatively constant. In Australia, LG is restricted in its ability to raise funds for programs at the local level (ALGA 2008) and has limited access to funds outside of rates collected from land-owners and businesses. There have been constitutional challenges to the ability of federal government to provide funds directly to LG in Australia (see Pape 2005), requiring LG to obtain additional funds through federal grants administered by state government. The options for LG to raise funds for action appear to be increasing the density of dwellings within its area or seeking extra contributions from its existing rate payers. However, from this analysis, it is not clear that the average of the council rates charged in the residential sector has any relationship to cost being a barrier to taking action on climate change. For councils with lowest total residential rates per land area, cost tended to be a barrier, but as the total residential rates per land area increased there was a cluster of councils in each state that did not mention cost as a barrier. Specific questions related more directly to cost barriers and limitations to the level of rates which LG charges its land-owners may reveal greater understanding of why such clusters have appeared in this analysis.

Table 4.14 Analysis of cost as a barrier to taking ideal action - key LG statistics

LG ID	Cost mentioned as a barrier? Yes/No	Average annual residential rates $/dwelling	Dwellings in LG number	Estimated total residential rates $m/yr	Area sq km	Total residential rates per unit LG area $/ha
V08002	No	$837	51,048	43	114	$3,748
V08004	Yes	$1,308	63,000	82	60	$13,734
V08005	No	$1,134	54,964	62	50.9	$12,245
V08006	Yes	$1,100	27,832	31	31.2	$9,813
V08007	Yes	$930	42,550	40	487	$813
V08008	Yes	$2,075	45,417	94	36.5	$25,819
V08009	Yes	$937	51,239	48	504	$953
V08012	No	$1,403	38,305	54	114	$4,714
V08013	No	$899	44,961	40	25.6	$15,789
V08014	Yes	$1,000	50,000	50	91	$5,495
V08015	Yes	$1,000	75,000	75	400	$1,875
V08016	No	$1,000	60,000	60	123	$4,878
V08017	Yes	$1,049	41,833	44	542	$810
V08020	No	$930	48,949	46	131	$3,475
V08021	Yes	$1,000	38,000	38	63	$6,032
V08022	No	$1,260	41,000	52	37	$13,962
V08025	Yes	$1,300	25,000	33	440	$739
V08026	Yes	$1,100	42,514	47	44.3	$10,557
V08027	Yes	$930	43,489	40	63	$6,420
SA08001	Yes	$920	32,427	30	55	$5,424
SA08003	Yes	$936	61,169	57	518	$1,105
SA08004	Yes	$940	16,719	16	15.1	$10,408
SA08005	Yes	$1,244	3,138	4	3.5	$11,153
SA08006	Yes	$1,089	15,247	17	14	$11,860
SA08007	No	$1,117	8,624	10	7.5	$12,844
SA08008	Yes	$3,000	9,186	28	15.2	$18,130
SA08009	Yes	$804	27,243	22	346	$633
SA08010	No	$1,032	25,651	26	76	$3,483
SA08011	Yes	$1,100	18,340	20	26	$7,759
SA08012	No	$954	7,647	7	41.1	$1,775
SA08014	Yes	$917	46,183	42	55.6	$7,617
SA08015	No	$1,065	35,883	38	95	$4,023
SA08016	Yes	$999	20,200	20	23.3	$8,661
SA08017	No	$838	47,272	40	160	$2,476
SA08018	Yes	$750	25,162	19	36	$5,242
SA08019	Yes	$1,195	13,230	16	795	$199
SA08020	No	$720	41,477	30	92	$3,246

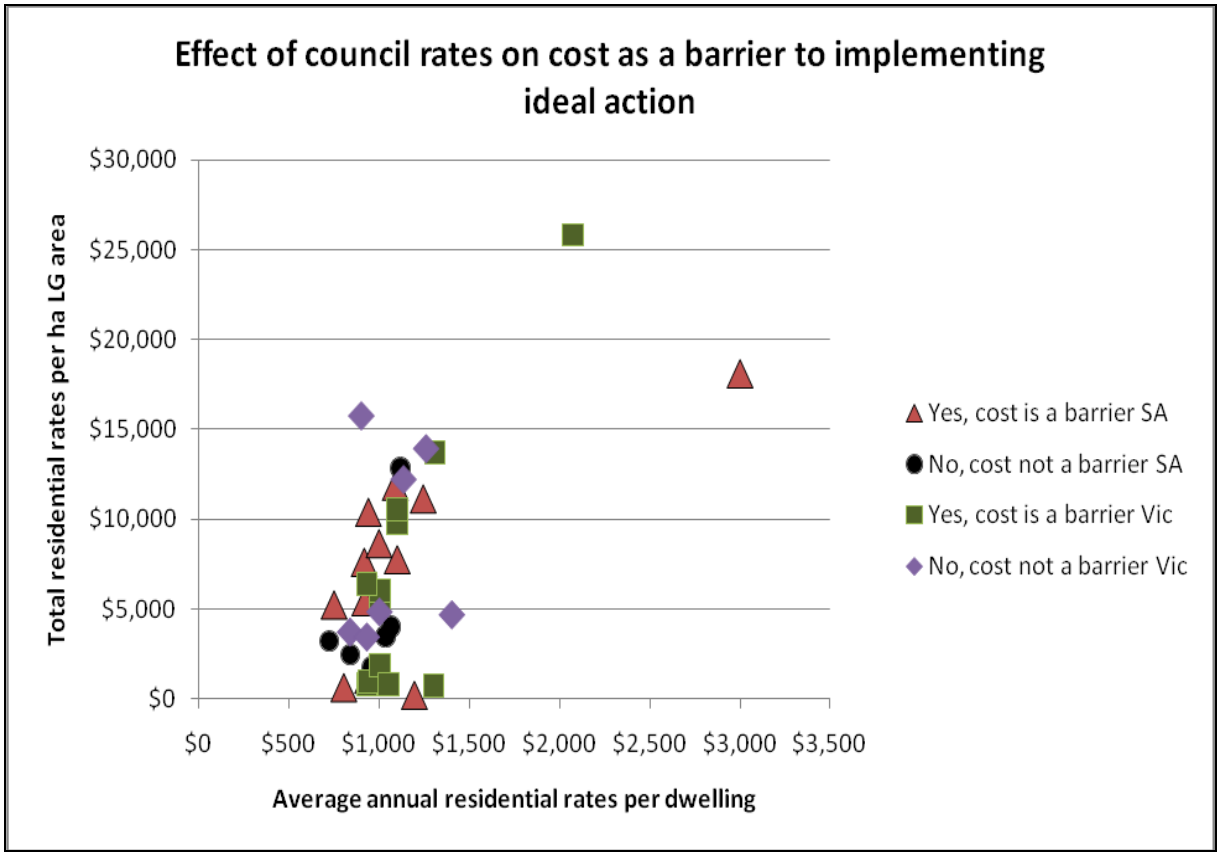


Figure 4.1 Analysis of council rates, rates per hectare of land in LG area and influence on cost as a barrier

4.6 Governance factors

Bulkeley and Betsill (2003) stated that the widespread influence of the ICLEI CCP program was evidence of the change in focus from government action on climate change to governance of climate change at the local level. In spite of most LG in this survey having an association with the ICLEI CCP program, none indicated, however, that the ICLEI CCP program was an ideal action for LG to take to address climate change. The role of government which Bulkeley & Betsill (2003) described as steering, enabling, facilitating, collaborating and bargaining within a networked governance structure does appear to have been acknowledged in part by LG, particularly those in Victoria. While the term steering was not referred to, facilitation, collaboration and advocacy were terms that were used by LG to describe the ideal actions that they could take.

4.7 Summary of Phase 1 research

In summary, the first phase of this research which obtained data from 90% of the metropolitan LG in South Australia and 70% of the metropolitan LG in Victoria, has found that the majority of LG have formally committed to taking action on climate change. There were a number of differences noted between the two states in the types of actions that LG have undertaken or were proposing to undertake to demonstrate their commitment to act on climate change and to support households to reduce carbon emissions. The Vic LG appeared to have a greater focus on programs to assist the community to reduce carbon emissions as well as undertaking action to reduce their corporate carbon emissions, while the SA LG were generally more corporate focused. From the analysis of the capacity for LG action, there was reliance on informing the community about the need for action and advocating for improved services such as public transport. Some initial action on facilitating the uptake of renewable energy at the household and community level was observed, and together with planning policy, these areas provide opportunities for increased local action, particularly if barriers can be overcome. The main barriers to taking action were cost and, for the Vic LG in particular, a frustration in the lack of political will to support LG to take action. This finding indicates a lack of recognition at higher levels of government that the governance structures are limiting the capacity for local action. Fewer SA LG considered that community based programs were ideal actions to take compared with their Vic counterparts and had yet to encounter the resistance and lack of political will from higher levels of government to support their endeavours to act on climate change in the community. Further research of the attitudes of LG towards their role to assist the community to reduce carbon emissions may reveal other issues that influence their capacity to act.

Chapter 5. Phase 2 – The local government cases

In Chapter 3, the purpose for conducting Phase 2 of this research was outlined. To recap, firstly, Phase 2 sought to provide greater understanding about the role of LG to assist communities to reduce carbon emissions and how this is contextualised. Secondly, it sought to identify the types of action LG takes to support households to reduce carbon emissions, the structures being produced and reproduced by these actions, and how these structures might affect and be affected by LG's capacity to act. Thirdly, Phase 2 of this research sought to identify differences and similarities between and across the cases in respect to the mechanisms that LG uses to build its capacity to act, which may indicate innovation and best practice. The rationale for selecting these LG authorities as cases and the methods used to collect and analyse data were also outlined in Chapter 3. Three of the Australian LG that were surveyed in Phase 1 have been included as cases in Phase 2, adding to the data collected during Phase 1. The remaining cases are LG authorities from Europe: three from England and two from Germany.

This Chapter provides a brief summary of each case including a brief history of development of the LG area, and the key factors driving development of the LG area including key statistics of current and projected population and dwellings. For each case, the results of an analysis of corporate and community plans and urban planning documents for reference to policy, plans and programs to address aspects of climate change mitigation are presented, followed by the results of a review of corporate and community governance of climate change. The individual case summaries conclude with the short and long term key issues identified by participants. As the cases were drawn from three countries, they have been given unique identifiers including a country code: Australia (AU), the United Kingdom (UK) and Germany (DE).

5.1 Case AU09001

Case AU09001 is the City of Playford, a LG in the northern metropolitan area of Adelaide, the capital city of South Australia (see Figure 5.1). Six officers agreed to participate in this research, providing responses to the questions. In this Thesis, they are referred to as AU09001 Participant 1, AU09001 Participant 2, AU09001 Participant 3, AU09001 Participant 4, AU09001 Participant 5, and AU09001 Participant 6.

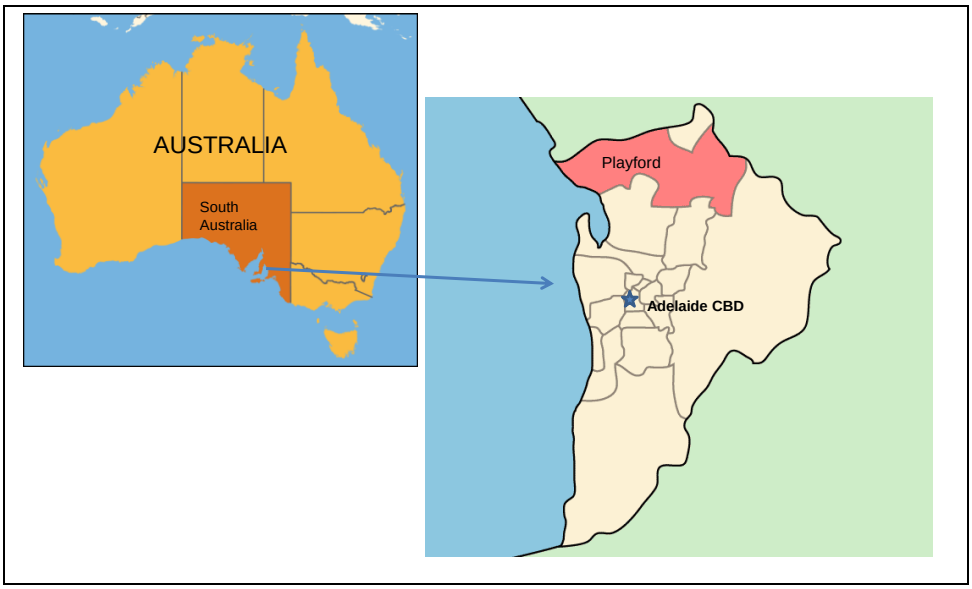


Figure 5.1 Location map for Case AU09001
(adapted from Wikipedia 2010a/b)

5.1.1 Profile

The current council was formed in 1997 with the amalgamation of two councils: one urban and one rural (City of Playford 2007a). The City of Playford consists of 35 suburbs with three rural townships within its boundary; and has 11.4 km of coastline dominated by mangroves, a protected species in South Australia. European settlement of the local area commenced in 1838, two years after the settlement of South Australia (City of Playford 2008a). Population in the LG area grew rapidly with the development of the city of Elizabeth from the mid-1950s onwards. While urban development slowed from the 1970s, it is still continuing with new housing estates offering affordable housing in three northern parts and one eastern part of the case study area. There is a significant but declining manufacturing industry located in the case study area, including an automobile

manufacturing plant. Growth in employment is projected into the future with most jobs expected to be in manufacturing, retail trade, health and community services, and government administration and defence (Blandy et al 2008).

The key statistics are summarised in Table 5.1. The population of approximately 70,000 persons (City of Playford 2007b) is expected to increase by between 33,000 (47%) and 45,000 (64%) by 2018 (City of Playford 2008b). Many of the existing urban areas established in the 1950s and 1960s have also been identified as areas for revitalisation. The height of dwellings, flats and apartments rarely exceeds two storeys (ABS 2007a) and 81% of dwellings are separate houses. The low gross population density of 2.0 persons/ha classifies Playford as an automobile oriented urban form (Newman and Kenworthy 1999), although some residential areas have densities of more than 29 persons/ha (Atlas of South Australia 2010).

Table 5.1 Key statistics for Case AU09001

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council rates Residential Average per dwelling
City of Playford	346	69,418	27,243	545	47 – 64% by 2018	$804

5.1.2. Review of documents

In 2002, five LG councils from Northern Adelaide, including Playford, collaborated to produce a regional action plan to manage greenhouse gases (Cities of Salisbury, Playford, Tea Tree Gully, Port Adelaide Enfield & Charles Sturt 2002). This plan had a number of objectives which included increasing energy efficiency for residents and increasing the use of renewable energy. Its approach was to enhance the community awareness regarding greenhouse issues, jointly implement actions for change and create a collaborative inter-governmental approach to managing the risks of climate change. In addition, the plan aimed to improve the capacity of the planning system to encourage energy efficient design in all types of development. Other objectives related to revegetation and establishing carbon sinks and minimising the volume of organic material disposed to landfill. When the plan was published in 2002, Playford had undertaken carbon reduction actions that focused

on: alternative fuels for Council vehicles; energy efficient equipment for council facilities; and staff education about use of lighting and individual heating systems to reduce energy consumption (Cities of Salisbury, Playford, Tea Tree Gully, Port Adelaide Enfield and Charles Sturt 2002). The plan outlined the role of LG as focusing on the following areas: leading by example; education and awareness; facilitation; incentives; services and infrastructure; regulation and control; lobby and influence; provision of technical advice; and accommodation. Hence at the time the plan was developed, the focus was on both corporate and community carbon reduction.

5.1.2.1 Review of Community Plan

In 2005/06 Playford developed a *Community Plan* which has three goals: economic prosperity, environmental care and community wellbeing. A goal plan for each of these priorities has been prepared in addition to an organisational excellence plan. The *Environmental Care Goal Plan* has 7 key objectives, a number of which relate to climate change and carbon reduction (City of Playford 2006). These include: sustainable waste management focussing on waste minimisation and resource recovery; a community actively addressing climate change through low energy use; and a community managing and using water resources sustainably. While the goal plan had an objective of addressing climate change through low energy use, a search for the terms 'renewable energy' and 'climate change' in the goal plan document failed to find a reference to actions that would increase the uptake of renewable energy or address climate change.

5.1.2.2 Review of Development Plan

Under the Development Act 1993 (South Australia), the management of new development in each LG area is through a Development Plan (DP), a statutory document which is reviewed every five years. The DP is produced by the Council, in this case the City of Playford, after a process including consultation with its community and other stakeholders and is approved by the Minister for Planning and Development in the Government of South Australia (Government of South Australia 2008b).

This section presents the analysis of Playford's DP (City of Playford 2008c) for reference to actions related to carbon reduction, particularly for the residential sector. The analysis is presented under the three headings: household energy efficiency, renewable energy and low carbon transport.

5.1.2.2.1 Household energy efficiency

The DP includes guidance for development that applies to all zones across the LG area as well as guidance for development within specified zones. With respect to residential development, the council wide guidance (p.16) addresses the building bulk and materials; privacy and access to sunlight to benefit amenity and enable effective use of solar energy collection systems; building and allotment orientation; and appropriate shading of windows to reduce summer heat gain. There are six Principles of Development Control (PDC) that relate to energy efficiency in residential development: requiring design elements that reflect ecologically sustainable principles such as access to solar and natural light, energy efficiency and stormwater re-use (PDC 73 p.28); requiring adequate thermal comfort for occupants while minimising the need for mechanical heating and cooling by providing an internal day living area (e.g. lounge, family room or kitchen/dining room) with a northfacing window (other than for minor additions); zoning house layout to enable main living areas to be separately heated and cooled (other than for minor additions); locating, sizing and shading windows to reduce summer heat load and permit entry of winter sun; and allowing for cross ventilation to enable cooling breezes to reduce internal temperatures in summer(PDC 91 p.39). Exceptions are made for minor additions which have a floor area less than 50% of the remaining portion of the existing dwelling and do not incorporate a day living area. Building materials and insulation are required to: assist in thermal performance, and maintain internal comfort levels (PDC 93); and minimise energy requirements and greenhouse gas emissions (PDC 94).

5.1.2.2.2 Renewable energy

With regard to renewable energy, the DP has two Objectives (p.148): to site renewable energy facilities, such as wind and biomass energy facilities, in appropriate locations (Objective 113); and locate, site, design and operate renewable energy facilities to avoid or minimise adverse impacts and maximise positive impacts on the environment, local community and the State (Objective 114). There are three Council Wide PDCs related to the location, site, design and operation of renewable energy, mainly focusing on wind farms (p.148): avoiding or minimising adverse impacts of renewable energy facilities, including wind farms, and maximising positive impacts on the environment, local community and the State (PDC 512); maximising the efficient generation and supply of electricity from renewable energy facilities, including wind farms, and ancillary developments (PDC 513); and listing a number of conditions on renewable energy

facilities, including wind farms, and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) (PDC 514). These address the character, landscape quality, visual significance or amenity of the area; the materials used; the avoidance of sensitive land uses; the potential conflicts with various modes of transport; noise; interference with signals; and potential impact on vegetation and fauna. The DP identified that for the Horticulture West Zone, there are potential synergies between existing and envisaged electricity users within the locality, such as the saltfields, large scale hydroponics and packaging sheds operations, with renewable energy facilities (p.277). As at the end of 2008, no applications for development of wind energy facilities had been received for assessment by Playford's Development Assessment Unit (pers. comm.).

The DP contained guidance for roof orientation and pitch to facilitate the efficient use of solar collectors and PV cells on roof surfaces of buildings, which at the time of review, was subject to development approval. PDC 92 (p.40) specifies that a roof is to incorporate an area of at least 10m² which faces between 30º and 20º east and west of north respectively; and has a pitch of greater than 18º. However the DP also states that 'Appurtenances, including solar water heaters …, located on the roof of dwellings should not be unduly visible from any public street and should, where possible, be architecturally integrated with the dwelling' (PDC 80, p.31). This clause is a potential barrier to placing solar panels on roofs. Since March 2009, a Residential Development Code (RDC) applies in Playford (Government of South Australia 2009). The RDC allows the fixing of SPV panels flush to roof surfaces subject only to building consent rather than requiring both development and building consent which was the case previously.

5.1.2.2.3 Low carbon transport

Objective 8 of the DP states that a comprehensive, integrated, and efficient, public and private transport system is a key objective for the movement of people and goods (City of Playford 2008c, p. 10). The DP seeks to develop a network of roads, paths and tracks, to accommodate satisfactorily a variety of vehicular, cycle and pedestrian, traffic (p.11). The transport systems should maintain the options for the introduction of suitable new transport technologies (p.11). The Council wide guidance within the DP seeks to discourage high volumes of traffic and opportunities for high speeds in residential precincts or neighbourhoods. Streets, open space links and major roads are to provide for pedestrian and bicycle movements while new development should allow for the staging of physical

infrastructure and bus routes along collector roads. The DP specifies that residential development should be responsive to changing community needs and promote better design outcomes in terms of access to transport (p.15) and encourage walking , cycling and public transport usage. The timely and early provision for public transport, community and shopping services is expected in new development. Neighbourhoods should have a layout which integrates movement networks and land-use, reduces local vehicle trips, travel distances and speeds in residential streets; enhances the effectiveness of public transport; and facilitates walking and cycling to daily activities (p.19). The urban design aspects of the public realm are required to address amenity, safety, connectivity, convenience and suitability of public transport.

The DP includes performance criteria for housing density which is based on its proximity to regional and district centres and major public transport interchanges (City of Playford 2008c). For instance medium density housing is preferred particularly on sites within 500 metres of these facilities. Design techniques have been specified in the DP to accompany performance criteria related to car parking for residential dwellings. Detached, semi-detached and row dwellings are provided with two on-site resident parking spaces, one of which is covered (the second space can be tandem). There is no relation however between the number of persons or bedrooms in each dwelling and the number of car park spaces required to be accommodated on the site of the dwelling.

The grouping of a wide range of facilities in integrated centres is a feature of the DP and is described as a benefit to the community by encouraging economic, and shared, use of facilities, providing a meeting place for communities, and encouraging ready access by both public and private transport (City of Playford 2008c, p.62). Zones are used to delineate the hierarchy of centres within Playford. Ribbon development along arterial roads is specifically discouraged with centre development along an arterial road required to discourage pedestrian movement across the arterial road, hence centres are required to be developed only on one side of an arterial road. Minimum parking space requirements exist for centres development to accommodate customers, employees and service vehicles, and additional parking spaces are required for expansion of centres.

While mention is made of transport modes such as walking, cycling and public transport, many more references relate to development that provides for ‘adequate’ car parking, vehicle parking, vehicle movement or vehicle access. It is clear from the analysis of the DP document that transport planning and traffic control are key issues for the LG area.

5.1.2.3 Review of governance

The City of Playford is governed by a Council of one Mayor and 15 Councillors elected every four years by residents, landlords and business operators in the local area. The Mayor is elected directly by the citizens.

This section summarises the corporate and community governance arrangements for climate change that were evident in a review of corporate documents. This analysis was undertaken to better understand the opportunities for the community to influence formal decision-making processes for carbon reduction initiatives.

5.1.2.3.1 Corporate governance

Various committees had been created by Playford's Council, some of which are required by legislation (SA Dev Act or SA Local Govt Act). The committees listed in Playford's *2008/09 Annual Report* were the: Economic and Corporate Committee; Community and Environment Committee; Corporate Governance Committee; Council Development Assessment Panel; Governance Structure Review Committee; Next Generation Buildings Committee; and the Australia Day Event Committee(City of Playford 2009b). The terms of reference of the Community and Environment Committee require it to oversee action of Council to address sustainability and climate change (City of Playford 2009b).

5.1.2.3.2 Community governance

According to council documents, the decision to consult or engage the community follows a risk management approach with twenty six topics being listed as requiring consultation. Consultation in respect of climate change may take place in the processes relating to: development of strategic management plans; matters relating to management, exclusions, or alienation (through leases or licence) of community land; the planting of vegetation or trees; and planning scheme amendments. Thus if the issue of climate change was a key issue in the strategic plan, a key principle related to amendments to planning schemes, or was an objective for use of community land or planting of vegetation, then the community could be involved in decision-making. Hence there are mechanisms whereby the community can be engaged or consulted. The questionnaire completed by the key contact person for Playford during Phase 1 indicated that climate change was not a key issue in the strategic plan, hence the LG would be relying on other mechanisms to engage the community on decision making in relation to climate change.

5.1.3 Key issues identified by the staff

Six staff including the key contact person from Phase 1 provided data for this case. The key issues in the short term (2 to 3 years) and in the longer term (5 to 10 years) have been categorised under seven headings and are presented in Table 5.2. The impact of growth in population in terms of planning and providing infrastructure for new and revitalised residential areas dominates. The organisational response to the demand for increased services is also raised as a key issue for the LG. Energy and carbon emissions were mentioned in relation to the need to monitor and manage energy used by corporate activities and carbon trading which was a new issue for their LG. The issues that were raised as priorities for the short term were also continuing into the long term which may reflect the ongoing growth in population.

Of interest was the lack of reference to the regional approach to action on climate change which was being followed in the 2002 plan. It is not clear whether this regional strategic alliance has been effective in progressing local action on climate change and whether there is a need for a structure or system at a broader regional level in the Adelaide metropolitan area to support local action.

Table 5.2 Key issues for Case AU09001 identified by participants

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Urban growth and coping with growth in a sustainable manner	ST,LT	ST,LT	ST,LT			ST,LT	ST,LT
Urban design						ST,LT	ST,LT
Public transport and connecting communities						ST,LT	ST,LT
Fuel consumption	ST,LT						
Unemployment		ST,LT					
Impact on lower socioeconomic groups		LT					
Increased demand for new and expanded services		ST,LT		ST,LT	ST,LT		
Education		LT					
Financial sustainability			ST,LT		LT		
Carbon trading and its impact on council and community			LT		LT		
To improve elected members' understanding of issues				ST,LT	ST,LT		
Look at our own emissions / Tracking corporate and community emissions	LT				ST,LT		
Identify council energy use / Reducing energy use	LT				ST,LT		
Purchase of "Green" power	LT		LT		LT		
Replacement of major assets including civil services & buildings					LT	LT	
Quarantine of water resources	LT						

ST = Short term issue; LT = Long term issue

5.2 Case AU09002

Case AU09002 is Manningham City Council in the eastern metropolitan area of Melbourne, the capital city of the State of Victoria in south-eastern Australia (see Figure 5.2). Five officers agreed to participate in this research, providing responses to the questions. In this Thesis, they are referred to as AU09002 Participant 1, AU09002 Participant 2, AU09002 Participant 3, AU09002 Participant 4, and AU09002 Participant 5.



Figure 5.2 Location map for Case AU09002
(adapted from Wikipedia 2010c/d)

5.2.1 Profile

Land use is mainly residential with all or part of 11 suburbs within its area which is bounded on three sides by watercourses. Manningham prides itself on being named as the second most liveable municipality in Victoria and the seventh most liveable community in Australia (BankWest 2009). Within its 114 square kilometres of area, 17% comprises open space of high environmental significance which contains 56 threatened animal species, 4 nationally significant native plant species and 11 native plant species of state significance (Manningham City Council 2009a). The area was first settled by orchardists in the 1850s. Gold mining also took place after the first discovery of gold in Victoria was made in this area in 1851. The fruit industry persisted until the 1950s at which point land was developed

for residential purposes. The area is marketed as a tourist destination focusing on the natural environment and the heritage of gold mining in the area.

The key statistics for AU09002 are summarised in Table 5.3. According to the data collected from Manningham in Phase 1 of this research, the population was approximately 116,000 persons living in just over 38,000 dwellings. The gross population density of 10.2 persons/ha categorises Manningham's urban form as automobile oriented (Newman and Kenworthy 1999). From the 2006 census, almost half (49%) of the people who work in the LG area also reside in the area (ABS 2007b). There were approximately 16,000 businesses operating in the local area in 2006 with 80% categorised as small businesses and one third of these home-based. The businesses were mainly in the services sector, dominated by property and business services (53%). The Municipal Strategic Statement (MSS) states that between 2006 and 2031, an additional 20,200 will move into 11,000 new households in the local area. Of interest is the consultation with the community about their preferences in how this population increase will take place. The community preference was for new generations of younger families to move in to revitalise the area (Manningham City Council 2009b).

Table 5.3 Key statistics for Case AU09002

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council rates Residential Average per dwelling
Manningham City Council	114	115,702	38,305	674	17.5% by 2031	$1,403

5.2.2 Review of documents

In the State of Victoria, each LG is required to produce a Council Plan of at least four years duration and review it annually. Each LG is also required to have a Planning Scheme (PS) and a MSS which builds on the State Planning Policy Framework (SPPF) for Victoria (Department of Planning and Community Development 2008; Government of Victoria 2008). The latest Council Plan was adopted in 2009 and addresses the period 2009 to 2013. The Council Plan has nine objectives, the last of which is the environment and global warming. The priorities of the Manningham community, identified via their 2008 survey

were public transport, road infrastructure, aged care services and waste management (Manningham City Council 2009c).

5.2.2.1 Review of Planning Scheme

The Planning Scheme (PS) of Manningham addresses, amongst other things, energy efficiency, urban design, alternative energy sources and transport. There is a requirement on each LG as a planning and responsible authority, to encourage land use and development that is consistent with the efficient use of energy and the minimisation of greenhouse gas emissions (SPPF Clause 15.12); to promote energy efficient building and subdivision design (SPPF Clause 15.12-1); and consolidation of urban development and integration of land use and transport (SPPF Clause 15.2-2) (Government of Victoria 2008).

5.2.2.1.1 Household energy efficiency

The urban design section of the MSS states that development in Manningham should, amongst other things, promote energy efficiency (MSS Clause 21.05-1); achieve site responsive development with a high energy rating and achieve increased acceptance in the development sector about design responses that result in Best Practice Environmental Design (BPED) (MSS Clause 21.07). Strategies include: promoting and developing Manningham as an "Energy Smart" municipality; encourage dwelling applications to achieve an energy efficiency rating of at least 4 stars; provide technical advice and expertise to facilitate suitable techniques to achieve energy efficient designs; link financial incentives and disincentives to a new development's level of energy efficiency; and promote and educate local designers and developers about the business benefits of achieving energy efficient built form. Policies include: requiring development to incorporate energy efficient design, construction and operation techniques, and using local policy to provide specific guidance for BPEDs (Clause 22.01).

The MSS also includes: implementing the *GreenPrint for a Sustainable City* (Manningham City Council 1998) that encourages BPED; encouraging applicants, as part of the building process for new buildings in the municipality, to use the Energy Rating System (Energy Victoria), First Rate House Energy Rating Software (2000) to assess and modify dwelling proposals; encouraging BPED through suitable building and development, including best practice in resource use, and demonstrating low environmental impact without significant cost; making access to the First Rate House Energy Rating Software (2000) available to the general public at the municipal offices; requiring proposals to have regard to the energy

efficiency design guidelines for residential dwellings as outlined in Energy Efficient Housing Manual – Design Guidelines and Case Studies (1994); referring complex energy efficiency issues to Council's Energy Conservation Officer or an external expert as required; and carrying out a range of actions in relation to database development, community education and information.(MSS Clause 21.07)

Local Policy Planning Framework Clauses have been used to implement sustainability objectives set out in the MSS. An example is Clause 22.13 *Doncaster Hill Activity Centre Sustainability Management Plan Policy* (Government of Victoria 2009a).

5.2.2.1.2 Renewable energy

With regard to alternative energy sources including renewable energy, the objective in the MSS (Clause 21.07) is to reduce air pollution and limit greenhouse gas impact by progressively reducing dependence on non-renewable energy. Strategies to achieve this objective include: promoting the benefits and the business case for applying appropriate alternative energy options for a range of different circumstances; and promoting and encouraging the incorporation of alternative energy installations including PV arrays, SWH and grid-interactive power generators into the design of buildings (MSS Clause 21.07). At the time of review (end of 2008) there was no policy for implementation. Other actions listed in the MSS included: providing/distributing information on alternative energy practices and products and advice on the benefits of alternative energy options; and implementing programs funded and supported by the Australian government. At the time of initial review in 2008, planning approval for wind turbines required individual assessment (Webb 2007). Wind energy facilities are subject to Particular Provisions Clause 52.32 and the revised *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria* (Government of Victoria 2009b). These guidelines allow LG to assess applications for wind energy facilities with generating capacity less than 30 MW. Upon reaching that capacity, the Victorian Minister for Planning undertakes the assessments. The Victorian Renewable Energy Target Scheme (VRET) which was introduced in January 2007 sets a target of 10% of Victoria's electricity consumption to be supplied from renewable energy sources by 2016. It is not clear how LG are to support these targets other than advising residents of the opportunities to purchase green-power from electricity retailers or to encourage households to install SWH and SPV systems.

5.2.2.1.3 Low carbon transport

With regard to transport the objective in the MSS is to increase use of transport options that reduce dependence on fossil fuels (MSS Clause 21.07). Strategies to achieve this objective include: encouraging the use of public transport; increasing the number and length of bicycle, pedestrian and horse riding trails; ensuring that development applications, particularly for subdivision, maintain and enhance opportunities for bicycle and pedestrian linkages and public transport; and promote and encourage bicycle use and development of bike and ride facilities. Policy includes: encouraging land use and development proposals that generate large numbers of trips to be located close to existing public transport; requiring proponents of development to have regard for the need to provide 5m wide reservations to accommodate walk/bikeways to connect new development with open space and surrounding areas where appropriate; and requiring proponents of development and subdivision to provide safe and convenient pedestrian linkages on site and to surrounding areas. Other actions listed include: implementing the *Bicycle Strategy* (1999), particularly with regard to the provision of bicycle path connections, access to bicycle paths and provision of bicycle facilities; promoting and encouraging bicycle use; implementing initiatives from the Australian government's alternative fuels grant program; investigating options for a 'park and ride' facility; and implementing the *Manningham Public Transport Strategy* (Manningham City Council 1997) which sets out key strategy measures to increase use of transport options that reduce dependence on fossil fuels.

The information about Manningham indicates that the area has a Park and Ride facility with buses to the Melbourne CBD every five minutes during peak times, every 15 minute in off peak and every 30 minutes at night. The use of public transport by the working population is estimated to be 9% (Manningham City Council 2009a).

5.2.2.2 Review of governance

During the data collection phase of this research, the ward boundaries and number of Councillors changed. The previous Council had 8 Councillors from four wards with a mayor elected from these 8 Councillors. At the elections in November 2008 there were three wards with three Councillors elected in each Ward making a total of 9 Councillors with the Mayor elected from these 9 Councillors (Manningham City Council 2009c).

Manningham's organisation has a Chief Executive and four Directors in the areas of Community Services; Environmental Amenity; Assets and City Development; and Quality and Corporate Services. The Council's annual report for 2009 states that it is 'the first council in Australia and the first LG organisation in the world to achieve a Quality Management System conforming to both ISO 9001 and ISO 14001' (Manningham City Council 2010a). In 2007, the council stated that it was changing its model of operating from a 'Corporatisation Model' which it had operated within since LG reforms of the 1990s (Manningham City Council 2007). By 2010, Manningham City Council had developed an integrated Management System – Safety, Health, Environment, Quality and Risk Management System (SHE Q RMS) - that incorporates: AS 4801 OH&S Management Systems; AS 4360 Risk Management; ISO 9001 Quality Management; and ISO 14001 Environmental Management (Manningham City Council 2010a).

5.2.2.2.1 Corporate governance

Manningham City Council states it is a signatory to the Code of Good Governance in Victoria, which it describes as establishing standards and principles for LG, ensuring the highest level of governance and community leadership (Manningham City Council 2009c). The Council stated that they had also adopted a 'Code of Conduct', which sets out the statutory obligations on Councillors and staff in relation to their behaviour and conduct. It describes the ethical behaviour that is expected of Councillors and staff in a range of situations including the appropriate management and use of Council resources. The council's website states that 'In relation to corporate governance, Council has processes and controls in place to deliver quality service, to prudently manage resources and to safeguard community assets' (Manningham City Council 2010b). The design of the SHE Q RMS adopts a 'Corporate Governance Model', where 'Service Units' work to a common set of standards, yet retain the flexibility to deploy methods of compliance suitable to the nature of their individual business needs. The SHE Q RMS is an integral part of Manningham's 'Management System' and its design is documented in the 'Enterprise Risk Management Operational Framework' (Manningham City Council 2010a.

5.2.2.2.2 Community governance

A Council plan objective is 'Strong community' which it states is focused on improving community health and wellbeing. The focus is on providing opportunities for people to come together, socialise and be involved in their community. Within the strong community focus an online discussion forum, for people interested in local issues, was trialled in 2007

to gauge community interest in online discussions. Water and Energy Conservation were two areas discussed. The on-line discussion forum was also used as part of the community budget consultation process, however a search of the corporate website on 21 October 2010 did not reveal any reference to an on-line discussion facility (Manningham City Council 2010c). The most recent Council Plan includes an action to establish a 'Household Panel', to be used as a basis of community research to inform Council's planning and service delivery, and to monitor Council's performance over time (Manningham City Council 2009d). Hence it appears that Manningham is experimenting with various mechanisms to engage the community in decision-making.

5.2.3 Key issues identified by staff

Four senior staff and the key contact person from Phase 1 comprised the staff participants for this case study. The key short term and long term issues that these participants identified for their LG have been combined and are summarised in Table 5.4. Many of the issues relate to infrastructure required for their community to become self-sufficient, to reduce the use of resources and thereby have a lower impact on the environment. Climate change was viewed in terms of its impact on water supplies and the need to prepare for carbon trading.

Table 5.4 Key issues for Case AU09002 identified by participants

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Water & drought	ST,LT						
Climate change/ Climate adaptation measures	ST,LT				ST		LT
Impact on environment	ST						
Non-renewable resources	ST						
Biodiversity	ST						
Housing affordability		ST,LT					
Public housing		LT					
Cost of petroleum products			ST				
Carbon trading & preparation			ST,LT				
Lobby for regulating change				ST			
More efficient street lighting					ST		
Support increase community demand for assistance					ST		
Public Transport						ST	
Encourage less car use						ST	
Consider the need for new infrastructure						ST	
Improve opportunities for cycling and walking						ST	
Develop local energy sources						LT	
Becoming self-sufficient in renewable energy locally generated						LT	
Improve energy efficiency of existing buildings							ST
Provide services close to people's homes							LT

ST = Short term issue; LT = Long term issue

5.3 Case AU09003

Case AU09003 is the City of Onkaparinga, a LG located in the southern metropolitan area of Adelaide, the capital city of the State of South Australia (see Figure 5.3).

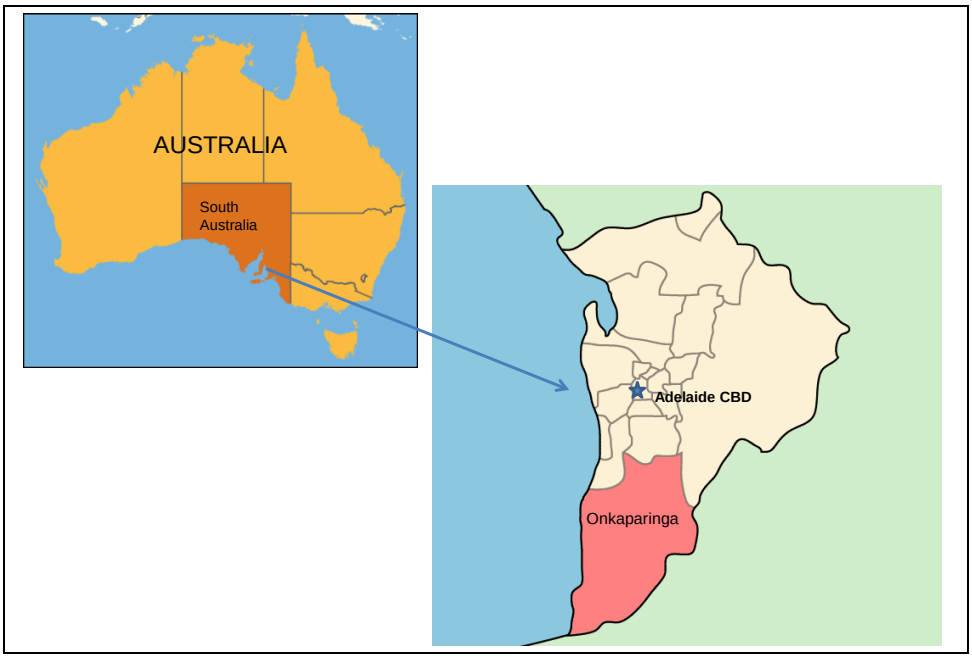


Figure 5.3 Location map for Case AU09003
(adapted from Wikipedia 2010a/f)

5.3.1 Profile

European settlement began in 1837 with townships established around agricultural pursuits (City of Onkaparinga 2010). Approximately 260 sq km of land within the City of Onkaparinga boundary is still used for viticulture, horticulture, forestry, cropping and grazing. The local economy, however, is dominated by the construction industry (24% of businesses), property and business services (19%), retail services (12%) and the agriculture, forestry and fishing industry (9%). Approximately 68% of businesses are owner-operators without employees. The main sectors of employment for people working in the local area in 2006 were: manufacturing (18.7%), retail trade (16.4%), health care and social assistance (12.0%) and education and training (10.0%) (City of Onkaparinga 2010).

A summary of the key statistics for the City Of Onkaparinga is provided in Table 5.5. The City of Onkaparinga comprises 51 suburbs with almost 156,000 residents in just over 61,000 dwellings which is approximately 10% of the state's population (ABS 2007c; City of Onkaparinga 2010). The low gross population density of 3 persons per hectare, would classify this urban form as automobile oriented (Newman and Kenworthy 1999). The population is projected to increase by 40,000 persons by 2028, requiring approximately 20,000 new dwellings and an increase in infill development in addition to planned green-field development to constrain urban sprawl and energy consumption (City of Onkaparinga 2008). Two suburban areas have been identified for urban regeneration projects. There is also a proposal for a transit oriented development (TOD) which is a larger scale, intensive urban regeneration at a suburban rail station adjacent to the regional commercial centre (City of Onkaparinga 2008).

Table 5.5 Summary of key statistics for Case AU09003

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council rates Residential Average per dwelling
City of Onkaparinga	518	155,919	61,169	748	26% by 2028	$936

Public transport consists of a single rail route connecting the area to the Adelaide Central Business District (CBD), and bus services with four park and ride facilities. Some urban and township areas are serviced by buses which feed into centres providing access to commercial, educational and medical centres as well as the Adelaide CBD. The area contains a network of suburban footpaths although no data were available about the length of footpaths within the LG, and a range of recreational trails, some of which are along the 31 km of coastline within its boundary (City of Onkaparinga 2010).

5.3.2 Review of documents

The Community Plan 2008 to 2028 includes strategies for 20 years to address climate change, economic renewal, an expanding and ageing population, access to water and energy, public transport, and social services and facilities (City of Onkaparinga 2008).

5.3.2.1 Review of Community Plan

The first Five year Focus 2008–2013 is on Sustainable Growth, stating

> Planning for sustainable growth is the focus of the first five years of the Plan as we anticipate around 40,000 new residents will make the City their home over the next 20 years (City of Onkaparinga 2008).

The City of Onkaparinga has developed a *Climate Change Strategy* as part of its *Community Plan* (City of Onkaparinga 2008). An important focus of the Climate Change Strategy is the Community Owned Renewable Energy Project (City of Onkaparinga 2009b). Onkaparinga has also developed a draft *Transport Plan*, a *Public Realm Strategy* and a *Recreational Plan*. The provision of effective private, public and community transport options that meet community needs and reduce car dependency is said to be critical (City of Onkaparinga 2008).

5.3.2.2 Review of Development Plan

Climate change is mentioned in Objective 6 of the *Development Plan* (City of Onkaparinga 2009c) which requires development to 'accommodate anticipated changes in sea level due to natural subsidence and probable climate change during the first 100 years of the development' The following sections review the Development Plan for specific references to policy to address household energy efficiency, renewable energy and low carbon transport.

5.3.2.2.1 Household energy efficiency

Within the *Development Plan*'s council wide planning policy, energy efficiency is a key objective with a number of Principles of Development Control (PDC) relating to the conservation of energy and the minimisation of waste (City of Onkaparinga 2009c). These PDCs address the design and siting of buildings to provide for efficient solar access to buildings, ensuring natural light and open space all year around with these areas facing north for exposure to winter sun. The *Development Plan* designates a Mixed Use Zone in the main regional centre. The PDCs for this zone require buildings to demonstrate high levels of energy efficiency and minimise energy consumption for lighting, heating, cooling and ventilation (p. 310). These requirements are expected to be met by: building design and siting to maximise opportunities for passive heating and cooling, inclusion of verandahs (shaded outdoor areas), wide eaves and breezeways, maximising use of natural light and effective use of landscaping (p. 310). Within the Aldinga Dunes Policy Area, the Development Plan states that buildings should include shading elements such as verandas, eaves and screens to assist with energy efficiency (p. 336).

5.3.2.2.2 Renewable Energy

The *Development Plan* has three council wide PDCs related to renewable energy. These address aspects of building design such as the pitch of the roof, the north facing slope to accommodate solar collectors. There was no minimum area nominated for the north facing slope of the roof. An additional PDC addresses the design of public infrastructure, including lighting and telephones, to enable the generation and use renewable energy. Further references to renewable energy (p. 80) relate to aspects of the design, siting and operation of renewable energy facilities, such as wind and biomass energy facilities.
A stated objective of this type of development is to minimise adverse impacts and maximise positive impacts on the environment, the local community and the State. There are specific PDCs relating to wind farms and the ancillary facilities associated with wind farms. Renewable energy sources are also mentioned in relation to using sustainable technologies within tourism development (p. 95).
A Waste Management Zone has been defined within the council boundary which has a desired character that is primarily dedicated to the 're-use, recycling, recovery, treatment, transfer and disposal of waste as well as renewable energy technologies, and ancillary development' (p. 428).

5.3.2.2.3 Low carbon transport

The review of the *Development Plan* in relation to low carbon transport, identified a number of policies for new development. For Centres and Retail Development, centres should be integrated with public and community transport (p. 15). Design should include sheltered waiting areas for passengers (p. 16). For Community Facilities, the siting and development should ensure accessibility by pedestrians, cyclists and public and community transport (p. 21) with appropriate public amenities (p. 22). For industrial development, siting should ensure integration with transport networks (p. 53), but there was no specific mention of public transport. Land division is also required to be integrated with existing transport networks including public and community transport (p. 60), with open space land adjacent to waterways also being linked to pedestrian and transport networks (p. 62). Within land division, on-street parking for visitors is required, but may be affected by the availability of public and community transport (p. 63). Ratios of off-street car parking spaces are specified in the *Development Plan* (p. 446) with a minimum of 1 car park for a single bedroom dwelling and 2 car parks for dwellings of 2 or more bedrooms. For multiple dwelling buildings, the ratio is 1 car park per two persons (p. 448). The layout of land divisions should incorporate street patterns designed to enhance the efficient

movement of traffic and minimise trip lengths (p. 63). Open space is to be designed to incorporate pedestrian and cycle linkages to: other open spaces, centres, schools and public transport nodes (p. 75). Access points to regional parks should be located close to public transport (p. 75).

Orderly and sustainable development is an objective of the Development Plan for AU09003 (p. 76). Development should form a compact extension to an existing built-up area and to maximise the use of existing services and infrastructure including transport networks (p. 77).

The increased density of residential development is expected in areas close to centres, public and community transport and public open spaces (p. 81). For instance, in the Noarlunga Regional Centre Mixed Use Policy Area, densities are specified to be 40 dwellings per hectare (p. 310). Within this area, the number of car parking spaces may also be reduced if sufficient on-street and commercial car parking spaces are available. Supported accommodation is expected to be located within walking distance of essential facilities such as convenience shops, health and community services and public and community transport and ensuring that slope of the land does not restrict easy movement by these modes (p. 91). Transportation and access policies relate to integration of all modes of transport, including pedestrian and cycling (p. 96). The incorporation of new technologies is specifically mentioned in the *Development Plan* in respect of ensuring that development maintains options for the introduction of suitable new transport technologies while making best use of existing transport facilities and networks (p. 96). Safety and efficiency for motorised and non-motorised modes of transport are specifically mentioned (p. 96). Land use is to be arranged to ensure the efficient provision of sustainable transport networks (p. 96) particularly rail and road corridors. Active transport modes (p. 96) are referenced in regards to land uses that generate large numbers of visitors. Priority is to be given to pedestrians, cyclists and public and community transport users when designing pick up or set down zones near schools and other centres (p. 97). Permeable path networks should be incorporated into development to enhance walking and cycling and consideration of provision of end of journey facilities for cyclists is suggested (p. 97).

5.3.2.3 Review of governance

Onkaparinga's Council is made up of a community elected Mayor and 20 elected members, four from each of five wards (City of Onkaparinga 2009a). A Deputy Mayor is

chosen by the elected members to support the office of the Mayor. Elections are held every four years with the last election having taken place in November 2006.

The SA *Local Government Act 1999* (SA LG Act) specifies 14 areas which Onkaparinga lists as governance. These areas are now discussed under the headings of corporate governance and community governance.

5.3.2.3.1 Corporate governance

The areas of corporate governance include: appoint a CEO; establish procedures for the review of decisions; prepare policies on contracts and tenders; prepare and adopt a code of conduct; maintain a register of interests; maintain a register of member allowances and benefits; hold at least one ordinary Council meeting per month; give notice to public of the time and place of meetings; take minutes of meetings and make documents available for inspection; prepare and adopt a code of practice (for access to meetings and documents); prepare and adopt a code of conduct for employees; maintain a register of interests; maintain an audit committee and auditor; and hold periodic elections and maintain a voters roll (City of Onkaparinga 2009a). The annual report for 2008/09 states that Onkaparinga uses its own resources as well as those of nongovernment organisations and the State and federal governments as appropriate, to deliver a diverse range of services, projects and programs (City of Onkaparinga 2009a).

5.3.2.3.2 Community governance

Onkaparinga is required to develop and implement a community engagement framework, however this requirement is not included in the section on governance. Community engagement entails a statutory requirement for the preparation of a public consultation policy (SA LG Act, S. 50). Onkaparinga states that other services and activities are provided by local choice and identified need and that the LG is responsive to the needs, interests and aspirations of individuals and groups within its communities and aims to ensure that resources are used equitably. Onkaparinga partners with a number of state government departments to plan, fund and deliver services to local communities, and that Council makes decisions on policy issues relating to services that are provided for its communities. (City of Onkaparinga 2009a).

5.3.3 Key Issues identified by staff

During an interview with the staff participant (a senior manager) who also provided data for Phase 1, the key issues in the short term (2 to 3 years) and in the longer term (5 to 10

years) were identified. While they mentioned the short term issues specifically, they referred the researcher to the *Community Plan* document (City of Onkaparinga 2008) for the longer term issues. The issues are summarised in Table 5.6. Short term issues related to growth in population and the major infrastructure projects taking place within the LG boundary, both to support the growth and to provide water security for metropolitan Adelaide. Planned urban growth had created policy tensions around densification and / or urban sprawl (AU09003 Participant 1, December 2009).

It is clear that climate change was an important issue in both the short and long term and that adaptation to sea level rise was of particular concern due to the extensive coastal development in the area and the pressure for further growth along the coastline.

Table 5.6 Key issues for Case AU09003 identified by participants

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Growth		ST		ST		ST	ST
Climate change	ST,LT						
Urban design in the built environment							ST
Large scale major projects						ST	
Adaptation and sea level rise (coastal areas)	ST						
Economic renewal			LT	LT			
An expanding and ageing population		LT					LT
Access to water and energy	LT					LT	
Public transport				LT		LT	LT
Social services and facilities		LT			LT		

ST = Short term issue; LT = Long term issue

5.4 Case UK09001

Case UK09001 is Sheffield City Council, a LG authority in the Yorkshire and Humber region of England in the United Kingdom (see Figure 5.4). Four officers of Sheffield City Council agreed to be interviewed with separate interviews taking place at a venue of their choice which for three, were their respective offices and for the fourth, at an office that the researcher was using while in Sheffield. These interviews took place on 3 July 2009 for UK09001 Participant 1, on 2 July 2009 for both UK09001 Participant 2 and UK09001 Participant 3, and on 13 July 2009 for UK09001 Participant 4.

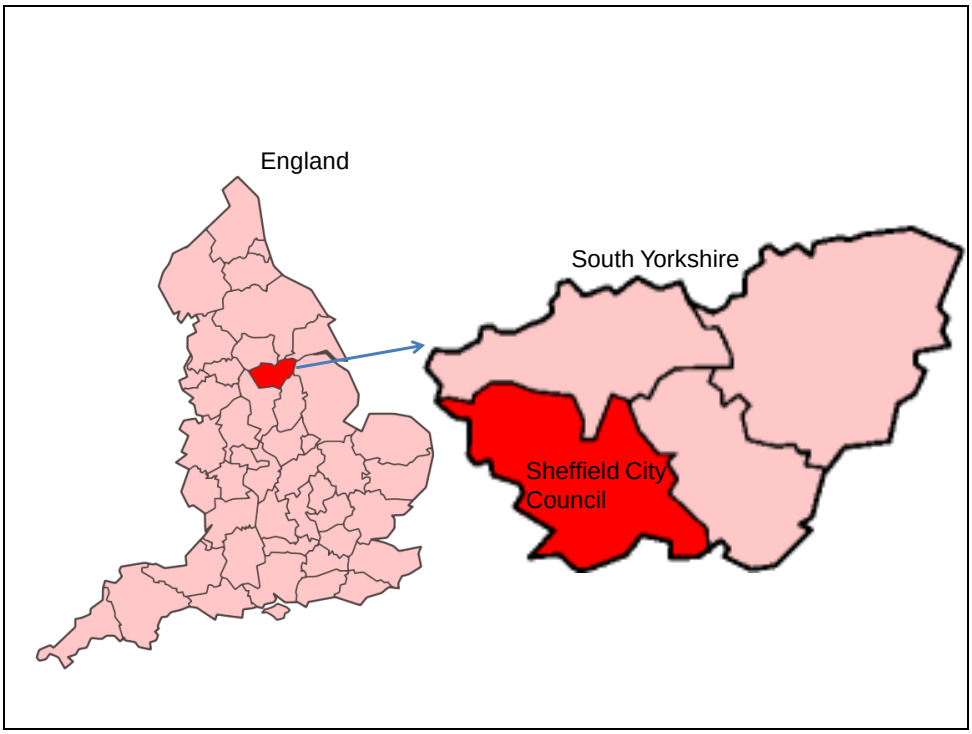


Figure 5.4 Location map for Case UK09001
(adapted from Wikipedia 2010d)

5.4.1 Profile

Sheffield City Council has a spatial area of 363 sq km; is land-locked, and consists of a compact urban area and rural townships (Sheffield City Council 2007). It is situated at the confluence of five rivers and is built on seven hills, hence flooding is and has been an issue for the city region. Within its boundary are 135 sq km of parks and gardens including a

significant part of a large national park (The Peak District) which is a popular destination for locals and tourists. The environment is a priority to retain during development (UK09001 Participant 2, 2 July 2009).

The Sheffield area has a history in steelmaking that dates from the late 19th Century when it was a supplier of railway stocks and armaments (Thomas et al 2009). Much of the city centre was rebuilt in the 1950s and 1960s due to damage from bombing during World War 2. From the 1970s a decline in demand for products from these major steelworks and related manufacturing and engineering businesses commenced. This decline resulted in high unemployment levels (16.2%) by 1987. Post world war two housing estates from the 1960s housed many of the unemployed, while other areas in the south and west dating from the late 19th Century were more affluent. By 1993, employment in the city was dominated by the services sectors – retail, health, public administration, education and recreation (Taylor et al, cited in Thomas et al 2009) with most employed in the public sector. In 2000, South Yorkshire was granted European Objective 1 status, being recognised as one of the poorest regions in Europe and having a Gross Domestic Product (GDP) of less than 75% of the European average (South Yorkshire Integrated Transport Authority 2008). This classification brought an acceleration of funding to support redevelopment of former industrial areas into commercial retail development and facilities for sports, leisure, creative arts and cultural activities (Thomas et al 2009). The Index of Deprivation in 2007 (DCLG 2008) ranked Sheffield as 63rd of the 354 local authorities of the England. In this ranking, the lower the rank the higher the deprivation (ie 1 is most deprived).

The key statistics for Sheffield City Council are summarised in Table 5.7. In 2001, at the time of the most recent Census, Sheffield had a resident population of 513,234 living in 217,622 dwellings. Sheffield has two universities and a high student population which was estimated to be 40,000 in 2005. Growth averaged 2,692 new dwellings per year from 2001 to 2006. The population is projected to rise to 561,300 by 2029 (Sheffield City Council 2007). Average cost of housing has increased considerably since 2002/03, with house prices generally doubling in the four years to 2006/07 (Neighbourhoods and Community Care and Sheffield Homes 2007). The proportion of housing which is owned by the LG reduced by over a third between 1997 and 2007 and in 2006/07 was 19% of the total housing stock (Neighbourhoods and Community Care and Sheffield Homes 2007). Homogeneous council type housing is being replaced by wider mixes of housing types and

is aiming to close the gap between the deprived and more affluent neighbourhoods by improving conditions in previously disadvantaged areas (Sheffield City Council 2009b). While the gross population density of Sheffield is 13.9 persons/ha which is automobile oriented (Newman and Kenworthy 1999), after deducting the land within the Peak District, the gross density increases to 22.5 persons/ha which could be classified as a transit oriented urban form (Newman and Kenworthy 1999).

Table 5.7 Summary of key statistics for Case UK09001

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council taxes Residential Average per dwelling
Sheffield City Council	363	513,234	217,622	378	9.4% by 2029	£1,452 Band D

5.4.2 Review of documents

The main documents used to outline the plans for Sheffield are the *City Strategy* (Sheffield City Council 2007) and the *Local Development Framework* (LDF) of which the *Core Strategy* (Sheffield City Council 2009b) is the main document outlining local planning policies.

5.4.2.1 Review of City Strategy

The vision for Sheffield is to 'be a successful, distinctive city of European significance at the heart of a strong city region, with opportunities for all' (Sheffield City Council 2007).

The *City Strategy* espouses three principles of prosperity, inclusion and sustainability which it states will permeate all it does (Sheffield City Council 2007). In the 2005 version of the *City Strategy* (Sheffield City Council 2005) it listed five themes to indicate success: a strong economy; successful neighbourhoods; inclusive, healthy communities; a great place to grow up; and environmental excellence. It stated:

> Cities of the future will need to offer a high quality of life and take account of the needs of the global as well as the local environment. Environmental quality is key to providing healthy and sustainable lifestyles for all and will attract and retain businesses in the city (Sheffield City Council 2005).

In 2007, Sheffield revised its five ambitions to the following: an economy that matches the best in Europe; establish excellence in its public transport system; every neighbourhood to

be a successful neighbourhood; everyone to be able to fulfil their potential through learning and enterprise; and Sheffield to be an attractive and sustainable, low-carbon city (Sheffield City Council 2007). If the order is significant, this revision shows that the economy is the first priority for the city, that public transport has become more important and the words sustainable and low carbon have been introduced as descriptors for the 'city to be'.

Sheffield has an overall theme of 'Environmental Excellence' and an ambition to be a sustainable, low-carbon city (Sheffield City Council 2009b). The Sheffield Environment First Partnership is charged with developing and implementing a city-wide, sustainable low carbon strategy. The strategy relied on promoting and supporting low carbon development, becoming a location of choice for the environmental technologies sector, and integrating this objective into the city's economic masterplan. As well as leading by example, the partners of Sheffield were required to champion strategies for sustainable energy, waste, green and open spaces, and transport. This action would contribute to a reduced ecological and carbon footprint for the city. The *City Strategy* (Sheffield City Council 2007) also states that it plans to establish public transport as the preferred choice for commuter journeys into the city, reducing overall congestion.

Planning is required to contribute to the achievement of sustainable development with four priorities for action: sustainable consumption and production; climate change and energy; natural resource protection and environmental enhancement; and sustainable communities. Housing market renewal aims to improve the wider environment in previously low-demand neighbourhoods. Council owned housing was required to meet standards defined as follows:

> A decent home should be in a reasonable state of repair; have reasonably modern facilities – this relates mainly to the size, age and layout of kitchens and bathrooms but also includes noise insulation and common entrances to blocks of flats; have a kitchen no older than 20 years and a bathroom no older than 30 years; provide reasonable thermal comfort, which covers both decent levels of heating and insulation. Decent homes should be warm, weatherproof with reasonably modern facilities and are a key element of any thriving, sustainable community (Sheffield City Council 2007).

The *City Strategy* (Sheffield City Council 2007) states while its economy is growing, 'We are still not moving at the rate of many other cities' and considers that the city faces many structural challenges to sustained and accelerated economic growth.

5.4.2.2 Review of Local Development Framework's Core Strategy

At the time of the data collection in July 2009, under the provisions of the *Planning and Compulsory Purchase Act 2004* (PCP Act), the National Planning Policy (NPP), the Regional Spatial Strategy (RSS) and Local Development Plan Documents (DPDs) together formed the Local Development Framework (LDF) (Sheffield City Council 2009b). The Regional RSS for the Yorkshire and Humber Region was issued in May 2008. It included a broad development strategy for the region, setting out regional priorities in terms of location and scale of development, including: economic development; housing; transport and communications; the environment (including water, minerals and waste, energy generation and use); tourism and leisure; and urban and rural regeneration (Sheffield City Council 2009b).

The RSS set out views on how much development there should be in each LG area up to 2026, and where it could go. The central government required each council to produce a plan (LDF) for development within their district which incorporates a Core Strategy and other mandatory and optional documents. These were to address where new housing and industrial development would be located; how town centres would change to cater for commercial uses; how the transport network would need to change, to ensure access for key uses such as travel to work, school, retail centres and businesses; and how business growth could take place, including land supply. The approval of all planning applications and proposed developments is governed by this plan (Sheffield City Council 2009b).

In March 2009, the *Core Strategy 2009 – to 2026*, the overarching planning document for Sheffield's LDF, was adopted (Sheffield City Council 2009b). Sheffield was one of the first local authorities in the Yorkshire & Humber region to adopt a Core Strategy. Sheffield's *Core Strat*egy nominates 15 Key Challenge areas, and espouses the three key principles of prosperity, inclusion and sustainability (Sheffield City Council 2009b). It contains the overall objectives and spatial context for decisions about particular developments and provides a broad outline of spatial policy. Specific guidance is set out in the 'City Policies' document, which contains the policies to promote sustainable design and safeguard the environment. Allocation of specific sitesoccurs through the 'City Sites' document. Location of areas and specific sites for detailed application is obtained from the 'Proposals Map' (Sheffield City Council 2009b).

The LDF has a statutory responsibility to 'contribute to the achievement of sustainable development' which is defined as 'enabling people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations' (HM Government 2005). Hence it is global in its focus rather than local. There are four priority areas for action: sustainable consumption and production; climate change and energy; natural resource protection and environmental enhancement; and sustainable communities (Sheffield City Council 2009b). The spatial vision for the LDF reflects changes still needed to regenerate the city and it takes up two recurring themes in existing strategies: transformation and sustainability, both reflecting the long-term nature of the strategy (Sheffield City Council 2009b).

Specific reference to minimising carbon emissions in the layout of developments is made (S11.1) focusing on the energy efficiency of buildings; renewable energy generation through schemes and for new buildings (S11.2); and for adaptation through reducing the impact of flooding (S11.3). All new buildings and conversions of existing buildings must be designed to use resources sustainably. The design objectives for sustainability focus on water, materials, minimising waste and building in flexibility (p.115).

Various mechanisms are identified to support these policies. These mechanisms include: supplementary planning documents; development management; negotiating developer contributions; housing market renewal; active identification of sites; and active procurement. Partners including developers, renewable energy operators and the Housing Market Renewal Pathfinder body for the area have been identified to support the delivery of the Core Strategy objectives (Sheffield City Council 2009b).

5.4.2.2.1 Household energy efficiency

The *Core Strategy*'s objectives address the causes and respond to the effects of climate change and accord with the priority for action in the *UK Sustainable Development Strategy* about climate change and energy and to national planning policy on climate change (HM Government 2005; Sheffield City Council 2009b). Policy CS 63 'Responses to Climate Change' promotes action to reduce the city's impact on climate change including designing development to increase energy efficiency and reduce energy consumption and carbon emissions (Sheffield City Council 2009b). Policy CS 64 'Climate Change, Resources and Sustainable Design of Developments' focuses on design of new buildings and conversions of existing buildings to reduce emissions of greenhouse gases and function in a changing

climate (Sheffield City Council 2009b). This policy requires all developments to: achieve a high standard of energy efficiency; and make the best use of passive heating and cooling, natural light, and natural ventilation.

There are five energy efficiency criteria for new dwellings, one of which includes meeting a Target CO_2 Emission Rate (TER). At the time of the data collection in 2009, the Building Regulations (HM Government 2006) designated an acceptable TER for dwellings to be the emission rate for a notional building compliant with Part L of the Building Regulations in 2002, reduced by 20%. The TER is expressed in terms of kilograms of CO_2 per square metre of floor area. From 1 October 2010, all dwellings will be required to achieve a 25% reduction in the TER for a notional building compliant with Part L of the Building Regulations in 2002 (HM Government 2010). The other criteria address minimum energy efficiency standards of building fabric elements and fixed building services, limiting solar gain in summer, ensuring that the Dwelling Efficiency Rate (DER) is not greater than the TER, and providing owners and occupiers with energy efficient operation instructions (HM Government 2006; HM Government 2010).

5.4.2.2.2 Renewable energy

Renewable energy capacity targets for the South Yorkshire area (which includes Sheffield) for supplying the Grid were South Yorkshire 47MW in 2010 increasing to 160MW in 2021 (Yorkshire and Humber 2008). The *Core Strategy* needs to state the scale of provision proposed for planning purposes and identify where the energy might be generated. (S11.10, p.116) Renewable energy is promoted in CS65, the 'Renewable Energy and Carbon Reduction Policy' which sets renewable energy capacity targets for the City of Sheffield to exceed 12MW by 2010 and 60MW by 2021 (Sheffield City Council 2009b).

Areas have been identified for the potential location for larger-scale wind generation though not exclusively. All significant developments will be required to: provide a minimum of 10% of their predicted energy needs from decentralised and renewable or low carbon energy; and generate further renewable or low carbon energy or incorporate design measures sufficient to reduce the development's overall predicted CO_2 emissions by 20% including the decentralised and renewable or low carbon energy required for the 10% minimum demand. The renewable or low carbon energy technologies must be operational before any new or converted buildings are occupied. Policy CS65 therefore focuses on sustainable design which includes local generation for a specific development or larger-

scale development to supply the Grid. If it can be demonstrated that the required reduction in carbon emissions cannot be met through decentralised renewable or low carbon energy and/or design and specification measures, a contribution towards an off-site carbon reduction scheme may be acceptable. (Sheffield City Council 2009b, p.117)

The policy applies to both new-build and conversions of 5 or more dwellings (including apartments), or more than 500 sq m gross internal floor-space. These triggers are stricter than the National Planning Policy (and RSS requirement) which is for 10 dwellings or 1000 sq m gross internal floor-space.

Developments for waste (or biomass) to heat or cogeneration are encouraged to connect to the City Centre District Heating Scheme or establish new shared energy schemes within large developments or between neighbouring developments. Policies CS68 and CS70 promote methods of waste management that reduce the need for landfilling with its associated methane emissions and policy CS69 supports the energy recovery plant at Bernard Road (Sheffield City Council 2009b, p.114).

5.4.2.2.3 Low carbon transport

Routes for sustainable travel are promoted in policies CS16 and CS54-58 (Sheffield City Council 2009b). Policy CS 63 ‘Responses to Climate Change’ promotes action to reduce the city’s impact on climate change including: prioritising development in the City Centre and other areas served by sustainable forms of transport; promoting higher densities of development in these locations; and encouraging walking, cycling and the use of public transport. To help reduce the expected impact of development on climate change, appropriate location and density of development are provided for particularly in policies for business and industry (CS3 and CS5), retail and built leisure (CS14, CS15, CS34 and CS39) and housing (CS23 and CS26) (Sheffield City Council 2009b).

5.4.2.3 Review of governance

Local elections are held on a four year cycle: an election is held every year for three years and then no election in the fourth year. In Sheffield there are 84 elected Councillors with three Councillors for each of the 28 Wards. There are also three Parishes (or townships) within Sheffield with Parish elections held once every four years and usually at the same time as a local election (Sheffield City Council 2009a).

A review of council documents and the corporate website have revealed the following summaries of corporate and community governance arrangements operating within Sheffield City Council.

5.4.2.3.1 Corporate governance

The overriding duty of Councillors is to the whole community, but they have a special duty to their constituents, including those who did not vote for them (Sheffield City Council 2009a). All Councillors meet together as the Council, and at Full Council meetings, which are held monthly, members of the public may put questions about Council business to the Cabinet Members and submit a petition. Councillors decide the Council's overall policies and set the budget each year (Sheffield City Council 2009a). The Council appoints the Leader and at its Annual Meeting will appoint Councillors to serve on its Committees. It also appoints representatives to serve on joint bodies and external organisations. The Cabinet discusses and takes decisions on the most significant issues facing the Council (Sheffield City Council 2009a). These include issues about the direction of the Council, its policies and strategies, as well as city-wide decisions and those which affect more than one Council service. Meetings are chaired by the Leader of the Council.

There are five Scrutiny Committees that monitor and evaluate decisions affecting services and the performance of officers (Sheffield City Council 2009a). Committees can review decisions made by the Cabinet and certain officer decisions and make recommendations to the Cabinet or Full Council on changes to policy and the provision of Council services. The Committees cover the following areas: Children and Young People; Culture, Economy and Sustainability; Health and Community Care; Strategic Resources and Performance; and Successful Neighbourhoods (Sheffield City Council 2009a).

Each LG in the United Kingdom is required to report its performance against an agreed set of National Indicators (NIs). There is a formal three year Local Area Agreement (LAA) between Sheffield City Council and the central Government, which sets out the priorities for local people (Sheffield City Council 2009c). The NI 186 addresses carbon reduction across the LG area and is included in Sheffield's high priority Nis within their LAA (Sheffield City Council 2009c).

Included within the LAA is the commitment to ensure that more people feel able to influence decisions about their lives and local area and to increase the number of people who volunteer (Sheffield City Council 2009c). The Council is the lead accountable agency

for the LAA and all partners legally have to work in ways that will make sure that there is increased involvement of local people in the area. Community satisfaction is monitored and relates to overall performance, community engagement and advocacy, the average rates for all assessments and the average rates for residential assessments, capital and operating expenditure per assessment and liabilities per assessment, infrastructure renewal and maintenance ratios.

5.4.2.3.2 Community governance

A Partnership Board has endorsed a Community Engagement Strategic Framework for the city, which sets out key principles for partners in the city to be guided by when engaging with local communities.

> The strategy sets out why extending citizen and community involvement in our work and in the city generally is important to us. It also sets out what we will do to lead this work, support local people and communities to be involved and empowered to take action themselves, and how we will change and develop to expand and improve involvement and democracy. The strategy will help us to be more open and transparent in the way decisions are made and to empower local people to be part of the process (Sheffield City Council n.d.).

In May 2009, Sheffield established seven Community Assemblies, led by local Councillors. These are expected to change the way the Council works, giving local people a much greater opportunity to influence which services are provided and budgets in their area (Sheffield City Council n.d.).

A number of 'Golden Rules' have been written into the Community Engagement Strategy, these relate to the following: honesty, communications, realism, inclusion, respect, recognition, democracy, equality of opportunity, and flexibility and innovation. The enhancement of community engagement and involvement of citizens in decision-making was a new initiative at the time of the data collection in July 2009 focused on a democratic approach and development of a community development function within the LG (Sheffield City Council n.d.).

There is a Partnership program operating, whereby key stakeholders from the private, public and Voluntary, Community and Faith (VCF) sectors, developers and other organisations commit their organisations to the city's carbon reduction target and implement a city-wide communication strategy (Sheffield First 2009). A behavioural shift towards low carbon lifestyles is said to involve everyone (which is defined as householders, businesses, the third sector and the public sector) (Sheffield First 2009).

5.4.3 Key issues identified by staff

Three staff participants provided information about the key issues for their LG. The key issues for the short term (2 to 3 years) and in the longer term (5 to 10 years) have been categorised and are summarised in Table 5.8. A key issue for UK09001 in the short term was the importance of meeting the national indicators, while achieving the objectives of the Core Strategy, which is a major planning document for the city was identified as the main long term issue. Issues were spread across all categories with changes in local political leadership, importance of environmental protection and social issues dominating. The impact of the financial crisis on the local economy was described by most participants as a slowdown in investment for new commercial and industrial ventures.

Table 5.8 Key issues for Case UK09001 identified by participants

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Environmental issues	ST						
National Indicator 188 – planning to adapt to climate change	ST,LT			ST	ST		ST
Equality, Health (Closing the gap) Health and wellbeing		ST		ST			
'Everyone matters'		ST		ST			
National Indicator 186 – reducing carbon footprint for the city	ST			ST	ST		
Economy			ST				
Sustainability	ST	ST	ST				
Transport						ST	
Affordable housing		ST					
All issues in Core Strategy				ST,LT	ST,LT		ST,LT
Customer service					ST		
Impacts of financial crisis			ST				
Playing our part in the bigger environmental agenda	LT						

ST = Short term issue; LT = Long term issue

5.5 Case UK09002

Case UK09002 is Kirklees Council, a LG authority in West Yorkshire, England. One officer agreed to be interviewed, with the interview taking place at both their office in Huddersfield, West Yorkshire, and at a café within walking distance of their office. In this thesis, the officer is referred to as UK09002 Participant 1. The officer provided copies of electronic files which contained additional information about some of their LG initiatives and about their planning system.



Figure 5.5 Location map for Case UK09002
(adapted from Wikipedia 2010e)

5.5.1 Profile

Kirklees has a spatial area of 409 sq km. Kirklees is not dominated by a major city, although there is a large town (Huddersfield) in which a university, the local authority administration and main retail development are located. The LG has a number of discrete communities across its area which historically rose up around the mining, textile, engineering and chemical industries (Audit Commission 2007). Based on information

provided by UK09002 Participant 1, Kirklees has a resident population of approximately 490,000 living in 160,000 dwellings. The key statistics report of council states that only 20% of these dwellings are separate houses (Kirklees Metropolitan Council 2003). Council provides rented accommodation for 23,746 households with a further 4,452 provided by housing associations. Kirklees has a growing number of older people and a high proportion of black and minority ethnic (BME) population at 15.1%, with people of Asian origin comprising 11.6% of the total population. Children from the BME population account for about 30% of all school pupils, with Asian pupils over 21% of the total (Kirklees Partnership 2009). The 2007 Index of Deprivation ranked Kirklees 82nd of 354 local authorities (DCLG 2008). In this ranking the lower the rank the higher the deprivation.

The key statistics for Kirklees Council are summarised in Table 9. Population is expected to grow by approximately 11% by 2026. This level of growth is above the regional average but marginally below the national average for England. The number of households is expected to increase by 28,000 in that time. The gross population density is 9.5 persons/ha which may be classified as an automobile oriented urban form according to Newman and Kenworthy (1999).

Table 5.9 Summary of key statistics for Case UK09002

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council taxes Residential Average per dwelling
Kirklees Council	409	403,935	159,031	337	11% by 2026	£1.373 Band D

In 2001, 23.8% of workers were still employed in manufacturing industries which is significantly higher than the 15% figure for all of England and Wales. Other key employment sectors were the wholesale and retail trades; real estate, property rental and business activities; health and social work; education; and construction. (Kirklees Metropolitan Council 2003)

Kirklees has undertaken climate change risk assessment studies and has noted extreme weather events in the local area: severe flooding in the summer of 2007; drainage problems in the region as a result of increased rainfall; storm and flooding damage to houses and

businesses in parts; storm damage to historic buildings and heritage sites; heat waves reaching record highs in the summer of 2003; and higher risk of Moorland fires due to increasing summer temperatures (Kirklees Council 2009b).

5.5.2 Review of documents

The key documents for Kirklees are the *Sustainable Community Strategy* (SCS) and the *Local Development Framework* (LDF) with its antecedent document – the *Unitary Development Plan* (UDP) in operation until all aspects of the LDF have been adopted.

5.5.2.1 Review of Council wide strategy

The Kirklees area is not dominated by a city but has seven discrete localities within its area. Hence the SCS sets out the strategic direction and long term vision for Kirklees across these localised communities. It includes the priorities for each of these localities, encompassing the Housing Strategy and Economic Strategy to promote the social, economic and environmental wellbeing of the area.

A visioning process was first undertaken in 2002 with objectives set to guide action to achieve a '*Vision for 2012'*. These were: create a stronger economy that is better able to meet the needs of the local community; reduce all forms of discrimination and prejudice; make Kirklees better connected; increase children's and young people's attainment and opportunities; make Kirklees safer; make Kirklees cleaner and more attractive; improve health, well-being and independence; increase the number of safe, warm and affordable homes; develop living, vibrant town centres; and support the development of individuals and communities.

The latest Vision is for 2020 and states:

> By 2020 Kirklees is recognised in West Yorkshire and beyond as an area of major success. Its strong economy is supported by an attractive, high quality environment, offering the best of rural and urban living. Creativity and learning are highly valued. Communities are proud of their past, but enjoy diversity, are outward looking and face the future with optimism. Both young and old find it a safe, healthy and supportive place, where there is a clear commitment that all should share in this success (Kirklees Council

The current SCS is a three year strategy for 2009 to 2012. It adopts four ambitions: real help for communities; reducing inequalities; responding to recessions; and reducing carbon. The economy and housing are the key focus for the strategy with a focus on energy efficiency of housing through the Warm Zone project and interest free loans.

Kirklees' strategy for developing and implementing a sustainable travel strategy stems from the objectives contained in the subregional *Local Transport Plan* (LTP-2) for West Yorkshire (2006). They are: delivering accessibility; tackling congestion; safer roads; better air quality; and effective asset management. The carbon reduction initiatives are undertaken through the better air quality objective of the strategy.
Kirklees has signed up to the *Aalborg Commitments* - a set of principles that help the council create targets and objectives which ensure local sustainable development (Kirklees Council 2009d). These principles are stated as providing help in areas such as: decision-making, effective management, promoting health and well-being, protect nature, reduce waste and sustainable transport (Kirklees Council 2009d).

5.5.2.2 Review of planning strategy

The planning policy system within Kirklees was changing at the time of the interview with the staff participant in July 2009. The old system of a single document UDP was being replaced with a LDF in accordance with the *Planning and Compulsory Purchase Act 2004* (PCP Act). As previously explained, under the provisions of the PCP Act, the National Planning Policy, the Regional Spatial Strategy (RSS) and Local Development Plan Documents (DPDs) together form the LDF. The RSS for the Yorkshire and Humber Region, which was issued in May 2008, has influenced the LDF which incorporates a Core Strategy and other mandatory and optional documents. At the time of the data collection in 2009, consultation was taking place on four options for the Core Strategy to deliver an increase of 36,820 dwellings across the Kirklees area between 2004 to 2026. A Sustainability Appraisal of the options for the Core Strategy had also been undertaken with an assessment of how efficiency in water, energy and raw material use is obtained (Kirklees Council 2009c).

Until the New Core Strategy is in place as part of the LDF, Kirklees Council makes planning decisions according to the existing UDP. The last UDP for Kirklees was developed in 1999 and updated with a written statement in 2007 (Kirklees Council 2007). Section 1.10 of the UDP contains the following statement:

> The use of energy conservation measures is of particular importance if there is to be progress towards sustainable development. The plan has been prepared taking into account relationships between land use and energy conservation. The land allocations and policies controlling the location of development take account of the desirability of minimising the need to travel. The plan also seeks to ensure that energy conservation is taken into account in the siting of buildings and it provides guidelines for development associated with the generation of energy from renewable resources. (Kirklees Council 2007).

The following sections summarise the policies related to energy efficiency, renewable energy and low carbon transport that are addressed by the UDP.

5.5.2.2.1 Energy efficiency

Policy EP10 states that, in assessing planning applications, account will be taken of the extent to which measures have been incorporated into site development to maximise opportunities for solar heating and minimise exposure to wind chill (Kirklees Council 2007). Section 5.27 also refers to the use of natural lighting, and site development layouts that consider siting, orientation and type of buildings, earth sculpting and tree planting. The objective is energy conservation, particularly for heating in winter. The UDP refers generally to the quality of buildings, materials, scale and consideration of character in local areas. The UDP claims that 40% of development applications are for extensions to existing dwellings rather than for new development.

5.5.2.2.2 Renewable energy

Sections 5.10 to 5.26 pertain to maximising opportunity for renewable energy across the Kirklees area. These sections provide information about factors to take into account in considering applications for wind energy facilities (all sizes of wind turbines), solar energy installations and biomass energy installations. It is clear that considerable background research has informed the discussion of opportunities for using wind energy resources in the area (see Sections 5.14 to 5.22 of the UDP, Kirklees Council 2007). In addition to the support for using renewable energy indicated in the UDP, there is acknowledgement of the potential conflict between 'possible adverse local effects of the proposed activity and the wider environmental benefits it would bring, for example, through a reduction in the burning of fossil fuel' (Section 5.1, Kirklees Council 2007).

5.5.2.2.3 Low carbon transport

Policy T1 of the UDP pertains to the development of an Integrated Transport System with an emphasis on improving public transport and encouraging a modal shift away from travel by private car. The UDP refers to setting priorities for improved personal accessibility including encouraging a more energy efficient and less polluting pattern of travel, while taking account of the needs of those who are disadvantaged in their ability to avail themselves of facilities. The UDP states that as 'a large proportion of the population does not have priority use of a car', the focus is on integrating bus and train modes, giving

priority to buses over cars. The following two sections provide evidence of Kirklees Council's approach:

> New development will not normally be acceptable if it will create or add significantly to safety or environmental problems on the existing highway network, or, it if does not make provision for appropriately designed new highways within the development. (Section 8.33, UDP, Kirklees Council 2007)

> A key feature of the Integrated Transport Strategy is the designation of certain important bus corridors as Green Routes where high quality bus services will be introduced. Accordingly on these routes priority will be given to improved bus shelters to give safer, more comfortable waiting areas, improved passenger information, level access to buses, and to bus priority measures such as bus lanes. (Section 8.36, UDP, Kirklees Council 2007)

5.5.2.3 Review of governance

Kirklees operates within a structure of seven directorates and three arm's length management organisations to deliver services to its residents and businesses. Kirklees Council has seven localities, 23 districts, 69 Councillors and 12 area committees (Kirklees Council 2009a). The political election cycle was explained by the staff participant as being a little different from the other two UK cases in that a third of the elected members are stood down each election and elections are held three years out of four.

It uses partnerships with other institutions extensively to deliver its services and uses the broader community to establish its vision (Kirklees Partnership 2009).

5.5.2.3.1 Corporate governance

The Council website states:

> The Policy and Governance Service is responsible for providing corporate policy and research expertise to Councillors, officers and partners to support the challenges facing the Council. The service supports the democratic and accountable decision making processes of the council, the arrangements for elections, and provides a range of support to elected councillors (Kirklees Council 2010)

Within its own corporate areas of responsibility Kirklees operates within an environmental management system which is based on the European EMAS system. It was the first UK local authority to achieve this accreditation. It also trades its carbon emissions within the EU's emissions trading scheme. In 2008, the council launched a carbon budget process for council services focusing on the energy use and efficiency of council buildings, fleet transport and employee business mileage. The *Corporate Carbon Reduction Strategy for 2010 to 2013* requires council services to make a 3% per annum cumulative reduction in carbon emissions from a 2007/08 baseline figure.

The *Local Area Agreement 2008-2011* (LAA) identifies a number of national indicators (NI) that relate to action to address climate change (Kirklees Partnership 2009). Kirklees has agreed to take action on NI 186 which is 'per capita reduction in CO_2 emissions in the LA area'. From a per capita base of 6.7 t CO_2, the council is expected to achieve 3% reductions per annum. The Council is the lead agency and works in partnership with many organisations to deliver on this target. NI 192 addresses the recycling of waste for which the LAA sets targets. There is also a local indicator related to increasing the number of local or community based bus services that has been included in the LAA and for which the Council is the lead agency (Kirklees Partnership 2009).

5.5.2.3.2 Community governance

The community governance arrangements that have been established within the LG reflect the history of the formation of Kirklees. In 2004, the following was written about engagement, partnerships and council leadership in respect of highways management in the local area:

> We are the seventh largest of the 36 metropolitan districts in the country and the largest district not based on a major city. Our area is one of significant contrasts and diversity: rural and urban, communities within communities with wide variations of affluence and poverty. Our boundaries were artificially created in 1974 from 11 constituent authorities, and this legacy has brought problems of community identity with our administrative area that has shaped the way Kirklees Council has evolved as an organisation and engaged with our local communities ever since. There has been concentrated regeneration activity in Kirklees over the past 15 years with the council working in partnership with public agencies, the private sector, local people and central government to improve our environment, tackle disadvantage and inequality and enhance our built heritage (Idea 2004)

Kirklees has 12 area committees consisting of ward councillors and partner agencies that provide the residents with the opportunity to make a contribution on issues which affect their local community (Kirklees Council 2009a). The area committees work with communities to identify the areas issues and needs; developing community action plans that address the most important issues through partnerships with other service providers and agencies. The area committees also scrutinise local services and make sure these are accountable to local people. Across Kirklees a number of common themes have been identified for action: community engagement; young people; environment; community safety; highways; town centre/regeneration; and health/active lifestyle.

Every council has a duty to prepare a *Sustainable Community Strategy* (SCS) in consultation with its partners and in Kirklees this is undertaken by the Kirklees Partnership. The role of the Kirklees Partnership is to develop, in consultation with local

people and organisations, a SCS that will provide a framework for partners to plan and deliver services across Kirklees (Kirklees Partnership 2010). The SCS looks at areas such as the economy, education and skills, health, housing and crime. A recent check of the council website indicates that a fourth SCS 2009-2012 was published in November 2009 (Kirklees Council 2009c). In addition, the Kirklees Partnership has roles to: oversee the negotiation and implementation of the LAA; ensure effective communications across the partnership and successful shared decision making; break down organisational barriers and promote service delivery that is consistent and relevant to residents' needs; ensure that resources are used effectively, based on local priorities; encourage active involvement by local people in decisions which affect their lives and their communities; ensuring regeneration activity brings social inclusion and environmental sustainability; forge partnerships with central government; and provide district wide voice into regional and sub-regional plans (Kirklees Partnership 2010).

5.5.3 Key issues identified by staff

During the interview, UK09002 Participant 1 identified the key issues in the short term (2 to 3 years) and in the longer term (5 to 10 years). Their responses are summarised in Table 5.10. It is clear that all of the issues identified were both short term and long term issues for the Council.

Table 5.10 Key issues for Case UK09002 identified by participants

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Maintain a robust and diverse economic base			ST,LT				
Creating a greener economy	ST,LT		ST,LT				
Supporting Climate Change Adaptation and Mitigation	ST,LT						
Regeneration and Sustainable Development			ST,LT				ST,LT
Affordable housing'		ST,LT					
Housing - sustainable excellence		ST,LT					ST,LT
Tackling issues of social exclusion, health inequalities		ST,LT					
Education - building environmentally friendly schools		ST,LT					
Supporting our vibrant and diverse communities		ST,LT		ST,LT			
Warm Zone programme	ST,LT				ST,LT		

ST = Short term issue; LT = Long term issue

5.6 Case UK09003

Case UK09003 is Leeds City Council, a LG in West Yorkshire, England (see Figure 5.6). Two officers agreed to be interviewed, separately, at their respective offices on 16th July 2009. In this thesis the officers are referred to as UK09003 Participant 1 and UK09003 Participant 2.



Figure 5.6 Location map for Case UK09003
(adapted from Wikipedia 2010e)

5.6.1 Profile

A summary of the key statistics for Leeds City Council is provided in Table 5.11. Leeds City Council has an area of 552 square kilometres consisting of a main urban area surrounded by small towns, villages and countryside. Two thirds of the district is Green Belt with countryside, parks and green space, together with a large number of conservation areas of significant landscape, biodiversity and heritage quality. The earliest records of settlements of the local district date back to 730 AD with the first map being produced in

1725 (Leeds City Council 2008). By 1840 the industrial revolution in Britain had transformed the area into an industrial city with marketing, manufacturing, water transport through canals and communications defining it as a prosperous urban centre. With the decline in industry, the city area has become a broadly-based commercial centre, the second most important financial, legal and business services centre in England (Leeds City Council 2008). Leeds documents state it has a strong and diverse economy and has been awarded as one of England's favourite cities and a good place to live, work and study (Leeds City Council 2008). Between 1996 and 2002, over 51,000 additional jobs were created. The economic growth and prosperity is reported to be similar to the growth during the industrial revolution (Leeds City Council 2008). Nearly a third of jobs within the Metropolitan District are located in the City Centre, which is a significant destination for employment, shopping, tourism and cultural activities. (Yorkshire Forward and Leeds City Council 2007). The growth in the office market has generated property value increases across many parts of the city (Leeds City Council 2008). Leeds has the lowest proportion of manufacturing employees (14.2% of 16 to 74 year olds in employment) in the Yorkshire area but the highest in real estate, renting and business activities (12.8%) (Kirklees Metropolitan Council 2003). The council and the health services account for nearly a quarter of the city's employment. As a regional centre, Leeds is also a centre for education, having two universities, three higher education institutions, seven further education colleges, numerous schools and training providers (Yorkshire Forward and Leeds City Council 2007).

Based on information provided by the key contact person, Leeds has a resident population of 761,124 residing in 315,620 dwellings (UK09003, Participant 1, 16 July 2009). The key statistics report of council states that 14.7% of these dwellings are separate houses (Leeds Initiative 2001). The gross population density of Leeds is 13.8 persons / hectare which may be classified as automobile oriented (Newman and Kenworthy 1999). The revised population estimates for mid-2008 show that the population has increased to 779,300, an increase of 8.9% from the 2001 figure (Leeds City Council 2008). The population is projected to increase by 12.8% in the decade to 2018, which is higher than projections regionally (8.5%) or nationally (7.4%) (Leeds City Council 2008). In the longer term, the population is projected to increase by 29% from 779,300 in 2008 to just over 1 million by 2033 which again is higher than projections regionally (20.7%) or nationally (18.0%) (Leeds City Council 2008).

The Index of Deprivation ranks Leeds at 85th of 354 local authorities in England (DCLG 2008), although the deprivation ranking varies across the LG area. Around 150,000 people (almost 20% of the population) including many from black and ethnic-minority (BME) communities, live in areas that are officially rated as being among the most deprived in the country (Leeds City Council 2008). While unemployment is low for the city as a whole, there are some areas in Leeds that experience unemployment that is more than double the city's average. There are similar inequalities in house prices, educational achievement, health and crime (Leeds City Council 2008).

Table 5.11 Summary of key statistics for Case UK09003

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council taxes Residential Average per dwelling
Leeds City Council	552	761,124	315,620	373	12.8% by 2018	£1,280 Band D

5.6.2 Review of documents

The main documents used to outline the plans for Leeds are the *Strategic Plan 2008 to 2011*, the *Unitary Development Plan* and the Local Development Framework (LDF), particularly the Core Strategy. The LDF documents acknowledge the central government objective from the Climate Change Act 2008 to seek an 80% reduction in carbon emissions by 2050 (Leeds City Council 2009).

5.6.2.1 Review of Strategic Plan

The *Leeds Vision 2004 to 2020* states:

> Our Vision for Leeds is an internationally competitive European city at the heart of a prosperous region where everyone can enjoy a high quality of life. Leeds will have a reputation for environmental excellence through the quality of our built environment, the use of our green space, the effective use of natural resources, clean air quality and waste management. It will be a place that joins economic, social and environmental objectives so that the action we take today does not limit the choices of future generations or others elsewhere in the world (The Leeds Initiative 2004)

At the heart of the *Leeds Strategic Plan 2008 to 2011* (Leeds City Council 2008) is the ambition to transform the quality of life in Leeds to see:

> people happy, healthy, safe, successful and free from the effects of poverty; young people equipped to contribute to their own and the city's future wellbeing and prosperity; local people engaged in decisions about their neighbourhood and community and help shape local services; neighbourhoods that are inclusive, varied and vibrant offering housing options and quality facilities and free from harassment and crime; an environment that is clean, green, attractive and above all, sustainable; and a city-region that is prosperous, innovative and distinctive enabling individuals and businesses to achieve their economic potential (Leeds City Council 2008).

A statutory framework for reducing greenhouse gas emissions will set 'carbon budgets' to drive reductions in CO_2 emissions by households, businesses, local authorities and other public bodies (Leeds City Council 2008). Improvement Priorities by 2011 are to: increase the amount of waste reused and recycled and reduce the amount of waste going to landfill; reduce emissions from public sector buildings, operations and service delivery, and encourage others to do so; undertake actions to improve our resilience to current and future climate change; address neighbourhood problem sites; improve cleanliness, and access to and the quality of green spaces; improve the quality and sustainability of the built and natural environment (Leeds City Council 2008).

Supporting strategies or plans were listed as: the *Local Development Framework*; *Regional Spatial Strategy 2004 to 2016; Climate Change Strategy; Integrated Waste Strategy 2006 to 2025; Leeds Strategic Flood risk assessment; West Yorkshire Local Transport Plan 2006 to 2011; Energy and Water Management Plan*; and *Parks and Greenspace Strategy* (Leeds City Council 2008).

Leeds has developed some indicators by which it will measure its success (Leeds City Council 2008). These include: being the cleanest city in Europe; making sure that everyone in Leeds is able to walk, or have easy access, to a local open green area and be able to see a tree or green space wherever they are; making sure that all parts of Leeds meet national air-quality standards, making sure that all rivers flowing through Leeds are rated as 'very good', 'good' or 'fair', reducing the amount of CO_2 produced by 20% of 1990 levels and supporting regional targets for electricity from renewable sources. In addition the Strategic Plan is focusing action on: meeting national and regional targets on waste; making sure that development on brownfield land is above 80%; the city centre population being 20,000; every school pupil being involved in environmental projects; public-sector organisations and 50% of local businesses (with over 100 employees) working towards adopting environmental management systems; and making sure that all households in Leeds can afford to heat their homes (Leeds City Council 2008).

5.6.2.2 Review of Unitary Development Plan (revised 2006)

Leeds' *Unitary Development Plan* (UDP) is slowly being replaced by the LDF. The UDP refers to Planning Policy Guidance clauses (PPGs) and stresses that 'newer environmental concerns, such as energy conservation, global warming, and consumption of non-renewable resources should be reflected in plans'. Sustainable development is to be pursued in an integrated manner, in line with the principles of sustainable development set out in UK strategy. PPS1 also points out that development plans contribute to global sustainability by addressing the causes and potential impacts of climate change (Leeds City Council 2006a, p. 50). The UDP states that 'the Plan promotes renewable energy, sustainable design and more energy efficient homes and workplaces' (Leeds City Council 2006a, p. 106). It refers to a Lancashire and Yorkshire Renewable Energy Planning Study conducted in 1997, which identified renewable energy sources within the District including landfill gas and biogas, municipal and industrial waste, biomass (including short rotation coppice), solar energy, including regard to passive solar design in new buildings, and small scale hydro power (p.105). All proposals would be assessed against National Planning Guidance and Leeds' General Policy GP5 which states:

> development proposals should resolve detailed planning considerations (including access, drainage, contamination, stability, landscaping and design). Proposals should seek to avoid problems of environmental intrusion, loss of amenity, pollution, danger to health or life, and highway congestion, to maximise highway safety, and to promote energy conservation and the prevention of crime. Proposals should have regard to the guidance contained in any framework or planning brief prepared for the site or area (Leeds City Council 2006a).

5.6.2.3 Review of Local Development Framework

The planning information on the Leeds corporate website indicates that new documents for the LDF are gradually being prepared, with the preferred approach for the Core Strategy document published in 2009 (Leeds City Council 2009). In addition to the Core Strategy, Leeds City Council has indicated it is using Area Action Plans (such as for the Aire Valley), and has prepared a Natural Resources and Waste Development Plan Document (NRW DPD) (Leeds City Council 2010c) which sets out where land is needed to manage resources including minerals, energy, water and waste. The NRW DPD is considered to be necessary to meet objectives for identifying opportunities for renewable energy generation and heat distribution (Leeds City Council 2010c, p. 3). A draft Supplementary Planning Document (SPD) on Sustainable Design and Construction (Leeds City Council 2010b) has also recently been released for consultation to provide planning guidance from the Leeds City Council.

5.6.2.3.1 Household energy efficiency

The Council encourages developments of 1000 or more square metres or 10 or more dwellings (either new build or conversion if feasible) to meet at least the standard set by the Code for Sustainable Homes (for residential development). Leeds has translated the Code for Sustainable Homes into the following requirements: by 2010, all housing to be Code level 3; by 2013, Code level 4; and by 2016, Code level 6 which is zero carbon (Leeds City Council 2009; Leeds City Council 2010b). The Council encourages developments of 10 dwellings or more or over 1,000 square metres of floorspace, whether new-build or conversion, to reduce total predicted CO_2 emissions to 20% less than the Building Regulation Target Emission Rate until 2016 which is to be verified by a post construction review certificate (Leeds City Council 2010b).

5.6.2.3.2 Renewable Energy

The Core Strategy identifies targets of 11MW by 2010 and 75MW by 2021, for installed, grid-connected renewable energy in Leeds which was set from regional targets outlined in the Yorkshire and Humber Regional Spatial Strategy (RSS) (Leeds City Council 2009).

According to the UK Code for Sustainable Homes, in 2016 all new dwellings will be expected to achieve a rating of Code 6 which is zero carbon, and provide a minimum of 10% of the predicted energy needs of the development from decentralised, renewable or low carbon energy (Leeds City Council 2010b). The draft SPD on Sustainable Design and Construction (Leeds City Council 2010b) indicates that CO_2 reductions achieved in meeting the 10% renewable target will contribute to meeting the Code 6 rating. The planning guidance indicates that if it can be demonstrated that decentralised, renewable or low carbon energy generation is not practical on or near the proposed development, it may be acceptable to provide a contribution equivalent to the cost of providing the 10% which the Council will use towards an off-site renewable energy scheme (Leeds City Council 2010b) and the renewable or low carbon energy technologies must be operational before any new or converted buildings are occupied. The required percentage reduction of CO_2 may increase as advances in technology enable higher levels of carbon reduction.

The NRW DPD estimates that 10 MW of potential capacity could be generated from distributed renewable energy systems, such as SWH and SPVs, placed on 50% of future house developments (Leeds City Council 2010c, p. 10).

5.6.2.3.3 Low carbon transport

The Regional Transport Strategy (RTS) for Yorkshire and Humber (Yorkshire and Humber 2005) indicates that LG have a lead role in transport planning, parking, freight, public transport and for tourism. The mechanisms identified in the RTS were the Local Transport Plans; Public Transport Plans; Local Development Frameworks; and Local Tourism Strategies. The *West Yorkshire Local Transport Plan 2006 to 2011* was informed by the RTS, a 25 year Leeds City Region Transport Vision (Leeds City Region 2006), the Highways Asset Management Plan and Traffic Management Action Plans (Leeds Initiative 2010). Transport challenges include congestion, improving public transport quality and reliability, the need for better connections between neighbouring LG areas (Yorkshire Forward and Leeds City Council 2007). The strategic outcome for transport that has been set by Leeds City Council is that by 2011, there is increased accessibility and connectivity. This outcome is expected to be achieved through investment in a high quality transport system, through influencing others and by changing behaviours.

Most of the job growth in Leeds is expected to be filled by people from outside the Leeds district and increased commuting is expected to severely affect the transport systems. The percentage of households within an area who do not own a car or van varies from 0% (in 11 areas of North and East Leeds) to nearly 90% in parts of the city centre. In the outer rural areas there are few households who do not own at least one car. The reason for households not to own a car vary: insufficient income to purchase and run a car; adequate public transport provision; or most facilities are within walking distance (Leeds City Council 2003).

The Leeds Initiative has developed a Transport Strategy which states that by 2011, it seeks to: deliver and facilitate a range of transport proposals for an enhanced transport system, including cycling and walking; improve the quality, capacity, use and accessibility of public transport services in Leeds; improve the condition of the streets and transport infrastructure by carrying out a major programme of maintenance and improvements; improve road safety for all our users, especially motor cyclists, pedal cyclists and pedestrians (Leeds Initiative 2010)

The UDP states that ‘efficient access by public transport makes an important contribution to meeting overall transport needs and reducing congestion on roads (Leeds City Council

2006a, p. 18). The UDP refers to the West Yorkshire Transport Plan (p.21), and outlines a Strategic Aim (SA) for Transport as follows:

> SA2: to encourage development in locations that will reduce the need for travel, promote the use of public transport and other sustainable modes, reduce the journey lengths of those trips which are made by car, whilst promoting safe travel, economic development and protection of the environment;
> transport systems are not ends in themselves, but a means of connecting land-uses. Chapter 6 of the UDP seeks to promote a high quality integrated transport system that meets the needs of local people and businesses safely and reliably, whilst maintaining the overall quality of the environment. Getting the balance right between car and non-car use will remain a key factor in achieving more sustainable patterns of travel. The Council is committed to encouraging greater use of public transport and more sustainable modes of transport throughout the City; (Leeds City Council 2006a, p. 25)

A Strategy Principle (SP) for the UDP states that 'new development will be concentrated largely within or adjoining the main urban areas and settlements on sites that are or can be well served by public transport. This is in order to reduce growth in the length and number of motorised journeys' (SP3, p. 28), while SP4 states that' Priority in the introduction of new transport infrastructure is given to supporting public transport (including new forms) with some limited new road building' (p. 28). The UDP states that 'development plans should attempt to take account of energy conservation and global warming issues in determining the development strategy' (p. 50), while the following further explains the objectives related to energy conservation within the strategy:

> Energy conservation is taken into account, in particular through proposals for new development in locations closely related to public transport (and to improvements to public transport systems), and by the encouragement of the re-use of existing buildings, and of new development being adaptable to change. Similarly, a further fundamental objective of the strategy is to maximise the accessibility of developments which attract journeys (for example shops, employment and leisure) (Leeds City Council 2006a, p. 50).

A focus on restricting car parking spaces in centres and favouring pedestrians and cycling is also made (p.50), while new development was to be directed towards areas that are accessible by a range of transport modes (not just the car) (p. 109). Public transport is expected to be safe, reliable and attractive to users (p. 109), as well as efficient and sustainable (p. 109). The UDP refers to the central government's PPGs and PPS documents, and discusses transport planning within 31 themes. Park and Ride schemes are encouraged in the UDP, with bike storage facilities, and priority for bus movements is supported (p. 126). For car parking, Leeds City Council operates car parking guidelines. The UDP explains that 'In all cases these identify a maximum level of provision which is considered appropriate to serve a particular type of development, having particular regard to the proposed land use, the location, the scale and nature of the development, public

transport accessibility and the local highway network' (p. 135). Volume 2 of the UDP details the policies for car parking provisions for residential development which varies from one car park per dwelling to one car park for four dwellings for student accommodation (Leeds City Council 2006b). Planning for the use of water based transport is also mentioned in the UDP for East Leeds (p. 357) and Rothwell (p. 413) (Leeds City Council 2006a) which adds a different dimension to the infrastructure for transport and accessibility.

5.6.2.4 Review of governance

The Leeds website contains a number of documents that describe the extent of the governance arrangements operating within Leeds City Council. The Council comprises 99 elected Councillors with three Councillors for each of the 33 designated areas Wards. Local elections are held on a four year cycle: an election is held every year for three years and then no election in the fourth year (Leeds City Council 2010a).

The corporate and community governance arrangements are discussed in the following sections.

5.6.2.4.1 Corporate governance

Leeds' corporate governance framework comprises its policies, procedures and operations that are in place to: establish and monitor the achievement of objectives; identify, assess and manage risks to achieving those objectives; facilitate policy and decision-making; ensure the economical, effective and efficient use of resources; ensure compliance with established policies, procedures, laws and regulations; safeguard the Council's assets and interests from losses of all kinds; and ensure the quality, integrity and reliability of information, accounts and data.

The Council has appointed three Committees with responsibility for overseeing the Council's governance arrangements, namely the General Purposes Committee, Corporate Governance and Audit Committee and the Standards Committee, all of whose Terms of Reference are within the Council's Constitution. It has a Code of Corporate Governance which has six principles: focussing on the Council's purpose and community needs; having clear responsibilities and arrangements for accountability; good conduct and behaviour; taking informed and transparent decisions which are subject to effective scrutiny and risk management; developing the capacity and capability of members and officers to be effective; and engaging with local people and other stakeholders.

The Audit Commission's Direction of Travel assessment concluded that 'the Council has made progress in improving the lives of people in its most deprived communities, but recognises that it still has more to do' .

There is a formal three year agreement between Leeds City Council and the central government which sets out thirty-five measures that are priorities for local people and are acceptable to central Government. Leeds has selected National Indicators (NIs) 185 (CO_2 emissions from its corporate operations) and NI 188 (Adaptation to Climate Change) as two of the key performance indicators which it has negotiated with the central government in its LAA (Leeds City Council 2010)

5.6.2.4.2 Community governance

The *Leeds Vision 2004 to 2020* states that Leeds will 'get local people and businesses involved in their own environment' (Leeds Initiative 2004). There is an expectation that getting more individuals, community groups, businesses and public organisations involved in positive environmental activity will result in finding 'better solutions to today's problems'. There are also relevant strategies in the Environment Leeds (2009) *Leeds Climate Change Strategy: Vision for action* document. These strategies focus on improving communication on environmental issues, creating and supporting community partners especially in the deprived areas, and developing better links with key sectors such as business. Practical projects are suggested such as community clean-ups and planting trees or bulbs. Mention was made of the need to introduce high-profile demonstration projects to raise the awareness and expectations of local organisations and communities. Examples of practical projects included local car clubs, energy-efficient housing, and spending money locally. The links between climate change action and sustainable development were also emphasised and opportunities for learning about sustainable development through regeneration projects (such as Aire Valley).

A 'Partnership Board' has endorsed a 'Community Engagement Strategic Framework' for the city, which sets out key principles for partners in the city to be guided by when engaging with local communities (Leeds City Council 2008). A local strategic partnership (The Leeds Initiative) comprising nine strategy and development groups, and a number of partnership groups were working to deliver the *Vision for Leeds 2004 to 2020*. The groups listed were: Safer Leeds Partnership; Healthy Leeds Partnership; Leeds Cultural Partnership; Climate Change Partnership; Neighbourhood Policy Group; Leeds Integrated

Transport Partnership; Harmonious Leeds Partnership; Skills and Economy Partnership; and Children Leeds Partnership (Leeds Initiative 2010). Hence there was a strong focus on partnerships as a mechanism for delivering a low carbon future for Leeds.

5.6.3 Key issues identified by staff

Staff participants were asked to identify the key issues in the short term (2 to 3 years) and in the longer term (5 to 10 years). Their responses have been combined and are summarised in Table 5.12. Some of the longer term issues such as public transport infrastructure would also be important to deliver short term objectives of area based regeneration.

Table 5.12 Key issues for Case UK09003 identified by participants

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Social services particularly, child protection Every Child Matters		ST			ST		
Waste - we are currently working on a regional waste solution	ST						
Area based regeneration – housing targets		ST				ST	ST
Get Leeds through the recession			ST	ST			
Educational Standards		ST					
Strategic Plan - the top 35 to be no-fail targets				ST	ST		
Congestion.	LT			LT		LT	
Employment growth			LT			LT	
Public transport provision				LT		LT	
Energy infrastructure						LT	
District heating to have security of energy supply & low carbon	LT		LT	LT			
Energy & resource efficiency	LT		LT				
Climate change agenda	LT			LT	LT		

ST = Short term issue; LT = Long term issue

5.7 Case DE09001

Case DE09001 is Freiburg im Briesgau (City of Frieburg), a city council in the *Länder* of Baden-Wurttemberg in the south west of Germany (see Figure 5.7). One staff participant agreed to be interviewed at their office in Freiburg on 3 August 2009 and provided additional information during the interview. In this thesis, the officer is referred to as DE09001 Participant 1.

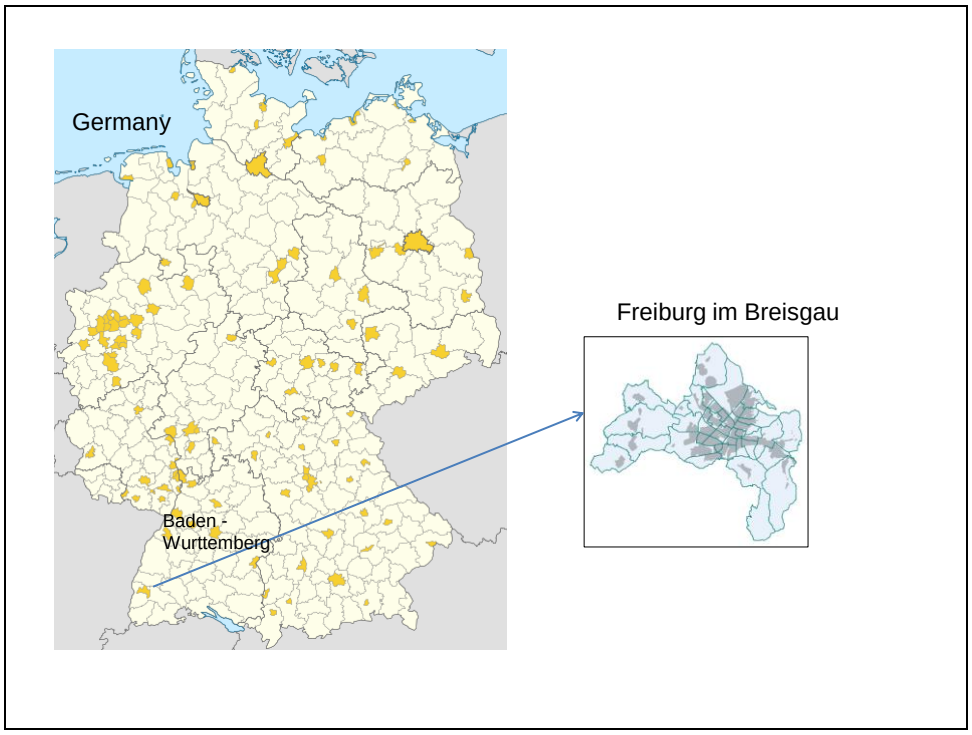


Figure 5.7 Location map for Case DE09001
(adapted from Wikipedia 2010f; Wikimedia 2010c)

5.7.1 Profile

The history of settlement in the area dates back to the 11th century AD. Until 1962, Freiburg was considered to be a conservative city, dominated by the university and the catholic bishop. The city´s position at the edge of Germany and the wars with France had led to the absence of large companies that pollute the environment. In the mid-1970s, environmental protests with 'sit-ins' prevented a French chemical factory from being built near Freiburg, as well as three nuclear plants in nearby German, French and Swiss cities.

Based on the successful 'No' to nuclear power and the early 'Yes' to sustainable energy sources, regional networks of environmentalists arose (City of Freiburg 2006). The City of Freiburg states that it is the ‘environmental capital of Germany’ based on evidence of: the deep-seated environmental awareness in the city’s citizens; the long-term perspective of its sustainable urban development; and its network of institutions for environmental protection (City of Freiburg 2006).

The key statistics for the City of Freiburg are summarised in Table 13. Freiburg has a land area of 153 sq km of which 70 sq km is conservation area (City of Freiburg 2006). There are 500 ha of open spaces, parks and conservation reserves in addition to the urban forest which provides recreational areas to the city (City of Freiburg 2008). The management practices of its green spaces have adopted environmental principles that ensure that no pesticides are used and that only indigenous trees and shrubs are planted. The city encourages small garden allotments on the outskirts of the city for growing fresh vegetables and for close contact with nature. The Freiburg forest covers 5,200 ha and is one of the largest urban forests in Germany. This forest is municipally owned and sustainably managed to provide forest timber for use in construction. Groundwater is used for drinking water, and green spaces are used for filtering pollutants before the water percolates into the groundwater system. Within the city there is a series of small, open, shallow water channels (Bachle) which are thought to originally provide water for industrial use and were used as sewers (City of Freiburg 2006).

The key statistics for Freiburg are summarised in Table 5.13. While the population in other German regions is said to be decreasing, the Freiburg region is experiencing growth (DE09001 Participant, 3 August 2009). Developments such as Vauban and Rieselfeld are attracting families back into the city from surrounding rural areas (Siegl 2009). The gross population density of Freiburg is 14.2 persons / hectare which may be classified as automobile oriented (Newman and Kenworthy 1999). If the conservation area of 70 sq km is removed, the gross population density increases to 26.2 persons / hectare which may be classified as transit oriented (Newman and Kenworthy 1999).

Approximately 1,500 environmental companies including research, supply and waste management, solar technology and consulting employed nearly 10,000 people and approximately €500 million to the economy (City of Freiburg 2006). The employment in the solar sector is four to five times above the national average based on a study conducted in 2004 (City of Freiburg 2008). Freiburg hosts numerous international industrial trade

fairs and symposia, hosts the office of the International Solar Energy Society and the headquarters of ICLEI, and has a Solar University with an Interdisciplinary Centre for Renewable Energies (City of Freiburg 2008).

Table 5.13 Summary of key statistics for Case DE09001

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council taxes Residential Average per dwelling
City of Freiburg	153	217,547	103,782	362	nr	€423

5.7.2 Review of documents

In 2006, Freiburg signed the Aalborg Charter, committing itself and its citizens to developing models for reducing energy consumption and increasing the proportion of renewable energy used (City of Freiburg 2008).

Freiburg has a *Land Use Plan 2020*, a *Landscape Plan 2020* as well as a D*evelopment Plan*. These are in German and have not been translated into English for review. However the *Freiburg Green City* (City of Freiburg 2008) and *Environmental Policy in Freiburg* (City of Freiburg 2006) documents which had been translated into English versions were obtained from the staff participant interviewed in 2009. These documents highlight some aspects of land use planning.

The *Land Use Plan 2020* was agreed in 2006 and focuses on reducing land use for building in the city by 30 ha. It places great value on managing environmental and social compatibility, and retaining cool air flow areas and urban ventilation lines within and outside the city, interconnecting open spaces with the city (City of Freiburg 2008, p. 18). The *Landscape Plan 2020* provides a vision of quality living spaces for both humans and animals within the city.

5.7.2.1 Review of Development Plan

Freiburg has a *Development Plan* and area or zone specific development plans such as for Vauban and for Rieselfeld. These detail the building requirements which are fixed and relate to the building quality, the number of storeys and the type of roof.

5.7.2.1.1 Household energy efficiency

The building quality is Passivhaus for some developments in Vauban and very low energy in other areas. A Freiburg low-energy house – such as those mandated in Vauban – has a defined heating energy demand of 65 kWh per m^2 per year (City of Freiburg 2005). A passive house uses 15 kWh per m^2 per year or less for heating and cooling purposes (C40 Cities 2010; City of Freiburg 2005).

5.7.2.1.2 Renewable energy

The city was aiming for 10% of electricity to be provided by renewables by 2010. By the end of 2008, installed PV produced 11.3 MW, or approximately 1% of Freiburg's electricity needs. The participant stated that for solar this figure was 1.1% and that they were trying to achieve 2% in the short term. The FreeSun project has estimated that 27% of Freiburg's energy demand could be provided by roof-top SPV (DE09001 Participant 1).

5.7.2.1.3 Transport

Freiburg has focused on cycling, public transport and walking to reduce reliance on motor vehicles and the congestion within its city centre. Planning conditions of new urban development include the provision of tram lines in the centre of new developments, with no dwelling to be more than 400m from tram track, and traffic speeds reduced to 30 km/hr (Hildebrandt n.d.; Siegl 2009). In the Rieselfeld district, priority is given to the streetcar, pedestrians and cyclists (Siegl 2009).

It is claimed that 65% of the city's residents live in the catchment of a tram stop and 90% of residents live in zones where the speed of traffic is no greater than 30 km/hr (City of Freiburg 2006). In August 2009, at the time of the researcher's visit to the city, there were four tram routes plus numerous bus routes interlinking areas across the city. Three of the tram routes and numerous bus routes also linked to a regional train service and intercity trains. The *Environmental Policy* document states that the local public transport, run by a regional transport association, offers an almost 3,000 km long network of light rail transport, buses and urban railways (City of Freiburg 2006). A monthly ticket was priced at €41.50 for the entire region and 24 hour tickets with unlimited travel across the region not just in the City of Freiburg area were available for a single person or for a family of up to 5 people (City of Freiburg 2006).

Over 500 km of cycling tracks have been constructed and 9,000 cycle parks have been created linked to the public transport system (City of Freiburg 2008). A cycle garage at the

central railway station has space for 1,000 bikes (City of Freiburg 2006). It has been reported that in 1999, cycling had reached 28% of the traffic volume with public transport making up 18% (C40 Cities 2010). Distances travelled by car had decreased to 30% in 1999 from 38% in 1982 and by 2007, 35% of residents had chosen to live without a car (C40 Cities 2010). The year book statistics indicate that in 2008, there were 78,857 passenger cars (City of Freiburg 2009). One source (VAG) states that there are 650 km of roads, 425 km bicycle lanes and 210 km public transport in Freiburg, and 46% of Freiburg's tramway tracks are grass embedded (Hildebrandt n.d.).

5.7.2.2 Review of governance

The Council consists of the Mayor as chairman and three deputy mayors who are elected for a term of eight years, and 48 volunteer councillors who are directly elected by the citizens for a term of five years. Mayoral elections were held in 2002 and in April 2010. The last Council election was in 2006. The dominant political party in the local Council is the Greens. The decisions of LG may be influenced by political ideology which is proportionally representative of the voting population in the LG area.

5.7.2.2.1 Corporate governance

A review of LG information indicates that the council has fourteen committees: seven for decision making and another seven for advice. Detailed discussion takes place within these committees which are comprised of Councillors, citizens and experts.

5.7.2.2.2 Community governance

Citizens and experts as well as Councillors are formally included in decision making through the committees. According to the information available on the corporate website, the recent *Landscape Plan 2020* was developed with 'considerable civic involvement' (Stadt Freiburg 2010).

5.7.3 Key issues identified by staff

The staff member that was interviewed was asked to identify the key issues in the short term (2 to 3 years) and in the longer term (5 to 10 years). Their responses are summarised in Table 5.14. While they hinted at social issues within the city, the focus of their role within LG was on climate protection and their responses generally related to the mitigation of climate change. If a planner had been questioned, it is likely that a longer list of issues would have emerged.

Table 5.14 Key issues for Case DE09001 identified by participant

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Social issues – in centre of city		ST					
Climate protection	ST,LT						
CO_2 emissions	ST						
Renewable energy generation to 10% by 2010			ST			ST	
Natural resources - protect	ST,LT						ST,LT
Avoid nuclear hazard	LT			ST,LT			

ST = Short term issue; LT = Long term issue

5.8 Case DE09002

Case DE09002 is the City of Augsburg in Swabia, Bavaria, in the south of Germany (see Figure 5.8). An officer agreed to be interviewed at their office in Augsburg on 6 August 2009, and further information was obtained from a second officer who had arranged the interview. In this thesis, these officers are referred to as DE09002 Participant 1 and DE09002 Participant 2.

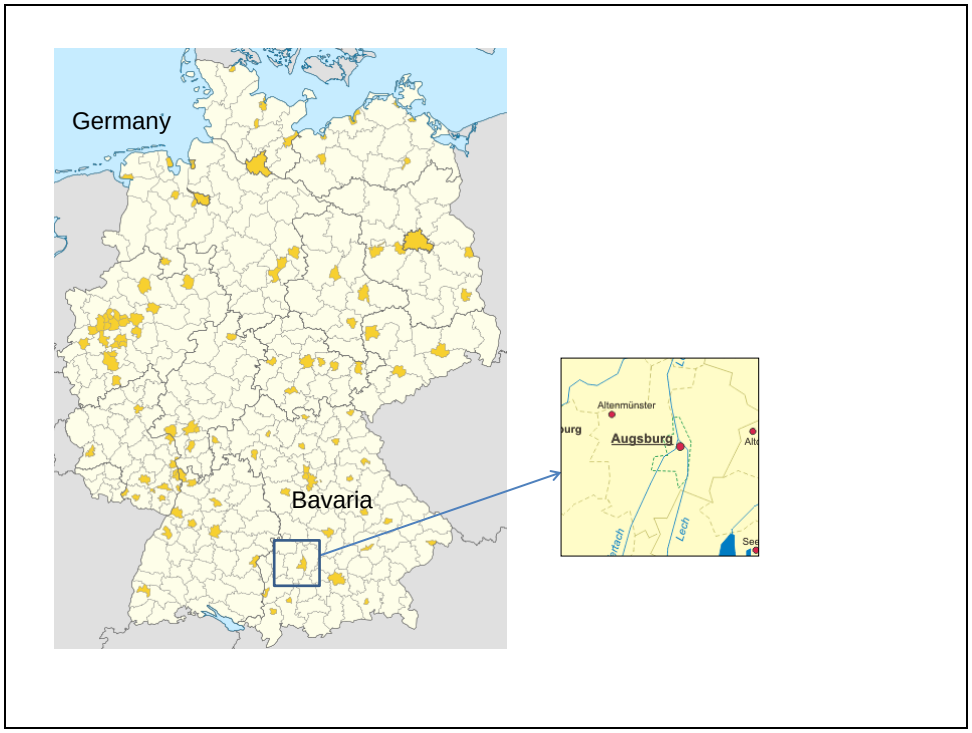


Figure 5.8 Location map for Case DE09002

(adapted from Wikipedia 2010f; Map of Augsburg, Bavaria used by permission of Thomas Griesbacher (thomasgraz.net), Graz, Austria.)

5.8.1 Profile

The City of Augsburg covers a land area of 147 sq km and is to the east of the District of Augsburg in Swabia, Bavaria. Augsburg has a long history, being founded as a Roman colony by Augustus in c.14 BC and is one of the three oldest cities in Germany. It became a free city in 1276 and was a major banking and commercial centre in the 15th – 16th centuries. Augsburg houses 'The Fuggerai', the world's first social settlement for 'hardworking, honest but impoverished citizens who were Catholic', which was founded in 1516 (Fugger n.d.). Augsburg has been part of Bavaria since 1806 and, in terms of its

population, is currently Bavaria's third largest city. Following World War II, the United States of America (US) established army sites in Augsburg and in 1991, twelve of these army sites totalling 1450 ha in area were still operational (Cunningham and Klemmer 1995). In 1998, the last of the US army units left the Augsburg area and these sites are now being redeveloped (e.g. Reese-Kaserne). Residential and traffic areas make up only 36% of the city's land use; one-third is used for agriculture as it is situated at the confluence of two rivers, and nearly 24% of the land is forest. In the city centre it is stated that there are still significant areas (approximately 200 ha) of public- and railroad-owned property to be developed (Stadt Augsburg 2009). Public transport is controlled by the Augsburger Verkehrsverbund and extends over central Swabia. There are seven regional rail lines, four tram lines, 27 city bus lines and six night bus lines serving the city (Augsburger Verkehrsverbund 2009).

The free state of Bavaria has invested in institutions to promote the economy, environmental education, science and administration and also promoted environmental pilot projects in the region (Bavarian Ministry of Economic Affairs, Infrastructure, Transport and Technology 2007). Trade fairs such as the RENEXPO, IHE Internationale HolzEnergie, Umwelt Innovativ and Bayerische Abfall- und Deponietage have been established. Augsburg has a polytechnic college and a university (City of Augsburg 2010).

The key statistics for the City of Augsburg are summarised in Table 5.15. In 2007, the population of Augsburg was approximately 267,000 persons residing in 140,000 dwellings. The gross density of Augsburg is 18.2 persons per hectare which is at the top end of the automobile oriented urban form (developed by Newman & Kenworthy 1999). However as more than 50% of the land area is used for agriculture and forest the density is higher and meets Newman and Kenworthy's classification as a transit oriented urban form. In 2007, there were 112,678 passenger vehicles in Augsburg which equates to 422 cars/1000 people (City of Augsburg 2009a). Information about the expected growth of the city was not available at the time of the data collection, while council taxes paid by the residential sector was estimated to be an average of €284 per dwelling (City of Augsburg 2009a).

Table 5.15 Summary of key statistics for Case DE09002

Name	Area sq km	Resident population	Dwellings	Passenger vehicles per 1000 persons	Expected growth % by date	Council taxes Residential Average per dwelling
City of Augsburg	147	266,976	140,000	422	nr	€284

5.8.2 Review of documents

The local documents build on the Federal Government directions such as 'Protection of natural resources, economic efficiency and social responsibility belong together - especially with regard to the welfare of future generations after us.' (translated from the German original – Federal Environment Agency, Sustainable Germany, 1997). Development plans (*Bebauungsplan*) (BP) are prepared under statutory powers for the development of land describing the types of development permitted in each part of the land area.

5.8.2.1 Review of Council wide strategy

In 1996 the government of the state of Bavaria set out to fulfil its vision of developing Augsburg and Bavarian Swabia into the Bavarian centre for environmental competence. More than 170 environment-relevant institutions and businesses serve as active partners and strengthen the network of the environmental competence centre – KUMAS (2010). KUMAS states that 'environmental protection today is a dynamic impulse to develop products and procedures, secure jobs as well as the structural change in the region'.

5.8.2.2 Review of Planning Strategy

For Augsburg, a land use plan or *Flächennutzungsplans* (FNP) which incorporates a *Landschaftsplanung* (LSP) or landscape plan was adopted in 1995. This plan is approved by the Government of Swabia and any changes to the FNP and LSP that have legal effect also require approval from the Swabian Government. The FNP proscribes zones for various land uses. Criteria for the sustainability of urban development have been documented (City of Augsburg 2007a) as well as guidelines for climate protection and urban planning (City of Augsburg 2007b). While these documents are in German, parts have been translated to understand the factors that have been addressed in reducing carbon

emissions from the residential sector. The Building Code regulates the content of the development plan for a proposed development, and the development plan contains the legally binding determinations of the town planning regulations.

5.8.2.2.1 Household energy efficiency

The major focus of carbon reduction is the improvement in housing standards to reduce the energy used for heating (City of Augsburg 2007b). The City of Augsburg incorporates a number of factors into its urban planning policy which address household energy efficiency and should be incorporated into the development plan for a new development. These are supported by the Building Code. The orientation of the housing is required to encourage passive heating, and to limit the energy consumption required for heating. New housing needs to comply with standards of passive or low energy houses (City of Augsburg 2007b, p. 11). Other factors address the compactness of new developments, with row dwellings favoured over detached dwellings, the shading of houses which affects the ability to maximise potential for passive heating, and the ventilation heat losses of housing. The compactness of developments is also being linked to reducing heat losses (City of Augsburg 2007b, p. 48). The Passivhaus standard is defined as having a total energy demand for heating of 15 kWh / (m^2 a), and combined heating, hot water and electricity of about 30 kWh / (m^2 a) (City of Augsburg 2007b) and the guidance document details the orientation to achieve maximum use of passive solar energy (p. 49).

5.8.2.2.2 Renewable energy

The orientation and pitch of the roof of new housing is required to maximise the potential for SWH systems and SPV systems (City of Augsburg 2007b, p. 11). Connection to existing energy supply systems, eg a cogeneration plant, a local or district heating network is also encouraged (§ 11 para 1 No 4 Building Code). Use of alternative energy sources such as biogas or wood pellets for heating which are said to be carbon neutral are also encouraged (City of Augsburg 2007a, p.16).

5.8.2.2.3 Transport

While access to public transport was clearly important and the City of Augsburg was planning to upgrade the transport infrastructure in the central business district, there were difficulties experienced in finding information that directly related to low carbon transport modes in the planning documents, which were also in German. Hence this is a gap in this aspect of the research undertaken.

5.8.2.3 Review of governance

The Council consists of a Lord Mayor, two deputy mayors who are also elected Councillors and six additional Professional Councils appointed as heads of departments or Referat. There are 62 Councillors in total elected for a term of five years. The last election was held in 2008. The CSU (Christian Social Union of Bavaria) dominate with 40% of the votes and 25 seats in Council. The SDP (Social Democratic Party of Germany) have 30% of the votes and 19 seats in Council. The Greens have 6 seats on Council having 10% of the vote at the 2008 Council election. The decisions of LG may be influenced by political ideology which is proportionally representative of the voting population in the LG area.

5.8.2.3.1 Corporate governance

The organisational chart for the City of Augsburg identifies 15 Committees (*Ausschuss*) each having between 7 and 14 elected members. The committees that may have some interest in climate change are the General Committee and Committee on Public Order and Health (*Allgemeiner Ausschuss und Ausschuss für öffentliche Ordnung und Gesundheit*); the Construction and Conversion Committee (*Bau- und Konversionsausschuss*); the Environment Committee (*Umweltausschuss*); the Works Committee of the Eigenbetr. "Waste management and sanitation operations Augsburg" (*Werkausschuss des Eigenbetr. "Abfallwirtschafts- und Stadtreinigungsbetrieb Stadt Augsburg"*); and the Works Committee for sewerage operations Augsburg (*Werkausschuss für den Eigenbetrieb Stadtentwässerung Augsburg*).

5.8.2.3.2 Community governance

Following the adoption of Agenda 21 in 1992, the involvement of the community and citizens in planning of new developments has been supported. Consultation with the community and other stakeholders takes place during redevelopment of land such as that previously used for industrial purposes or used as US army bases.

5.8.3 Key issues identified by staff

The officer interviewed in August 2009 (DE09002 Participant 1) was asked to identify the key issues for their LG in the short term (2 to 3 years) and in the longer term (5 to 10 years). The short term responses are summarised in Table 5.16. In response to a request for information about long term issues, they stated ‘I have a term for 5 years, planning for the councils is in terms of 5 years’ (DE09002 Participant 1) indicating that they could not comment on the key issues beyond five years.

Table 5.16 Key issues for Case DE09002 identified by participants

Key Issues	Environmental	Social	Economic	Political	Organisational	Infrastructural	Urban Planning
Renewable energies	ST					ST	
Efficiency of house-building and renovation		ST					ST
Reducing energy use/consumption	ST	ST					

ST = Short term issue; LT = Long term issue

5.9 Summary of key issues for Phase 2 cases

While a table summarising the combined analysis of short and long term issues has not been presented here, on the basis of responses to questions of staff in these cases about the key issues for their LG, some conclusions can be formed. For the Australian cases, the focus of LG is on the economy and employment as well as ensuring affordability of housing for the community. In respect to climate change the main focus is on water shortage. In the South Australian cases, there is concern about the increased demand for services to be provided by LG and the need to connect dispersed communities across a relatively large land area. For the Victorian case, there is a focus on providing access to services locally, adapting to climate change and enabling local energy.

In the UK cases, there were varying views about whether local authorities are proactive or reactive. Climate change is seen as an important long term issue. Infrastructure projects, particularly related to transport systems are also key long term issues and views were expressed about the difficulty in getting politicians to take long term views and assign funding. Crises, such as flooding (Sheffield) or extreme wind events (Kirklees) which created local impacts, were a key driver for action in the short term in these two UK cases.

Neither German case considered climate change impacts of heat or drought to be a key issue according to the staff participants interviewed. However mitigation of climate change was considered to be a priority. In the German cases, strategic planning was for 5 years, the term of the local politicians and politically appointed senior managers (*Referat*). Hence the key issues were short term rather than long term. The structure of electricity supply systems was identified as a constraint to action within the German cases. Environmental

impacts – eg acid rain in the 1980s, have driven action in the past, resulting in a focus on sustainability and resource conservation.

The LG cases from Australia, while somewhat similar in land area to the cases from the UK and Germany, were all suburban LG, each having authority over part of the metropolitan area of the cities of Adelaide (AU09001 and AU09003) or Melbourne (AU09002). On the other hand, the cases from the UK and Germany are all LG that have either a city wide role (UK09001; UK09003; DE09001; DE09002), or a sub-regional role (UK09002). In addition to the comparison of land area, other key statistics for each LG case are presented in Chapter 6 to enable further understanding of the differences between cases.

The number of staff participating in this research for each case is summarised in Table 5.17. It is clear that these vary between cases, and may affect the issues that have been identified by each case. This issue has been discussed in the limitations of the research.

Table 5.17 Summary of numbers of staff participating in research

Case study	Number of staff participants
AU09001	5
AU09002	4
AU09003	1
UK09001	3
UK09002	1
UK09003	2
DE09001	1
DE09002	1

Chapter 6. Phase 2 – results of in depth analysis of local government case studies

> It's great to build new and efficient homes. We have to because this will be the existing housing stock in a few years' time but to tackle the vast amount of existing housing and to reduce energy use and carbon footprint of those properties is such a mammoth task I think it can only be done in collaboration -a nation-wide campaign and resources behind it. (UK09001 Participant 1)

> We are planning to do more area based initiatives, so where we work directly in partnership with a grant provider, and then do door knocking in a whole area, so that's the council working in partnership with a utility. (UK09003 Participant 1)

The results of the broader survey of metropolitan LG in two states of Australia, presented in Chapter 4, highlighted a number of factors which were considered worthy of deeper exploration. Firstly, the survey revealed that there was significant activity taking place at the LG level, but that there were differences in the extent of the activity taking place in each state. Secondly, each LG indicated that they would experience difficulties in taking the type of action that each thought LG ideally should be taking to positively address climate change. Thirdly, the analysis of capacity to act in relation to taking these ideal actions revealed that most actions could be categorised within the gathering/ disseminating of information, convening / facilitating and advocacy to other levels of government or other stakeholders. This finding may indicate a low capacity for LG to take action on the systems within their community that lead to the generation of carbon emissions. Frustration was expressed by some Vic LG about the lack of political will and institutional barriers that were affecting their ability to act on energy systems that were supplying energy to households in their communities. However, there were also comments that LG was ideally placed to work with their communities to address climate change. One respondent reflected on the need for all levels of government to be collaborating on actions

to address climate change. These opinions reflect the need for a structure of governance of climate change in which LG have a recognised role.

Chapter 5 described aspects of each of the eight LG cases used in Phase 2 of this research and summarised the review of corporate documents for evidence of objectives and policy to mitigate climate change. It also summarised the issues that participants from each case thought were key issues for LG in the short term (2 to 3 years) and also over a longer term (5 to 10 years). In this Chapter, the results of Phase 2, a deeper analysis of these issues across eight (8) LG cases, is presented. The Chapter presents the results of a cross case analysis of the commitments of the eight cases to act on climate change, including a comparison of their targets for carbon reduction. Next, the self-evaluation of the initiatives that each case has undertaken or proposed to undertake to assist households within their area to reduce carbon emissions is presented. Following the current or proposed action, the ideal actions nominated by participants for LG to address climate change and the barriers that they expected to encounter are presented. This section is followed by presentation of the cross case Thematic analysis of the role that LG has to support households to reduce carbon emissions from energy use in their houses as well as through their transport use and an analysis of their capacity to act. Finally, the cross case analysis of the manifestation of community governance is presented. The significance of the findings of this analysis is discussed in Chapter 7.

6.1 Local government commitment to act on climate change

This section presents the analysis of the responses of participants to questions about how important climate change is to their LG, about the ways in which they demonstrate its importance, about the targets that they have set to reduce carbon emissions, and the initiatives that they have undertaken or propose to undertake to assist households to reduce carbon emissions.

6.1.1 How important is climate change to the LG cases?

During the in-depth questioning and interviews of staff in these case studies, the degree of importance of climate change (CC) and reducing carbon emissions (GHG) to their LG was explored. See Table 6.1 for the participant responses about the importance of climate change to their LG. The majority of participants indicated that climate change was considered to be either quite important or extremely important to their LG, with only two

staff (AU09002 Participant 4; UK09003 Participant 2) responding that climate change was not important. Where multiple staff responses from an LG were obtained, it became clear that there was not a consensus in opinion across the participants. These results indicate that within any LG, there is likely to be differing perspectives about the importance that is accorded to climate change, and these perspectives should be considered further if LG is to take a key leadership role in addressing climate change.

Table 6.1 Degree of importance of climate change

LG ID (number of staff)	Number of staff who indicated			
	Not important	**Somewhat important**	**Quite important**	**Extremely important**
AU09001 (n=5)		2		3
AU09002 (n=4)	1		1	2
AU09003 (n=1)				1
UK09001(n=3)		2	1	
UK09002 (n=1)				1
UK09003 (n=2)	1		1	
DE09001 (n=1)				1
DE09002 (n=1)		1		

Table 6.2 summarises the participant responses about the importance of reducing carbon emissions to their LG. Most responses indicated that reducing carbon emissions was considered to be either quite important or extremely important to their LG, except for the responses from AU09001, where the majority of participants indicated that their LG either did not think it was important or it was only somewhat important. Again only two participants (AU09001 Participant 4; UK09003 Participant 2) indicated that reducing carbon emissions was not important to their LG. The spread of responses indicates that further research into the reasons why these differences occur and the implications these differences have for LG's ability to lead carbon reduction initiatives.

Table 6.2 Degree of importance of reducing carbon emissions

LG ID (number of staff)	Number of staff who indicated			
	Not important	Somewhat important	Quite important	Extremely important
AU09001 (n=5)	1	2		2
AU09002 (n=4)			3	1
AU09003 (n=1)				1
UK09001(n=3)		1	1	1
UK09002 (n=1)				1
UK09003 (n=2)	1		1	
DE09001 (n=1)			1	
DE09002 (n=1)				1

See Table 6.3 for a breakdown of the ways in which climate change is demonstrated as important by each LG. The main findings from this analysis are that the German LG interviewed have focused on mitigation and hence had not seen the need to support businesses or community groups to adapt to climate change. Two of the three Australian LG and all three UK LG have focused more specifically on climate change adaptation. All Australian LG cases and both German LG cases have been associated with the ICLEI CCP program. Of the three UK cases, only Kirklees (UK09002) was a member of ICLEI. Two staff participants of UK09001 (UK09001 Participant 2; UK09001 Participant 3) were not aware of the ICLEI CCP program while a third participant from this LG (UK09001 Participant 1) commented that while 'ICLEI have such a good network and papers' there was 'ignorance' and 'argument about it' within their LG.

In addition to the demonstrations of responses to climate change outlined in Table 6.4, each LG was requested to provide information about the carbon reduction targets that had been set for their corporate activities as well as for the broader community. These aspects are discussed separately in the following section (6.1.2).

Table 6.3 How Climate Change is acknowledged as important by each Case

Climate Change Acknowledgements	AU09001	AU09002	AU09003	UK09001	UK09002	UK09003	DE09001	DE09002
Key issue Strategic Plan		✓	✓	✓	✓	✓	✓	✓
Modified development plan		✓	✓ Needs review	✓	✓	✓	✓	
Modified planning policy guidance		✓		✓	✓	✓	✓	
ICLEI CCP	✓	✓	✓		✓		Strategic alliance	✓
Corporate Energy & Water Conservation	✓	✓	✓	✓ Energy only	✓	✓	✓ Energy only	✓
Community water & energy use estimates	✓	✓	✓	✓	✓	✓ Energy only	✓ Energy only	✓
Report water & energy use & GHG to community		✓	✓	indirectly	indirectly	✓	✓	✓
Appointed climate change officer		✓	✓	✓	✓	✓	Have climate protection section	✓
Conducted Climate Change seminars		✓	✓	✓	✓	✓	✓	
Support business to adapt to climate change		✓	✓	✓	✓	✓		
Support business to reduce GHGs		✓	✓	✓	✓	✓	✓	✓
Support community groups to adapt to climate change		✓	✓	✓	✓			
Support community groups to reduce GHGs		✓	✓		✓	✓	✓	✓
Other (explained below)								
Investigating local renewable energy generation		✓		✓				
Established dedicated fund			✓					
Climate Change Adaptation Strategy			✓			✓		
New Director Sustainability - resources				✓				
Signed Nottingham declaration					✓	✓		
Annual Carbon Budget reporting					✓			

6.1.2 Carbon reduction targets

Similarly to Phase 1 of this research, information about the targets for carbon reduction was provided by participants. These targets related to carbon reductions associated with both the LG's operations (corporate) and those set for the community. These targets have been summarised and are presented in Table 6.4. It is clear, from reviewing this information, that there is significant variation in the targets set by each LG both at the corporate level and also at the community level. Where community targets have been set, two UK cases (UK09002 and UK09003) have defined these targets as annual targets which may have been in response to the adoption of the National Indicator (NI) associated with development of a carbon reduction plan across their community. Only one LG (AU09003) indicated that they had set a corporate target of carbon neutrality by 2013. The concept of carbon neutrality or net zero energy embraces the notion that carbon emissions are zero through switching to using renewable energy, by purchasing 'green' energy from accredited sources, by exporting green energy or by offsetting energy used from non-renewable sources by purchasing carbon credits. The latter may include schemes for planting trees which store carbon and thus offset the emissions from the generation of energy used.

Table 6.4 Summary of carbon reduction targets for the LG cases

LG ID	Carbon reduction Targets			
	Corporate Target	**Base Year**	**Community Target**	**Base Year**
AU09001	Reduction of 20% by 2010	1997/98	0% growth by 2010	1994/95
AU09002	Reduction of 20% by 2010	1996	None set	
AU09003	Carbon neutral by 2013		None set	
UK09001	Reduction of 30% by 2020	1990	Reduction of 30% by 2020	1990
UK09002	Reduction of >30% by 2020	2005	Reduction of 3% per annum	
UK09003	Reduction of 3.4% over two years	2008/09	Reduction of 80% by 2050 107,000 t CO_2-e/yr	
DE09001	Not stated		Reduction of 40% by 2030	1992
DE09002	Reduction of 50% by 2030	1990	None set	

The following sections present a summary of the initiatives which staff indicated their LG had done, were doing or were proposing to assist residents to reduce carbon emissions in order to achieve any targets which they may have set.

6.1.3 Initiatives to reduce carbon emissions by households

The initiatives which participants indicated that their LG had done or proposed to do have been grouped using policy silo categories developed by Hammer (2009) and are presented in Table 6.5. This data was drawn from the Phase 1 questionnaire (see Appendix 1) for the Australian LG cases and from the interviews with staff for the UK and German cases, using the questionnaire in Appendix 2. From this analysis, the area of greatest action by most LG cases is recycling of wastes with Australian LG cases planning to increase the recycling of organic wastes. Providing information and facilitating community forums are key actions of general awareness-raising within programs of energy efficiency and renewable energy promotion was mentioned by most LG cases. Transport has been a key focus of UK09001, while energy efficiency in housing appears to be a focus of initiatives for LG cases in both the UK and Germany. These broad areas have been analysed further in the following section.

Table 6.5 Initiatives undertaken to assist households to reduce carbon emissions

Policy Silos / Initiatives	AU09001	AU09002	AU09003	UK09001	UK09002	UK09003	DE09001	DE09002
Electricity supply, distribution and use								
Energy audit kits Energy meters (power-mate meters)	✓			✓	✓	✓		✓
Home energy audits				✓	✓	✓		
Over-flight and drive by thermal imaging						✓		
Rebates / subsidies for energy conservation		✓					✓	
Land use planning								
Stricter planning framework				✓	✓		✓	✓
Climate protection in urban planning	✓							
Design of new suburbs to improve energy efficiency	✓						✓	
Smart energy zones		✓						
Transportation								
Improved walking and cycling tracks		✓	✓	✓		✓	✓	✓
Improved access to public transport	✓	✓	✓	✓			✓	
Advocate for public transport improvements	✓	✓	✓		✓	✓		
Car club				✓	✓	✓		
Care4air				✓				
Vehicle stars scheme				✓				
Schools program				✓				
Electric vehicle charging points				✓				
Travel plan officers				✓				
Cycle to work scheme				✓				
Bike loan scheme				✓				
District energy and on-site thermal energy								
Local community-based energy service providers					✓		✓	
Local Energy Studies	✓	✓	✓	✓	✓			
Housing and energy information database						✓		
Solar resource map							✓	
Provide incentives for local renewable energy schemes		✓					✓	
Fee concessions on planning applications for renewable energy					✓			
Building design and codes				✓	✓	✓	✓	✓
Energy efficiency in council owned housing				✓	✓	✓		
Waste and other forms of embodied energy								
Recycling services	✓	✓	✓	✓	✓	✓	✓	✓
Organic waste	✓	✓	✓					
Water delivery and treatment								
LESS program – water saving shower heads		✓						
WaterWatch		✓						
Water sensitive urban design		✓						
Assist developers – integrate energy and water efficiency/conservation	✓							
Energy-related economic development								
Facilitate bulk purchase of SPVs & SHW		✓						
Physical or technical assistance - installation		✓		✓	✓	✓		
General energy governance practices								
Involve local communities in deciding the appropriate mix of energy solutions							✓	
Associated with Solar Cities	✓							
Information - reduce GHGs		✓	✓	✓	✓	✓	✓	✓
Sustainability Street		✓						
Challenge to change program		✓						
Forums for community groups		✓	✓	✓	✓	✓	✓	✓
Shop-front or drop in centre				✓				
Climate Change Risk Assessment	✓							
Community transport strategy			✓					

6.2 Identifying innovative local government initiatives

The participants in Phase 2 of the research were requested to provide an evaluation of the initiatives (policies or programs) that they had mentioned. For each initiative, participants provided information about the targets and objectives, the scale or scope of the initiative, whether there were partners involved, the critical success factors and the barriers encountered. It was clear from the responses of LG staff that LG had undertaken very little evaluation of its initiatives particularly to understand how these actions had actually affected household energy use or carbon emissions. As will be seen in section 6.3.2, even in cases such as the UK LG, where data was available to monitor energy use and carbon emissions in the residential sector, there was a reluctance to link specific initiatives to carbon reduction outcomes, and outcomes were qualitative rather than quantitative.

Based on the information provided, however, innovative aspects of each initiative were identified, noting aspects of best practice in each of three categories of initiatives: household energy efficiency, renewable energy, or reducing carbon emissions from transport. The information (and limited evaluation) provided by LG, together with the barriers identified by LG and aspects of innovation identified by the researcher are summarised in Tables 6.6, 6.7 and 6.8, respectively for each category. The key findings and aspects of best practice or innovation are discussed in the following sections.

6.2.1 Household energy efficiency

From Table 6.6, initiatives to address household energy efficiency generally focused on meeting higher standards which could be provided by a combination of house design for new housing and retrofitting of insulation. LG initiatives to support the uptake of energy efficient appliances was most evident in the boiler replacement schemes of UK cases.

In the UK, one LG (UK09001) demonstrated initiative which may be deemed best practice by implementing stricter housing standards policy for new housing than the central government was requiring of LG, in an effort to better prepare the local industry for meeting zero carbon standards for new housing by 2016. This approach incorporated higher standards of thermal insulation for walls, roof-spaces and windows, the designs of new housing that can be heated or cooled passively, and a proportion of energy to be provided from renewable energy sources (see further discussion in section 6.2.2). The

industries that are involved range from energy supply companies to appliance manufacturers, and architects to the building and construction industry. The LG (UK09001) had chosen to act on the structure of the industry, steering small developers to also improve the energy efficiency standards of housing for its residents.

Other actions of LG demonstrated the opportunity that LG in the UK had for working in partnership with energy providers to insulate and draught-proof housing to improve the energy performance of the housing stock. The technology included insulation of lofts and cavity walls, undertaking energy audits which rely on measuring energy use over time, reviewing the heating systems and controls including the potential need for valves on radiators etc. One case (UK09003) was also using technology to undertake thermal imaging of properties to reveal energy wastage due to heat escaping from houses, as well as distributing 'thermometers' on cards to show the internal temperature levels of houses and to educate the residents about 'acceptable' comfort levels. The objective was to avoid the excessive use of energy for heating while also indicating when heating should be introduced. Two of the Australian cases also provided energy meters which citizens could borrow (from libraries) to test the electricity being used by appliances in their homes.

The main barriers identified related to the lack of powers of LG to force owners or developers to implement improvements to home energy efficiency and the lack of funding for new developments to adopt higher standards. The innovative approaches included the establishment of partnerships with energy supply companies and networking across the industry and partner institutions. Information developed through social marketing approaches was also considered to be important to the success of public awareness efforts about initiatives to improve energy efficiency of housing.

6.2.2 Renewable energy

From the summary provided in Table 6.7, renewable energy initiatives mentioned by participants in this study included: SWH; SPV systems; wind turbines; wood chip or wood pellet boilers; and district heating systems which use municipal waste as a source of energy in a combined heat and power scheme or in a heating scheme. In general a combination of renewable energies may be possible although the structure of communities in cities and the potential conflict between land uses restricts the use of wind farms as sources of renewable energy. Hence the location of wind farms is tending towards off-shore schemes in both the UK and also in Germany. The main technology that uses solar energy in the UK was stated

to be SWH, which UK09001 indicated was being chosen by developers to provide 10% of energy demand for developments of five dwellings or more as required by the new planning policy. The visible use of SPV was not obvious in the UK, although in UK09002, one village had been used as a demonstration of the potential to capture and use solar energy through SPV. The Vauban district in Freiburg (DE09001) was the most widely developed solar precinct of any of the cases in this study. While building integrated PVs (BIPV) are promoted in theory, little evidence of the installation of these products was apparent in any of the cases for residential development but was evident on some commercial buildings in Freiburg (DE09001). The retrofitting of existing roof surfaces with the technology after the building is complete appears to be more common, although in Vauban in Freiburg it was clear in some instances that the design of the buildings had aimed to maximise the collection of renewable energy from solar panels.

The initiatives of LG cases to increase the proportion of energy sourced from local renewable energy included providing information about the potential for solar energy on rooftops through renewable energy resource assessments (AU09001, AU09002, AU09003) and providing web-based information about the suitability of each rooftop to be fitted with SPV panels (Free Sun in DE09001). The participant from Freiburg (DE09001) stated that in developing their Free Sun web based product, they had estimated that half of the rooftop of each dwelling would be suitable for retrofitting SPV panels. This assumption was based on the simple gabled design of rooftops across the urban area. Hence the design of buildings, including orientation and roof style, influences the ease with which solar energy can be harvested.

At the time of the data collection, only one Australian case (AU09002) had facilitated a bulk purchasing agreement for SPV systems for interested citizens in their LG area. The bulk purchase scheme reduced the price of purchase considerably and with the Australian government's rebate at the time, enabled these systems to be purchased and installed economically. The other two Australian cases in Phase 2 (AU09001; AU09003) have since joined a consortium of LG in South Australia to engage a SPV provider to work within their respective areas (LGA SA & ZEN Home Energy Systems 2010). One of the LG cases (AU09001) had previously been a partner in the Adelaide Solar Cities project, within which a SPV product was promoted. This product was reported to have been popular with home-owners and rapidly became fully subscribed, there being only 1400 allocated to the entire Adelaide Solar Cities project which spanned four LG authorities. The popularity of

this product indicates that if marketed at the right price, SPV would be quickly taken up by home-owners. A critical success factor for these initiatives is the ability for LG to act quickly to support the community to take advantage of financial incentives. The LG policies for approving renewable energy technology installations are therefore important and may either enable or prevent potential renewable energy resources being harvested.

Some participants in this research also referred to low energy zones and low carbon zones which imply a spatial planning role for LG to define these terms and delineate these zones for the community and developers. Development plans then direct activities that are permitted within these zones. For example activities may be required to limit carbon emissions through low energy use regardless of the source or to require development to incorporate facilities to capture and use renewable energy. Alternatively such zones may refer to precincts where industry or business that produce or promote low carbon renewable energy technology may be located.

6.2.3 Low carbon transport

From the review of development plans for the LG cases, the transport infrastructure for communities is extremely important, and has been linked to the achievement of economic and social outcomes for the local communities. Existing transport infrastructure has in some cases dictated the location of services, industry and dwellings, with zones of activities being defined by proximity to road, rail or light rail systems, and the confluence of these systems. In the initiatives summarised in Table 6.8, there was acknowledgement of the importance of development planning to the integration of low carbon transport choices for residents. There was evidence of one LG having provided infrastructure for charging electric vehicles at a new regional shopping centre (UK09001) to encourage the uptake of electric vehicles as a transport mode. Other actions to improve energy efficiency of transport modes focused on the promotion of motor vehicles with efficient technology (e.g. hybrid vehicles and regenerative braking systems).

Local government cases in each country indicated that they worked at a regional level to integrate transport systems and so enable movements across LG boundaries. These negotiations may require extended periods of time for negotiations with partners to enable changes to systems and may affect the ability to upgrade technological systems that are used by the transportation sector. One LG case in Germany (DE09001) had introduced an advanced integrated regional ticketing system for transport which enabled users to transfer

from buses and light rail within the city to the regional train system. The two German LG cases (DE09001; DE09002) were in control of public transport across their city and had provided real time information systems to ensure that their public transport systems were a reliable option for the community. From a corporate perspective, LG cases had introduced schemes for LG staff to use electric bicycles instead of cars for work trips within city area (UK09001); annual public transport cards for LG staff (UK09002) and on-line system of booking cars within the car-share scheme that was operating in their city (UK09001). In one case (UK09001), designated car parking spaces for car-share scheme vehicles had also been provided to promote and reward community membership in such schemes.

Table 6.6 Self-evaluation of household energy efficiency initiatives undertaken by case studies

LG ID	Targets / Objectives	Policies/ Programs	Partners	Scope / Scale	Critical Success Factors	Barriers identified by LG	Innovation identified by researcher
AU09001	Not stated	Building code Sustainable objectives in new developments	State Govt Developers Dwelling owners Builders	Urban regeneration site	Enquiry by design process	Not evaluated	Enquiry by design process Partnership
AU09002	Not stated	Building Code Insulation Bulk Purchase	Developers Dwelling owner Builders	Council wide	Expressions of interest	Not stated	Bulk purchase broker
	Reduced GHG, & energy & water use; education / engage community & Councillors; $ savings	LESS program; Free installation of energy efficient lights and water saving showerheads	Households - both rental and owner occupied	Council wide	Councillor engagement; high customer / household satisfaction; required very little officer time	Not stated	Good PR/Press Release / Media Opportunity; ease of implementation; high profile story for Councillors
AU09003	Not stated	Building code	Developers; Dwelling owners Builders	Council wide	Not stated	Not stated	
UK09001	Carbon reduction targets	Free Insulation	Energy supplier Contractors Referring agencies	Area based initially then all households - everyone matters	Funding Engagement with residents - door to door Build trust	Unstable funding sources No legal powers - Can't force residents to implement any improvements	Joined up service delivery Contracts cover scaffolding Thorough approach for quality outcome
	All new homes carbon neutral by 2016	Core Strategy - Planning Policy Code 3 then 4 for Sustainable Homes Code 6 by 2016	Developers	New homes - minimum development size - 5 dwellings	Developer education	Cost of building to higher standard	5 dwelling criteria is more strict than national requirement
UK09002	Not stated	Warm Zone Code for Sustainable Homes	Energy Services Company Developers	Area based	Efficiency from area based approach Performance of arm's length energy services company	Application processes for funding	Energy Services Company
	All new homes carbon neutral by 2016	Not stated	Developers	Council wide	Not stated	Not stated	

Table 6.6 Self-evaluation of household energy efficiency initiatives undertaken by case studies (continued)

LG ID	Targets / Objectives	Policies/ Programs	Partners	Scope / Scale	Critical Success Factors	Barriers identified by LG	Innovation identified by researcher
UK09003	Improve SAP rating of housing stock	Fuelsavers	Energy supplier Contractors Referring agencies Landlords	Area based - Disadvantaged, deprived initially then proposed to identify high energy users / wastage	Efficiency from area based approach Funding Engagement with residents - door to door Build trust	Unstable funding sources No powers - Can't force residents to implement any improvements Unable to access SAP ratings on properties	Database Calendars & social marketing Thermo - thermal imaging
	All new homes carbon neutral by 2016	Urban eco-settlements	Developers Government	Aire Valley proposed	Government to come on board with urban regeneration not new green-field eco-towns	Funding for new developments Government funding green-field development	Redevelopment of urban industrial areas as urban eco-settlement with carbon neutral objective
DE09001	Passivhaus	Framework to support market based approach	Developers Dwelling owner	Local authority wide	Relationship with developers	No legal powers	
DE09002	Passivhaus	Framework to support market based approach Web-site e+haus	Developers Dwelling owner	Demonstration		None stated	
	Motivation for the further development of the campaign through the forum, important feedback from the participants, new contacts between participants, better knowledge about e+haus	Conduct forums for members of the partner institutions of e+haus	Department of Climate Protection of the City of Augsburg Members of partner institutions	City wide	Get the members of the partners knowing each other, develop the campaign further on, information through the forum	None stated	Networking between the members of the partner institutions of e+haus - a marketing campaign to increase the number and the quality of energy modernisation of housing
	Reduction of the energy consumption in the ten households; information about energy saving and education of energy consumption in further households	Augsburger Stromdiatt (energy diet Augsburg	Department of Climate Protection of the City of Augsburg 10 Households	Ten households involved	Advice at home, measure and analysis of the energy consumption at home, change in lighting, provide support for further investment	None stated	Information for all households to reduce their energy consumption; lend energy-consumption meters

Table 6.7 Self-evaluation of renewable energy initiatives undertaken by case studies

LG ID	Targets / Objectives	Policies/ Programs	Partners	Scope / Scale	Critical Success Factors	Barriers identified by LG	Innovation identified by researcher
AU09001	Reduce energy consumption Trialling new approaches to producing and using energy	Solar Cities	Big Switch ANZ Origin Energy Delfin Lend Lease BP Solar City of Salisbury City of Tea Tree Gully Adelaide City Council	Limited number of products available across each LG area	Number of different products Mass marketed	None stated	Community, user acceptance of new technology, new tariff structures
	More effective use of solar power on new houses Greater uptake of solar power	Design of new suburbs to improve energy efficiency	State Govt Developers Dwelling owners Builders	Urban regeneration site	Inquiry by design Workshops	None stated	Built into Development Plan Amendment – council sign off
AU09002	To increase the installed base of "sustainable technologies" such as PV + SHWs into existing housing stock	Solar Homes - Residential Bulk Buy Program	Broad range of community Business partners	Council wide	Capitalised on the narrow window of opportunity to take advantage of $8000 SPV rebate; made it easy and credible; engaged with broad range of community 35 to 75 yrs	None stated	Installed PV & SHWs; attract govt funding to municipality; increased community capacity; new business delivery models; reduce GHG emissions and energy use; plus Councillor engagement
AU09003		None identified					
UK09001	Provide a minimum of 10% of development's energy needs from renewable or low carbon sources.	CS65 Renewable Energy and carbon reduction	Developers	Council wide For minimum 5 dwellings	In Core Strategy Code 3 standard Acceptance by developers	Developers saying too expensive	Gone beyond standard – which is for 10 dwellings minimum
UK09002	Increase local installations of renewable energy	RE-Charge	Kirklees Energy Services Kirklees Legal Services Landowners	For Biomass heating systems; SWH; SPV systems; Ground source heat pumps; Air source heat pumps; Hydroelectricity; Micro CHP	Interest free loans up to £10,000 for renewable technologies	New – not evaluated Not for wind	This scheme is the first of its kind in the UK A 'mortgage' will be taken as security over the property, the sum of the loan will become repayable upon change of ownership of the property.

Table 6.7 Self-evaluation of renewable energy initiatives undertaken by case studies (continued)

LG ID	Targets / Objectives	Policies/ Programs	Partners	Scope / Scale	Critical Success Factors	Barriers identified by LG	Innovation identified by researcher
UK09002	Increase local installations of renewable energy	Planning fee waiver for renewable projects	Land owners	Council wide	Getting council to agree		Removing cost barrier for planning approval Assisting land owners with applications for planning approvals
UK09003		None identified					
DE09001	Increase renewable energy to 10% of energy demand	Free Sun – Solar Map	Residents	Council wide	Feed-in tariff Availability of information	New – not evaluated	Freely available on internet for resident to check suitability of roof area for solar panels
	Increase renewable energy to 10% of energy demand	Solar subsidies	Residents	Council wide	Feed-in tariff Incentive for resident to act during renovation	Cannot force people	
DE09002	Better information about the technical and creative possibilities for renewable energy in Augsburg, show already realised systems, achieve further investments	Provide information about how to reduce GHG emissions in homes	Department of Climate Protection of the City of Augsburg	Council wide	Get people to realise their own installation		Show examples about installed actual projects

Table 6.8 Self-evaluation of low carbon transport initiatives undertaken by case studies

Case	Targets / Objectives	Policies/ Programs	Partners	Scope / Scale	Critical Success Factors	Barriers identified by LG	Innovation identified by researcher
AU09001	Reducing car dependency GHG emissions reduction	TOD – ARC project support and encouragement	University of South Australia South Australian Government				Inquiry by design Workshops Research on TODs
	Provide residents with greater access to public transport Reduce car dependency	Encouraging effective public transport in the city	Community organisations; Residents associations; Regional lobby groups	Council wide	State government could be doing what is asked	Council limited in action	
	Co-location of services	Development Plan – allows establishment of regional and district centres and levels of neighbourhood centres		Council wide	Good theoretical base for thinking; adoption of principles for development; opportunity of wide range of people to make comments to contribute to the amendments to development plan		Inclusive nature of processes
AU09002	Tangible outcomes - improved bus provision; community bus	Major Bus Initiative	Public transport contractors State government	Council wide	Leadership in public transport advocacy; Improved bus stops by providing shelters & improves access; Tangible outcomes - improved bus provision; community bus etc		Advocated strongly for public transport improvements
		Constructed bike paths		Council wide			
AU09003	Rail extension	Lobbying to State Government	Residents		Public support for rail extension	Council limited in action	Sustainable Onkaparinga branding
	Recreation paths for cycling & walking	Recreation strategy		Council wide	Funding	Funding	

Table 6.8 Self-evaluation of low carbon transport initiatives undertaken by case studies (continued)

Case	Targets / Objectives	Policies/ Programs	Partners	Scope / Scale	Critical Success Factors	Barriers identified of LG	Innovation identified by researcher
UK09001	Raise awareness amongst variety of audiences	Care4Air	South Yorkshire Passenger Transport Board Social marketing company Community group - East End Quality of Life Initiative	South Yorkshire	Brought on the clean air message very gently. Don't have to do negative campaigning	Technical issues. Anti-car immediately switched off politicians. Planners didn't want to get involved	Social marketing Bill Oddie – celebrity used – air quality link to driving habits
	Reduce car ownership and car use	Whizz Go Car Club	Whizz Go	Council wide	Membership of car club Car parks for car club members		Car share scheme Multi-city use Car park spaces for car club members
UK09002	Increase use of public transport	Free city loop bus	Metro	Inner city	Links key destinations including bus interchange and railway station		
UK09003	Increase use of public transport	New Generation Transport	Leeds City Region West Yorkshire region	Region wide	Regional approach to transport infrastructure	Political factors	Trolley bus
DE09001	Public transport to redeveloped areas	Transport infrastructure	Developers	City wide	Density of residential development along transport corridors		Provide trams system to new residential developments at beginning
	Reduce dependence on cars	Transport infrastructure integration		City wide and region wide	Bike paths integrated with public transport interchanges		Connected to public transport and regional transport systems System of bike paths
DE09002		Ausbau der Linie 6 Mobilitatsdrehscheibe		City wide			Trams systems Park and ride Central interchange

6.3 Quantifying carbon emissions

A summary of key statistics about the LG cases is provided in Table 6.9 This data was obtained from staff from each LG or from official government statistics and was supplemented by estimations of carbon emissions from carbon profiling studies of the Australian case studies undertaken as part of the CNC project (Hamilton et al 2008b; Kellett & Hamilton 2009a/c), from the UK Government's calculation of carbon emissions for LG (AEA & DECC 2009) and from estimations of carbon emissions from the two German LG cases based on LG publications.

Table 6.9 Comparative statistics for case studies – Phase 2

LG ID	Area sq km	Resident population	Dwellings	Passenger vehicles	Estimated per capita carbon emissions		
				Per 1000 persons	Total t CO_2-e/yr	Residential t CO_2-e/yr	Transport t CO_2-e/yr
AU09001	346	69,418	27,243	545	13.8 – 17.1	2.4 – 3.6	3.0 – 4.3
AU09002	114	115,702	38,305	674	8.9 – 20.2	3.3 – 4.4	3.0 – 4.6
AU09003	518	155,919	61,169	748	9.6 – 16.4	2.4 – 3.1	2.8 – 4.1
UK09001	363	513,234	217,622	378	6.5	2.3	1.1
UK09002	409	403,935	159,031	337	6.0	2.4	1.1
UK09003	552	761,124	315,620	373	6.3	2.3	1.4
DE09001	153	217,547	103,782	362	8.5	nr	1.8
DE09002	147	266,976	140,000	422	7.6*	nr	nr

nr = not reported; * = not including transport

While information about the area, population and number of dwellings was readily available, it was more difficult to obtain disaggregated sectoral information for carbon emissions at the LG level, except for the UK cases where information was available from the national government and reported at the local scale. However the carbon emissions associated with transport published by the national government (AEA & DECC 2009) included all transport using roads rather than for only passenger vehicles, hence it is not an accurate representation of household transport use.

Two of the UK LG cases also estimated their carbon emissions using an Ecological Footprinting methodology. The Ecological Footprint of the UK had been estimated to be 5.4 global hectares per person (ghp) which was estimated to be 65% higher than the ecological budget for the UK (Leeds City Council 2007). Case UK09003 had chosen to report its Ecological Footprint as well as its carbon emissions, reporting that their Ecological Footprint is the same as that for the UK - 5.4 ghp. According to the Ecological

Footprint for case UK09003, the food sector produced the largest single impact at 22% of the Ecological Footprint; household energy consumption was responsible for 19%; manufactured durables and consumables contributed 11%; and the transport sector was responsible for 11% of the total (Leeds City Council 2007). The total per capita carbon footprint for UK09003 was stated to be 11 t CO_2 per year, compared with the UK average per capita carbon footprint of 11.8 t CO_2. The largest carbon contributor was stated to be 'home and energy' at 29% of the total with the next largest being transport, which was also stated to be the fastest growing sector (Leeds City Council 2007). LG case UK09001 estimated that its total carbon footprint (based on 2004/05 consumption figures) was 5,798,361 t CO_2 per year (City of Sheffield 2009). They stated that carbon emission contributions came from housing (34%), transport (25%), consumption (11%), private services (9%), public services (8%), food (8%) and capital investment (5%). No data for the carbon footprint for UK09002 was available using this methodology.

Carbon emission data for German cases was multi-sectoral with household, business and minor uses combined (DE09001; DE09002) while for Augsburg (DE09002), the transport sector had been excluded. In the German cases, it was not possible to estimate the contribution of the residential sector to the total per capita figure as there was insufficient data to separate the energy use of the business and household sectors, an issue which was confirmed by the participant from the City of Freiburg in a recent communication via electronic mail (DE09001 Participant 1, 2010). The ranges of data on estimates of carbon emissions for the Australian cases in Table 6.1 result from the difficulty in obtaining local data and the need to use state level per capita data (Hamilton et al 2008b) which they consider to be inadequate for identifying local influences, local trends or assessing impacts of local initiatives. Hamilton et al (2008b) report that using three different methods, significant variations, particularly in the industrial and transport sectors were obtained. Where transport data was able to be estimated at the LG level for the Australian cases that they studied, the majority of energy use and carbon emissions could be assigned to passenger vehicles (Hamilton et al 2008b). The analysis of carbon emissions data for the LG cases in the current study highlights problems in obtaining comparative data for reporting carbon emissions at the LG level, and that this problem is not unique to Australian LG.

The Australian cases had high per capita total carbon emissions which is consistent with other studies (IEA 2008; IEA 2010). Case AU09002 had the highest per capita carbon

emissions for both the residential and transport sectors. For each of the Australian LG cases, the estimated carbon emissions associated with transport were of a similar order of magnitude to the estimated carbon emissions from energy used in the residential sector. For the UK LG cases, the energy used within households was approximately double that used for transport, while for the German case which had data available, the transport emissions were approximately 20% of total per capita emissions. The percentage of total per capita emissions that may be attributed to transport was estimated to be in the range of 17% to 22% for the UK cases; and 22% to 34% for the Australian cases. The UK and German cases were somewhat similar in this respect while the Australian cases were higher due to greater car ownership in the latter. For the Australian cases, the residential sector contribution ranged from 17% to 37% of total per capita emissions. In the UK cases the contribution of the residential sector to total per capita emissions was estimated to be in the range of 35% to 40% due to the need more for space heating, and was likely to also be the case in the German cases.

There were notable differences in the total population resident within each LG area, with the cases from South Australia particularly low in gross density. An attempt has been made to review the importance of dwelling density to the ownership of passenger vehicles (see Figure 6.1). While not conclusive, the high passenger vehicle ownership in Australia may be influenced by the low gross dwelling density across each LG area. However, from this analysis and according to this data which has not been adjusted for areas of conservation, while the gross density of dwellings in DE09002 is higher than for DE09001, there was a higher passenger vehicle ownership rate in DE09002.

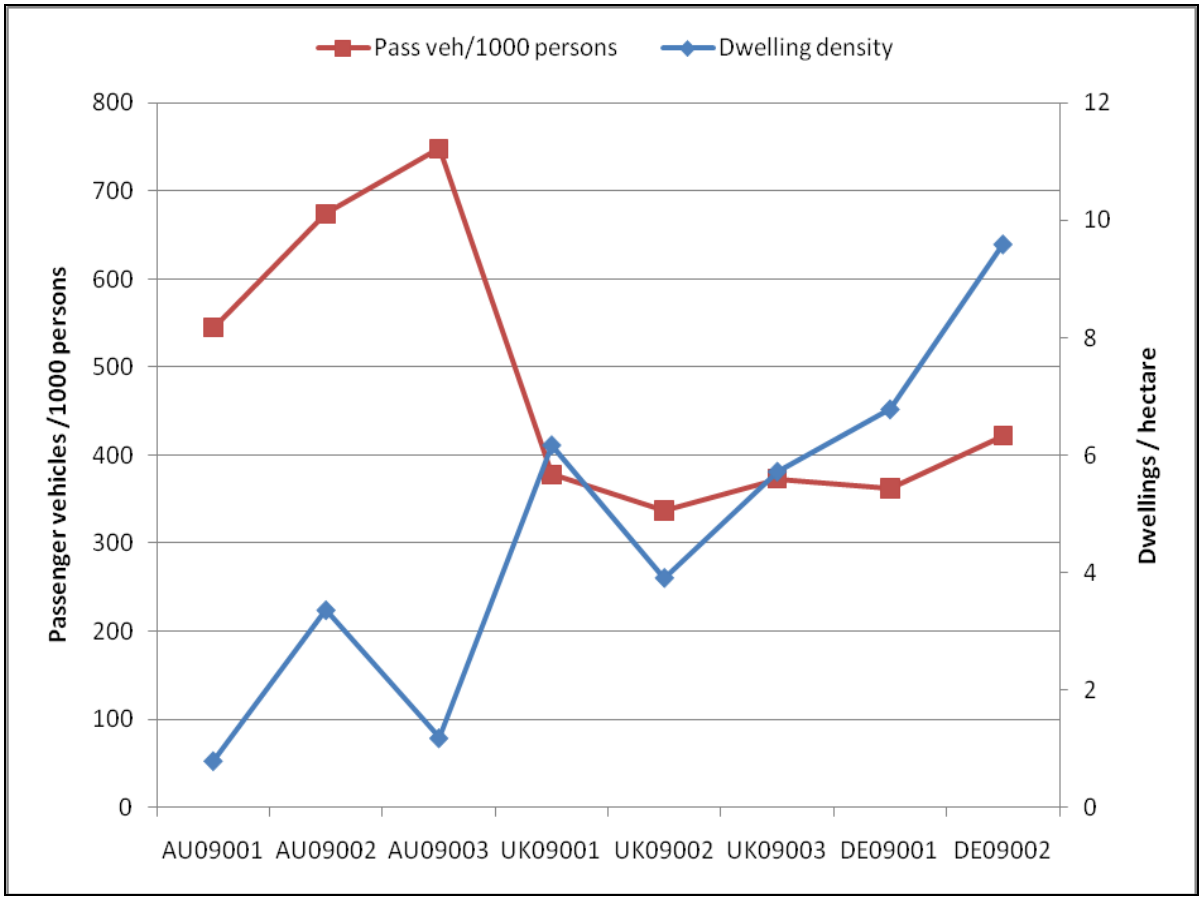


Figure 6.1 Cross case analysis - dwelling density and passenger vehicle ownership

6.3.1 Trends in carbon emissions across LG cases

Estimations of carbon emissions had been obtained from carbon profiling studies of the Australian case studies undertaken as part of the CNC project (Hamilton et al 2008b; Kellett & Hamilton 2009a/c). Estimates for carbon emissions from both the residential and transport sectors for AU09001 and AU09002 had been generated by the ICLEI CCP program for 1995 and 2001 and were used by Hamilton et al (2008b) to compare with other methods for estimating carbon profiles for these LG cases for the year 2006. The CCP program also provided projected carbon emissions to 2010 and showed increases across all sectors. The Australian Bureau of Statistics (ABS 2007) reported that, in Australia, the largest sectoral increase in carbon emissions over the 1990 to 2005 period, of 42.6% (83.4 Mt CO2-e), occurred in the stationary energy sector, driven in part by increasing population, increasing household incomes and export increases from the resources sector. The ABS also reported that the transport sector had the next largest growth, with an increase of 29.9% (18.5 Mt CO2-e) from 1990 to 2005. The main driver

for the increase in transport emissions was reported to be continuing growth in household incomes and number of passenger vehicles (ABS 2007). Hamilton et al (2008) reported a lack of data to enable accurate assessments of community carbon emissions for Australian LG cases but considered that state based data (from per capita state data for each sector) was inadequate for LG to establish baselines at the local level and set appropriate targets for reducing community carbon emissions.

In contrast to the Australian cases, one of the German cases (DE09001) and all UK cases had been monitoring the trends of carbon emissions for their LG. The LG officer interviewed for case DE09001 provided figures stating that at 2009 an overall reduction of 13.8% of CO_2 emissions (baseline 1992) had been achieved and that this figure equated to a per capita reduction of 20% since 1992 (DE09001 Interviewee, 3 August 2009). According to C40 Cities (2010), Freiburg (case DE09001) is a best practice city, and that in 2007, the average Freiburg citizen was only producing 8.53 t CO_2 annually, a reduction from 10.6 t of CO_2 in 1993. They reported that the total carbon emissions for energy and transport had reduced from 2,073,000 t CO_2 in 1993 to 1,787,000 t CO_2 in 2007. For **e**nergy, CO_2 emissions had reduced from 1,660,000 t CO_2 in 1993 to 1,394,000 t CO_2 in 2007 – a 16% decrease. For transport, CO_2 emissions had reduced from 413,000 t CO_2 in 1993 to 393,000 t CO_2 in 2003 – a 4.8% decrease. More recent data for transport carbon emissions was not provided.

In the UK, the national government report data for each LG area which is used for the National Indicator (NI) performance reporting for NI 186. For UK09001, the total carbon emissions from energy used in 2007 was 3,443 kt CO2-e. The data for the industrial and commercial use of energy show that these sectors contributed 48.6% of carbon emissions. Road transport fuel use contributed 17% of carbon emissions and the domestic use of energy contributed 34.3% of carbon emissions (AEA and DECC 2009). The per capita carbon emissions for UK09001 were calculated to be 6.5 t CO2-e per capita per yr in 2007, a reduction of 5.1% from 6.8 t CO2-e per capita per yr in 2005. Data for UK09002 indicated that total carbon emissions were 2,411 kt CO_2-e per yr in 2007, with 41.5% of emissions arising from the energy used in the industrial and commercial sectors; 39.7% from the domestic use of energy; and 18.9% of carbon emissions arising from road transport. (AEA and DECC 2009). The per capita emissions had reduced by 7.4% from 6.5 t per yr in 2005 to 6.0 t per yr in 2007. Data used for reporting on the NI 186 indicate that UK09003 produced a total of 4,808 kt CO2-e per year in 2007, a reduction of 5.7% since

2005 (AEA and DECC 2009). 41.5% of GHG emissions are from the industrial and commercial sectors (combined); 35.8% from the domestic use of energy; and 22.7% from road transport. The per capita carbon emissions were estimated to be 6.3 t per yr in 2007, a reduction from 6.7 t per yr in 2005. Hence across all three UK cases, the per capita carbon emissions had reduced between 2005 and 2007.

6.3.2 Outcomes of local government initiatives

While LG cases variously indicated that they had set targets for carbon reduction at the corporate level and some also at the community level, obtaining quantitative data on the outcomes of initiatives to reduce carbon emissions at the community level proved to be more difficult. It is also worth noting that internationally, responsibilities for reporting progress on carbon reduction and powers to obtain information about energy use and associated carbon emissions vary. The data provided by LG cases about the outcomes of initiatives have been summarised and are presented in Tables 6.10, 6.11 and 6.12 for each of the three categories of household energy efficiency, renewable energy or low carbon transport respectively. Participants often did not state whether initiatives were considered to be effective, although where responses were given, most affirmed the initiative as effective. These outcomes need to be linked back to previous information about critical success factors presented in Tables 6.6, 6.7 and 6.8.

For energy efficiency initiatives, outcomes provided in Table 6.10 were often expressed in terms of the number of households visited and the number of households that took up offers, such as free insulation. While two LG cases had quantified energy savings or carbon emissions associated with these initiatives, only one LG case (DE09002) actually measured the savings achieved. Other savings were estimated across the sample of houses where energy efficiency work was undertaken. From the summary provided in Table 6.11, there were relatively fewer initiatives focused on enhancing the uptake of renewable energy compared to energy efficiency. Where information about the outcomes of initiatives was provided, only one German case (DE09001) and one UK case (UK09001) actually quantified the carbon reductions or energy savings. The initiative of the UK case quantified the outcomes at the community scale rather than at a household or individual dwelling scale.

From the review of transport initiatives presented in Table 6.12, the focus appeared to be on providing public transport to new developments and planning for reduced vehicle use.

Some initiatives targeted vehicle ownership, promoting car-sharing. Only one LG case (DE09001) had quantified the impact of initiatives to reduce carbon emissions from transport fuel and one LG case (AU09001) indicated that initiatives to increase public transport services and reduce car use in its LG area had not been effective. Further research would be needed to quantify the impact of local action to reduce transport carbon emissions.

Table 6.10 Outcomes of household energy efficiency initiatives undertaken by case studies

LG ID	Targets / Objectives	Policies/ Programs	Expected Outcomes	Stated Outcomes	Considered by staff to be effective?
AU09001	Not stated	Building code Sustainable objectives in new developments	Reduction of energy cost to individual householders; Wider environmental benefits of using more energy efficient materials generally	Not provided	Yes
AU09002	Not stated	Building Code Insulation Bulk Purchase		Increase installations; Examples of sustainable homes; Education; plus community presentation of installations & sustainable homes	Not stated
	Reduced GHG, & energy & water use; education / engage community & Councillors; $ savings	LESS program; Free installation of energy efficient lights and water saving showerheads; You have the power	Increased awareness of energy issues within individual households and across the sample; consumption data for year, winter and summer peaks	Reduced GHG, & energy & water use; education / engage community & Councillors; $ savings but not quantified; Improved & timely data; increased participation & ownership by surrounding community; buy-in by water retailer (Yarra Valley Water & Melbourne Water) A report summarising findings; outcomes achieved	Yes
AU09003	Not stated	Building code	Not stated	No data available	Not stated
UK09001	Carbon reduction targets	Free Insulation	Cost savings for residents. Insulating cavity walls and lofts, can save 15-30% of household's energy cost depending on existing insulation, size of cavity or loft, type of terrace house. In energy terms payback was stated to be 2-3 years.	Had only started in 2009	Not stated
	All new homes carbon neutral by 2016	Core Strategy - Planning Policy; Code 3 then 4 for Sustainable Homes ; Code 6 by 2016	The overall aim is that all new homes are to be zero carbon by 2016	Code 3 had only started in 2009	Not stated
UK09002	Council target is that 55% of the housing stock will be adequately insulated at the end of the scheme. Estimated capital investment at the end of the programme £40-50 million	Warm Zone	Over 50,000 homes insulated. Carbon emissions reduced by 38-55,000 tonnes,; Significant householder energy savings – projected up to £10 million /year; Improved energy efficiency ratings of homes; these should be reflected in improvements in the Home Energy Performance Certificates (HEPs) for lease and sale; Reduced numbers of households in fuel poverty (dependant on changing energy prices); defined as when a household spends more than a tenth of its income on utility bills. Improved rates of benefit take up. Reduced rates of excess winter deaths. Reducing carbon monoxide poisoning by offering free detectors to all homes.	To May 2009: more than 30,000 homes insulated – more than 40,000 measures implemented. Carbon reductions of 28,000 t/yr. Home energy savings and increased benefit uptake of more than £6 million/yr. More than £13 million investment in insulation measures to date.	Yes

Table 6.10 Outcomes of household energy efficiency initiatives undertaken by case studies (continued)

LG ID	Targets / Objectives	Policies/ Programs	Expected Outcomes	Stated Outcomes	Considered by staff to be effective?
UK09002	All new homes carbon neutral by 2016	Code for Sustainable Homes	The overall aim is that all new homes are to be zero carbon by 2016	Not stated	
UK09003	Improve SAP rating of housing stock	Fuelsavers	32,000 properties in the first band. Next program is just under 71,000 properties - door knocking and mail.	Contact made with 20,000 households after 3 attempts - supported 12,000 households with insulation and boiler improvements. Annual 2000 household survey conducted for nearly 20 years.	Yes
	All new homes carbon neutral by 2016	Urban eco-settlements			Not stated
DE09001	Passivhaus	Framework to support market based approach			
DE09002	Passivhaus	Framework to support market based approach Web-site e+haus			
	Motivation for the further development of the campaign through the forum, important feedback from the participants, new contacts between participants, better knowledge about e+haus	Conduct forums for members of the partner institutions of e+haus		New impulses for the further development of the campaign through the lecture, important feedback from the participants, new contacts between participants, better knowledge about e+haus	
	Reduction of the energy consumption in the ten households; information about energy saving and education of energy consumption in further households	Augsburger Stromdiatt (energy diet Augsburg	Reduction of the energy consumption in the ten households; information about energy saving and education of energy consumption in further households	The ten households reduced their energy consumption about 10,700 kWh, more than 22%	

Table 6.11 Outcomes of renewable energy initiatives undertaken by case studies

LG ID	Targets / Objectives	Policies/ Programs	Expected outcomes	Outcomes	Considered by staff to be effective?
AU09001	Reduce energy consumption Trialling new approaches to producing and using energy	Solar Cities	Reduced energy consumption by households and businesses Increased knowledge of the effectiveness of incentives for uptake of renewables; broader community awareness of renewable energy	Still underway at time of data collection – no information available	Yes
	More effective use of solar power on new houses Greater uptake of solar power	Design of new suburbs to improve energy efficiency	More effective use of solar power on new houses; Greater uptake of solar power	No houses had been built at time of data collection	Yes – has been implemented but too early to make a comment – no houses built yet.
AU09002	To increase the installed base of "sustainable technologies" such as PV + SHWs into existing housing stock	Solar Homes - Residential Bulk Buy Program		Installed PV & SW;H attract govt funding to municipality; increased community capacity; new business delivery models; reduce GHG emissions and energy use; plus Councillor engagement	
AU09003		None identified			
UK09001	Provide a minimum of 10% of development's energy needs from renewable or low carbon sources.	CS65 Renewable Energy and carbon reduction	Actual targets for MW of generation by 2010 and 2021. 12 MW by 2010. 60 MW by 2021	At the moment we are looking like we won't achieve that. There is a planning permission for a very big biomass power station which will be 35 MW – expected in 2011. But then will have gone well over the 12 MW.	Yes
UK09002	Increase local installations of renewable energy	RE-Charge		Not stated	Not stated
UK09002	Increase local installations of renewable energy	Planning fee waiver for renewable projects		Not stated	Not stated
UK09003		None identified			
DE09001	Increase renewable energy to 10% of energy demand	Free Sun – Solar Map		From solar - 1.1% and were trying to achieve 2% in the short term.	Too early to say
	Increase renewable energy to 10% of energy demand	Solar subsidies		From solar - 1.1% and were trying to achieve 2% in the short term.	Not stated
DE09002	Increase uptake and investment in renewable energy in Augsburg	Show already realised system - provide information about how to renewable energy to reduce GHG emissions in homes	Inform about the technical and creative possibilities for renewable energy in Augsburg	Good available information; several systems shown	Yes

Table 6.12 Outcomes of low carbon transport initiatives undertaken by case studies

LG ID	Targets / Objectives	Policies/ Programs	Expected outcomes	Outcomes	Considered by staff to be effective?
AU09001	Reducing car dependency GHG emissions reduction	TOD – ARC project support and encouragement	Same as objectives	Yet to be realised	Too early to tell
	Provide residents with greater access to public transport Reduce car dependency	Encouraging effective public transport in the city	Better or more effective public transport	Minor improvements in public transport network	No
	Co-location of services	Development Plan – allows establishment of regional and district centres and levels of neighbourhood centres	More effective centres – retail and service centres; Convenience for residents; Better urban form	All of the expected outcomes have been achieved and ongoing; New Urbanism; Walkable neighbourhoods	Yes
AU09002	Tangible outcomes - improved bus provision; community bus	Major Bus Initiative		Community bus and improved services	Not stated
		Constructed bike paths		No information	Not stated
AU09003	Rail extension	Lobbying to State Government		Commitment by State Government to extend rail line.	Yes
	Recreation paths for cycling & walking	Recreation strategy		Not stated	Yes
UK09001	Raise awareness amongst variety of audiences	Care4Air		Increased engagement; more technical - amount of space generated in the media	Yes
	Reduce car ownership and car use	Whizz Go Car Club			Yes
UK09002	Increase use of public transport	Free city loop bus		Not stated	Not stated
UK09003	Increase use of public transport	New Generation Transport		Had not been agreed at time of data collection	Not stated
DE09001	Public transport to redeveloped areas	Transport infrastructure			Yes
	Reduce dependence on cars	Transport infrastructure integration	Overall reduction of CO2 emissions (baseline 1992) was 13.8% as at 2009 which equated to a reduction per capita of 20%		Yes
DE09002		Ausbau der Linie 6 Mobilitatsdrehscheibe			Not stated

6.4 Capacity to act

In addition to the summary of initiatives of LG cases presented in section 6.2, data provided by participants during interviews and data from a review of corporate documents have been analysed with respect to LG's capacity to act. The analysis used Hammer's Capacity to Act Matrix (Hammer 2009) with the results presented in Table 6.13. As outlined previously in Chapters 2 and 3, Hammer (2009) considers that capacity to act is reflected in the mayoral levers that each LG can exert and is manifested through its policies and programs. Using the five mayoral levers that Hammer identified (namely: rulemaking, regulatory oversight, direct expenditure, financial incentives, and information gathering / dissemination/ advocacy/ facilitation), it is clear that most initiatives map to the mayoral lever of information gathering and dissemination, facilitation / convening of activities, or advocacy to higher levels of government or other agencies for action. The results of this analysis are commented on in the following sections, aligned with the five mayoral levers.

6.4.1 Rulemaking

The ability for an LG to make rules depends on the power or authority vested in it and is determined by higher levels of government. The rulemaking mechanisms available to LG cases generally consisted of planning powers, by-laws and specific orders. The planning powers included the setting of objectives for new development, which were documented in development plans and through conditions of development which were noted in the review of each case. The creation of by-laws was generally for managing potential problems or nuisance, or use of LG land and local roads. While LG may be able to make rules about the activities which may take place on LG land and on LG roads, restrictions may apply to other aspects of rulemaking regarding the use of roads. These restrictions are of particular importance for LG in metropolitan areas of Australian cities where there are multiple LG authorities operating across each city region and responsibility for roads is split between the State and LG. These systems require LG to act uniformly and cooperatively across boundaries to enable ease of citizen movement and service provision. Examples may be standardised rules such as for maximum vehicle speeds on local and State roads, and for signage. Similarly a proliferation of different building standards for housing across a city may create problems with training and compliance for the building industry. To overcome potential problems, building codes may be established at a national level and for Australian

cases, each State adopts the national building code through state legislation and regulations. LG is therefore restricted in some of the rules which they may apply in their local area and may be expressly limited in creating by-laws which conflict with the rights of citizens under other legislation, or which affect competition, and must ensure that by-laws are not inconsistent with other legislation (see LGA SA 1999 for examples of guidelines for making by-laws). In the following sections, the rules that LG cases had developed locally are discussed, focusing on land use planning, building design and codes, mandating renewable energy in new developments, transportation planning, water management and waste management.

6.4.1.1 Land use planning

The UK cases studied were in various stages of transitioning from their Unitary Development Plans or similar planning documents within the previous system to the Core Strategy and other documents within the new Local Development Framework (LDF), with UK09001 the furthest advanced of the three LG cases. Thus the visions and land use planning rules for the major urban areas for the next 10 to 15 years in the UK were being formulated through these current processes of establishing the LDF documents, and the role that LG will take to address carbon reduction through planning should be defined through these processes.

In the German planning system, modifications to existing housing were approved through building regulations and housing standards such as ‘Passivhaus’. Larger scale development such as Vauban and Rieselfeld districts of Freiburg and the Reese-Kaserne development in Augsburg require development plans. These development plans allow German LG to include the planning policy and conditions of development which can integrate sustainability objectives such as use of low carbon energy sources and improved energy efficiency of housing. These development plans can also be a mechanism for ensuring that infrastructure, amenities, facilities and services are provided and positioned appropriately within developments.

Different systems were evident in each of the two Australian states surveyed in this study. Development Plans (DPs) provided the conditions of new development in South Australian LG cases (e.g.. AU09001; AU09003). These DPs allocate land use spatially referring to policy areas or zones where specific land uses are encouraged (AU09001; AU09003). Conditions of development are then established and documented for the various policy

areas. In Victorian LG (e.g.. AU09002), the planning mechanisms included the Municipal Planning Scheme (MPS) and Municipal Strategic Statement (MSS), with Local Planning Policy Framework Clauses used to implement sustainability objectives included in the MSS.

6.4.1.2 Building design and codes

While planning policy may differ from case to case and is dependent on the state or regional jurisdiction, each country has a relatively standard means of assessing the energy efficiency of new buildings. The objectives for building designs and standards for housing in the UK and in Germany focused on achieving levels of thermal comfort and minimising cost of heating, although minimising the carbon emissions from heating is beginning to be seen in standards for housing in the UK. The importance of house energy ratings, codes for buildings including codes for passive housing; the materials used; professionalism and testing of energy efficiency of housing has emerged in policy for new developments of ten dwellings or more across the UK, although one case (UK09001) had made a decision to apply the higher standard to housing developments of five dwellings or more. A housing information and energy database which gathered and disseminated information about factors that influence energy use was evident in only one case (UK09003).

In Germany the market for home energy efficiency improvements was considered to be well developed, particularly in Freiburg, where LG's role was to provide a framework in which the industry could function competitively. The LG in Freiburg did not have responsibility for social housing, however the participant mentioned other cities in Germany (e.g. Frankfurt) where LG was responsible for social or council owned housing and were working on improving the energy efficiency of their housing stock.

In Australia, LG does not own or manage social housing, as this is a state government responsibility. The Australian LG cases focused on the location of services and infrastructure used by citizens (AU09001; AU09002) and compliance of new development with building standards and planning policy. The assessment of house design against standards for heating and cooling through a star rating system has been established at the national level in Australia and is then adopted as a standard by each State. The current Australian standard for new homes is for 6 stars although this standard has only recently been established. The need for cooling systems is apparent in mainland Australian States. The need to minimise energy required for cooling through passive means appeared to be a

motivator for the general references to the need for eaves and verandahs in the planning policy for some areas of AU09003. These passive mechanisms together with energy from renewable sources for operating cooling systems remain an opportunity for incorporation into planning policy.

6.4.1.3 Mandating renewable energy

There was evidence of planning policies that favour renewable energy within planning documents of all cases. For new developments in the UK, LG cases were generally following the Merton Rule established in the UK, which requires 10% of energy demand for a new development of nominally 10 dwellings or more, to be provided by renewable energy (New rules 2010). The diffusion of this policy across LG cases in the UK was therefore evident. However, one of the cases (UK09001) had implemented stricter rules than the Merton Rule and had challenged the local industry to accept this stricter standard for new development (UK09001 Participant 2). The implications of this stricter policy were that the LG had developed a role to educate and guide the local (smaller) developers in the industry, assisting them in developing designs that incorporate new technology to achieve the stricter standards.

The need for information about potential renewable energy resources which were available across their LG area had also prompted some LG cases to undertake renewable energy resource assessments. Two LG cases in the UK had consequently developed renewable energy resource targets which were incorporated into planning objectives (UK09001; UK09002). While renewable energy resource assessments had been undertaken by all three LG cases in Australia (Hamilton et al 2008a; Sunter, Hamilton & Kellett 2010), none had incorporated targets into planning policy at the time of the data collection.

In Freiburg, an assessment of rooftops had indicated that 27% of energy demand for Freiburg could be theoretically supplied by SPV panels (DE09001 Participant 1). According to the participant, the methodology included an assumption that 50% of roof area of housing in Freiburg was potentially suitable for SPV panels.

There were potential conflicts identified in clauses within development planning guidance. An example is for case AU09001, where at least 10 sq m of north facing roof is required for the potential collection of solar energy, however appurtenances such as SWH systems should not be unduly visible from the street and are to be integrated into the building. Hence those who dwell on the southern side of the street, may have a reduced capacity to

capture and use the renewable energy that may be falling on their 10 sq m of north facing roof which is visible from the street.

The market for renewable energy in Germany, although advanced in world terms due to their feed-in tariff, was still reliant on incentives to be economic (DE09001; DE09002). An increased ability for smaller communities in Germany to capture their renewable energy resources was raised by the participant from Freiburg (DE09001 Participant 1) who indicated that smaller communities were more easily able to garner community support for harvesting biomass and wind energy.

The need for heating of housing was clearly evident in all of the UK and German cases as winters are much colder than in urban areas of southern Australia, where this research was focused. The transition towards zero carbon and passive houses in these countries has also required the planning policy to change to ensure appropriate orientation, insulation and use of materials as well as the integration of SWH and solar electricity generation. From the comments of participants, the need for efficient and low carbon heating systems in Europe has resulted in the widespread uptake of wood pellet heating systems to replace gas and oil for heating. In the UK and in Germany, district waste to heat systems are also becoming more attractive, and cities were variously using or investigating the establishment of such systems within their business districts and for new residential developments (UK09001; UK09002; UK09003; DE09002). While there is still a need for some level of heating in winter months in South Australia and Victoria, there is a considerable focus on cooling of homes during summer for the Australian cases.

6.4.1.4 Transportation planning

The LG cases in this research considered that they had a role to advocate for improved transport services, however, in the Australian cases, they did not consider themselves to be a policy maker in this area. Generally there was little evidence of planning policy in any of the UK or Australian cases which addressed the incorporation of low carbon transport at the outset of development, although one LG (AU09003) had designated a regional centre within their boundary as suitable for a transit oriented development, to take advantage of an existing rail station and rail infrastructure linking the regional centre to the Adelaide Central Business District. In Germany, on the other hand, planning policy in the form of conditions in development plans for new district developments, such as for Vauban and Rieselfeld, required light rail systems to be incorporated from the outset (Siegl 2009).

In the UK cases, policies had been developed to support car-sharing (e.g. inner city car-parking for car-share vehicles in UK09001) and development of bus lanes or priority lanes for high occupancy vehicles. However, across all of the LG cases participating in this research, the improved access to public transport and providing more walking and cycling tracks was the most frequently mentioned low carbon transport initiative that was being planned for implementation in the short term. In the UK, there was also evidence of cyclists being given priority at signalled intersections (UK09001), while in the German cases, separate and interconnecting bicycle paths were common and extensive in Freiburg, while the participant from Augsburg indicated that they did not have as many bicycles as Freiburg (DE09002 Participant 1).

The increased density of urban and suburban developments and the co-location of services within the UK and German cases may have assisted the use of bicycles, however the culture of bike-riding was evident, with the researcher observing families cycling, particularly noticeable in Freiburg. While this is anecdotal evidence, other aspects of inner city urban design observed in Freiburg included traffic diversion around the city centre, car-free zones where only trams and bicycles are permitted, dedicated bicycle parking areas in the inner-city and extensive and inter-connected bicycle paths. Vehicle speed restrictions were evident in the districts of Vauban and Rieselfeld and the policy to provide public transport into district developments was providing low carbon transport mode.

In contrast tackling carbon reduction from transport was noted as a key challenge in the Australian cases with high levels of vehicle ownership and long distances of travel particularly problematic in peri-urban and outer suburban LG cases (e.g. AU09001 and AU09003). In spite of the lower car ownership in the UK cases and in Augsburg, compared to Australian cases, the participants in the UK cases and in Augsburg indicated that their levels of car ownership are considered to be too high as congestion was being experienced.

Other aspects of rulemaking for energy use and energy services relate to water management (restricted to stormwater in Australian LG) and waste management and these are briefly discussed in the following sections.

6.4.1.5 Water sensitive urban design and water conservation

In southern Australia, the shortage of reliable water resources was reflected in the responses that water and drought were key issues for LG cases. Water shortage was less of

a concern in the UK or German cases, although with climate change, the impact of extreme weather events and flooding was mentioned by the UK cases. In all cases, LG had a key role in providing infrastructure for managing stormwater and minimising flooding. Planning policy is required to take potential flooding issues into account in determining the appropriate uses of land. Other aspects of rulemaking for water conservation which may contribute to energy efficiency are set at a regional or state level in Australia such as through water efficient appliances or restrictions on water use.

6.4.1.6 Waste management

While waste management has not been a focus of this research, the policy silos used by Hammer included waste management as a policy that influences energy service provision at local level. Waste management is a key responsibility of LG in all three countries. The rules and systems for waste management appeared to vary across the cases, and reflected local decisions about the type of waste for which recycling schemes had been established, and the different regional arrangements which had been established. In one UK case (UK09001), a waste to heat scheme had been established, which collected all waste material from households and incinerated the waste. In the other UK cases (UK09002; UK09003), participants referred to investigations into similar schemes. The schemes may reflect the ability to collect, store and reuse waste material, as well as the distances for which wastes would need to be transported for disposal or reuse, all of which may be reliant on effective planning policy for zoning of waste management industries near areas of waste generation.

In all cases, multiple bin systems were evident where sufficient space was available for storage of bins, however recycling collection points had also been established in the UK cases to enable households and citizens to recycle materials should they wish to do so. Recycling targets were ranging from 30 to 35% in LG plans in the UK, lower than the 60 to 65% diversion rates being quoted in documents by Australian cases (Manningham City Council 2006; Zero Waste SA 2010), or 35 to 40% currently being achieved in household waste diversions by the Playford case (AU09001) in South Australia (NAWMA 2008).

Traditionally, in Australia, responsibility for waste management and recycling initiatives has rested with LG through public and environmental health legislation and environmental protection legislation. Systems for household waste collection have been established which are largely under the control of LG either individually or through collaborations and

alliances established with neighbouring LG authorities. Most services are provided by contractors and costs are paid for by rates or council taxes collected from land-owners. In South Australia, some key roles for LG in waste management had been identified by the state authority, Zero Waste SA (2010) and those that relate to rulemaking included: regional collaboration and investment in infrastructure; management of existing facilities; restoration of closed landfills; household hazardous waste collections; and actions to reduce illegal dumping. The state authority states that:

> Local government assumes responsibility for planning and management of municipal solid waste, including operation of systems for solid waste, recyclables, green organics and transfer stations. It has a key role in planning for infrastructure needs for waste (Zero Waste SA 2010)

While rulemaking refers to the rules that LG can develop for implementation locally, regulatory oversight refers to the role that LG has to administer policies and programs that are developed by higher levels of government. Examples of LG's role in overseeing regulations are presented in the following sections.

6.4.2 Regulatory oversight

The role of LG in overseeing regulations is to ensure legislative compliance by organisations and individuals undertaking activities in the local area. Participants in both Phases of this research indicated that LG had compliance programs related to building regulations, codes and standards, water conservation standards, and waste management, although the latter has been discussed extensively in the previous section and is not discussed further here.

6.4.2.1 Building codes

The compliance with building codes is a responsibility of LG in all three countries participating in Phase 2 of this research, with building approval accompanying development approval, however the rules are set at a higher level of government rather than at the LG level. Standards required of developers and home builders were higher in the UK for multiple family development compared to owner builder development. The Passivhaus standard in Germany and the Code for Sustainable Housing in the UK were forcing new development into achieving more energy efficient designs, while in Australia, the need to comply with six star energy efficiency ratings (new in 2010) for house designs was variously being required for new housing developments. Aligning LG documentation with changing state based standards appeared to be an issue for AU09002 where the

minimum rating for new housing was 4 star rather than the mandatory higher standard in that state (Victoria).

6.4.2.2 Water conservation

From LG's perspective, the standards for water related fittings in housing would be established through the building code and overseen by building inspectors in accordance with specified codes. Some mandatory water conservation measures such as dual flush toilet cisterns and low flow shower heads are standard for new dwellings, while other measures such as the standards for a separate water supply for toilet flushing and garden use which may be provided by rainwater collected and stored on site are voluntary. The public health responsibilities of LG ensure that it has a role to monitor water conservation initiatives such as local reuse, while the stormwater management responsibilities would ensure that water sensitive urban design features, which are a rapidly developing field of expertise, are compatible with carbon reduction initiatives of LG and households. Very little reference to water conservation was made by the UK cases, while in Germany, the high standards required of appliances and fittings in buildings were taken as a given by the participant from Freiburg (DE09001 Participant 1)

6.4.3 Procurement

Phase 2 of this research, particularly in the UK and Australian cases, indicated a focus on internal or corporate responsibilities such as reducing corporate costs. The role of LG was therefore seen as demonstrating, through procurement practices, that carbon reduction was an objective, although the overarching objective may be to reduce the cost of operation of energy consuming infrastructure such as street lighting. Where LG occupied buildings or operated facilities such as swimming and recreation centres, the 'greening' of the energy used in operating these facilities was becoming more important including the purchase of 'green power' from energy suppliers (AU09001; AU09002; AU09003).

The inclusion of carbon reduction and energy efficiency targets in contracts and agreements for service providers appears to be an emerging area for LG and is an area for further research. Two areas where energy services are procured particularly in the UK are in council housing and energy services to residents.

6.4.3.1 Housing services

The procurement of services for management of social or council owned housing was evident in the three UK cases, where the standard for council owned housing was becoming increasingly focused on meeting energy performance standards (SAP rating) to comply with national government directives for 'decent' housing, as previously discussed. The UK LG cases used arm's length management bodies as partners to meet targets for carbon reduction and energy efficiency standards set within local area agreements.

6.4.3.2 Energy services

Local government contracts for providing energy efficiency improvements to housing were most evident in the UK cases with LG negotiating agreements with energy supply companies to fund energy audits across the community with follow up free insulation for dwellings found to be in need of upgrading. Australian and German LG cases were not directly involved in procuring these services or establishing these types of contracts. However one Australian LG indicated that they provided a home and community care visiting service which was able to identify potential improvements to energy efficiency during visits (AU09001) although no information regarding its effectiveness was provided.

The lack of funds for taking ideal action was widely identified by LG in Phase 1 of the research and the following section explores the initiatives of LG cases in Phase 2 to provide incentives to households to reduce carbon emissions from energy use.

6.4.4 Financial incentives

The role of LG to provide financial subsidies or incentives was the least mentioned of any of the policy areas that could be used as mayoral levers. Innovative mechanisms for partnering with energy suppliers or obtaining grants from other funding bodies such as higher levels of government were evident, particularly in the UK cases and the following sections explore the financial incentives being provided for home energy efficiency, renewable energy and low carbon transport in the LG cases participating in this research.

6.4.4.1 Home energy efficiency

In the UK cases in Phase 2, a sophisticated system of LG partnering with energy suppliers had developed, which enabled LG to deliver schemes that provide free home energy audits and free cavity and loft insulation to households, often focusing on areas or neighbourhoods of high disadvantage. The focus on energy wastage in more affluent areas

with drive by thermal imaging was also providing an incentive for households in these more affluent areas to take up free insulation offers (UK09003). While some financial subsidy to improve energy efficiency was provided by German cases, no financial incentives for home energy efficiency improvements in the Australian or German cases in Phase 2 of this research.

6.4.4.2 Renewable energy

While renewable energy was considered to be the most popular means to ideally address climate change, the role for LG to provide financial incentives was most evident in the German cases in Phase 2, where subsidies for renewable energy on renovations were mentioned for Freiburg (DE09001) and Augsburg (DE09002). In the UK one LG (UK09002) was providing a £10,000 loan to households to install renewable energy which was to be paid back at the time of sale of the home. None of the other UK LG cases had developed such a scheme at the time of the interviews with participants in the UK. In the Australian LG cases, only one LG (AU09002) indicated that it had established a scheme for bulk purchasing of SWH and SPV systems, although these schemes were limited in number and had to be fully subscribed prior to installation.

6.4.4.3 Low carbon transport

The role for LG to provide financial incentives to residents to use low carbon transport was evident in two LG cases only – in negotiating schemes such as a free inner city bus system (UK09002), and the establishment of a monthly ticket that accessed all forms of public transport across a broader region in Freiburg (DE09001). A role for LG to provide incentives to reduce carbon emissions from transport is a problem for most LG cases due to their lack of funds available and their role as an advocate rather than a service provider of public transport in the UK and Australia cases. The main role for LG is therefore to provide information and be an advocate for improved services which are discussed in the next section.

6.4.5 Information gathering and dissemination; convening and facilitation; and advocacy

One of the most commonly mentioned ideal actions for LG in Phase 1 of this research was to inform and educate the community about climate change and the responses required to address it. In Phase 2 of this research, LG cases had identified and evaluated various programs designed to address household energy efficiency improvements, the increased

uptake of renewable energy and low carbon transport choices for their residents. Local government cases were variously supporting community based groups to run forums for their community, acknowledging their role as a facilitator, and that after the initial information sharing, the community needed to take ownership of their actions and programs.

In the Victorian case (AU09002), a range of guidelines such as the Energy Smart Housing Manual which are developed at the State level, are not reflected in the LG's MSS and the LG would need to rely on information and education for citizens, architects and builders to implement these standards. In Germany, one case (DE09001) indicated that a significant proportion of the staff's time in the energy department was spent advocating for higher standards of energy efficiency and incorporation of renewable energy into new developments and negotiating informally with developers as the LG had no legal power to enforce the incorporation of renewable energy other than through building regulations. The broader acceptance of LG's role to broker bulk purchasing of renewable energy for residents had been acknowledged by AU09002 to increase the uptake of SPV installations across its LG area. Gathering information about the potential for renewable energy to be captured and used across the LG area, which had been undertaken by Freiburg in Germany (DE09001). A similar exercise had been undertaken by Hamilton et al (2008a) for Playford (AU09001) and Manningham (AU09002) and by Sunter et al (2010) for Onkaparinga (AU09003). In the German case (DE09001), this information had been made available on LG's world wide website to enable residents to assess the potential for themselves.

LG cases indicated that they were not in control of transport systems and that their main role consisted of advocating for improved public transport routes and services.

Few initiatives mentioned by participants had deliberately involved the community in their development. The exception was AU09001 which had involved community representatives in 'Inquiry by Design' workshops for a major redevelopment. However, the UK cases each had formal Partnership arrangements with various representative bodies which variously enabled community involvement in setting targets and developing programs to meet these targets.

Concern was expressed in Germany about the increasing electricity usage in households despite the improvements in energy efficiency of housing, which would predominantly address gas or oil for heating (DE09001). There was also concern raised by participants

from cases in all three countries that private motor vehicle ownership and transport energy usage was increasing (AU09002; AU09003; UK09001; DE09002), although the participant in Freiburg (DE09001) stated that their passenger vehicle transport usage rate was the lowest in Germany, a statement supported by the participant from Augsburg (DE09002).

Table 6.13 Analysis of LG capacity to act in relation to LG initiatives

		Mayoral levers				
Policy Silos / Initiatives	**No. of LG**	**Rulemaking**	**Regulatory oversight**	**Direct expenditure procurement**	**Financial incentives**	**Information gathering & dissemination; convening / facilitation; advocacy**
Electricity supply, distribution and use						
Home energy audits	4			4		4
Energy audit kits Energy meters (power-mate meters)	5			5		5
Rebates / subsidies for energy conservation	2				2	
Over-flight and drive by thermal imaging	1			UK09003		UK09003
Land use planning						
Stricter planning framework	4	4	4			
Climate protection in urban planning	1					AU09001
Design of new suburbs to improve energy efficiency	2					2
Smart Energy Zones	1					AU09002
Transportation						
Improved walking and cycling tracks	6	6	6	6		
Improved access to public transport	5	5	5	5		5
Advocate for public transport improvements	5					5
Car club	3	3				3
Care4air	1			UK09001		UK09001
Vehicle stars scheme	1					UK09001
Schools program	1					UK09001
Electric vehicle charging points	1			UK09001		UK09001
Travel plan officers	1			UK09001		UK09001
Cycle to work scheme	1					UK09001
Bike loan scheme	1			UK09001		UK09001
District energy and on-site thermal energy						
Local community based energy provider	2					2
Local Energy Studies	5					5
Provide incentives for local renewable energy schemes	1				AU09002	
Easy Being Green	1				AU09002	AU09002
Housing and energy information database	1					UK09003
Solar resource map	1					DE09001
Building design and codes	5	5	5			5
Energy efficiency in council owned housing	3	3	3	3		3
Waste and other forms of embodied energy						
Recycling services	8	8	8	8		8
Organic waste	3	3	3	3		3
Water delivery and treatment						
LESS program – water saving shower heads	1			AU09002		AU09002
WaterWatch	1			AU09002		AU09002
Water sensitive urban design	1			AU09002		
Assist developers – integrate energy and water efficiency/conservation	1					AU09001
Energy-related economic development						
Facilitate bulk purchase of SPVs/SHW	1					AU09002
Physical or technical assistance -installation	4			4		4
General energy governance practices						
Involve local communities in deciding the appropriate mix of energy solutions	1			DE09001		
Associated with Solar Cities	1			AU09001	AU09001	AU09001
Information - reduce GHGs	7					7
Sustainability Street	1					AU09002
Challenge to change program	1					AU09002
Forums for community groups	7					7
Shop-front or drop in centre	1			UK09001		
Climate Change Risk Assessment	1					
Community transport strategy	1					

Note: while the number of LG cases in each cell are provided, the intensity of colour shading also provides a visual indication of the number of LG cases

6.5 Ideal actions of local government to address climate change

Similarly to Phase 1 of the research, the participants were asked to nominate the ideal measure or process that LG cases could take to have a positive impact on climate change. Their responses are summarised in Table 6.14. It is clear from the responses of staff participants of Australian and UK cases in particular that they are aware of many types of actions which could ideally be undertaken to address climate change. These responses also indicated that multiple actions to address climate change were thought to be needed. In contrast, ideal action nominated by the participants from the German cases focused solely on renewable energy as the ideal way to address climate change. One of the German cases indicated that renewable energy should supply 100% of energy used by their community, while six LG cases in total mentioned the need for greater incorporation of renewable energy sources into the mix of energy used by its community.

The UK and Australian cases focused on information, education and awareness raising programs while partnerships to address climate change were mentioned by staff from three cases. Two of the UK LG cases indicated that these partnerships would be needed to implement energy efficiency programs. For the Australian cases, planning mechanisms such as addressing building design and urban form were frequently mentioned by participants while action to reduce transport related carbon emissions also rated highly in responses from these cases.

6.5.1 Capacity for ideal action

The ideal actions for LG to address climate change have also been mapped against the mayoral levers using Hammer's Capacity to Act Matrix. The results are presented in Table 6.15. Many actions link to information gathering and dissemination, convening/facilitation and advocacy. Rulemaking and regulation relate to planning policy mechanisms such as Development Plans (South Australian cases) or the Core Strategy (UK cases) and therefore address new developments only. There is some progression towards increasing capacity through financial incentives to subsidise emerging technologies and direct expenditure for access to walking and cycling infrastructure. One case (UK09003) suggested incentives for reducing carbon emissions be provided and that they be linked to council taxes. Within this framework, one participant saw that LG would have a role as a carbon broker and would be trading carbon emissions on behalf of its community.

Table 6.14 Ideal measures for LG to address climate change

Policy Silos / Ideal measures	AU09001	AU09002	AU09003	UK09001	UK09002	UK09003	DE09001	DE09002
Electricity supply, distribution and use								
Monitor and timely feedback of household & suburb energy use & GHG emissions		✓						
Provide replacements - lights		✓						
Facilitate energy audits - in peoples homes		✓						
Seek funding - support low income individuals - energy efficiency programs	✓							
Partner in energy efficiency programs				✓	✓			
More power over energy efficiency						✓		
Improve efficient use of resources			✓					
Land use planning								
Locate new housing close to public transport and facilities		✓						
Stricter planning framework - energy efficiency in Development Plan	✓		✓					
Increase density	✓							
Low energy zones						✓		
Transit Oriented Development	✓		✓					
Carbon Park new development project			✓					
Develop sustainable built environments responsive to climate change			✓					
Transportation								
Bike storage areas close to bus stops		✓						
Advocate - public transport improvements	✓	✓						
Improve bike and pedestrian access	✓		✓					
Electrify and extend rail line			✓					
Shift to low greenhouse emission modes			✓					
District energy and on-site thermal energy								
Local information	✓							
Subsidies for emerging technologies	✓							
Renewable energy			✓	✓	✓	✓	✓	✓
Community-owned renewable energy projects			✓					
Advocate for State and Federal Govts - continue financial incentives - renewables			✓					
Building design and codes								
Encourage developers to raise the bar – re energy efficiency – construction	✓							
Develop high performance green standards for building design, construction and operation			✓					
Waste and other forms of embodied energy								
Continue waste and recycling services - waste minimisation and recycling of waste			✓					
Water delivery and treatment								
Energy-related economic development								
Local skills and jobs						✓		
Provide land for the next generation of low-carbon industries			✓					
General energy governance practices								
Information & education & awareness	✓	✓		✓				
Provide educational brochures on what is achievable		✓						
More advocacy and practical initiatives		✓						
Management system – business approach				✓				
Partnerships		✓		✓	✓			
Decisions that reflect sustainable practices	✓							
Link energy use to taxes on property						✓		
LG as Carbon broker						✓		
Climate change risk assessment			✓					
Marketing and communication program - promote low emissions destination for residents, business and investors			✓					
Support community leadership in sustainability action			✓					
Define roles for LG			✓					

Table 6.15 Analysis of capacity to act in respect of ideal measures

		Mayoral levers				
Policy Silos / Ideal measures	**No. of LG cases**	**Rule making**	**Regulatory oversight**	**Direct expenditure procurement**	**Financial incentives**	**Information gathering & dissemination; convening / facilitation; advocacy**
Electricity supply, distribution and use						
Monitor and timely feedback of household & suburb energy use & GHG emissions	1					AU09002
Provide replacements lights	1			AU09002		AU09002
Facilitate energy audits - in people's homes	1					AU09002
Apply for funding to support lower income individuals to implement energy efficiency programs	1					AU09001
Partner in energy efficiency programs	2			2		2
More power over energy efficiency	1					1UK09003
Improve efficient use of resources	1					AU09003
Land use planning						
Locate new housing close to public transport and facilities	1	AU09002	AU09002			
Stricter planning framework - energy efficiency in Development Plan	2	2	2			
Increase density	1	AU09001	AU09001			
Low energy zones	1	UK09003	UK09003			
Transit Oriented Development	2	2	2			
Carbon Park new development project	1	AU09003	AU09003			
Develop sustainable built environments responsive to climate change	1	AU09003	AU09003			
Transportation						
Bike storage areas close to bus stops	1		AU09002	AU09002		
Advocate - public transport improvements	2					2
Improve bike and pedestrian access	2			2		
Electrify and extend rail line	1					AU09003
Shift to low greenhouse emission modes	1					AU09003
District energy and on-site thermal energy						
Local information	1					AU09001
Subsidies for emerging technologies	1				AU09001	
Renewable energy	6	6	6			6
Community-owned renewable energy projects	1			AU09003		AU09003
Advocate for State and Federal Govts - continue financial incentives - renewables	1					AU09003
Building design and codes						
Encourage developers to raise the bar – re energy efficiency – construction	1					AU09001
Develop high performance green standards for building design, construction and operation	1	AU09003	AU09003			
Waste and other forms of embodied energy						
Continue waste and recycling services - waste minimisation and recycling of waste	1	AU09003	AU09003			AU09003
Water delivery and treatment						
Energy-related economic development						
Local skills and jobs	1					UK09003
Provide land for the next generation of low-carbon industries	1	AU09003	AU09003			
General energy governance practices						
Information & education & awareness	3					3
Provide educational brochures on what is achievable	1					AU09002
More advocacy and practical initiatives	1					AU09002
Partnerships	3			3		3
Link energy use to taxes on property	1	UK09003			UK09003	
LG as Carbon broker	1	UK09003			UK09003	
Marketing and communication program - promote low emissions destination for residents, business and investors	1					AU09003
Support community leadership in sustainability action	1					AU09003
Management system – business approach	1					
Decisions that reflect sustainable practices	1					
Climate change risk assessment	1					
Define roles for LG	1					

Note: while the number of LG cases in each cell are provided, the intensity of colour shading also provides a visual indication of the number of LG cases

6.5.2 Barriers to taking ideal action

The staff participants were asked to explain the barriers that would prevent them from implementing the ideal actions to address climate change that they had nominated. The responses have been summarised for each LG case and barriers have been categorised as organisational, political, economic, technological or social. The results are presented in Table 6.16. Cases AU09001, UK09001 and UK09003 identified organisational barriers to taking actions. These barriers included access to information, the culture of the LG organisation, planning to address climate change, awareness and skills of staff, and cooperation across the LG organisation. Political barriers were raised by two of the Australian cases and all three UK cases. These barriers included a lack of willingness on the part of politicians to take action, complex funding application processes at higher levels of government, long timescales for changes to planning policy at local level and lack of expertise outside of industries with vested interests, eg the coal industry in the UK. The lack of partnerships across levels of governments was mentioned as a barrier by AU09001. Only one case (AU09002) did not mention the economic or financial implications of taking action on climate change as a barrier. All other cases indicated that cost of taking action such as implementing renewable energy projects is the main barrier for their LG. The current models for financing projects were not considered to be appropriate for LG to make a positive impact on climate change. Technological barriers were raised by only one Australian case (AU09003) and one UK case (UK09001). These barriers related to the lack of down-scaled local data being available and inadequate space for large scale renewable energy projects such as wind energy at the local level. Only two cases identified social issues as key barriers – AU09001 considered that there was an unwillingness to take up actions by the community, while UK09001 was concerned about the impact on residents of energy auditors and other tradespeople entering the homes of residents to implement measures.

Table 6.16 Barriers to taking ideal action identified by LG staff

	Barriers identified by staff of LG				
LG ID	**Organisational**	**Political**	**Economic**	**Technological**	**Social**
AU09001	Access to data/locally specific information;	Working partnerships with other Govts	Tight financial outlook for council		Competing interests/priorities within community Willingness and ability to take up measures
AU09002		Lack of political will! Jurisdictional and institutional barriers.			
AU09003			For mitigation it is Money	For adaptation the downscaled/ regional level/scale climate change projections / impacts	
UK09001	No dramatic improvement to housing in LG plans; New planning policy; Culture – stuck in the last century; Need expertise and awareness - resources	Not easy – takes a long time	Cost PV most efficient but expensive - loans for renewable – LG can't afford Different models for financing are important	Space for large renewables; Small wind - difficult in urban areas; Visual impact (wind); PV most acceptable; Developers opting for SWH	How people feel about someone coming into home; Willingness to act – do work
UK09002		National government - applications for funding should be improved	Lack of better funding support; More financial incentives needed		
UK09003	Need cooperative approach	LG no power - influence only; Lack of expertise without vested interests in 'old coal'; Need admission of problem and willingness to work on this issue	Issue in funding long term infrastructure projects		
DE09001			Cost.		
DE09002			Economic - it is really difficult to switch from coal to renewables.		

6.6 Role of local government to assist households to reduce energy use

The staff participants were asked for their opinion about the role that LG had to assist households to reduce energy use in their homes and for their transport choices. Participants provided responses to the questions about the role of LG by specifying on a scale of 1 to 4 where 1 is no role and 4 is a major role, where they would rank the role of LG to assist households to reduce energy use. Their responses have been compared in Tables 6.17 and 6.18 for household energy use and for transport energy use, respectively. The staff generally responded that LG had a minor or moderate role, although some staff from the UK cases indicated that LG had a major role to provide assistance to households to reduce energy use, particularly in their homes. While there is a slightly more consistent response to specifying LG's role to assist households with their transport choices than was evident for its role to assist in reducing household energy use, variability is still observed within each LG case where multiple staff provided opinions. The reasons for these responses have been explored during further questioning of participants and these responses about the role of LG to assist households have been analysed further during the Thematic analysis of interview transcripts and questionnaire responses in the section 6.7.

Table 6.17 Role of LG to assist households to reduce energy use in homes

LG ID (number of staff)	Number of staff who indicated			
	No role	Minor role	Moderate role	Major role
AU09001 (n=5)	1	2	2	
AU09002 (n=4)			3	1
AU09003 (n=1)			1	
UK09001 (n=3)		1	2	
UK09002 (n=1)				1
UK09003 (n=2)				2
DE09001 (n=1)		1		
DE09002 (n=1)		1		

Table 6.18 Role of LG to assist households to reduce energy used for transport

LG ID (number of staff)	Number of staff who indicated			
	No role	Minor role	Moderate role	Major role
AU09001 (n=5)		1	3	1
AU09002 (n=4)		1	3	
AU09003 (n=1)		1		
UK09001 (n=3)			2	
UK09002 (n=1)				1
UK09003 (n=2)		2		
DE09001 (n=1)			1	
DE09002 (n=1)		1		

6.7 Thematic analysis of interviews

The Thematic analysis of interview transcripts and questionnaire responses was undertaken during January 2010 and the results are also presented in Tables 6.19 and 6.20. The methods used to undertake the Thematic analysis were described in section 3.2.6.3. The factors arising from the Thematic analysis have been grouped into five themes: organisational; political; economic; technological and social. These five themes are used as a basis for discussing the findings of this research in Chapter 6 together with the Findings identified through the Multiple Case Study Analysis from the application of Stake's (2006) methods which are presented in section 6.8.

6.7.1 Organisational factors

Participants revealed a number of issues related to the drivers for LG action in response to climate change, as well as knowledge, skills and systems which indicated that the organisation itself was a key factor in LG supporting the community to address climate change. The organisational issues raised by participants that are summarised in Tables 6.19 and 6.20 related to: core functions of LG; diverse responsibilities; the role of LG; leadership by LG; planning; people resources; the organisational culture; and the need for networks. The responsibility and role of LG to mitigate climate change was variously established or supported by legislation. However, in each country the level of authority afforded LG differed. For instance in, Australia, LG is not recognised in the federal constitution, and are reliant on the state jurisdictions for defining their responsibilities and for approving funding, particularly the rates and fees that LG can collect from its citizens and local businesses to deliver services. The pressure on LG in Australia to deliver more

services on behalf of the State and the cost shifting from higher levels of government was evident in this study by the increased community demand for extra services as a key issue (e.g. case AU09001) and the identification of a lack of funding as a key barrier to implementing 'ideal' action to address climate change.

From the cases studied in this research, the potential additional costs of the emergency response required to address extreme weather events arising from climate change were also seen as a driver for adapting to rather than mitigating climate change, as evident in the following comment:

> As an authority we have costed out some of those (extreme weather impacts) for the last five years and we are going to look at those in terms of UK projections data, the science that tells us what we can expect for the future, and say look if we just keep reacting to those as emergency scenarios in the way we have been doing then they are going to cost us this amount, this amount and this amount escalating - on an escalating scale between 2010, 2015, 2020, 2040, 2050. However if we are spending that much on treating it as an emergency response, what would it cost us to do the adaptation work that meant we would be 'fit for purpose' when they hit us (UK09002 Participant 1).

Australian cases had identified water supply, drought, heat stress and other impacts on infrastructure and facilities as driving risk assessments by LG cases. Two of the UK cases had identified flooding and heat stress as key impacts, while the third identified extreme wind events and extreme snow-falls as climate change impacts. For both of the German cases and also for one of the UK cases, there was relatively less concern about the need to adapt to climate change as they were not experiencing impacts of climate change related to drought, heat stress, or extreme weather events. Instead, the focus for these cases was directed towards 'sustainable development' and wise use of resources. Within this debate, the 'reality of climate change' was still an issue for some LG cases in Australia, as indicated by the following:

> It's a big council …. so you are going to have differences of opinion (AU09003 Participant 1);

> Many of our Councillors are climate change sceptics (AU09002, Participant 2).

The responsibility for managing climate change programs within some LG cases was spread across the organisation. From the results of the analysis of the title of the position occupied by the participants from Phase 1 of the current research, climate change was linked to one or a combination of three key areas of responsibility: the environment (environmental health - particularly air quality); sustainability (sustainable development); or planning (strategic or environmental). In most of the LG cases in Phase 2, climate

change responsibilities were either already within or were transitioning to a sustainable development or sustainability function within the organisation. The justification for treating climate change as an issue for sustainability was perhaps best summarised in the following statement from one UK participant:

> Initially I think the task for us is to make sure that the people responsible for the economy realise that climate change is not an environmental issue- it's an economical issue (UK09001 Participant 1).

In the German LG cases, one participant explained that LG's commitment to act on climate change was a direct result of their commitment to sustainability, stating:

> I think it is because … we have this commitment to this sustainability. That is whatever you do, do it in a way that can be sustained (DE09001 Participant 1).

While participants identified advantages in linking climate change action to sustainability including raising its profile in the organisation, some disadvantages were also identified by participants. One disadvantage relates to the historic positioning of climate change mitigation with air quality through reducing GHG emissions to air. The focus on air quality in both the UK and Germany, which dates back to the 1980s, had been successful in achieving significant air quality improvements in cities. The programs and legislation targeted sources such as industry, domestic heating systems, transport systems and vehicle emissions. For two of the UK cases, the repositioning of climate change to the area of sustainable development highlighted potential tensions inside the organisation. Participants referred to examples of grants provided to schools to replace coal, oil or gas fired boilers with biomass fuelled boiler systems. These same schools, which in the UK are a responsibility of LG through arm's length management organisations (UK09003 Participant 1) would then need to be supplied with wood chips or pellets transported at considerable cost and with associated carbon emissions for transport energy used (UK09001 Participant 4). The participants were also concerned that biomass fuelled boiler systems may produce emissions which could adversely affect local air quality, hence adversely affecting some of the improvements that environmental health departments had been delivering. Thus, participants were concerned about the consequences of a new structure, and that technical expertise may not be incorporated into decision-making about appropriate actions to reduce carbon emissions across the community.

Within this sustainability agenda, action to mitigate climate change was driven and supported by targets for carbon reduction which were being voluntarily set by LG in Australia and Germany. However, targets had been set at the national level and then via

regional strategies in the UK and were being devolved to the local level. In the UK, the system of National Indicators (NIs) and local area agreements (LAAs) had developed three NIs (185, 186 and 188) which related to climate change. The absence of a top down structure for LG to set community carbon emission reduction targets in the Australian and German cases is a barrier for LG action at the community level. In spite of LG targets for carbon reduction at the corporate level for all cases in Phase 2 of this research, and while climate change itself was apparently a key issue, the consequent allocation of resources and development of action plans to address climate change, both adaptation and mitigation, was problematic with internal tensions expressed in comments such as:

> I am only a part of the local government, and it (climate change) is important in papers and planning - very important. Money - it is lower. Financial commitments are really difficult. (DE09002 Participant 1)

The incorporation of regionally imposed targets and the consequent incorporation of these targets into hierarchical plans generated within, say, a planning department, may have a 'planning perspective rather than a wider corporate (perspective)' (UK09001 Participant 2). However, even within the planning department of one LG, the changes resulting from commitments to reducing carbon emissions required 'having our own internal discussions … about what the priorities are because you can't necessarily expect people to achieve everything, particularly with the economy the way it is at the moment' (UK09001 Participant 2). Hence there were acknowledged organisational change management implications arising from targets and initiatives to reduce carbon emissions. The frustration of different perspectives across the organisation was evident in the comment by one participant that 'some departments are stuck in the last century – business as usual – out-dated approach to change of procedures, inflexibility' (UK09001 Participant 1). This participant was extremely concerned that their LG's organisational culture was inhibiting its rapid adoption of new ways of monitoring energy use which would be needed for new reporting and trading of carbon emissions in the UK's carbon reduction commitment. They expressed the following comments about what was holding their LG back:

> We have apparently a very unsophisticated and very old and dusty recording of utility bills - we have not all the meter readings and you must have all the half hour meter readings to do all of this and apparently our energy unit is still working in the last century - it will be very difficult to get all the data (UK09001 Participant 1).

In spite of the organisational cultural issues, responses from other participants in two UK cases indicated the presence of formal and informal networks across the organisation, which they thought helped in taking action across the organisation:

> We are split up into little teams but the teams do a lot of cross referential work. A lot of us do have specialist background like myself as well as doing generic sort of cross-cutting work. It seems to work, …… it's a quite strong and solid team, it's a team that's built on the back of a reputation for excellence (UK09002 Participant 1);

> An eco-audit for each team might be sent to say my manager and it would get filtered through to me. But just because I have been here for 3 and half years, I know all these people, I know everybody that deals with similar things to me in different capacities in different parts of the council. I do work quite closely with […]'s team for instance and the guy that does that (eco-audit) I just met him at different events and meetings and things, so I guess it happens organically (UK09001 Participant 2).

From the review of responses from cases in all three countries, LG competes for funds and for recognition of its action to address climate change. Competition and prestige were highlighted in some participant responses as being a motivator for taking action – to be the 'Greenest City in Europe' (DE09001); or to be a 'Beacon Council' (UK09002). Freiburg (DE09001) was mentioned by participants in LG cases in both the UK (UK09001) and in Australia (AU09002; AU09003) as demonstrating best practice. The participant from Freiburg mentioned that Munich and some smaller LG authorities in Germany were offering some good ideas which larger LG authorities could benefit from studying. In the UK, the participant from Kirklees Council (UK09002) professed their LG to be an exemplar in a number of areas including: SPVs; wind energy; energy efficient improvements for housing; and in their corporate approach to carbon reduction, carbon accounting and adaptation to climate change. They stated that:

> We have got a reputation for excellence in that we lead in the European Environmental Management Systems work, and we advise other local authorities in that as well as some businesses (UK09002 Participant 1).

Participants from the other two UK cases also nominated Kirklees as exhibiting best practice, although other UK LG authorities were also recognised as leading in climate change action in some areas. One participant expressed an opinion that none of the LG authorities in the UK were taking action across all areas related to climate change (UK09003 Participant 1), which may indicate that each LG was taking a strategic approach in focusing their action. This participant also commented that managers from the eight largest cities in the UK were meeting regularly to discuss their actions on climate change and to learn from each other about the types of programs being implemented. Hence there was evidence of a network for sharing information across some UK LG.

While membership of the European Union (EU) adds a layer of complexity to LG in both the UK and in Germany, it also enables LG to compete for money from the EU for undertaking programs at the city-wide level, although in the opinion of one participant

(UK09001 Participant 1), the opportunities provided by EU membership had not been fully exploited, as evident by the comment that:

> The Climate (Change) Alliance in Frankfurt have not a single UK member. They've got thousands across (Europe) (UK09001 Participant 1).

Not only does LG develop and utilise internal and external LG networks, it draws on a wider network or structure of actors working across the community, and one participant stated that 'the number of services that local authorities have which touch people's lives … could be used to lead behaviour change' (UK09003 Participant 1). LG departments and the UK LG cases used partnerships to oversee the delivery of services for the community and variously manage council owned social housing, parks and gardens, community owned facilities and infrastructure. Each of the departments and partners of LG may then be required to contribute to the achievement of the externally imposed targets, adding to their core responsibilities. While one participant thought that there was potential to use the wider network to facilitate action across the community to 'make it easy for people to choose to be low carbon', they indicated that this would only occur if 'you could persuade all of the service managers … to understand how they contribute to the climate change in the community' (UK09001 Participant 1). The informal influence of some staff within the organisation and also the influence of networks and partnerships external to the LG were used to demonstrate leadership by participants in two of the UK cases (UK09001 Participant 2; UK09003 Participant 1).

The informal institutional frameworks that were developing not only used resources from within the organisation, but reflected the establishment of networks and partnerships with external groups, the sharing of information and resources, and an increased capacity for action. The recognition that LG could not do it on its own, and needed to tap into other resources and knowledge was expressed by one participant through the comment that 'Kirklees is very green, but it is not an island' (UK09002 Participant 1) while another participant noted that:

> …it's always useful to know what other people are doing. I just ring people up and say what are your new planning policies going to say, and it's always useful to just have a chat through....I have spoken to the guy at Merton and he was really, really helpful and he talked me through what they were doing (UK09001 Participant 2).

The reliance on informal networks can also have its disadvantages with participants commenting that:

> We did have a really good website for a while – it was called the Merton-Rule.org … and it had a list of all the authorities that were planning to implement good renewables

> policy but the website has disappeared. So I'm struggling a bit more these days (UK09001 Participant 2);
>
> Victoria's got a better – their LGA arrangement's got better project support, and the councils there work better regionally than we do here (AU09003 Participant 1).

The latter comment indicated the need for LG in Australia to work regionally, but that it was proving to be more difficult for some LG than others. The Victorian LG case (AU09002) had been part of a 'Greenhouse Alliance' which involved nine LG authorities working together to develop and implement programs to reduce carbon emissions at the local level.

In summary, from an organisational perspective, LG's role was seen as leading the community towards a low carbon future by being an example to the community: setting goals, planning for reducing energy use, procuring low carbon products and services and establishing formal and informal networks or structures, both internally and externally, to deliver community carbon reduction.

6.7.2 Political factors

The analysis of issues summarised in Tables 6.19 and 6.20 highlighted a number of political issues which relate to: accountability; willingness for politicians to act; and the need for brave actions. Political structures exist within LG and the influence of political ideology on local politics was most evident in the UK and Germany cases. Other than the mention of the word 'democracy' by one Australian participant, political party ideologies were not discussed in responses from Australian LG in either Phase of this research. In the UK cases, all participants interviewed commented about the frequency and impact of LG elections, with changes in political party controlling the types of programs being supported. These changes in political party at the local level trigger a review of the LG's current strategic plan and the vision statements, with the liberal democratic focus in one council being 'everyone matters', a change from area based initiatives focusing on improving equity in areas of deprivation in the previous Labour Party LG (UK09001). In another case (UK09003), two political parties formed a coalition to gain control of LG decision making, alternating the leadership role through the term of government, with political conflict evident in the following statement:

> The current Lib Dem leader has been the leader of the Lib Dems for a year and a half or so and has been the leader of the council twice now and he is personally very passionate about climate change and he has been quite happy to stand up in front of quite hostile audiences and represent the council and his party in terms of the what we

> are going to do on climate change – he has given us quite a big focus on climate change and he is doing a lot of work to influence the senior members of council. (UK09003 Participant 1)

Within the UK and German LG cases, the political ideologies were clearly evident and reported on corporate websites. In Australian LG cases, while there was less evidence of political ideology and none of the participants indicated that local politics was an issue, the decisions of state and federal politicians were being criticised.

Similarly in the UK cases, past decisions of central government had removed some functions from LG as was revealed in the following critical comments:

> It (public transport) was deregulated in the 1980s but before then everybody went everywhere on the bus because it just cost pence. (UK09001 Participant 2)

> Local government in the UK has had its powers sort of systematically stripped away over the years, whereas we used to really control a huge amount of the infrastructures and utilities in the local area, they have all been taken away and privatised and dealt with by private companies now. (UK09003 Participant 1)

Action to take back some level of local control, particularly with respect to transport and energy systems, was seen to be difficult, highly political and very costly. Comments such as the following were made:

> We are working to try and develop a much better public transport system but then the way it has been dealt with in the UK is the money you need to attract in comes with strings which are normally related to congestion charging or other demand management measures, so it's a big, big political issue to sort out transport (UK09003 Participant 1).

Accountability within LG had in some cases been established through assigning portfolios or establishing committees to address various aspects of governance, eg. environmental, sustainability and climate change issues. The structure may have been triggered by action taking place outside of the LG such as through statutory requirements of legislation (e.g. in Australian cases) that require specific committees to be formed or may have come from within the LG itself through a process of public scrutiny which was evident in the UK (UK09003 Participant 2).

The barrier of political willingness to address climate change was mainly raised by some of the Australian cases as in Phase 1 of this research (see Chapter 4). The cases from the UK and Germany appeared to have overcome this issue through assigning responsibility and accountability to take action to portfolios such as environment or sustainability with an obligation to then develop action plans and publicly report on progress. The resultant

structure supports politicians who were in some cases described as ‘brave’ for taking a strong stand for action on climate change (UK09003).

The use of the media and the creation of ‘stunts’ or of media attention generating action was also evident across the cases (UK09001, UK09003, DE09002) although rarely mentioned by Australian cases. Promotion of bike riding was referred to by one German case (DE09002) through the local politicians coming from all directions into the centre of the city – which was referred to as a ‘star’.

Grass roots activism within communities was mentioned by participants in most cases. The types of groups included Transition Towns, Carbon Action Networks, Carbon Reduction Action Groups, Renewables groups including a pro-wind lobby group, a Greenhouse Alliance and a group called Stop Climate Chaos. These groups were observed by participants to act voluntarily, garnering support from within the community for actions to address carbon emissions and then lobbying their LG for support for collective action. Some of these groups are part of a larger global network, enabling knowledge to be shared and providing further support for global activism. The power of belonging to a larger politically active network however did not always meet expectations. In one case, evidence of a change in ideology was provided in the following comment:

> We’ve got a very active Transition Town movement - …. it’s kind of borne out of Stop Climate Chaos …. they wanted to see something which is more about activity on the ground (UK09003 Participant 1).

Where there was action by grass roots groups or activists within a community, the evidence of action also manifested itself in the LG cases providing support to enable technological solutions to address climate change, eg assistance in development applications for renewable energy (UK09002), or meters to measure energy use in homes (UK09003). In one UK case (UK09001), a system of Community Assemblies was being established to provide the community with greater involvement in decision-making about local issues, including carbon reduction.

The urgency of the need for broad action by LG was highlighted by the following comment from one LG case:

> However green we became and however much we cut our own emissions, and adapted our own local authority area, if the people around us aren’t doing likewise and we are not working with them to support each other to do likewise then it’s too late. And that goes for each nation, it goes for Europe or Australasia or Asia or wherever. It’s something we have got to work together on and very fast. (UK09002 Participant 1)

Hence LG's position within a political structure that ranges from the local to the global is apparent and requires it to work in cooperation with other LG authorities and at higher levels of government to enable climate change to be broadly undertaken. The knowledge of local politicians about the urgency of climate change and their skills to foster cooperation while leading their own community may be critical to the broader adoption and success of initiatives to address climate change.

In summary, from a political perspective, the role of LG was seen as providing local politicians with skills and knowledge to understand the need for action to mitigate climate change. LG was also establishing mechanisms for holding local politicians accountable and responsible for developing action plans and publicly reporting progress to reduce carbon emissions.

6.7.3 Economic factors

The economic issues summarised in Tables 6.19 and 6.20 focused on: the cost of energy; green business; and economic opportunities arising from addressing climate change. As climate change was being viewed as an issue of sustainability, the drivers for LG action were often focused on the economic aspects of climate change, both in terms of opportunity and cost. The global financial crisis was of considerable concern to all LG cases but most particularly in the UK and Germany, with the impact on investment in new capital projects in each city being of major concern. Some participants stressed the opportunity to develop a green industry that would assist in the uptake of technology to reduce carbon emissions, thereby providing local jobs such as for installing and retrofitting renewable energy technology or energy efficient technology into housing. One LG was providing assistance to small land owners or rural land owners to enable development and uptake of renewable energy such as biomass (UK09002). Other actions by some LG cases were to support businesses that had an environmental focus (e.g. energy auditors, insulation contractors, architects) or were related to climate change education and research (e.g. universities, vocational skills development, consultants).

In Augsburg, Germany (DE09002), an economy focusing on the environment manifested itself in an annual renewable energy event for industry (RenExpo) to promote heating system technologies that use biomass and other renewable sources of energy. Freiburg, in Germany (DE09001), has long been recognised as the solar city of Germany and of most of Europe in part due to the industry that has developed around solar energy which ranges

from manufacture of SPVs, to education (DE09001). Institutions specialising in academic research and vocational education have established in the city as well as organisations such as the International Solar Energy Society and the ICLEI program both of which have their head offices in Freiburg. There is a pride and prestige that has developed through the label of being green and a solar city which has led to economic benefits through the tourism that has been generated from their sustainable development focus. In particular, the harnessing of renewable energy within parts of the city, particularly Vauban and Rieselfeld, has been identified as exemplary demonstration of sustainable development. The participant from Freiburg was adamant that they have a fully developed market and that LG only provides support to households to add renewable energy or improve energy conservation to renovations of existing homes. They also commented that their focus on sustainability across all sectors was resulting in population growth in their area, while other areas of Germany were experiencing decreasing population.

All cases considered the cost of undertaking initiatives to install renewable energy or upgrade energy efficient equipment to be a barrier to effective progress in reducing carbon emissions. LG cases in the UK had developed alternative sources of funding and were partnering with energy suppliers and building contractors to deliver energy efficiency programs such as free home insulation installation and energy auditing (UK09001; UK09002; UK09003). The economic and business models being employed in two of the UK cases (UK09001; UK09003) included the council as the lead agency with funding from energy providers and the council contracting the actual installation work out, while the other case (UK09002) had established performance based contracts with arm's length management organisations or service providers to deliver the services on behalf of the council, enabling the council to act as principal and oversee performance.

The UK policy for requiring the declaration of a building's energy performance on sale or change of tenancy legitimises the development of an industry to assess energy performance. However, concern was raised by one participant about the capacity for 'the industry' to support housing assessments with comments about 'not having enough assessors and having to be stratified in its delivery' and that LG were providing this assessment service under contract to landlords (UK09003 Participant 2). While the real estate market in the UK is regulated, requiring the assessment of the energy performance of a property at sale or lease, the information from these assessments is not provided to LG

cases. In the case of residential dwellings, this was an obvious frustration to a participant from one UK case who made the following comment:

> …the legislation for energy performance certificates in the UK, debars local authorities from the energy performance certificate data, so if we don't carry out Energy Performance Certification on our own property or for others they don't allow us to see it. (UK09003 Participant 2)

The varying responses of participants to questions about the importance of climate change to LG and the role that LG should be playing to support households to reduce carbon emissions clearly demonstrated dilemmas that LG were having in reconciling their role for tackling broad environmental issues at the local level while at the same time supporting economic growth and delivering social outcomes for their citizens.

In summary, the economic role for LG was seen as supporting industry to be part of the new clean technology solution, using less carbon intensive energy and providing products and services that enable the community to adopt clean technology.

6.7.4 Technological factors

The technological issues that are summarised in Tables 6.19 and 6.20 related mainly to: the acceptance of technology; and the availability of information about technology at the local level. From a technological perspective, the actions of LG cases in this study did not relate directly to the development of new technology. However, participants in the current research referred to various technological systems related to energy use and carbon emissions. These included: energy systems – the electricity grid, the gas pipelines across Europe, transportation systems, infrastructure for charging electric vehicles, infrastructure for public transport, systems for generating energy from renewable sources, systems of other technology (microwave signals) which prevented renewable energy (e.g. wind farms) from being developed, equipment to measure the energy use inside homes, equipment used inside of homes, as well as the internet and systems of communicating information about energy use.

Mechanisms to develop technologies that were mentioned in this study included incentives and rebates to build industry capacity followed by legislation to underpin a shift in the technology base. This approach was considered to be the best approach for transitioning to low carbon technology by Participant 2 from UK09003. Another UK LG (UK09001) had chosen to implement stricter energy efficiency housing policy in the short term than the

central government was requiring of LG cases in an effort to better prepare the industry for meeting zero carbon standards for new housing by 2016.

In Freiburg, an assessment of rooftops had indicated that 27% of energy demand for Freiburg could be theoretically supplied by SPV panels (DE09001 Participant 1). According to the participant, the methodology included an assumption that 50% of roof area of housing in Freiburg was potentially suitable for SPV panels. A review of the new Playford North development which incorporates redevelopment of state owned housing in case AU09001 revealed that all new and refurbished houses would require SWH systems, however, SPV panels were not mandated.

It was clear that providing information about energy efficient and renewable energy technologies was a priority for LG cases. Raising the community's awareness of new technology and increasing its visibility and desirability were considered by participants to be key factors in increasing the uptake of new technology. The visibility of new technology was being enhanced and promoted through various initiatives that relied on spatial mapping, demonstration projects, signage and social marketing. These initiatives themselves relied on technology to demonstrate the spatial representation of potential renewable energy resources and databases of information about the socioeconomic status of segments of the community. Hence technology was a mechanism used by LG to enhance the distribution of information to the community about the need to reduce carbon emissions and potential solutions.

In summary, from a technological perspective, the role of LG was to enable a technological shift at the local level toward a low carbon future, encouraging citizens to adopt new technology and higher standards required to make the shift.

6.7.5 Social factors

A number of social issues arose and have been summarised in Tables 6.19 and 6.20, including: differing local priorities; the identification of the need for a lifestyle shift; the emergence of grass roots initiatives within local communities; access and equity to solutions for carbon reduction; diverse attitudes of the community towards climate change; and cultural diversity within local areas within each case.

Social factors were most evident in the UK cases with programs based on the principles of 'everyone matters' or 'closing the gap' where the gap between rich and poor was being

bridged through providing free programs for installing home insulation to everyone, partially subsidised by the energy supply companies (UK09001). According to one participant (UK09003 Participant 2), housing policy in the UK was being structured around comfort and decent living standards, culminating in a definition of what a 'decent house' is. The inclusion of a heating system within the standard of a decent house rather than the previous indicator which, according to UK09003 Participant 2, was a power socket to enable a heater to be plugged in, had focused both public and private landlords on ensuring that each house is fitted with a heating system. The focus on ensuring a 'decent house' has also produced a structure of defining the energy performance of housing – known as a Standard Assessment Procedure (SAP) rating by which new owners or renters can understand how well each house performs compared to a standard. For LG, the introduction of SAP ratings had focused its attention on social housing or council owned housing within its local area and how these houses perform compared to the 'standard'. Each of the UK LG cases was working in partnership with social housing landlords and, in one case, private landlords (UK09003). The action of developing a classification of housing in terms of its energy performance characteristics, however this may be defined, had also resulted in a system of reporting to prospective homeowners and tenants through a home information pack. Problems had arisen, however, with the confidentiality of the house energy rating information and concern was expressed that it was not available to LG in the UK (UK09003 Participant 2).

From an analysis of transcripts of participant interviews and responses, the ability of LG to influence communities and individuals to change their behaviour and become energy efficient, or a user / supporter of renewable energy initiatives, or a user of public transport was considered to be a key factor in making progress on addressing climate change in the community. Social marketing mechanisms were considered to be important and for some participants the ultimate objective of their carbon reduction programs was to make a low energy life-style 'sexy and alluring'. An example provided by one participant was the advertising for a BMW car which they considered to be the pinnacle to which all LG advertising should aspire to address climate change (UK09003 Participant 2). Some participants referred to perceived problems when threats, gloom and risk of hazards were the primary means being used to motivate people to change their behaviour (UK09001; UK09003). The participants considered that a 'doom and gloom' approach may be a de-motivator for some people. In the Australian LG cases studied, the focus appeared to be on

making it easy (AU09001) and fun (AU09002; AU09003), in an effort to attract and engage the interest of the general public.

From an analysis of participants' responses to questions, social structures within their communities were evident. When discussing programs focusing on energy efficiency to reduce energy use by residents, participants referred variously to citizens as: working, not working, young, under 25s, school children, old, plus 50s, aliens, migrants, male, female, English speaking, non-English speaking, educated, affluent, deprived, owner occupiers or renters. These descriptors were then sometimes reflected in the priorities set by LG within segments of the community, such as the deprived, selected for receiving support to reduce carbon emissions and improve the warmth of their homes (all three UK LG cases). Each of the UK LG cases had identified spatial areas, or neighbourhoods, within their community where energy efficient home improvements needed to be undertaken. One case (UK09003) had compiled a database of information collected through surveys over many years.

> We have a very comprehensive home energy database, looking at energy use and building construction information across the whole of the area and we quite often make that information available to grant providers who are looking to target specific areas. So we provide intelligence to people who can then say "OK our grant fits well with the population in this area and the built form in this area" and ….. it's incredibly powerful. (UK09003 Participant 1)

Using this information, the LG could target the types of dwellings and focus their attention to maximise the benefit socially, financially and in terms of reduced carbon emissions. Some LG cases (UK09001; UK09003) were starting at the 'bottom' of the list (the deprived or most disadvantaged) for some programs such as free loft and cavity wall insulation while one of these (UK09003) was also tackling the 'top' of the list (the affluent) through an initiative to identify 'energy wastage'. Thus a structure in society was emerging which spatially linked affluence and the concept of energy wastage. This concept then legitimised action to 'show energy wastage' via images generated using over-flights and drive-by thermal imaging of these affluent housing areas. Maps of streets and neighbourhoods matched to thermal imaging results were then used to target residents advising them of their energy wastage which was revealed in the images (UK09003 Participant 2).

Concern was expressed that 'green aspirers' in the community were motivated more by doing something that was visible and image-making than being serious about addressing energy wastage and energy efficiency (UK09003 Participant 2). Examples were provided by UK09003 of inquiries about assistance to install solar panels on rooftops or a small

wind turbine, supposedly motivated by the visibility of this action to neighbours, rather than insulating the house which would improve energy efficiency but not be seen by others. LG cases in Phase 2 of this research acknowledged the diversity that exists within the community, and considered that it would be more difficult to develop this depth of understanding at broader levels.

One of the UK cases had been providing information to residents annually through a calendar, but had found that the complexity in the energy markets, such as multiple energy supply companies and the introduction of peak and off-peak energy charges, was making the provision of information about energy costs too difficult to keep up-to-date (UK09003). Conducting energy audits and providing energy meters which citizens could borrow (from libraries) to test the electricity being used by appliances in their homes were examples of initiatives being used by most cases to highlight opportunities for energy savings. Reference was made by participants from UK09001 and UK09003 to the potential for unscrupulous door-knocking and so-called 'dodgy' sellers of energy efficiency products to residents who may lack the 'knowledge' about the standards for such products. The potential for this practice had resulted in these cases choosing to undertake the door-knocking themselves, claiming that the LG are a 'trusted entity' which would protect their citizens' interests, taking the responsibility and risk for ensuring the need for and the quality of the work undertaken. This role for LG was not mentioned by cases in either Germany or Australia.

One area of significant influence however was in the design of new developments to address access to local services and activities. Each LG case in Phase 2 had at least one example of a new development or redevelopment underway or being planned, however the degree to which these developments incorporated renewable energy, energy efficiency, and improved access to public transport varied significantly. Links were being made between lifestyle, low carbon or low energy neighbourhoods and ethics or attitudes with comments about the type of people who live in or are attracted to these neighbourhoods.

The difficulty in providing public transport in low density and disconnected areas was noted in all three Australian cases and was typical of the majority of urban areas in the two states surveyed in Phase 1 of this research. Many participants referred to the increasing levels of ownership of motor vehicles in the UK attributing this to the privatisation of public transport services and increases in cost which affected the attractiveness of public transport as a viable option. Comments regarding the attitude of residents towards energy

used for transport focused on the difficulty in getting people out of their cars once they had purchased their car and that the increases in fuel costs in 2008 achieved much more than any other behaviour change program was able to do.

The culture of cycling in the German cases was higher particularly in Freiburg where the cycling behaviour of elected members was not considered to be 'leadership' but was the norm for the community (DE09001 Participant 1). Actions within UK LG cases indicated that some effort was being made to promote cycling as a way of getting to work (UK09001) and infrastructure for cyclists and assistance in planning travel routes which were bike friendly were thought to be helpful to citizens to make the change (UK09001) but that the motivators were cost of fuel for running a car rather than reducing carbon emissions (UK09001; UK09003).

Examples of social action included: the establishment of city farms where small groups could learn about sustainable living practices (UK09001); resident groups which assisted LG cases in local decision making (UK09001; UK09002); and organised forums in public places (UK09003; AU09002; AU09003). Where one-to-one in home approaches were being adopted, these were as a result of an in-home consultation such as an energy audit conducted for the free insulation schemes in all three UK cases. A travel planning service where a LG officer visits a citizen in their home to assist them in finding a low carbon solution to their travel patterns had also been undertaken by one LG case (UK09001). While there were examples provided of environmental groups taking action in addressing climate change, the social housing and residents groups in the UK also appeared to be taking some action in these areas through their involvement in Partnerships, which were mandated to deliver action for Local Area Agreements (UK09001 Participant 1).

The financial savings to the local community were clearly seen by LG cases as being a prime motivator for taking action, with transport mode switching identified as a result of fuel price increases in the UK. However, as was noted in this research, the local data on energy consumption and carbon emissions was not available in the Australian and German cases. One participant (UK09003 Participant 2) suggested that a council tax related to the standard of energy performance of each building should be imposed and that this should be related to carbon emissions of the house.

In summary, at the social and local community level, LG was seen to have a key role in providing information and opportunities for the adoption of new technology linking lifestyle to low carbon outcomes.

Table 6.19 Thematic analysis of interview transcripts – summary of cross case analysis

Factor	Ideal World	Barriers	Enablers	LG action	Central / State Govt action
Organisational	Accountable Strategic Visionary leadership Flexible Cross disciplinary Opportunistic Innovative Local workforce	Core functions Diverse responsibilities Not LG role Short term internal thinking Lack of commitment at senior level Lack of resources Lack of skills Staff may not have local focus	Vision Targets Incentives Performance contracts Community focus Networks and internal champions Transparency	Educate and skill staff Develop policy position and action plan Assign responsibility Provide resources Encourage innovation –cross-disciplinary teams Look outside for ideas	Devolve responsibility to LG using targets Provide funding on basis of commitments and performance Facilitate networks across LG cases Provide data to LG
Political	Willing to act Brave	Short term thinking Not supportive of climate change Vested interests	Assign portfolio	Educate and skill elected members Develop policy position and action plan	Devolve accountability to local politicians / LG
Technological	Renewable Energy Technology Energy efficient housing Public Transport	Cost of energy Cost of technology Knowledge of what to use Acceptability Poor quality/reliability Access	Advisory service Incentives / rebates Data about performance (in $$)	Provide advice Provide service for home assessments Arrange installation of new technology and energy efficiency measures Distribute funds / incentives Support local industry – procure locally Urban & house design standards/policy	Provide funding Urban & house design standards/policy
Economic	Green business Opportunistic Local workforce	Old ‘coal’ thinking Cost of energy Procurement practices	Forward thinking Partnerships Demonstration projects	Establish partnerships for green businesses Local procurement of services Ensure framework for business – eg energy policy	Provide assistance to develop green industry Provide data on local vs other product Set standards or targets – eg renewable energy
Social	Low carbon lifestyle Engaged community Equal access to initiatives Live and work locally Community ownership and empowerment	Local priorities Attitudes Diversity Language Age Disability Who to trust Social practices	Encourage grass-roots initiatives Support local community based demonstration projects Use local champions Support schools education Transparency	Provide officer for grass-roots initiatives Go to community for ideas Use sophisticated social marketing Build trust in LG for delivering best advice and high quality services Gather and disseminate carbon emissions and energy use data	Provide funding Empower LG to develop community governance capacity

Table 6.20 Thematic analysis – summary of revelations / signs across cases

Factors emerging	Organisational factors/ role of LG	Political factors	Technological factors	Economic factors	Social factors / local issues
Aspects	Role of LG	Political willingness	Technological shifts	Cost of new technology	Climate change impacts – local priorities
	Targets, performance measurement	Accountability	Policy to promote adoption of new technology	Jobs	Leadership – grass roots
	Leadership in LG	Leadership	New Technology – Energy supply - SPV; Wind; Gas-fired boilers; wood chip and wood pellet boilers;	Skills	Local activism – grass roots
	Networks – internal / external	React to Activism	New technology in buildings - low energy buildings	Industry / Business development	Attitudes to energy use and ways of living / travelling / working
	Partnerships – internal / external	Incentives = votes?	New technology in appliances – energy efficiency	Incentives / rebates	Social policy to promote / support low carbon 'lifestyle' – access to funds & information
Solutions	Measure and report	"Brave"	Incentives and rebates to build industry capacity then legislate to underpin shift	Economic base shift	Lifestyle shift –?
Funding needs	Central funding linked to performance	Supporting and incentivizing brave politicians	Funding low energy technology (Energy company & central / LG)	Funding low energy industry (Attracting Venture Capital and Developers)	Funding lifestyle shift (attracting people to live in low energy neighbourhoods)
Manifestations	Visibility of performance and taking action	Visible Leadership	Visibility of technology - demonstration	Visible incentives until regulated	Green aspirers? – motives? Is it fundamental or to be seen to be doing the 'right' thing? - Image
Role for LG	Lead community	Provide local politicians with skills & knowledge	Policy to be performance based – requires technological shift	Framework for business and partnerships	Provide information and incentives eg council tax based on building performance

6.8 Stake's Multiple Case Study Analysis

In addition to the Thematic analysis, Stake's Multiple Case Study Analysis (MCSA) methods have been used to draw out Findings and Assertions in relation to particular Themes outlined in the research questions and how these manifested themselves across and within the cases. Note that these Themes are not the same as the five themes which have arisen from the Thematic analysis presented in the previous section. The summary of the cross case analysis from the MCSA is presented in Table 6.21 which is based on Stake's Worksheet 4. Nine Themes were explored in the MCSA and related to the questions being asked of the research data. A high manifestation means that the Theme is prominent in the particular case study. From Table 6.21, all three of the UK cases demonstrated a high manifestation in relation to policies or programs to address energy efficiency, as well as the use of partnerships for implementing programs. While the knowledge of senior management about sustainability was manifested highly in all of the UK and German cases, only two of the three Australian cases demonstrated this Theme. In case AU09001, this Theme was less evident in the analysis of responses provided by staff participants, compared to the other cases. While there was some manifestation of LG leadership across the cases, three cases stood out as demonstrating high manifestation of community based leadership. These were UK09002, UK09003 and DE09001. Three cases - AU09003, UK09001 and DE09001 - had a higher focus on transport than the other cases. The Australian case was notable for negotiating an extension to a suburban rail line, the UK case had focused on engaging the community about the links between air quality and transport emissions, while the German case had positively addressed all forms of transport, particularly ensuring that new development integrated tram and cycling infrastructure from the outset, favouring passive forms of transport such as cycling and walking. Only two cases (AU09001 and UK09001) raised moderate concern about LG staff attitudes towards taking action to reduce carbon emissions, considering that it was a barrier to effective LG action.

A highly unusual situation (far from ordinary) is one that is expected to challenge the generality of themes. In this MCSA, three cases were thought to be somewhat unusual compared to the other cases – these were AU09003, UK09002 and DE09001. Case AU09003 had undertaken a role definition exercise and a significant review of energy related issues for its local area, developing a climate strategy and action plan. Case UK09002 had developed a carbon budgeting process which was being adopted more

broadly across UK LG, and had been exploring innovative financing models for increasing the uptake of renewable energy across its area. Case DE09001 had developed policy specifically about sustainable transport and supported community based renewable energy schemes. The German case was unusual with respect to the degree of community ownership of initiatives rather than government led top-down policy. In the UK and German cases, studies had been undertaken to gather and disseminate information to the community about the potential for renewable energy.

Table 6.21 Multiple case study analysis – summary of cross case analysis of Themes

Worksheet 4. Estimates of Ordinariness of the Situation of Each Case and Estimates of Manifestation of Multicase Themes in Each Case

	AU09001	AU09002	AU09003	UK09001	UK09002	UK09003	DE09001	DE09002
Ordinariness of this Case's situation:	u	u	W	u	W	u	W	u
Original Multicase Themes								
Theme 1 Main objectives for reducing energy use	m	m	M	m	M	m	M	m
Theme 2 Local policy – energy efficiency		m	m	M	M	M	m	m
Theme 3 Local Policy – renewable energy		m	m	M	M		m	
Theme 4 Use of partnerships	M	M	m	M	M	M		
Theme 5 Local authority leadership		m		m	m	m		m
Theme 6 Senior management knowledgeable – sustainability & CC	m	M	M	M	M	M	M	M
Theme 7 Staff attitude re LG role a barrier?	m			m				
Theme 8 Community leadership		m	m	m	M	M	M	
Theme 9 Local Policy – transport mode		m	M	m	m	m	M	m

Ordinariness: W = highly unusual situation, u = somewhat unusual situation, blank = ordinary situation
Manifestation: M = high, m = some, blank = almost none

In addition to the cross case analysis of Themes in the MCSA, a number of Findings were noted from a review of responses by staff participants for each case. These Findings have been mapped to the Themes using Stakes Worksheet 5. The results are presented in Tables 6.22 to 6.29. A high manifestation means that for this Theme, the Case Finding is of high importance.

From Table 6.22, case AU09001 has important findings related to staff attitudes and culture and had moderately important findings related to transport for carbon reduction.

Table 6.22 Multiple case study analysis – mapping of Findings to Themes for case AU09001

Case and Finding	Themes								
	Main objective	Energy efficiency	Renewable energy	Partnerships	LG leadership	Knowledge –staff/em	Staff attitude / culture	Community leadership	Transport
Case AU09001 Finding I Minimal action to reduce carbon emissions in the community						L	H		
Case AU09001 Finding II Focus is on corporate activities						L	H		
Case AU09001 Finding III Expectation from elected members for better public transport services						L			M
Case AU09001 Finding IV Expectations from community for more services – particularly in townships outside the main urban centres						L			M
Case AU09001 Finding V Awareness of issues such as problems in measuring carbon emissions was not very high amongst elected members						L			
Case AU09001 Finding VI Previous partnerships with other LG have not worked?				L					
Case AU09001 Finding VII Investigating TODs									M
Case AU09001 Finding VIII Centres policy – co-location of services									M
Case AU09001 Finding IX Planning regulation mentioned as possible further action						L	H		
Case AU09001 Finding X Provide home energy audits		L							
Case AU09001 Finding XI Urban regeneration incorporates sustainability principles	L	L				L	L		L
Case AU09001 Finding XII Have areas / zones where wind energy is encouraged but none have been implemented			L						

H= high importance; M=middling importance; L=low importance.

From Table 6.23, case AU09002 has Findings which are important to a discussion of the knowledge of senior management and elected members about climate change and that LG

action was using partnerships. Other Findings were moderately important for a discussion of energy efficiency, renewable energy, particularly their innovative bulk purchasing programs and advocating for improved public and community transport.

Table 6.23 Multiple case study analysis – mapping of Findings to Themes for case AU09002

Case and Finding	Themes								
	Main objective	Energy efficiency	Renewable energy	Partnerships	LG leadership	Knowledge –staff/em	Staff attitude / culture	Community leadership	Transport
Case AU09002 Finding I Main focus is on information, education and Partnerships	M			H					
Case AU09002 Finding II Key roles are advocacy and leadership					M	H			
Case AU09002 Finding III Practical initiatives rather than just information	M								
Case AU09002 Finding IV Have been highly innovative in bulk purchasing initiatives for interested citizens in council area – brokering role			M	H					
Case AU09002 Finding V Advocacy for better transport services is focus too									M
Case AU09002 Finding VI Provided better amenities for those using public transport – eg shelters and access									M
Case AU09002 Finding VII Role to facilitate energy efficiency home audits		L							
Case AU09002 Finding VIII Increased demand from community for brokering energy efficient actions and renewable energy deals		M	M		M				
Case AU09002 Finding IX Climate adaptation measures seen as longer term issue						H			

H= high importance; M=middling importance; L=low importance.

From Table 6.24, case AU09003 had Findings which were important to a discussion of the knowledge of senior management and elected members about climate change. Other Findings were moderately important to a discussion of setting an overall objective for action on climate change and community leadership.

Table 6.24 Multiple case study analysis – mapping of Findings to Themes for case AU09003

Case and Finding	Themes								
	Main objective	**Energy efficiency**	**Renewable energy**	**Partnerships**	**LG leadership**	**Knowledge –staff/em**	**Staff attitude / culture**	**Community leadership**	**Transport**
Case AU09003 Finding I Have developed clear picture of their role and use this rigorously	M								
Case AU09003 Finding II Have set a vision as a low emission city	M					H			
Case AU09003 Finding III Have a culture of innovation being heard and supported – pay back is important							L		
Case AU09003 Finding IV Innovative funding mechanisms internally – revolving resources fund / externally – community						M			
Case AU09003 Finding V Have conflicts with densification and sprawl – policy response is for densification						M			L
Case AU09003 Finding VI Local policy requires leadership at elected member level					L				
Case AU09003 Finding VII Self reported high level of uptake of SPV in community – based on national data			M						
Case AU09003 Finding VIII Supportive of larger communication and information program rather than inconsistent messages – between councils				L					
Case AU09003 Finding IX Grass roots activity happening regardless of council								M	
Case AU09003 Finding X Overseas councils doing better than Australian except for some City examples in some areas							L		
Case AU09003 Finding XI Target setting accompanied by modeling of what is possible	L								

H= high importance; M=middling importance; L=low importance.

From Table 6.25, case UK09001 had Findings that were important for a discussion of action to address energy efficiency, renewable energy and transport, with knowledge of staff and elected members also of importance. This case had some important Findings related to staff attitudes and culture which affect LG in addressing climate change.

Table 6.25 Multiple case study analysis – mapping of Findings to Themes for case UK09001

Case and Finding	Themes								
	Main objective	**Energy efficiency**	**Renewable energy**	**Partnerships**	**LG leadership**	**Knowledge –staff/em**	**Staff attitude / culture**	**Community leadership**	**Transport**
Case UK09001 Finding I Sustainable Development receiving high priority	M					H			
Case UK09001 Finding II Innovative partnership model for energy efficiency program in existing houses		M		H					
Case UK09001 Finding III Relying on market and new planning policy for renewables		M	H						
Case UK09001 Finding IV Economic issues rating higher than environmental or social	M					M			
Case UK09001 Finding V Trying to link CC mitigation and adaptation to economy – multiple objectives	M					M			
Case UK09001 Finding VI Main focus is own estate		H			M	H	H		
Case UK09001 Finding VII Internally there is a resistance to change							H		
Case UK09001 Finding VIII Change agents use networks - internal and external				M		M	M		
Case UK09001 Finding IX Seems to be a view inside LG that they have a greater role in assisting households to reduce energy used for transport than for energy used in houses	L						M		H

H= high importance; M=middling importance; L=low importance.
Parentheses around a Theme number means that it should carry extra weight in drafting an Assertion.

From Table 6.26, case UK09002 has Findings that were highly important for the discussion of all Themes. This analysis indicates that this case may have high significance in drafting the research conclusions.

Table 6.26 Multiple case study analysis – mapping of Findings to Themes for case UK09002

Case and Finding	Themes								
	Main objective	Energy efficiency	Renewable energy	Partnerships	LG leadership	Knowledge –staff/em	Staff attitude / culture	Community leadership	Transport
Case UK09002 Finding I High focus on actual performance and achievement – EMAS, carbon budgeting	H				H		H		
Case UK09002 Finding II Strong use of arm's length contracts for management and joint partnerships				H					
Case UK09002 Finding III Open with information – share their experiences with other councils				M		H			
Case UK09002 Finding IV Focus is service to the public – officers directly assist		H	H				L		
Case UK09002 Finding V Team approach – inside and outside				H					H
Case UK09002 Finding VI Enthusiasm and pride of staff							L		
Case UK09002 Finding VII Leading the nation in most aspects of sustainability and in CC Impact Assessment and Planning						H			
Case UK09002 Finding VIII Strong leadership at all levels					H			H	

H= high importance; M=middling importance; L=low importance.

From Table 6.27, case UK09003 had Findings which were important to a discussion of action to address energy efficiency, community leadership especially grass roots action, and LG leadership through target setting and advocating for improved public transport.

Table 6.27 Multiple case study analysis – mapping of Findings to Themes for case UK09003

Case and Finding	Themes								
	Main objective	Energy efficiency	Renewable energy	Partnerships	LG leadership	Knowledge –staff/em	Staff attitude / culture	Community leadership	Transport
Case UK09003 Finding I In spite of regular six monthly leadership changes due to political coalition, local politicians demonstrate significant leadership and personal passion in taking major steps towards low carbon future and sustainable development					H				
Case UK09003 Finding II The dedication and persistence of staff working for local authority likely to be a key factor in influencing action at higher levels							L		
Case UK09003 Finding III Significant grass roots action in the community is also taking place – role of local authority is to support this and not put the dead hand of LG on it	L							H	
Case UK09003 Finding IV CC impacts locally not seen to be a major motivator for action	L								
Case UK09003 Finding V Significant ambitious targets for carbon emission reductions are being set for the city	H								
Case UK09003 Finding VI Ideal action relates to devolution of power to local level from central government	M						L		H
Case UK09003 Finding VII Has not done very much on renewable energy but looking at a district waste to heat scheme			L						
Case UK09003 Finding VIII Large scale wind sites difficult to find – conflicts with other land uses			L						
Case UK09003 Finding IX Has challenges with regard to transport mode and public transport provision – looking at trolley buses as next generation transport									H
Case UK09003 Finding X Scrutiny committee and performance reporting are driving action at local level	H					M			
Case UK09003 Finding XI Most action to date has been on energy efficiency related to housing and fuel poverty		H		M					
Case UK09003 Finding XII Innovative marketing is seen as best way to reach community, engage them and influence behaviour – Fuelsavers is council led for trust but a brand in its own right		H		M					
Case UK09003 Finding XIII Imagery – making the invisible visible		H							

H= high importance; M=middling importance; L=low importance.

From Table 6.28, case DE09001 had Findings which were important to a discussion of community leadership, transport, renewable energy and the knowledge of senior management and elected members. Other Findings were of importance to the discussion of LG leadership, the main objectives for climate change action and partnerships

Table 6.28 Multiple case study analysis – mapping of Findings to Themes for case DE09001

Case and Finding	Themes								
	Main objective	Energy efficiency	Renewable energy	Partnerships	LG leadership	Knowledge –staff/em	Staff attitude / culture	Community leadership	Transport
Case DE09001 Finding I Objectives related to sustainability and energy security and anti-nuclear since 1986	M (at)				M	H			
Case DE09001 Finding II Co-generation of energy supply has brought greatest reduction in carbon emissions					M				
Case DE09001 Finding III Businesses much more focused on carbon and energy reduction than residential sector	L								
Case DE09001 Finding IV Focus is on what local authority responsible for – eg public transport					L				H
Case DE09001 Finding V LG Work with developers – influencing not enforcing role				M	L				
Case DE09001 Finding VI Renewables only 1.1% of all energy used			H						
Case DE09001 Finding VII Citizens are the leaders, not staff nor elected members								H	
Case DE09001 Finding VIII LG provide framework and guidelines for businesses					L	M			
Case DE09001 Finding IX National Feed – in tariff has been the most effective mechanism for renewable energy uptake			L						
Case DE09001 Finding X Competition across Germany and Europe – amongst cities	L				L				
Case DE09001 Finding XI Fully developed market in energy and energy efficiency – only subsidies for adopting solar thermal water heating during renovations		M	M	M			L	H	
Case DE09001 Finding XII Industries and businesses developed around solar renewable energy				M					
Case DE09001 Finding XIII Media report the activists' perspective – 'climate scene'							M	H	

H= high importance; M=middling importance; L=low importance.

The notation "(at)" after a case Finding means that its situation might warrant extra caution in drafting an Assertion

From Table 6.29, case DE09002 had Findings which were important to a discussion of energy efficiency and transport, while other Findings were moderately important.

Table 6.29 Multiple case study analysis – mapping of Findings to Themes for case DE09002

Case and Finding	Themes								
	Main objective	Energy efficiency	Renewable energy	Partnerships	LG leadership	Knowledge –staff/em	Staff attitude / culture	Community leadership	Transport
Case DE09002 Finding I LG role is to take the message to the people – marketing					L		M		
Case DE09002 Finding II Policies at State or higher level need to be transported into action at local level		M	M			L	M		M
Case DE09002 Finding III Standards for housing to improve energy use		H							
Case DE09002 Finding IV Park and Ride linked to Tram system									H
Case DE09002 Finding V High focus on waste recycling						M			
Case DE09002 Finding VI Focus has been on council estate and have 30% renewables in energy mix			L		L	M	M		
Case DE09002 Finding VII Concern about coal					L	L			
Case DE09002 Finding VIII Personal importance – personal role in LG					M	L			
Case DE09002 Finding IX Cost is main barrier to addressing coal and carbon reduction	M								

H= high importance; M=middling importance; L=low importance.

The Findings presented in Tables 6.22 to 6.29 have been useful in relating each case to the Findings of the cross-case analysis (Table 6.21), the Thematic analysis presented in Tables 6.19 and 6.20 and the review of community governance (in the next section) and are further discussed in Chapter 7.

6.9 Cross case review of community governance

Governance of climate change is an area that has received increased attention since the landmark study of Bulkeley and Betsill published in 2003. While effort was made to review the governance of climate change as a separate issue, the staff participants invariably linked climate change to sustainability hence the review of governance of climate change has been undertaken using reference to each LG case's governance of sustainability as well as through specific reference to climate change. Taking the key aspects of community governance of sustainability identified by Evans et al (2005) and the need to engage with the broader community, specifically the business and voluntary sectors to effect policy change which was recommended by Bulkeley & Betsill (2003), the extent to which these aspects were manifested by each case has been analysed. The data for this analysis were the responses from staff participants to questions about community leadership, the involvement of the community in initiatives and from a review of corporate documents and information about governance available on the respective LG case's world wide web portal. For each aspect, a scale of 1 to 4 has been assigned, where 1 is low manifestation and 4 is high manifestation. The results of this analysis are presented in Table 6.30. From this analysis, cases AU09002, UK09002 and DE09001 demonstrated a broader range of community governance aspects than the other cases and in particular were addressing social capacity, stakeholder engagement and the role of the individual. In contrast, while there was some manifestation of institutional capacity in terms of the Development Plan and interaction with other levels of government for processes for planning new developments similar to the other cases, the community governance aspects for AU09001 were less evident in the data obtained in this research, with this case having a predominantly corporate focus. Case AU09002 demonstrated significant manifestation of community governance of climate change and sustainability in spite of LG in Australia having minimal autonomy to act in comparison to LG in the UK and in Germany. The high manifestation of trust in LG, the existence of informal links between LG and its community, and the establishment of partnerships between LG and businesses in the community and between LG and other levels of government have been highlighted in the analysis of community governance across most of these cases. Only three LG cases (AU09002, UK09001 and UK09002) were observed to be driving the climate change action or efforts to achieve sustainability across the community. The importance of

community governance of climate change and the significance of these results are discussed further in Chapter 7 (Section 7.3).

Table 6.30 Review of community governance of climate change and sustainability

Aspect of community governance	AU09001	AU09002	AU09003	UK09001	UK09002	UK09003	DE09001	DE09002
LG autonomy	1	1	1	2	3	3	4	4
The role of the individual	1	4	3	1	4	3	4	3
Institutional capacity	3	3	3	3	4	3	3	4
Stakeholder engagement and social capacity	2	4	3	2	4	3	4	2
Trust, consent and informal links	2	4	3	4	4	4	4	2
LG as the driver	2	4	3	4	4	3	3	3
The importance of incremental and pragmatic action	2	4	2	2	4	4	4	3
Outward looking LG	1	4	3	4	4	3	4	3
Interaction with other levels of government	3	3	3	3	4	4	4	3
Capacity building	2	4	3	3	4	3	4	3
Engage with the business and voluntary sectors to effect policy changes	2	4	3	3	4	4	4	4

Note: 1 indicates a low manifestation and 4 indicates a high manifestation.

6.10 Summary of findings of case study analysis for Phase 2

The second phase of this research has explored in greater depth the issues that emerged in Phase 1 of this research about the role of LG to assist households to reduce carbon emissions. It has analysed these issues across eight case studies from three countries – Australia, the United Kingdom (England) and Germany. While each LG case had set a corporate goal for carbon reduction at the time of data collection, the setting of goals for community carbon reduction was less common, particularly for the Australian cases.

The initiatives undertaken by each case to support households to reduce carbon emissions through energy used in their houses as well as for transport mode choices have been identified from primary data from questionnaires and interview responses from staff participants for each LG case. The analysis of LG action has focused on three key areas which may assist a community to reduce carbon emissions, namely: improving household energy efficiency, increasing the uptake of renewable energy and choosing low carbon transport modes. Through an analysis of the primary data collected from staff participants and of LG documents, some similarities and differences between the actions undertaken by LG cases have emerged. The UK cases have demonstrated a major focus on household energy efficiency retrofit initiatives undertaken in partnership with energy service providers and energy supply companies. The German cases have focused on enabling renewable energy and low carbon transport solutions with high energy efficiency standards for redevelopments, particularly in Freiburg (DE09001). While the Australian cases had mainly focused on information and education, there was evidence that they had started to explore mechanisms for enhancing the uptake of renewable energy by the community. While Australian cases acknowledged that increasing public transport provision for the community was important, their ability to deliver such services had involved significant advocacy on their part, supported by the community. The staff evaluation of the initiatives has identified the objectives, their scope and scale, critical success factors, community involvement, and barriers for each initiative. Aspects thought by the researcher to demonstrate innovation have been highlighted.

The analysis of LG's capacity to act has focused on the policy silos and mayoral levers developed by Hammer (2009) in his studies of LG actions on energy systems for cities. The policies and programs that are evidenced by the initiatives of each LG case have been analysed using Hammer's five mayoral levers, namely: rulemaking; regulatory oversight;

procurement; financial incentives; and information gathering and dissemination, facilitation/ convening and advocacy. Most initiatives map to the information gathering and dissemination, facilitation/convening and advocacy levers, although the development planning and planning policy initiatives of cases indicate that rulemaking and regulatory oversight are important roles for LG, particularly to advance the uptake of renewable energy and enforce higher standards of home energy efficiency.

The results of the analysis of the role of LG to assist households in its community to reduce energy use and thereby reduce carbon emissions, demonstrated differences in opinions of LG staff toward LG's role. The qualitative analysis of interview transcripts used two Thematic analysis methods and enabled factors and issues (revelations or signs) to be grouped into five themes, namely: organisational; political; economic; technological; and social. In addition to a conventional Thematic analysis, a cross case analysis using Stakes' Multiple Case Study approach has also been used to explore manifestations of nine key Themes asked of the interview transcripts and participant responses to questions for each case. Qualitative Findings for each case have been described. Most cases demonstrated high manifestation of senior management knowledge of sustainability and climate change, with only two cases indicating that the culture of staff was a barrier to taking action on climate change. The manifestation of community leadership for climate change action varied across the cases as did the reference to partnerships, with the delivery of energy efficiency for UK cases leading to high manifestation of the use of partnerships for these cases. Of concern was the low manifestation of LG playing a clear leadership role in these cases. These Findings form the basis of the discussion that follows in Chapter 7.

An analysis of aspects related to community governance of climate change was also undertaken using aspects identified in other studies (Evans et al 2005, Bulkeley & Betsill 2003). The results indicated that three cases - one from each country - demonstrated a high manifestation of community governance of climate change. A further analysis, including a discussion of why only some cases demonstrate a high manifestation of community governance follows in Chapter 7.

Chapter 7. Discussion – learning from local examples of carbon reduction

> We could make an enormous difference if we had it as … one of those really key drivers of a local authority, so in the same way that child protection is absolutely fundamental, if we said that community based climate change work is fundamental, that would make a difference
>
> (UK09003 Participant 1)

As explained in Chapter 3, Giddens' theory of structuration (Giddens 1993) has been used as a basis for the examination of structure and agency. The policies and programs of LG define its capacity to act (its agency). The actions of citizens, staff and elected members of LG produce and reproduce the structure of systems in the community thereby locking in the reliance on carbon intensive energy sources. The corollary of this paradigm is that unless action is taken to change the systems (the structure) that lock in the generation of carbon emissions, carbon reduction is unlikely to take place.

The findings of Phase 1 of the current research which were presented and discussed in Chapter 4 indicated that urban LG (LG) in both South Australian (SA) and Victorian (Vic) was generally committed to taking action on climate change within its corporate responsibilities including reducing the carbon emissions associated with its activities. However, from an analysis of action to reduce carbon emissions using Hammer's capacity to act matrix (CTAM from Hammer 2009), except for providing information, there was less evidence of LG in these jurisdictions taking action on the systems which contribute to household carbon emissions. In Phase 1, it was also clear that there was substantial variation in the number and type of initiatives being undertaken by LG and the type of action thought to be 'ideal' for LG to address climate change.

In Chapters 5 and 6, the results of an in-depth analysis of eight case studies from three countries (Phase 2 of the research) were presented. Four analytical approaches have been used to analyse qualitative data collected for each LG case. The first approach was an analysis of LG documents for evidence of LG action to address three key areas for carbon reduction: household energy efficiency; renewable energy; and transport mode shifts. The second approach analysed the initiatives undertaken or considered to be 'ideal' actions for LG from questionnaires completed by employees of eight LG cases to understand LG's capacity to act, drawing on Hammer's CTAM for policy silos and mayoral levers (Hammer 2009). The third approach used a Thematic analysis of interview transcripts and questionnaires to identify issues, barriers and opportunities that may assist LG in developing its capacity to act. Finally, the results of an analysis of community governance of climate change and sustainability for the eight LG cases were presented. The analysis of community governance used a combination of criteria previously identified by Evans et al (2005) and Bulkeley and Betsill (2003).

In this chapter, the findings from all four analytical approaches are discussed and compared to each other and to previous studies of LG action to reduce community carbon emissions. The chapter is structured in three main sections. The first relates to the capacity for LG to act, which is discussed in relation to the findings of the analysis of initiatives and ideal actions of LG cases. The second section discusses barriers and opportunities to develop capacity to act that emerged from the findings of the Thematic analysis. The third section discusses governance of climate change, focusing on the potential for involving the community in decision-making about local action to mitigate climate change as a means to build capacity to act. The chapter concludes with a summary of the value and limitations of this research.

7.1 Local government's capacity to action local carbon reduction

As outlined previously in Chapters 2, 3, 4, 5 and 6, Hammer (2009) identified five mayoral levers that LG can exert to influence energy systems to reduce carbon emissions. These five levers are: firstly, rule-making; secondly, regulatory oversight; thirdly, procurement; fourthly, financial incentives; and fifthly, a collection of actions including information gathering and dissemination, convening and facilitation, and advocacy. According to Hammer (2009), these mayoral levers are manifested in LG policies and programs targeted toward locally influencing the carbon emissions arising from energy systems. From the

results of the analysis of initiatives of Australian LG in Phase 1 of the current research, most initiatives undertaken by LG or nominated by LG as ideal actions mapped to the fifth lever. In the few cases where LG indicated an ideal action that could be mapped to making rules, general references to planning policy to influence urban design and housing standards for new development and waste management which is an existing power of LG appeared to dominate. In Phase 2, many initiatives of LG cases also mapped to the fifth lever of information, education and advocacy. Many LG initiatives focused on LG conducting forums, awareness raising sessions and education programs for the community, particularly focused on sustainability rather than specifically on climate change and advocating to other levels of government for action, particularly on transport systems and services.

However, from the analysis of planning policy of the LG cases from the UK and Germany, there appeared to be a transition taking place. These LG cases were exploring planning policy options and variously developing local planning policy and planning guidance for building design and materials, specifying local codes for building energy efficiency and delineating zones where renewable energy, such as wind farms, may be preferred. In addition, in one UK LG case (UK09001), there was evidence of new planning policy which was specifying energy efficiency standards and renewable energy targets for new development of five dwellings or more - twice as strict as the central government requirement. From the analysis of ideal actions of the LG cases in Phase 2, it appears that within this transition, LG is developing increased capacity for specifying planning policy to achieve improved energy efficiency and integrating renewable energy. In these cases, planning policy is forward looking, with targets linked to strategies and a vision for each city to become more sustainable. Hence carbon reduction is clearly linked to sustainability outcomes for LG at the local level.

In Australia, however, there has been relatively less action by LG to develop planning policy to address energy efficiency beyond the Australian Building Code requirements which were recently raised to require new dwellings to achieve ‘6 star’ energy rating. While these standards are being set at a national level, the structure of government in Australia requires the states to develop matching legislation which must then be reflected in local development planning documents. Thus there is a process to be followed and a transition period within which LG and the building industry adopt higher standards for

energy efficiency. While this transition period for the industry was also evident in other countries, voluntary action to advance these standards was being pursued.

When exploring the references to planning policy in Australian LG responses from Phase 1, jurisdictional differences were noted. Vic LG more frequently recognised the need for appropriate planning policy to address climate change compared to SA LG which rarely mentioned planning policy as an ideal action to address climate change. These findings add to Burton's findings (Burton 2007) that no substantive provisions in planning schemes for climate change mitigation were evident in the Australian cases in Queensland that he studied.

Moore et al (2010) recently recommended that incorporating renewable energy systems into house design from the outset will be needed to move beyond the current standards and enable passive house standards to be met, similar to those required of new German houses and proposed for UK houses by 2016. One UK case (UK09001) demonstrated evidence of planning policy which quantified the proportion of renewable energy that new residential developments of five dwellings or more were required to incorporate. In a recent study of renewable energy resources potentially available across two of the Australian LG cases, Hamilton et al (2008a) found that there was considerable potential for both SWH and SPV systems and that at least 80% of existing housing had roof areas of sufficient size and orientation to capture solar energy for local use. In addition there was considerable potential for medium to large wind turbines across agricultural areas of AU09001, although small wind turbines on each dwelling were not considered to be cost effective. While some evidence of specific planning objectives to support facilities to capture renewable energy from solar and wind was found in the Australian LG cases in Phase 2, most action on the ground related to SWH in new dwellings which had been mandated by state governments and SPV systems supported by state feed-in tariffs (in South Australia) or federal rebates rather than through LG making rules.

The research findings add to a growing body of evidence that Australian LG planners need to develop capacity for making planning rules at the local level that deliver improved energy efficiency of housing and integrate renewable energy facilities, particularly solar and wind, into local scale development rather than rely on higher levels of government to develop policy and programs which are applicable to its local community. In building capacity for developing planning policy to mitigate climate change, local authorities have relied on learning from other local authorities and identifying local opportunities. The

importance of developing a knowledge base within LG was evident in building this aspect of capacity to act. The LG cases studied in this research, particularly in the UK and Germany, may be an appropriate starting point for Australian LG planners to learn more about such planning policy and how it has been developed and applied at the local level.

While most LG cases participating in the current research considered that LG had a role to advocate for improved transport services, they frequently identified action to improve access to public transport and provide more walking and cycling tracks which go beyond advocacy. From the review of planning policy, most development plans of LG cases were addressing density, mixed use zones and activity centre zoning, locating services such as health and education close to public transport. The focus on density, which Jenks and Dempsey (2005) indicated was dominating the urban planning agenda in the 1990s, was therefore still evident in the LG cases researched in Phase 2.

From the review of planning policy in Australian LG cases in Phase 2, there appeared to be considerable attention on car-parking spaces, and access and egress for motor vehicles in new developments. Lesser attention was paid to low carbon transport modes indicating that enhancing motor vehicle transport movement in new developments was important. In the Australian LG cases vehicle ownership rates were higher than for any of the UK or German cases. Building capacity for developing planning policy to integrate low carbon transport modes is likely to be a challenge for these Australian LG cases.

For the German cases, LG was a rule maker and provider of public transport actively encouraging residents to choose public transport over private motorised modes. The capacity to use planning policy to address transport mode shifts was most developed in the German cases where, for one case (DE09001), the maximum distance of residential dwellings from public transport was being defined and was used as an indicator of sustainability.

In the UK cases, LG worked cooperatively at a sub-regional level to deliver integrated transport services. These LG cases considered that they had limited capacity to act independently to influence transport mode shifts to lower carbon modes. In the past they had been responsible for public transport services, which were stated to be a low cost option for residents at that time. Marsden and Rye (2009) identified that, for UK LG, the ‘main policies for local carbon reduction which authorities have control over are parking allocations for new development, smarter choices and improvements to walking, cycling

and public transport (bus) infrastructure' which is consistent with the findings of the current research.

An exploration of the suitability of planning policy used by UK and German LG cases for integrating low carbon transport into Australian LG planning documents is warranted, particularly as researchers such as Beatley (2000), Newman and Kenworthy (1999), and Newman and Jennings (2008) highlight European cities such as Freiburg (DE09001) as demonstrating best practice in sustainable transport.

Other aspects of rulemaking which related to energy use and energy services focused on waste management and water management. Harnessing energy from biomass which includes waste was only a focus of planning policy in LG cases from the UK and Germany where either district or household level systems to produce heat from waste were encouraged. Australian LG has been proactive in providing systems for recycling of waste (see ICLEI CCP 2007) rather than in producing heat from waste and is likely due to the warmer climate and less need for heating. Water management, however, is more complex and while LG may have developed capacity to make rules for stormwater management, such as incorporating water sensitive urban design, various models or structures for drinking water supply and sewerage services were observed. In the Australian LG cases studied in Phase 2, management of water supplies and sewerage services was at a State or regional level rather than at an individual LG level. In the UK cases, these services were regionalised and privatised while in the German LG cases, these services were managed by the LG at the city level. In Australia, rulemaking for water conservation, eg for water efficient appliances and equipment which may contribute to energy efficiency through reducing water demand and associated energy for treating, pumping or heating water, was discussed but tended to be regulated at a state level and hence maps to the LG mayoral lever of overseeing regulation rather than rulemaking. The analysis of capacity to act in both Phases of research identified that LG had compliance programs related to building regulations, with codes and standards developed at higher levels of government. Within the approval of building designs to meet building codes, LG is variously required to adopt water saving systems and technology such as low flow toilet cisterns, although the carbon reduction contribution of water efficiency initiatives is not specified. While evidence of programs, such as rebates for rainwater tanks or providing low flow shower heads to support the conservation of water in the home was noted for some Australian LG in Phase 1, this level of support was not the norm. There is opportunity for LG to support water

conservation initiatives as a means to reduce carbon emissions. However, LG may need to develop capacity to quantify the carbon reduction benefits of water conservation and build these objectives into housing standards for new developments and significant refurbishments. While planning policy and building codes address new housing, their use to address existing housing may be problematic, raising other issues such as industry capacity and home-owner acceptance.

While rules for planning and building of new development may be in place at the local level, their effectiveness as a means to achieving carbon reduction relies on industry compliance and enforcement. Hence systems need to be established and implemented to ensure that rules are achieving their stated aims. In the UK, a review of the implementation of Part L of Building Regulations by Bell, Smith and Palmer (2010) reported that disconnections and lack of correlation between targets and as-built construction distorted figures for compliance, particularly for decreasing carbon emissions of housing. Their study noted a call from the industry to improve standards of compliance to minimise disconnects.

In the Phase 2 research, the analysis of capacity to act identified LG programs across all three UK cases for improving household energy efficiency by providing free insulation and draught proofing, which would also have an added benefit of addressing thermal comfort (cold homes). The UK LG cases had developed capacity to influence carbon emissions from energy used in council owned housing. Alafat (2008) considers that LG in the UK are expected to monitor the condition of housing on behalf of the central government. Indeed the only evidence of evaluation of initiatives at the local level was in these UK LG cases. However, it should be noted that only one of the cases had a broad database of housing condition and energy use that went beyond their own ‘estate’. Hence there is a need to develop capacity for LG to oversee such regulations legislated at higher levels of government.

The LG cases in both Phases of research identified ‘leading by example’ as an ideal action for LG to mitigate climate change. One aspect of leading by example is through procurement practices or purchasing, a mayoral lever identified by Hammer (2009). The action of LG to manage energy consumption in its own operations was a priority for SA LG in Phase 1, mainly in relation to street lighting. In Phase 2 of this research, particularly in the UK and Australian cases, responses from participants similarly focused on managing the internal operations of council to reduce carbon emissions. While the German and

Australian cases did not indicate that they managed social housing, LG potentially provide services to the community directly or through accredited businesses for undertaking energy audits, energy efficiency improvements or installing renewable energy technology. While the capacity to act analysis provides information about the policy areas in which procurement practices are focused, the effectiveness of such practices cannot be assessed using this approach alone. In addition, a system of monitoring and reporting carbon savings from these practices may be of benefit.

The analysis of capacity to act in this research clearly shows that LG has little capacity at present to provide incentives (funding) for climate change mitigation initiatives at the local level. The UK cases, however, demonstrated a developing capacity to attract and administer funding to citizens at the local level for energy efficiency programs. They also recommended that new technology such as high efficiency boilers be subsidised until the industry can establish itself and reduce costs to households. None of the Vic or SA LG in Phase 1 of this research indicated that rebates or financial incentives were provided to assist residents with the cost of energy efficiency and conservation measures. In Phase 2, a direct financial incentive to support renewable energy implementation at the local level was noted in one UK case (UK09002) and one German case (DE09001). While the Vic LG case in Phase 2 (AU09002) had assisted residents to purchase SPV and SWH through a bulk purchasing scheme, at the time of the data collection, the only similar scheme mentioned was the Adelaide Solar Cities project in which AU09001 was a partner. Since the data collection phase, both SA cases from Phase 2 (AU09001 and AU09003) have elected to participate in a multi-SA LG bulk purchasing scheme for SPV systems for dwellings. Hence there is increasing recognition that LG has capacity to assist households to adopt renewable energy through innovative schemes such as bulk purchasing without providing a direct financial incentive paid from its own budget. Research into the effectiveness of these schemes compared to the Solar Cities program in Australia may reveal the broader potential for such schemes to significantly increase the capacity for LG to influence the local take up of renewable energy technology.

The capacity to act analysis identified a significant role for LG to gather and disseminate information about its area. LG has been identified as an appropriate level for gathering information about the energy efficiency initiatives that have been implemented across the housing stock in the built environment, local energy use, carbon emissions and renewable energy resources potentially available to the local community (see Hamilton et al 2009a/b;

Kellett & Hamilton 2009a/c). However, researchers including Burton (2007), Gupta (2008), Hammer (2009) and Hamilton et al (2008b) have highlighted difficulties in estimating carbon profiles at the local level. In the Phase 2 research, one LG case (UK09003) had developed a housing information and energy database which may provide a model for LG. However, the UK LG cases had access to publicly available databases of local energy use and carbon emissions for each sector provided by the central UK government. They also made use of this data in their carbon reduction action planning and reporting of progress (UK09001; UK09002). It was clear that this local information provided an evidence base to assist policy makers in the review and development of local policies and programs to support carbon reduction. Other researchers have recommended that local information assists in improving governance for climate change as a key part of sustainability (see Adger & Jordan 2009).

The analysis of capacity to act allows an assessment of how the initiatives of LG map to aspects of the energy system which Hammer (2009) referred to as policy silos and to five mechanisms or mayoral levers. The capacity to act analysis identified that there was a need to develop further capacity in integrating energy efficiency and renewable energy into local planning rules but on its own, the capacity to act analysis was insufficient to identify issues within LG and more broadly in the community that may be affecting the capacity for LG to take action. It was able to identify jurisdictional differences and gaps such as planning policy, and may have usefulness in an examination of LG action across the other states of Australia. In the following section, the usefulness of the Thematic analysis of Phase 2 cases to identify barriers and opportunities is explored.

7.2 Barriers and opportunities

According to Giddens (1993), before new ideas, ie policies and programs, can be implemented, the structures and systems that need to be acted upon should be identified. In this research, the agency of LG is manifested in the policies and programs to support three outcomes: improved household energy efficiency; increased local generation of renewable energy; or enhanced options for residents to choose low carbon transport modes. In the identification of barriers, the issues related to policies and programs that LG had implemented and actions which LG considered to be ideal to address climate change have been analysed. The results of the Thematic analysis presented in Chapter 6 highlighted five categories of issues comprising barriers and opportunities that affect carbon reduction at

the local level. These categories (organisational, political, economic, technological and social) are used to structure the following discussion of the barriers and opportunities emerging from the Thematic analysis.

From an organisational perspective, in Phase 1 the barriers that prevented LG from taking action were: lack of commitment of senior management, lack of knowledge by councillors, limited people resources, and the need for better networks and partnerships. While the importance of climate change to LG was widely acknowledged by participants in the current research, there was rarely consensus about the extent of the role that LG had to assist households to reduce carbon emissions. Some participants commented that it is not the role of LG to be leading the initiatives to address community carbon reduction but to provide a framework in which innovation can occur within the wider community. Within LG cases in both Phases, there was evidence of climate change and carbon reduction action plans either already being implemented or being developed. LG was also widely involved in networks such as the ICLEI Cities for Climate Protection (CCP) program and had variously established corporate carbon emission reduction targets

Planning for carbon reduction and the setting of carbon reduction targets may be expected. While targets for carbon reduction were being voluntarily set by LG in Australia and Germany, in the UK, targets had been set at the national level and then devolved to the local level via regional strategies. The system of National Indicators (NIs) and local area agreements (LAAs) in the UK legitimises and supports action to identify and quantify carbon emissions, develop plans to reduce emissions, implement initiatives, and monitor and report progress in reducing carbon emissions at the local level. Hence it provides a framework in which LG can act at the local level. The absence of a top down central government structure within which LG can set community carbon emission reduction targets in the Australian and German cases requires LG and its local community to develop its own system. Hamilton et al (2008a/b) note that methods to establish carbon baselines, establish renewable energy resource potentials and monitor carbon emission reductions at the local level need further work.

The role of LG was variously described as encouraging, facilitating, providing services, influencing, acting as a portal to others, and networking. From these responses, an opportunity exists for LG to provide a first point of contact, providing information and advice to households. LG can take on a role as a trusted entity, taking local needs into account and enabling a more equitable approach to implementing carbon reduction

initiatives locally. This role links directly to the vision of LG as a servant of the public, evidenced by the following comments:

> We know we need to make it easy for people to do things and try and remove barriers. (UK09003 Participant 1).
>
> People will come to us and the media will look at us as being responsible for everything. (UK09002 Participant 1).
>
> We provide or we try our best to provide a kind of .... framework, for example we say there is an energy standard for all new buildings… So, not so much that we force people into that, but that they expect from us a reliable guideline. So they know what to expect in the future and they can then plan their own activities accordingly (DE09001 Participant 1).

The finding that incorporating regionally imposed targets for renewable energy and carbon reduction into local planning policy had challenged the culture of planning departments within UK LG (see UK09001) is consistent with the views of Kellett (2007) that the majority of local authority planners in the UK had little or no experience of dealing with renewable energy developments. While Kellett was referring to larger renewable energy development such as wind farms, the current research highlights similar issues for small-scale development including incorporating solar energy systems into residential development. Strategies identified in the current research to overcome these issues included establishing formal and informal networks and developing a shared understanding of priorities for LG, its partners and industry. The importance of LG working within broader networks was evident in the findings from the Thematic analysis and is consistent with the findings of other researchers (Bulkeley & Betsill 2003; Bulkeley & Kern 2006). Pillora, Blackburn and Artist (2009) identified dedicated sustainability staff; sympathetic organisational culture; effective management systems; and partnerships and external agency support as drivers for sustainability. The informal institutional frameworks that LG were developing in the current research used resources from both within its own organisation and from networks and partnerships with external groups, consistent with Pillora et al (2009). The sharing of information and resources and an increased capacity for action afforded to LG is also consistent with the theory of new institutionalism explained by Garson (2008) and described in Chapter 2. The assessment of capacity to act, however, did not on its own identify these issues.

While the responsibility and role of LG to mitigate climate change was recognised and supported by government and other stakeholders in each country, the level of authority afforded LG through legislation differed. In Australia, others have identified pressure on

LG to deliver more services on behalf of the State resulting in cost shifting from higher levels of government to LG (Aulich 1999; Dollery & Johnson 2006; ALGA 2008). These factors were evident in the current research as key issues (see AU09001) or barriers, particularly the lack of funding to implement 'ideal' action to mitigate climate change. Similarly, Pillora et al (2009) had found that external funding and legislation were key drivers for sustainability in LG. Participants in the current research considered that LG in Australia needs to work regionally and with higher levels of government to implement climate change initiatives. Dollery, Byrnes and Crase (2008) have recommended that for some services provided by LG in Australia, structural reform should focus not on amalgamation of councils but on regional service provision. The broader focus of climate change and potential scale economies for some actions such as programs for home energy efficiency, enhancing renewable energy uptake or low carbon transport systems could be undertaken through regional organisations of LG authorities, such as alliances of geographically adjacent LG which has been used in Victoria. LG case AU09002 had been part of a 'Greenhouse Alliance' which involved nine Councils working together to develop and implement programs to reduce carbon emissions at the local level. The institutionalisation of carbon reduction activity through such structures of governance however needs to ensure that individual LG authorities retain responsibility and accountability for local carbon reduction initiatives. There is the potential for such institutions, once established, to take the lead in driving carbon reduction rather than being a resource for LG to use to develop tools that LG then implements. The challenge for LG is to maintain action at the LG level sufficient to enable diffuse action and establish low carbon social norms in its community, while at the same time garner support for such regional and cross boundary approaches, developing appropriate governance structures at these scales.

If the title of the position occupied by the LG participants providing responses indicates the area of responsibility for managing climate change programs within LG, Phase 1 of the current research identified three key areas of responsibility: the environment (environmental health - particularly air quality); sustainability (sustainable development); or planning (strategic or environmental). In most of the cases studied in Phase 2, however, responsibility for climate change mitigation was either already within or was transitioning to a sustainable development or sustainability function within the organisation. The repositioning of climate change programs within the sustainability agenda acknowledges

that climate change is more than an environmental issue, with some participants specifically referring to the need for their local authority to recognise that climate change has economic impacts, not just environmental impacts.

From an economic perspective, LG action was being driven by both cost and opportunity. The threat of LG not being able to obtain insurance for known risks associated with climate change was driving it to identify potential hazards related to climate change, particularly on LG assets and infrastructure. There was also a focus on responding to emergencies and reassuring the public that assets and infrastructure were sound and fit for purpose (see UK09002). Hence there was a transition taking place where LG was placing a greater emphasis on climate change adaptation rather than mitigation. Bulkeley et al (2009) commented that, in the past, mitigation has been the main focus of LG action. Their research identified the need for more action on adaptation. LG will be increasingly required to deliver both climate change mitigation and adaptation actions. In theory, mitigation leads to a lessening of the causes of climate change globally and therefore lessens the impacts of climate change locally. There is a risk that LG may switch its focus from mitigation activities to managing the local risks associated with climate change - ie focus on adaptation – at the expense of pursuing carbon reduction activities. In the current research, both of the German cases and one UK case (UK09003) were less concerned about the need for LG to manage risks associated with climate change. Staff opinions were that their LG area had not experienced severe impacts of climate change related to drought, heat stress, or extreme weather events. Instead, their focus was on 'sustainable development' and wise use of resources, including energy conservation and energy switching. Thus these German and UK cases argue that climate change mitigation is required to achieve sustainability. These findings seem to align with Burch's observations about a focus on sustainability rather than climate change to achieve diffuse action for carbon reduction (Burch 2009). While it is potentially more difficult to argue against the concept of sustainability, which focuses on conserving resources for the future, sustainability itself has been hard to define with indicators of sustainability still a matter of debate in many countries and jurisdictions (Arman et al 2009) and the 'language of sustainability' being a barrier to LG action (Pillora et al 2009).

The willingness of politicians to support LG action on climate change was identified as a major barrier by Vic LG in Phase 1 of the current research. In overcoming this barrier, some of the LG cases in Phase 2 of this research had educated local politicians about

climate change and the need for local action to mitigate and adapt to climate change, outlining the political advantage that affords local politicians who take such action, seeming to confirm the findings of Kousky and Schneider's (2003) research with LG in the US. Various motivators for LG action were revealed through the Thematic analysis of participant responses. Competition, the prestige of winning awards such as the Ashden Awards, or being recognised as a Beacon Council in the UK were mentioned by some participants (UK09002, UK09003). The recognition of achievement of individual LG amongst its peers was being used by LG cases to strengthen the political will to take action on climate change locally. Pillora et al (2009) reported that senior management support and mayor (and councillor) leadership were two drivers for achieving sustainability identified in LG in the state of New South Wales (Australia). Parzen (2009) noted the importance of strong mayoral leadership for climate change action in the US, citing Chicago as one example. In Phase 2 LG cases, leadership was discussed in terms of a champion, a policy entrepreneur and the opportunities available for municipalities to perform leadership roles with respect to their peer communities. For Freiburg (DE09001), the mayor was personally involved in promoting the sustainable credentials of the city through statements in publications such as their *Environmental Policy* and *Green City* documents.

However, politicians were described as 'brave' for taking a strong stand for action on climate change (UK09003) and used the popular media and 'stunts' to generate public support for action (UK09001, UK09003, DE09002). While this level of political activism was less evident in the Australian cases, media attention to initiatives was highlighted as a motivation for councillor support during decision-making (AU09002). While Pillora et al (2009) identified media coverage of global and local issues as a driver for sustainability, they did not identify that media coverage of local initiatives was a motivator for LG decision-making. Other comments from participants were that politicians would need to overcome resistance from their fellow elected council members who may have vested interests such as personal business links with energy suppliers (DE09002 Participant 1). Peters (1999) raised a potential conflict between the personal ambition of politicians within public service institutions and societal norms about the role of a public official as a servant of the people. In each of the LG cases in the current research, local politicians are elected representatives of their community within spatial segments or wards. While this spatial representation offers an opportunity for LG to establish roles for councillors to be accountable for carbon reduction initiatives within their local area, such accountability was

only discussed in the UK cases. The knowledge of local politicians about the urgency of climate change and their skills to foster cooperative action within their own community and more broadly have been raised as problems by Burton (2007) in his study of LG in Queensland, Australia. The importance of preparing senior staff for making decisions about appropriate actions to address climate change was raised by Bulkeley and Betsill (2003), while Bulkeley et al (2009) concluded that municipal skills are important in the local governance of climate change. In the current research some LG cases referred to having undertaken skills development and capacity building for senior managers, executive and elected members. The findings from Phase 2 indicate that these factors are critical to the broader adoption and success of initiatives to address climate change. Further research into the attitudes and motivations of local politicians to support and promote action on climate change may assist in developing a greater understanding of the importance of their role as leaders in carbon reduction at the community level.

The importance of LG's position within a political structure that ranges from the local to the global was apparent in this research. Jurisdictional and institutional arrangements strongly influenced LG's autonomy for some types of action within its community. In particular, action to take back some level of local control with respect to transport and energy systems was viewed as difficult, highly political and very costly. There was concern expressed by research participants that higher levels of government dictate policy objectives and make decisions which restrict LG's capacity to legally impose conditions on new development in their local area. In addition the processes legislated for development of planning policy documents dictate the timeframes for their development and who needs to be involved or consulted. While there was recognition of the need to develop and implement appropriate planning policy at the local level, barriers expected to be encountered included lack of support from state government and the housing and development industry. If LG wanted to impose stricter policy at the local level than higher levels of government were willing to support, LG had to assist local developers in the industry. The newness of the policies for building codes to address energy efficiency and the economic downtown in the UK due to the global financial crisis had not allowed the outcomes of the stricter policy being implemented by UK09001 to be evaluated at the time of the data collection and further work in evaluating the effectiveness of the stricter policy is recommended. In one case (DE09001), 'more than half of their energy department' was working with developers to apply the stricter building regulations that were required for

'sustainable' developments in Vauban and Rieselfeld in its LG area (DE09001 Participant 1). Negotiations with developers to meet higher standards therefore require LG to commit staff resource for this activity. Staff resourcing was identified as a barrier to LG taking ideal action to address climate change in the current research. Hence LG is challenged by the staff requirements for implementing new policies and programs. Barriers reported by Pillora et al (2009) identified staff capacity and turnover as issues to be addressed while dealing with other government agencies was also highlighted as a barrier.

Local government has begun to develop mechanisms to work cooperatively with other LG authorities, at both a regional and more recently, international level and with higher levels of government to enable diffuse action to mitigate climate change. However, statements such as 'getting state and federal governments agreeing to work collaboratively with LG and community on joint initiatives' (V08020) indicate that a framework in which LG can take action is still required. One participant spoke of the benefit of LG completing a role definition process, stating:

> What (Council) does have that works really well is a really defined set of role statements, because to be able to determine what process or measures or what role you take, you have got to be clear about what your roles are, so it was very easy, you will see in the strategy, for us because those role statements were already agreed. Whenever you are going into a policy process or a strategy process, you have to demonstrate how those roles then apply to that particular issue or that particular context (AU09003 Participant 1).

There is potential for the statutory planning processes at both local and state government level to be a barrier to rapid implementation of carbon reduction initiatives. The lengthy processes to develop, review and amend planning documents (UK09001 Participant 2) and the time and cost involved in seeking out information and advice on integrating alternative energy technology into designs may adversely affect the decision making process. For some renewable energy technology such as wind farms, decisions must be made on an individual application basis. The current research identified an important role for national and state government in establishing appropriate legislation and policy to support carbon reduction and adoption of innovative technology at the local level. Participants in the current research referred to various technological systems related to energy use and carbon emissions. These included: energy systems – the electricity grid, the gas pipelines across Europe, transportation systems, infrastructure for charging electric vehicles, infrastructure for public transport, systems for generating energy from renewable sources, systems of other technology (microwave signals) which prevented renewable energy (e.g. wind farms)

from being developed, equipment to measure the energy use inside homes, equipment used inside of homes, as well as the internet and systems of communicating information about energy use. Mechanisms to force a shift in the technology base that were mentioned in this study included incentives and rebates to build industry capacity for manufacturing, distributing and incorporating new technology into dwellings and infrastructure, underpinned by legislation. Pillora et al (2009) had also identified that, in Australia, legislation for sustainability was not keeping up with best practice and that this was a barrier to achieving sustainability for LG.

Some participants from the UK LG cases stressed the opportunity that the uptake of technology to reduce carbon emissions provided to develop a green industry with associated local jobs to install or retrofit renewable energy technology or energy efficient technology into new or existing dwellings. The development of industry to respond to environmental issues such as climate change has been a key plank of the ecological modernization focus of Germany and was mentioned by both German LG cases (DE09001, DE09002). While evidence of an environmental economic focus in the German LG cases was to be expected, the Thematic analysis was also able to identify differences in the community leadership and diversity of economic activity between the two German cases. Information in the reports and responses provided by the participant from case DE09001 that Freiburg had a diverse economic base focused on renewable energy and sustainability, had been supported by independent studies conducted by Lutzky, Seitz-Schule & Kunze (2004). Freiburg (DE09001) has long been recognised as the 'solar city' of Germany and of most of Europe and a model for 'green urbanism' (Beatley 2000). This label was considered by the participant from Freiburg to be, in part, due to the industry that had developed around solar energy, which ranges from manufacture of SPVs to technical and university education centres (DE09001 Participant 1). While institutions specialising in academic research and vocational education have established in the city, other organisations such as the International Solar Energy Society and the ICLEI program have also based their headquarters in Freiburg, providing a focus of attention for solutions based on renewable energy and climate change action at the local level. In the current research there was also evidence of marketing initiatives to build a tourism industry focused on promoting the local industry sectors related to renewable energy. The participant from Freiburg also commented that LG's focus on sustainability across all sectors was delivering population growth, while other cities in Germany were experiencing population

decline. Exploring the link between a diverse economic base and population growth was outside of the scope of the current research and further work to verify this claim by the participant would be required.

In contrast to the 'fully developed market' operating in Freiburg, the economic and business models for delivering energy efficiency improvements for housing such as free home insulation installation and energy auditing in two of the UK cases (UK09001; UK09003) included LG as the lead agency with the council contracting out the actual installation work. The other UK case (UK09002) had established performance based contracts with arm's length management organisations or service providers to deliver the energy efficiency improvement services on behalf of the council, enabling the council to act as principal and oversee performance. Innovative mechanisms for raising funds such as partnering with energy suppliers and obtaining grants from national or regional bodies, particularly in the UK, were evident in this research and offer a new model for LG. However, the main reason for LG leadership for the programs was related to trust. In these cases LG had recognised a need to reassure the community that quality products and services would be provided and that people who entered their homes to undertake audits and arrange for contractors to install products were to be trusted. Trust has been identified as a key aspect of governance for sustainability (Evans et al 2009; Steffen et al 2009) and establishing networks for institutional collective action (Feiock 2009). Recent studies conducted in the EU about the trust that the community has for levels of government (Committee of the Regions 2009) indicated that while only one third of Europeans tend to trust their country's government, their trust of local and regional authorities was on average about 50% and thus higher than trust for national governments. For responses from Germany, the results were much higher (65%) than the average for Europe, while for the UK, trust in local and regional government was slightly lower (47%) than the average. Recent problems of poor quality work experienced with the federal government funded energy efficiency programs in Australia have exposed flaws in a national approach to carbon reduction. While increased LG administration of such programs is warranted, the current constitutional and legal system in Australia restricts the ability of federal government to devolve funds directly to LG (see Pape 2005). The Australian Constitution must be changed to enable LG to take a leadership role in these types of programs.

Local government's ability to influence collective public action relies on it developing a structure and systems to provide information such as local energy consumption and carbon

emissions to residents. In the cases explored in the current research, providing information to the community was complicated by a number of factors including the structure of energy markets with multiple energy supply companies and the introduction of peak and off-peak energy charges. The current study found that local data on energy consumption and carbon emissions was incomplete or not available in the Australian and German LG cases due to confidentiality. Hamilton et al (2008b), Hammer (2009) and Lowe (2005) have also identified this barrier in their research. Pillora et al (2009) identified inadequate systems for managing information as a barrier to achieving sustainability in LG in their studies. In the current research, there was evidence of LG cases having developed systems for gathering and disseminating information about renewable energy systems at the local level (DE09002) and housing energy efficiency (UK09003). The knowledge provided by these systems has led to an ability to plan strategically for future action and report progress towards carbon reduction.

The existence of a system of home energy rating system assessments at time of property sale and tenancy in the UK had also resulted in the development of an industry to undertake these assessments. However, concern was raised by one participant about the capacity for 'the industry' to support housing assessments (UK09003 Participant 2). They made comments about 'not having enough assessors and having to be stratified in its delivery' and that LG were providing this assessment service under contract to landlords. Comments such as these indicate that LG in the UK supports industry while it is developing capacity to meet demand and is concerned about the standard of service provision by the industry. Alafat (2008) had noted that the Housing Health and Safety Rating System may not be being used to best effect, and the comments of UK LG cases in Phase 2 about the difficulties they had experienced in assessing properties in their area may be linked to Alafat's observations. Lessons from the UK cases about a lack of capacity to audit houses may also be useful in understanding the reasons why the Australian government experienced problems with a green loan scheme which required a home energy audit. The Australian government also experienced problems with poor quality installation of insulation in homes during its recent home insulation scheme causing the scheme to be abandoned. The rapid scaling up of industry to support the scheme may have resulted in an under-capacity of inspectors to enable the industry to self-regulate.

Targets for reducing carbon emissions at the EU level have also led to the establishment of high standards of energy efficiency in housing (Passivhaus) and targets for generation and

use of renewable energy. As the capacity to act analysis demonstrated, the policies of LG are important for developing housing that integrates energy efficiency and renewable energy technology. Models are needed to develop schemes for increasing renewable energy installations at scale across the community. Recent schemes in South Australia have been established at the LG, regional or multi-LG scale in South Australia (LGA SA and Zen Home Energy Systems 2010) but if linked to one supplier as each of the schemes used in SA have been to date, the ability of the industry to establish a competitive market may be affected. There is an opportunity for the community to be debating decisions about including renewable energy technology into future housing policy and the benefits of building zero energy houses sooner rather than later as Moore et al (2010) recommend. This debate is particularly important as energy efficient housing is being viewed at conceptual, public policy and construction levels as being unaffordable and therefore not sustainable (see Arman et al 2009).

The cost of action to address climate change mitigation was identified as a significant barrier for LG participating in Phase 1 of the research. In Phase 2, the impact of the global financial crisis on private investment in new capital projects was of concern to all LG cases but most evident in the UK and Germany cases. A suggestion was made by one UK LG participant, that a (new) carbon tax on energy used by households be introduced. The suggestion was motivated, however, by their identified need to increase the uptake of free insulation offered by LG to households. Current UK programs for free insulation were said to be achieving at best a 30% uptake of energy efficiency initiatives. While the objective of a carbon tax would be to provide an 'incentive', obtaining political support for a 'stick' approach may be problematic. New norms for housing must also be acceptable to developers who will need to be convinced that there is a market in the community for dwellings with higher energy efficiency. The additional burden of incorporating such standards was said to affect its affordability with some UK participants stating that the Zero Carbon standard (Code 6) would add significantly to the cost of new housing, quoting a figure of an additional £30,000 to the cost of a house (UK09001 Participant 2). Moore et al (2010) recommend that the ongoing reduction in cost of energy use over time associated with higher standards of housing should also be considered rather than a focus on up-front costs alone. The influence of best practice communities such as Freiburg (DE09001) was evident in the responses of participants from LG cases in the UK and in Australia, indicating that such cases are a model for LG action. The extent to which the diffusion of

innovative carbon reduction programs across LG more generally is reliant on modelling and communicating effective implementation by best practice LG cases is a potential area for further research. Bulkeley and Betsill (2003) identified the influence of networks such as ICLEI CCP in communicating examples of best practice. However, the structure of the economy in Freiburg appeared to be unique among the UK, German and Australian cases studied in Phase 2 of the current research. Hence attempting to implement similar programs in LG in other countries may require a deeper understanding of the influence that economic, political and social bases have for community action.

The responses of participants to questions about the importance of climate change to LG and to the role that it should be playing to support households to reduce carbon emissions clearly presents a dilemma for LG. It needs to reconcile its role for tackling broad environmental issues at the local level with supporting economic growth and delivering social outcomes for its citizens. From the review of initiatives undertaken or proposed by the LG cases, it was clear that providing information about energy efficient and renewable energy technologies was a priority for LG. The focus of LG cases on technological solutions such as renewable energy, and a consequent 'greening' of the local economy, clearly shows that LG considers economic activity which results in local employment opportunities to be important.

LG invariably relies on technological advances and an uptake of new technology across a community to achieve reductions in carbon emissions. From a technological perspective, the actions of LG cases in this study did not relate directly to the development of new technology *per se* but to decisions made by LG cases to promote or hinder the adoption of low carbon technology. Targets were variously being established and policies and programs being developed to enhance the rate at which technology to reduce carbon emissions could be installed across the community. The raising of community awareness of new technology and increasing its visibility and desirability were considered by participants to be key factors in increasing the uptake of new technology. The visibility of new technology was being enhanced and promoted through various initiatives that relied on spatial mapping, demonstration projects, signage and social marketing. These initiatives themselves relied on systems of technology to demonstrate the spatial representation of potential renewable energy resources and databases of information about the socioeconomic status of segments of the community which previous studies have indicated

relate to the adoption of new technology and diffusion of innovation (Rogers 2005; Mallett 2007; McKenzie-Mohr & Smith 1999).

A reliance on technology to assist in solving environmental problems has also been highlighted by Shove (2003) in her research about the socio-technological aspects of energy use. However, as Shove observed in her research (Shove 2003), the structures of technological systems have been developed and legitimised through actions of individuals and collectives underpinning day to day actions such as cooking, cleaning, bathing, dressing, travelling, working, shopping, and communicating. These actions are also reinforced by social norms. As Shove and Walker (2007) contend, new initiatives require a transition period, a change in habits, learned over time through practice to enable actions to be undertaken with minimal conscious thought. When some aspect of an established system changes, conscious thought is called upon to practice and embed new actions. The normal behaviour of the past is no longer acceptable or applicable and new norms take their place. Understanding the direction of change and anticipating or being able to manage that change becomes important when seeking to reduce energy use and carbon emissions in the residential sector according to Shove et al (2008).

The review of planning policy and objectives for new developments undertaken in Phase 2 of the current research indicated that targets for reducing carbon emissions across the residential sector in most LG cases has not been integrated into planning policy. Issues for attention include: housing design and urban layout that maximise roof area for collection of solar energy; and passive forms of energy efficiency and conservation such as orientation, the size of windows, glazing standards, the use of eaves and vegetation. While the objectives of collecting renewable energy should be incorporated into the design of dwellings from the outset rather than be an add-on after the construction process is complete, the percentage of new houses built each year is minimal compared to the existing housing stock. Previous research by the author has assessed the potential for collecting renewable energy from rooftops of existing dwellings across two Australian cases (see Hamilton et al 2008a) and noted that, over the decades since 1950, the complexity of roof styles has increased. The degree of complexity of existing rooftops, such as the number of roof facets, affects the ease with which SPV and SWH can be retrofitted. Their studies noted that while north facing roof areas were sufficient to accommodate SWH and SPV, in reality these areas may comprise two or more roof facets, complicating the installation of SPV, and potentially reducing the renewable energy which

can actually be generated. In contrast, rooftops in Germany were much simpler in design, an observation confirmed by the assumption that 50% of roof area of housing in Freiburg (DE09001) (in this case facing South) was potentially suitable for SPV panels (DE09001 Participant 1). The findings about simple roof designs from the Freiburg case in the current research and Hamilton's previous research about the complexity of rooftops over the past 60 years in Australian LG need to be considered by LG in developing appropriate planning policy to maximise renewable energy collection.

Preserving the character of areas is also an issue for LG cases, particularly in the UK. The character of an area has itself been created through building designs and use of technology in the past, and may be a barrier to the easy installation of 'modern' technology such as SPV panels. The current research has a identified potential conflicts between policies and programs for mitigation of climate change and the design of new and existing housing to easily incorporate new technology such as for capturing renewable energy. Hamin and Gurran (2009) identified potential conflicts between policies for mitigation of climate change and for adapting to climate change. Opportunities exist for LG to resolve these conflicts through consultation with the community, as recommended by Kellett (2003). An approach may involve developing targets and priorities for carbon reduction and an agreed process for appropriately incorporating new technology such as that required for harnessing renewable energy locally. This aspect is further discussed in the section on governance of climate change (Section 7.3). The current research also highlights the importance of establishing a knowledge base of the renewable energy potential that exists on existing dwellings in a local area, the factors that influence the potential available and the areas where policy can be developed to both enhance the uptake of technology and increase the potential available. The approach recommended by Kellett and Hamilton (2009b) of developing renewable energy resource plans at the local level which sit within the development planning framework may offer a mechanism by which a local community can develop such a knowledge base.

From a social perspective, LG was using trials of new initiatives to enable community involvement and education, and to inform the development of systems in which new habits and socio-technical practices can be identified. The evaluation of trials together with sharing knowledge is a key part of social learning. Moloney et al (2009) identified the importance of social learning to the successful transition to a low carbon future. In the current research the Thematic analysis identified examples of social learning such as the

establishment of city farms where small groups could learn about sustainable living practices (UK09001), resident groups which assisted LG cases in local decision making (UK09001; UK09002), and organised forums in public places (UK09003; AU09002; AU09003). However, there was little evidence of in-home discussions advocated by Sarkissian's 'kitchen table sustainability' (Sarkissian et al 2009). Where one-to-one in home approaches were being adopted in the cases studied, these were as a result of an in-home consultation such as an energy audit conducted for the free insulation schemes in each of the UK cases. While the importance of trialling behaviour change initiatives was evident in the results of the Thematic analysis, there was less evidence of sharing of lessons learned from carbon reduction initiatives. In the current research, information from the evaluation of initiatives was at times not provided by LG cases. For some initiatives, there had not been an evaluation, or if there had been, the sample of households was very small and information about the scaling up of the initiative across the LG area was not provided.

In Phase 2 LG cases, social marketing approaches appeared to dominate the carbon reduction initiatives for UK LG. The identification of personality traits and attitudes which underpin values and behaviours of residents within a community was evident in the use of language such as 'green aspirer' (UK09003). Platt & Retallack (2009) consider that values associated with personality traits predominantly drive behaviour rather than the structure or systems in which people act. Mechanisms that enable the customer to respond to requests or pleas to reduce energy consumption without compromising other objectives of convenience and comfort are considered by some researchers to be important for citizens (see Shipworth 2000; McKenzie-Mohr and Smith 2000). The Thematic analysis revealed the importance of understanding the motivations of people within the community. For example, if the 'Now People', a term used by Pratt and Retallack (2009) to label a segment of the community, are being attracted to the schemes on offer because they are a visible demonstration of their commitment to carbon reduction, then that is a significant reason to justify demonstration projects.

Pillora et al (2009) identified the 'language of sustainability' as a barrier for achieving sustainability in LG. Similarly the language of carbon reduction programs may be a barrier to achieving carbon reduction. The challenge for LG is to structure programs that deliver messages using language that engages its community, acknowledging that broad programs may target only particular segments of a community. The knowledge of LG about its

community provides LG with an opportunity to target social learning and social marketing programs locally. Further efforts to involve the community in understanding the motivations that result in energy usage, energy wastage, carbon emissions and carbon savings may assist.

A focus for urban planners to address carbon emissions related to transport has been switching from private transport modes to public transport, cycling and walking which are favoured by increasing the density of residential development and mixed uses (Newman and Kenworthy 1999; Jenks & Dempsey 2005). While there was some evidence for linking the number of motor vehicles owned by a community to gross density of the population, simple quantitative assessments do not deliver in depth understanding of how the high rates of motor vehicle ownership in the Australian cases may be reduced. Dodson et al (2006) noted that the outer suburbs in Australian cities, of which LG cases AU09001 and AU09003 are examples, are home to many of the lower income households as house prices are more affordable, however lack access to transport services, and rely on private motor vehicles. The role of LG to shape the form and sustainability of such urban areas is challenged by the norms of the community to own and preferentially use motor vehicles, actions which were legitimised by planning policy and urban design for automobile oriented suburbs of previous generations. To make radical policy decisions for transit oriented development in these outer suburban areas such as the South Australian Government has done in its *30-Year Plan for Greater Adelaide* challenges these norms. Australian and UK LG cases in the current research identified their role not as a planning policy maker, but as an advocate and provider of information. In spite of the lower car ownership in the UK cases and in Augsburg (DE09002), compared to Australian cases, participants identified congestion in more densely populated parts of cities as a key issue for LG, a factor likely to be exacerbated by increasing densities alone without providing adequate transport alternatives and associated infrastructure. The history of government decisions for public transport provision described by some participants from UK cases is important in understanding the actions that LG may have taken in the past such as for subsidising public transport and which may be acceptable in future. Marsden and Rye (2009) noted the complex nature of the institutional relationships and multi-level governance of transport systems in the UK which affects policy making for carbon reduction from the transport sector and the use of policy making powers.

While LG informs the community about transport services, there was little evidence of LG informing the community about areas of poor urban design which contributes to private car use. The examples of new developments in each case where transport infrastructure was integrated at the outset may provide a useful benchmark of 'best practice' by which all new developments and existing ones may be assessed. However, Jenks and Dempsey (2005, p. 305) noted differences in the cultural expectations of different countries about the density of urban forms and further research about the acceptability of more dense urban areas in Australian suburbs is warranted if these policies are to be pursued. The base from which densification is pursued is higher in Britain and Germany than in Australia and policies to increase density may be more acceptable to communities in UK and German cities. Beatley (2000) commented on similar issues in America, expecting sceptical reactions to presentations about planning and sustainability strategies used in European cities. Studies using Freiburg (DE09001) as an example of sustainable transport have referred to the maximum distance for residents to walk to take public transport, the integration of public transport systems, the provision of parking for bikes in the city centre and at key places such as the main railway station as well as the extensive system of cycling infrastructure across the city (C40 Cities 2010, Beatley 2000). Radical change including the commitment to provide low carbon transport infrastructure takes time and when implemented at a local level, requires LG to bring its community, including its politicians, along on the journey of change. If imposed from higher levels of government without local community ownership, such change may encounter many barriers including social norms for cycling, which were obviously different in European cities compared to Australian communities. While some LG cases in Phase 2 provided financial incentives to residents to use low carbon transport, the capacity for LG to provide such incentives was considered to be limited by the barrier of lack of available funds and decisions made at state or regional level for transport infrastructure.

Planning policy that favours dense urban forms for low carbon transport, however, may have adverse effects on other carbon reduction initiatives such as waste recycling. Studies by Kurz, Linden and Sheehy (2007) in the UK found that recycling rates were higher amongst households living in lower density (semi-detached) housing compared with apartment style housing estates. Their findings may assist in explaining why recycling rates reported by Australian LG cases in Phase 2 of the current research were higher than UK LG cases. The increased density of dwellings, particularly terraced housing and

predominance of semi-detached houses across suburban areas, with some apartment-style living in inner city areas was apparent in the UK and German cities. More dense urban forms may challenge kerbside recycling schemes that require separation at source, and associated separate on-site storage. Conversely, more dense urban forms may favour waste to heat or waste to energy schemes that do not require separation at source. Hence local factors such as urban form are relevant in making decisions about appropriate carbon reduction schemes related to waste management.

While population increases in Australian and UK cases and declining populations in some European cities were described by participants in Phase 2, some social issues were not raised during interviews with LG participants. Examples included: the ageing of the community; the changing (reducing) household size over time; and the increasing proportion of single female households. From Australian statistics, women are twice as likely to use public transport as men and for women up to age 44, there had been a significant increase in those using public transport to travel to work or study over the decade from 1996 to 2006 (ABS 2008). The importance of age and gender in understanding the type of energy use patterns, different views on energy use and the initiatives that LG implement to reduce carbon emissions has not been assessed in the current research. LG cases in Phase 2 of this research acknowledged that racial diversity exists within the community and that LG has a role to address the diverse needs and social issues within the community. While LG is challenged by the diversity of the community, higher levels of government are further removed from the community and would be less able to address local diversity and prioritise need in implementing initiatives locally. Western economies and communities are simultaneously affected by ageing populations and an influx of migrants, creating social issues which planning needs to address. Population changes and demographics, including diverse communities and cultures, together with language barriers were identified as issues for community education and awareness programs as well as energy efficiency programs, and may also create problems in engaging the community in decision-making about carbon reduction. Problems expected to be encountered included developing meaningful local information about climate change impacts, local profiles of the energy use and carbon emissions from the residential sector, and developing broad policies and programs which engage and mobilise households or individuals and are equitable, catering for differences in the local community.

The findings of the capacity to act analysis allowed the identification of policy silos for which LG cases were taking action and those areas where LG were not taking action. LG action on energy systems has resulted in a focus on technical solutions. Giddens (2009) recommends that political and economic convergence need to be promoted to best address climate change, and that science and technology need to be at the forefront of action. However, the current research which has used a Thematic analysis has highlighted the importance of local factors such as social and organisational issues, including autonomy to act, which are important to local action. While Freiburg (DE09001) may be useful as a model of the type of convergence that Giddens (2009) recommends, and is widely held up as best practice to address sustainability, this research has identified that its current policies were struggling to meet future carbon emission targets and that other means to increase the proportion of energy from renewable sources were needed.

The capacity to act analysis has not provided a depth of understanding about the barriers affecting the choice of action for LG, or what opportunities have been identified by LG. The Thematic analysis undertaken in the current research, however, provided a means to identify and assess the relevance of barriers that LG expect to encounter in actioning carbon reduction and has identified opportunities which LG were pursuing. It therefore compliments the analysis of capacity to act. The following section discusses these barriers and opportunities further, focusing on the importance of governance of climate change at the local level.

7.3 Governance of climate change

Betsill and Bulkeley (2007) concluded that the cross-cutting nature of climate change governance poses problems for the institutional make up of LG, resulting in a lack of ‘fit’ between the nature of the problem to be governed and the institutions undertaking governance. While action to address climate change has been widely identified as a key priority in strategic planning documents of LG cases in both Phases of the current research, the main focus of LG action at the time of data collection has been on reducing carbon emissions arising from corporate activities rather than a broader community carbon reduction program. This research has found that ‘leading by example’ which many Australian LG cases in Phase 1 of the current research identified as an ideal action for LG to address climate change is a manifestation of corporate governance, focusing on internal processes which Bulkeley and Betsill (2003) claim are a result of new public management

(NPM). Responses to questions about leadership demonstrated by elected members and staff indicated that decision-making at the corporate level (corporate governance) about actions to address climate change was a demonstration of leadership. The findings from responses about leadership demonstrated by elected members generally related to their decisions as council to support a program put forward by LG staff. However Gilbert et al (1996) considered 'good' governance to involve leadership of all sectors of the community by elected officials, and the use of partnerships to deliver programs in the community rather than focus on internal processes of LG. The internal focus of LG staff and elected members may relate to a paradigm of LG elected members as being a 'servant of the people' (see Peters 1999), expending public funds responsibly and reducing costs of energy used rather than demonstrating leadership at the community level and developing formal and informal networks to progress action on carbon reduction more broadly.

The manifestation of community governance across the LG cases in Phase 2 has been analysed using criteria compiled by reviewing key aspects of social governance of sustainability noted by Evans et al (2005) and climate change governance noted by Bulkeley and Betsill (2003). The concept of community governance in the current research is defined as the community's involvement in decision-making and is also known as external governance (used by O'Toole 2005) or social governance (used by Evans et al 2005).

The involvement of external stakeholders such as local businesses and citizens was recommended by Bulkeley and Betsill (2003) as a means to strengthen the governance of climate change. Evans et al (2009) found that the influence of partnerships to take action on sustainability depended on which interests were represented and their relative power and resources. They noted that businesses were more often involved in partnerships and therefore had an impact on programs for sustainability across European cities while other social groups based on religion and ethnic minorities had relatively less impact. In Phase 2 of the current research, formal systems and structures of partnerships were most evident in the UK cases. The UK central government has made community involvement through a partnerships model a statutory requirement for LG rather than relying on LG developing such partnerships voluntarily. In these cases, partnerships involved community representatives and other stakeholder groups such as businesses and service providers, particularly those involved with managing council owned housing. These partnerships were directly involved in establishing targets and plans to reduce carbon emissions at the

community level. While partnerships were mentioned by other LG cases, these tended to refer to business interests and economic development with less evidence of formal community group involvement.

The research has found LG to be challenged by programs or processes that require action at the community level and may reflect the difficulty it has in involving the community in the process of planning. However, in one German case (DE09001), the community were highly active in leading on sustainability and had 'pushed' LG to undertake low carbon sustainable developments, also pushing for urban consolidation and reclamation of green areas within the city boundary. In this case there was a notable influence of 'environmental' ideology in mainstream politics through the 'Greens'. There was less evidence of green ideology in LG in the UK and Australian cases. While the 'Greens' in Australian politics had yet to develop a noticeable profile at the local level, they have made an impact at state and federal levels of government. LG participants, however, referred to the presence of grass roots groups associated with activism within the community. These groups had names including: Transition Towns, Carbon Action Networks, Carbon Reduction Action Groups, Renewables groups including a pro-wind lobby group, Greenhouse Alliances and a group called Stop Climate Chaos. LG research participants saw these groups as acting voluntarily, garnering support from within the community for actions to address carbon emissions and then lobbying LG for support for collective action. Some of these groups, such as Transition Towns and Climate Action Networks have established global networks, enabling knowledge to be shared and providing further support for global activism. However, one LG research participant (UK09003 Participant 1) commented that, for some citizens, belonging to a large politically active network did not always meet expectations for activity on the ground. The support that LG provides to these groups legitimises their role within the structure of climate change governance at the local level. While involving these groups in community governance of climate change is essential, engagement of the broader community is required to achieve the kind of carbon reductions recommended by Stern (2008).

There were differences in manifestation of community governance factors noted in the Australian cases. A greater emphasis on community input into decision-making was manifested in governance processes of the Vic LG case (AU09002) compared with those of the SA LG cases (AU09001; AU09003). At the time of data collection, the Vic LG case was still relying on actions of individuals, recruiting citizens to establish a carbon

reduction action group and running a series of education seminars to build knowledge and interest in the community. There was little evidence provided by Vic LG of existing community groups being active in decision-making about carbon reduction at that time. A widely held view amongst research participants was that the main motivation for reducing energy use by households was the cost of energy. In the UK cases, transport mode switching had been observed anecdotally as a result of fuel price increases and was used as an argument to support the focus on cost savings. While concerns about the security of supply of energy was mentioned in some cases in the UK and Germany as a motivator for action to switch to other low carbon sources of energy, a specific experience of loss of energy supply was not mentioned by participants. While education programs, conducted individually or in groups, are insufficient in themselves for changes of the extent needed to reduce carbon emissions across a whole community of households (Shipworth 2000, Chess & Johnson 2007, Moser & Dilling 2007), they may still be an important mechanism for LG to engage with existing groups to develop capacity for making decisions about carbon reduction at the community level.

One factor which seemed to be an issue for both Australian and German LG, but was less of an issue for UK LG was access to local information about energy use and carbon emissions. The UK central government monitor and report energy use and carbon emissions for each LG area annually, providing information for domestic electricity and gas use, commercial and industrial sectors and for transport. Access to local information builds awareness and allows progress of actions to reduce carbon emissions to be monitored and plans to be modified. With this knowledge, UK LG is progressively adopting carbon reduction targets, both corporately and at community level through the system of National Indicators which then holds LG accountable for carbon reduction. A review of carbon emissions for each UK LG case in Phase 2 of the research revealed that carbon emissions in the monitored sectors had reduced over time. While not conclusive, the statutory requirement imposed by central government onto LG, together with a formal decision-making framework that involves community governance of climate change, may be creating the appropriate mix of top-down direction and bottom up focus needed for community carbon reduction. At the time of data collection no legislated targets for carbon reduction at the local level had been imposed on Australian or German LG cases. While there was a legislated carbon reduction target at the state level in South Australia, together with targets for renewable energy generation and use, guidance for LG in translating this

target to the local level had not been provided. In the absence of such a framework, LG has to develop its own mechanisms to establish community carbon reduction targets. LG in Australia considered that it had few mechanisms by which it could act at the local level to have a widespread impact on carbon emissions without supporting mechanisms in place at higher levels of government. However, each LG had processes to review and update strategic, community and development plans. From the review of these plans for LG cases in Phase 2 of the current research (see each case summary in Chapter 5), it was clear that during these processes of plan development, consultation with the community and broader stakeholders takes place. LG therefore has the opportunity to engage the community in decisions about climate change action through these planning processes but may not be taking advantage of these opportunities to obtain support for community carbon reduction.

An area which could be explored further is community involvement in decision-making processes that incorporate renewable energy and passive energy efficiency measures into the design of new developments. Each LG case in Phase 2 had at least one example of a new development or redevelopment underway or being planned, however the degree to which these developments incorporated renewable energy and energy efficiency beyond building codes or regulations varied significantly. Taking the example of the new Playford North development (case AU09001) which incorporates redevelopment of state owned housing, the current research revealed that while all new and refurbished houses would be required to install a SWH, installing SPV panels was not mandated. Further research would be needed to understand why SPV panels were not incorporated into the sustainable design principles for this development. This is particularly important as low ongoing energy costs may have provided a mechanism to assist lower income residents to achieve 'affordable' housing. In the design of the Playford North redevelopment, it was stated that community representatives were involved in enquiry by design workshops (AU09001 Participant 2), also known as 'design charrettes' which are public participatory sessions linked to 'new urbanism' (Bond & Thompson-Fawcett 2007). The use of these forums for setting objectives and decision-making raises questions about the knowledge and attitudes of participants toward energy efficiency and renewable energy technology. The development of trust in LG to reflect the interests of a local community may also be an outcome of such involvement.

There was evidence in the UK and German cases that communities are supportive of renewable energy facilities, particularly solar energy, but that insufficient land and

conflicting land use may prevent large scale wind energy facilities. While wind resources may be available in peri-urban areas, community support is still needed to capture and use these resources. Knowledge of the potential renewable energy resources that exist across a local area may assist a community in making decisions about land use that is compatible with harnessing renewable energy. Where such studies had been undertaken in the UK cases, one German case (DE09001) and all three Australian cases in Phase 2 of the research (see Hamilton et al 2008 a/b; Sunter et al 2010), further action by LG to increase the uptake of renewable energy was being pursued. What was less clear was the involvement of the community in making decisions to develop programs for increasing the uptake of renewable energy. Involvement of the community in ownership and decision-making for renewable energy schemes has been recommended by Kellett (2003/2007), Hamilton et al (2008a) and Kellett & Hamilton (2009a/b). In the LG cases in Phase 2, there were examples of community owned renewable energy schemes provided by German and UK LG cases, while one Australian LG case (AU09003) was also investigating such a scheme. In Germany, small communities have authority equal to LG in cities and according to the participant from Freiburg (DE09001 Participant 1) could more easily implement local renewable energy projects. A greater understanding of the factors that allow small communities to harness renewable energy may identify differences in the mechanisms that LG use and whether these mechanisms relate to scale - ie rural/ regional or urban.

While most urban LG authorities in Australia had joined the ICLEI - CCP program to receive assistance in estimating energy use and carbon emissions across their corporate operations, less had engaged in the ICLEI program more broadly across sectors in the community, developing carbon reduction action plans at the community level. Bulkeley and Betsill (2003) considered that global networks such as the ICLEI CCP program had supported LG action to mitigate climate change. However the results of the current research indicate that the information and support provided by ICLEI was insufficient for decision making to achieve community carbon reduction. In the UK, only one of the three UK cases (UK09002) had participated in the ICLEI program, while one German case (DE09001) indicated that they were ahead of the ICLEI CCP program. During the course of the current study, the Australian government withdrew funding support for this program, removing a means by which LG can monitor carbon emissions at the local level. It is unclear what impact this withdrawal of funding will have on LG action in Australia and

governance of climate change. The findings of the current research indicate that ICLEI CCP may have assisted LG to get started on identifying carbon emission sources, particularly at the corporate level, leading to corporate governance of climate change but had not delivered community carbon reduction.

The influence of regional alliances of LG to address climate change was evident in Vic LG and more recently in SA LG, however regional governance structures need to recognise community governance of climate change rather than take decision-making up to a higher level. Regional approaches for sustainable development have been proposed by other researchers including Gleeson et al (2010) and Steffen et al (2009). The current research reveals that a regional approach may be a tool for LG to provide programs for improving essential infrastructure such as transport services or energy services. While a regional approach may assist with these larger infrastructure programs, the focus on community decision-making to support household action and the needs of local community groups may be lost.

In summary, this discussion of issues related to community governance of climate change has shown that LG variously involves the community in decision-making on climate change with most involvement focusing on business interests in the community. Australian LG cases showed a greater focus on corporate responsibilities and leading by example compared to UK and German cases, with UK cases having a highly developed partnership arrangement for involving the community in decision-making on carbon reduction. While LG is claiming that leading by example in its action on climate change and carbon reduction is ideal, more information about the community response to such action is needed. The processes for developing plans particularly for new developments provide an opportunity for LG to involve the community in decision-making about carbon reduction, particularly for incorporating energy efficiency and renewable energy. However, LG should review the outcomes of its processes and plans to ensure that progress towards mitigating climate change takes place. Hence information about carbon emissions across sectors and the opportunities that exist to reduce these emissions locally, through renewable energy and energy efficiency should be gathered and disseminated to the community to assist in building a knowledge base for decision-making at the LG level. Further study may lead to an improved understanding of the extent to which social groups in each community and ‘Green’ political ideologies influence decision-making about carbon reduction initiatives at LG level.

7.4 Limitations of this study

This study has been challenged by the dynamic nature of the research topic. Climate change has been a 'hot topic' and rarely a week goes by without a statement about climate change – challenging the reality of climate change and the need for mitigation; its current and potential impact on communities; actions of developed or developing countries to mitigate climate change including emissions trading, carbon pricing or taxes; policies and programs for mitigation as well as adaptation; progress toward an international agreement to replace the Kyoto Protocol or, more precisely, lack of agreement between countries about carbon reduction targets; issues of climate justice and the plight of island or coastal communities; or the link to population growth, economic development and consumption patterns. The social and economic implications of climate change play out in political debate in the media and fast moving policy making, sometimes with unintended consequences and lack of foresight about risks, as has been the case in Australian government policy for insulation schemes. It has been necessary to establish some boundaries around the research undertaken and the collection of data to enable the research to be completed in the time allocated for a PhD candidacy.

Data has been collected from primary sources (staff) and official documents within each LG case which has its own context - the systems and structures in which it operates. It is acknowledged that LG is dynamic, and is influenced by changing politics at both local and higher levels of government. The data can only be interpreted as the answers given by each participant at that particular time to the questions posed. The social and economic aspects of the community in each case study area also change over time and data have been obtained from official sources such as census statistics which are collected at intervals dependent on each country. Hence this study is a snapshot of LG's action and a reflection of its journey in reducing carbon emissions at the community level at the time of data collection. In addition, some programs implemented by LG cases may not have been evaluated at the time of data collection, and further information about the effectiveness of these initiatives may have emerged since that time. Further data collection may reveal the success or otherwise of new programs which participants described during the collection of data for this research. There is also a lack of quantitative data to verify the effectiveness of the measures (in different LG) discussed under household energy efficiency, uptake of renewable energy technology and low carbon transport. While questions were asked of staff to provide an evaluation of the effectiveness of measures, few participants were able

to provide such an evaluation. Without quantitative data either available to LG or to higher levels of government, the effectiveness of programs in terms of measurable carbon reduction still remains to be determined and is a limitation of this study.

The findings have been collected using qualitative research tools such as questionnaires and interviews, techniques which were considered applicable to analyse and interpret the data at a later date. Due to the limited amount of time available to collect data and the cost of more intensive research tools than interviewing staff of LG in cases across three different countries, a larger sample of LG has not been used in this study. There have been issues associated with obtaining agreement from individual LG organisations and individual staff from a broader range of functions across each LG case. Hence the findings are limited by the potentially narrow range of perspective and attitudes towards LG actions to assist households to reduce carbon emissions that arise from interviewing one or two staff from each LG. While, there has been a focus in this research on exploring how planning undertaken by LG cases has incorporated policies and programs to reduce carbon emissions at the community level, LG staff interviewed have not necessarily been in a planning role within LG, but have been involved in delivering climate change programs more generally. In Phase 2, the findings are based on responses from a few participants, sometimes even one for each LG who may or may not have been in a planning role. Where data has been obtained from staff in different departments of an LG case, differences in their responses and the conclusions able to be drawn from the analysis of the data have been noted.

7.5 Summary of chapter

In this chapter, the findings from four analytical approaches were discussed and compared to each other and to the findings of previous studies of LG action to reduce community carbon emissions. The capacity to act analysis identified that there was a need to develop further capacity in integrating energy efficiency and renewable energy into local planning rules. LG continues to rely on programs to inform and educate citizens and to advocate on behalf of its citizens for improved services that are more sustainable than current options. On its own, however, the capacity to act analysis was insufficient to identify issues within LG and more broadly in the community that may be affecting the capacity for LG to take action to reduce carbon emissions. While the capacity to act analysis was able to identify jurisdictional differences and gaps such as the need for planning policy and may have

usefulness in an examination of LG action across the other states of Australia, there were limits to its usefulness as a qualitative research technique.

The use of Thematic analysis highlighted the importance of local factors such as social, organisational and political issues, including LG's autonomy to act and access energy use information, which are important to LG establishing a knowledge base of quantified carbon emissions and potential reductions and making decisions for carbon reduction at the community level. This qualitative analysis tool was able to identify that LG considers its role to be leading the community by setting an example in reducing energy use and carbon emissions associated with its operations. However, LG is challenged by funding constraints, a lack of support from higher levels of government, the attitude of its community towards carbon reduction programs and the diversity in the community which affects the relevance of social marketing techniques to increase the uptake of new low carbon technology. Current LG initiatives were thought to be resource intensive, both in terms of staff and in cost. LG has, however, identified opportunities to overcome some of the funding constraints through establishing partnerships with energy suppliers and local businesses, building capacity for business and industry to service the community and promote new technology required to transition to a low carbon future.

Involvement of the community in governance of climate change where decisions are made through a participative process with community groups, citizens and other key partners is a significant challenge for LG, although LG is better placed to know its own community than higher levels of government. The analysis of community governance of climate change, using criteria developed from an analysis of social governance of sustainable cities (Evans et al 2005) and climate change governance (Bulkeley and Betsill 2003), has sought to build a picture of the level of community involvement in decision-making for carbon reduction that was manifested by each LG case. Of the eight LG cases in Phase 2, the analysis demonstrated that in each country, there was one LG case that was demonstrating greater community governance and which may be a model for others in that country. Of all of the cases, the City of Freiburg (DE09001) demonstrated the strongest leadership at the community level for making decisions that resulted in sustainable development outcomes including carbon reduction. This case explained its actions as providing the guidelines and framework to support action within the community rather than LG leadership focused on corporate operations. Outcomes from the types of policies potentially needed were observable in this case where council action was being driven by community demand and

leadership across all sectors rather than by direct regulation, although development planning was being strategically used to support the objectives of sustainable development across the whole community.

The importance of establishing a framework that provides LG with support from higher levels of government, however, may be needed in countries such as Australia where LG has little autonomy to act, compared to Germany. The UK cases had a framework in place that was resulting in carbon reduction across the LG over time, in spite of growth in population. Their planning system was also directing action on energy efficiency and renewable energy as means to reduce carbon emissions. Hence the UK model may be useful for Australia to consider in the future particularly if the Australian constitution is amended to recognise LG, enabling more direct national to LG direction and funding. In the interim, Australian LG has an opportunity to use its planning role to greater effect to engage the community in setting targets for local carbon emission reduction and increase the uptake of renewable energy and energy efficiency initiatives in new and redevelopment. Australian LG should seek to engage the community in decision-making about carbon reduction more openly by quantifying, monitoring and reporting carbon emissions and renewable energy resources that are potentially available and being used locally.

Chapter 8. Conclusions and recommendations

> '….we have a role where we influence, but very often can't directly mandate that something or other will happen and when you look at the big kind of challenges of sustainability, influencing is all well and good but it doesn't allow you to make some of the step changes that we know we need to achieve over the next few years.'
>
> (UK09003 Participant 1)

While local government (LG) is the level of government that is closest to the community, its role to support the community to reduce carbon emissions is not well defined. This research has sought answers to questions about the role for LG to support its community to reduce carbon emissions and its capacity to take action on energy systems at the local level that contribute to carbon emissions. It has also sought to understand the barriers and opportunities that LG faces and whether community governance of climate change might assist in overcoming barriers for local action to achieve carbon reduction. In so doing it has sought to identify differences and similarities across LG by comparing actions of metropolitan Australian LG, focusing particularly on South Australia and Victoria, with actions of LG in England and Germany, two countries which are also considered to be high per capita carbon emitters in their geographical region.

The research was undertaken in two Phases. In the first Phase, data were collected from metropolitan LG in two states of Australia - 18 LG in South Australia (SA LG) and 19 LG in Victoria (Vic LG) through a postal survey addressed to chief executive officers. From the analysis of the Phase 1 data it has been concluded that, while LG has generally acknowledged the importance of climate change, there is variation across LG in the degree of commitment to take action to address climate change, and the type of action undertaken to assist households to mitigate climate change at that level. While numerous types of LG action to reduce carbon emissions were being undertaken by LG in each jurisdiction, Vic LG appears to be more active in supporting households to reduce carbon emissions than does SA LG. From the analysis of actions considered by LG to be ideal for addressing

climate change, it appears that LG still focuses mainly on corporate activities, which it explains it does to set an example to its community. While targets were being set to reduce carbon emissions at the corporate level, few LG respondents indicated that targets were set at the community level. Those LG respondents that had community targets were concerned about their ability to achieve them. The barriers to taking action identified by LG in both jurisdictions demonstrated that the structure and systems within which LG acts are highly influenced by state and federal politics. This influence was particularly noticeable in Victoria, where LG respondents identified the barrier relating to the willingness of these politicians to take action to support LG as frequently as the barrier relating to lack of funding to enable action. The current constitutional and legal system in Australia continues to restrict LG in formally undertake action on carbon emissions in its community. It also restricts federal government in its ability to devolve funds directly to LG, relying on state government to direct LG in its core responsibilities and distribute funding. Hence for LG to take a formal lead role to address carbon reduction in the community, the Australian Constitution must be changed.

From the analysis of capacity to act using the five mayoral levers described by Hammer (2009) it can be concluded that most actions of LG nominated by respondents in Phase 1, including the actions thought to be ideal, were focused on information and education programs and advocacy to higher levels of government for improved provision of services, such as public transport, to local areas. Other mayoral levers – rulemaking; regulatory oversight; financial incentives; and direct expenditure and procurement - tended to be less evident which may reflect a lack of understanding within LG of the means by which carbon reduction objectives such as increasing energy efficiency and uptake of renewable energy may be integrated into policy or programs at the local level. The Vic LG respondents more frequently identified the need for better planning policy as ideal action to address climate change compared with SA LG responses. Hence there is awareness in Australian LG of the importance of planning policy to address climate change, although this awareness is not consistent across LG based on the findings of this study. On its own, the data collected during Phase 1 and the analysis of capacity to act was insufficient to identify which issues within LG, or more broadly in the community, may affect the capacity for LG to take action such as developing and implementing planning policy designed to reduce carbon emissions across the community.

The second Phase of the research utilised a case study approach and selected cases from three countries – three cases from Australia, three cases from England and two cases from Germany. From the qualitative analysis of data collected through questioning staff in the eight LG cases, it is clear that LG in each country acknowledges that it has a role to support its community to address climate change but that its role is not well defined across LG or within each LG case. Within each LG case, the responsibility for developing programs to address climate change at the community level appeared to be transitioning from an environmental area of LG to a broader sustainable development area, acknowledging that the impacts of climate change and action to address climate change have social and economic aspects as well as environmental aspects. LG cases had also recognised that LG is just one actor in the structure (or framework) of integrated action to mitigate climate change and that its role is rapidly expanding to address the need to prepare its community to adapt to climate change. While LG generally acknowledged that it had a role to assist the residential sector to reduce energy use in dwellings and for transport choices, there was widespread concern about its ability to effectively influence decisions at a household level. In each case, the private ownership of cars, the vested interests of existing energy and transport service providers, the perceived high cost of alternative energy solutions such as retrofitting existing dwellings with energy efficient measures and renewable energy, the ongoing investment in and subsidies for carbon intensive infrastructure and energy networks and decisions made at higher levels of government were all seen to be major barriers. However, in some cases, evidence of using networks across LG, lobbying higher levels of government for decisions on policy or increased autonomy for LG and for funding for programs were seeking to overcome these barriers. There were differences noted in the willingness and capacity of each LG case to work with external stakeholders, particularly with developers and energy suppliers, to achieve its objectives of reducing emissions from energy used in the home. For transport, a model of best practice in addressing the barriers was observed in Freiburg, while for improving energy efficiency in existing housing, the programs in the UK cases could be described as best practice. While acknowledging that there are different structural systems of government and differences in powers afforded LG in each country, there is significant opportunity for Australian LG to learn from the experiences of these examples of best practice. Consequently, there is value in fostering international networks of LG to share experiences in implementing initiatives to address climate change, particularly planning policy for increased energy efficiency and greater uptake of renewable energy.

LG cases had variously demonstrated willingness to adopt a leadership role as a 'trusted entity' which pursues innovative approaches on behalf of its community to overcome barriers and create opportunities for local action to mitigate climate change. The importance of LG developing capacity to fulfil its role to provide a sustainable future for its community is built on this notion of trust between the community and its local decision-makers. Increasing disillusionment of the populace with the efforts of international and national leadership to address climate change only emphasises the importance of LG decision-making and how LG can build on this notion of community trust. All of the LG cases in Phase 2 of this study had recognised that providing the community with information about local energy use, carbon emissions and potential renewable energy resources is an important first step for engaging the community in making decisions about appropriate carbon reduction programs. However this research has concluded that LG finds it difficult to obtain such data unless higher levels of government enable the gathering and dissemination of such data, a system evident in the UK LG cases. Irrespective of whether the data is available to LG, making decisions through planning policy may support or potentially hinder efforts to reduce carbon emissions. Supportive planning policy responses identified in this research included renewable energy resource plans, energy efficiency standards for passive houses, minimum targets for renewable energy for new developments and integrating public transport into new developments from the outset. While local government has the opportunity to use existing planning policy development processes to build capacity and community support for local carbon reduction, raising the awareness and understanding of LG staff and elected members, particularly in Australian LG, may be needed to enable actions to address climate change to be integrated into planning schemes or systems. The LG cases in Phase 2 of this study had begun the process of educating staff and elected members about the opportunities for carbon reduction at the local level, but in some cases, were still to garner widespread community support for such action and thereby influence decisions of higher levels of government.

At the LG level, leadership by either elected members or business and community groups is needed for decision-making to address climate change. However, regardless of where the leadership takes place, the elected members of LG are the final decision-makers on local policy. Examples of strong leadership either within the elected members, within the staff of LG or within the community were evident in those LG cases that demonstrated innovative approaches to carbon reduction at the community level. The knowledge and strength of

leadership of LG elected members and staff is potentially important in building community trust in LG to be acting for the public good. Questions about the demonstration of leadership by elected members, staff of LG and citizens brought forth a number of responses and issues that may be worthy of further exploration. The importance of leadership has been widely touted as essential for LG to lead change, however the location of leadership, whether it is in the LG organisational structure or in the community may influence the type of decisions being made for carbon reduction across the community. This research has identified that while LG may have limited capacity to act on systems, it builds its capacity with support from and participation of its community. Involving the community in developing an agreed vision of a low carbon future has assisted some LG cases in challenging the social norms of its community and increasing its community's understanding of the barriers and opportunities for local climate change action. Thus there is a significant role for LG to be educating its community about the need for mitigating climate change and how this action to reduce carbon emissions contributes to a sustainable future for its community.

As Australia moves into the second decade of this century, it is poised to demonstrate to the world that acting on climate change is a high priority. While the national government continues to be plagued by party politics in the debate about market mechanisms to price carbon, local communities are bearing the economic and social costs of extreme weather events. These include the high rainfall and widespread flooding, arguably linked to a changing climate, which occurred for the third year in a row in January 2011 in the eastern states of Australia. Local government has an opportunity to step up to the challenge of addressing not just the impacts of climate change but the major cause of climate change, its community's ongoing consumption and wastage of energy produced from fossil fuels. Communities look to local government as a trusted entity expecting it to be making decisions for the public good. What better indicator of making such decisions could there be but to develop and adopt mechanisms which value renewable energy resources and allocate them wisely for the future of the planet and humanity. Future generations may look back on this time of procrastination as a missed opportunity or they may look back on this time as the making of local government in Australia, taking responsibility for tackling the biggest issue yet - reversing the trend of growing carbon emissions.

Recommendations for further research

During the analysis of data collected and discussion of the findings, four areas for potential further research were identified. The first of these is to examine the relationship between LG leading by example in taking action to reduce carbon emissions with their own operations and broader community action. One area where leading by example may have an influence on broader community action is in personal action by leaders within LG (staff and elected members) and also in the community. Recent advances in community information and education using mechanisms such as social media and round the dinner table discussions should be reviewed to understand their effectiveness in addressing action for carbon reduction in the community and advancing social learning.

Secondly, it is recommended that further research be undertaken in understanding the various roles for LG to lead community carbon reduction, particularly how planning, a fundamental role for LG, is being utilised. There is a need to further research the uptake and acceptability of planning tools such as: mapping energy usage, identifying energy wastage, mapping renewable energy resources, developing plans to capture and use local resources and reviewing conflicts in planning policy that create a barrier to reducing carbon emissions. An opportunity exists to link renewable energy resources to natural resources management and further research into the appropriate mechanisms for creating this link is needed to enable local decision-making and management of renewable energy resources. Related to planning for energy management is access to data on energy usage, carbon profiles and carbon reduction at the local level. There is a need for further research to establish agreed methods for calculating local carbon emissions; for determining local renewable energy and energy efficiency potentials and monitoring the progress of local initiatives.

Thirdly, there is further research needed to understand the alternative funding mechanisms that are available to LG and its community, ensuring that incentives are widely available to increase the uptake of renewable energy in particular. One area which is increasingly being explored by LG is the bulk purchasing of SPV systems on behalf of residents and the emergence of community or citizen-funded renewable energy projects. The role for LG to identify the extent of local assistance required and in obtaining grants needs further research. Related to the increased uptake of renewable energy is the opportunity that LG has to support the development of local industry to service renewable energy generation. Further research into the opportunities that addressing climate change creates for LG and

its community is needed to enable a greater understanding of the economic and social benefits as well as the environmental benefits of carbon reduction. Hence there is a need to better understand how climate change action links with broader action to attain sustainability of development in communities.

Finally, the need to better understand the climate change aspects that affect sustainability links to a fourth research need which is to understand the conflicts that may arise through communities addressing both climate change mitigation and climate change adaptation. Recent research of Hamin and Gurran (2009) which identified such conflicts, together with the findings of this research which identified preliminary action taking place to plan for and prepare communities for coping with extreme climate related events, raises the importance and urgency of conducting research to identify appropriate mechanisms by which both climate change adaptation and mitigation outcomes can be met in the most effective and efficient manner.

Relevance of research findings

While this research mainly focuses on Australian LG, the inclusion of LG cases from the UK and Germany ensures its relevance to the body of research reviewing the capacity for LG to take action on climate change and governance frameworks for carbon reduction more broadly. In the absence of effective international and national responses, which are arguably far removed from day to day needs of a community, the collective action of LG to effectively mitigate climate change and reduce climate impacts in its local communities has become increasingly important. It is clear from this research that LG needs to involve its community in decision making about effective carbon reduction, implement appropriate planning mechanisms to address climate change and develop local leadership, both internally and externally.

Original contribution to knowledge

The research framework has enabled original empirical data collection relating to the actions of LG to mitigate climate change at the community level in the urban centres of two state capitals of Australia. It has also reviewed the planning and policy instruments of eight LG cases revealing a variety of regulatory policies that are being pursued by these LG cases in three countries, Australia, UK and Germany. The interviews with LG case study participants also contributes new knowledge and provides new insight into the

barriers and opportunities facing LG in developing and implementing initiatives for mitigating climate change at the local level.

Appendices

Appendix 1

Questionnaire for Phase 1 Research

Participant Information Sheet for Local Government Survey

University of South Australia

What can local government do to help residents reduce greenhouse gas emissions? The research I am undertaking is designed to address this question. My name is Cathryn Hamilton and I am a student of the University of South Australia undertaking a PhD in Urban Planning at the City East Campus.

I am inviting metropolitan local governments in South Australia and Victoria to be part of my research which is itself part of a larger project titled Carbon Neutral Communities – Making the Transition. This is being funded by the Australian Research Council.

As a participant each local government will be asked to complete a short survey and return the completed survey to me in the reply paid envelope. The survey may take between 15 to 20 minutes to complete and will provide real data for my research project. However participation is voluntary.

Confidentiality is an important factor in conducting research. The name and telephone number or email address of the person who completes the survey on behalf of your local government will allow me to make contact to clarify any issues related to the completed survey. This information together with the name of the local government itself will not appear in my PhD thesis or in any reports or papers which may result from this study. Please note that it is the University's policy to require all data collected for research purposes to be kept for a period of 7 years from the date of collection and to store this in a secure location. Data is expected to be in both paper form and in electronic form, the latter may be stored on either the secure computer network of the University of South Australia or in CD form. All data in paper or CD form will be stored initially in a locked file in the researcher's office. Following the completion of the candidature, it will be stored in the locked storage for the School of Natural and Built Environments, City East Campus.

This project has been approved by the University of South Australia's Human Research Ethics Committee. If you have any ethical concerns about the project or questions about your rights as a participant please contact the Executive Officer of this Committee, Tel: 8302 3118; Email: Vicki.allen@unisa.edu.au

If you have any questions which relate to the University's policies or my conduct please contact my Supervisor, Dr Jon Kellett, Head of Urban and Regional Planning, School of Natural and Built Environments, University of South Australia, City East Campus, ph 83021701 or email Jon.Kellett@unisa.edu.au.

I can be contacted using the contact details below.

Thank you for your cooperation. It is greatly appreciated.

Cathryn Hamilton
Student ID 09412337B
PhD Candidate, University of South Australia
Ph 83022356; Mobile 0424382905; Email: Cathryn.Hamilton@postgrads.unisa.edu.au

Survey of Metropolitan Local Government Authorities in South Australia and Victoria - Specific initiatives relating to climate change and greenhouse gas emission reduction

Information about LG Area ***Participant ID…….***

Request	Response	Office use only
LG Name		
Area	(sq kms)	
Number of Residents		
Number of Residential Dwellings		
Average Rates per residential property	($/yr)	
Name of Person Completing Survey		
Position within LG Authority		
Date of completion of survey	__ __/__ __/__ __	
Contact Phone Number		

Confidentiality: The information you have provided will only be used for the purposes of this study.

Thank you for completing this survey. Please return the completed survey in the Reply Paid

Envelope to:

Cathryn Hamilton
PhD Candidate
School of Natural and Built Environments
University of South Australia
North Terrace, Adelaide SA 5000

Question and Responses ***Participant ID……..***					Tick the box with your answer ✓	Office Use Only	
1.	**Has your local government formally acknowledged that Climate Change is an important issue?**						
1.a.	Yes						
1.b.	No						
2.	**Climate Change has been acknowledged as important through the following:** - (only answer this if you responded Yes in Q1)						
	(tick all that apply)			(tick all that apply)			
2.a.	Key Issue in Strategic Plan		2.h.	Appointed Climate Change officer			
2.b.	Modified Development Plan to address climate change		2.i.	Conducted Climate Change seminars			
2.c.	Modified Planning Policy Guidance documents to address climate change		2.j.	Support business to adapt to climate change			
2.d.	Participate in ICLEI Cities for Climate Protection (CCP)		2.k.	Support business to reduce GHG emissions			
2.e.	Implemented energy and water conservation measures within corporate operations		2.l.	Support community groups to adapt to climate change			
2.f.	Estimated water and energy use and GHG emissions across community		2.m.	Support community groups to reduce GHG emissions			
2.g.	Report water and energy usage and greenhouse gas (GHG) emissions to the community		2.n.	Other, please explain …… …… ……			
3.	**Has your local government implemented any initiatives specifically to assist residents to reduce greenhouse gas emissions?**						
3.a.	Yes						
3.b.	No						
4.	**The initiatives implemented to assist residents are:** - (only answer this if you responded Yes in Q3)						
	(tick all that apply)			(tick all that apply)			
4.a.	Provide home energy audits for residents		4.g.	Provide energy audit kits for use in homes			
4.b.	Provide recycling services for residents		4.h.	Established 'shop-front' or drop in centre(s) for residents to get more information about ways to reduce GHG emissions			
4.c.	Provide rebates for implementing energy conservation measures in homes		4.i.	Provide physical or technical assistance to install energy conservation measures in homes			
4.d.	Provide rebates for implementing water conservation measures in homes		4.j.	Provide improved access to public transport in residential areas			
4.e.	Provide information about how to reduce GHG emissions in homes		4.k.	Provide improved walking and cycling tracks in residential areas			
4.f.	Conduct forums for community groups – ways residents can reduce GHG emissions		4.l.	Other, please explain …… ……			

Question and Responses *Participant ID……..*					Tick the box with your answer ✓	Office Use Only	
5.	**Is your local government planning to implement any new initiatives in the next two years to assist residents to reduce greenhouse emissions?**						
5.a.	Yes						
5.b.	No						
6.	**The new initiatives you plan to implement are:** (tick all that apply) - (only answer this if you responded Yes in Q5)						
6.a.	Provide home energy audits for residents		6.g.	Provide energy audit kits for use in homes			
6.b.	Provide recycling services for residents		6.h.	Established 'shop-front' or drop in centre(s) for residents to get more information about ways to reduce GHG emissions			
6.c.	Provide rebates for implementing energy conservation measures in homes		6.i.	Provide physical or technical assistance to install energy conservation measures in homes			
6.d.	Provide rebates for implementing water conservation measures in homes		6.j.	Provide improved access to public transport in residential areas			
6.e.	Provide information about how to reduce GHG emissions in homes		6.k.	Provide improved walking and cycling tracks in residential areas			
6.f.	Conduct forums for community groups – ways residents can reduce GHG emissions		6.l.	Other, please explain …… …… ……			
7.	**Has your local government set a target for reducing greenhouse gas emissions?**						
7.a.	Yes						
7.b.	No						
8.	**What is this target and when is to be achieved?**						
8.a.	Target is……..						
8.b.	To be achieved by……						
9.	**In an ideal world, what process or measure do you think local government needs to implement to make a positive impact on climate change?**						
……							
……							
……							
10.	**In your opinion, what are the barriers to local government in implementing the process or measure you identified in Q9?**						
……							
……							
……							

Thank you for completing the survey.

Appendix 2

Questionnaire for Phase 2 Research

Participant Information Sheet for Local Government Representatives in Case Study areas – United Kingdom and Germany

University of South Australia, Adelaide, Australia

What can local government do to help residents reduce their greenhouse gas emissions? The research I am undertaking is designed to address this question. My name is Cathryn Hamilton and I am a student of the University of South Australia undertaking a PhD in Planning.

I am inviting you, as a representative of your local government authority, to contribute to my research which is part of a larger project titled Carbon Neutral Communities – Making the Transition. This project is being funded by the Australian Research Council and industry partners from local government, state government and community groups in Australia.

If you consent to participating, I will interview you about the importance of climate change and greenhouse gas emission reduction to your local government and the action your local government has taken. The questions I will be asking are attached. For every initiative that your local government has taken I will also ask you a few extra questions about how effective you think this action has been (see Section C). The interview itself may take about 30 minutes plus some additional time for providing the extra information about each action. You may choose to prepare some of the responses prior to the interview. The interview will be audio-recorded to assist me with the transcription of responses. If you would like a copy of the transcript of the interview please advise me at the interview.

Confidentiality is an important factor in conducting this research. Providing your name and telephone number or email address will allow me to contact you afterwards to clarify any responses and also to advise you of any reports or publications that include the results of this study. Your name will not appear in my PhD thesis or in any reports or papers which may result from this study. Please note that it is the University's policy to require all data collected for research purposes to be kept for a period of 7 years from the date of collection and to store this in a secure location. Data is expected to be in both paper form and in electronic form. The latter may be stored on either the secure computer network of the University of South Australia or in CD form. All data in paper or CD form will be stored initially in a locked file in my office. Following the completion of the candidature, it will be stored in the locked storage for the School of Natural and Built Environments, City East Campus, Adelaide, South Australia.

This project has been approved by the University of South Australia's Human Research Ethics Committee. If you have any ethical concerns about the project or questions about your rights as a participant please contact the Executive Officer of this Committee, Tel: +61 8 8302 3118; Email: Vicki.allen@unisa.edu.au

If you have any questions which relate to my conduct please contact my Supervisor, Associate Professor Jon Kellett, Head of Urban and Regional Planning, School of Natural and Built Environments, University of South Australia, City East Campus, ph +61 8 83021701 or email Jon.Kellett@unisa.edu.au.

If you wish to contact me please use the contact details below.

Thank you for your participation. It is greatly appreciated.

Cathryn Hamilton
Student ID 09412337B
PhD Candidate, Planning

Email: Cathryn.Hamilton@postgrads.unisa.edu.au
Ph +61 8 83022356; Mobile (Australia) +61 4 24382905;

Postal Address:
School of Natural and Built Environments, City East Campus
University of South Australia
GPO Box 2471
ADELAIDE, Australia 5001

CONSENT FORM
University of South Australia

Project title…

Mechanisms for local government to support carbon neutral households

Researcher's name……Cathryn Hamilton…….

Supervisor's name……Assoc Professor Jon Kellett ……..

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me.
- I agree to take part in this research project.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal details will remain confidential unless I agree separately.
- I understand that all completed surveys, recordings of interviews or written notes will be stored in a locked filing cabinet at the University of South Australia, City East Campus, School of Natural and Built Environment.
- I do / do not wish to receive a summary of the results of this research. (please circle)
- My email address for future contact is ……
- My telephone number for future contact is…….…

Name of Participant…….....

Local Government Name……...

Signed…….**Date**…….

I have provided information about the research to the research participant and believe that he/she understands what is involved.

Researcher's signature and date……...

Survey of Metropolitan Local Government Authorities in United Kingdom and Germany- Specific initiatives relating to climate change and greenhouse gas emission reduction

Information about LG Area ***Participant ID……..***

Request	Response	Office use only
LG Name		
Area	(sq kms / sq miles)	
Number of Residents		
Number of Residential Dwellings		
Average Rates per residential property	(£/yr or €/yr)	
Name of Person Completing Survey		
Position within LG Authority		
Date of completion of survey	__ __/__ __/__ __	
Contact Phone Number or Email		

Section A. Key Issues and Attitudes

(CH to use these questions to interview participant and explore and clarify responses)		Response ***Participant ID……***	Office use only
A1.	**What are the key issues for your local government in the short term – say in the next 2 years?**	…… …… …… …… ……	
A2.	**What are the key issues for your local government in the mid to long term – say the next 5 to 10 years?**	…… …… …… …… ……	
A3a.	**On a scale of 1 to 4 where 1 is not important and 4 is extremely important, how important is climate change to your local government?**	……	
A3b	**Which aspect of climate change do you think is the most important?**	…… …… …… …… ……	
A4a	**On a scale of 1 to 4 where 1 is not important and 4 is extremely important, how important is reducing greenhouse gas emissions to your local government?**	……	
A4b	**Which aspect of reducing GHG emissions do you think is the most important?**	…… …… …… …… ……	
A5a.	**How would you describe the attitude your residents have towards their use of energy in their home?**	…… …… ……	
A5b	**How do you know this?**		
A6a.	**How would you describe the attitude your residents have towards their use of energy for transportation?**	…… …… …… ……	
A6b	**How do you know this?**		
A7a.	**On a scale of 1 to 4 where 1 is no role and 4 is a major role what role do you think local government has to help residents reduce energy use in their home?**	……	
A7b	**What leads you to this conclusion?**		
A8a.	**On a scale of 1 to 4 where 1 is no role and 4 is a major role what role does local government have to help residents reduce energy use for transportation?**	……	
A8b	**What leads you to this conclusion?**		

SECTION B Interview/Survey Questions: Formal Response to Climate Change

Participant ID…….

B1.	**Has your local government formally acknowledged that Climate Change is an important issue?**						
1.a.	Yes						
1.b.	No						
B2.	**Which of the following have been used to acknowledge that Climate Change is important:** - (only ask if they responded Yes in B1)						
		(tick all that apply)			(tick all that apply)		
2.a.	Key Issue in Strategic Plan		2.h.	Appointed Climate Change officer			
2.b.	Modified Development Plan to address climate change		2.i.	Conducted Climate Change seminars			
2.c.	Modified Planning Policy Guidance documents to address climate change		2.j.	Support business to adapt to climate change			
2.d.	Participate in ICLEI Cities for Climate Protection (CCP)		2.k.	Support business to reduce GHG emissions			
2.e.	Implemented energy and water conservation measures within corporate operations		2.l.	Support community groups to adapt to climate change			
2.f.	Estimated water and energy use and GHG emissions across community		2.m.	Support community groups to reduce GHG emissions			
2.g.	Report water and energy usage and greenhouse gas (GHG) emissions to the community		2.n.	Other, please explain …… …… …… ……			
B3.	**Has your local government implemented any initiatives specifically to assist residents to reduce greenhouse gas emissions?**						
3.a.	Yes						
3.b.	No						
B4.	**Which of the following initiatives has your LG implemented?** - (only ask this if they responded Yes in B3)						
		(tick all that apply)			(tick all that apply)		
4.a.	Provide home energy audits for residents		4.g.	Provide energy audit kits for use in homes			
4.b.	Provide recycling services for residents		4.h.	Established 'shop-front' or drop in centre(s) for residents to get more information about ways to reduce GHG emissions			
4.c.	Provide rebates for implementing energy conservation measures in homes		4.i.	Provide physical or technical assistance to install energy conservation measures in homes			
4.d.	Provide rebates for implementing water conservation measures in homes		4.j.	Provide improved access to public transport in residential areas			
4.e.	Provide information about how to reduce GHG emissions in homes		4.k.	Provide improved walking and cycling tracks in residential areas			
4.f.	Conduct forums for community groups – ways residents can reduce GHG emissions		4.l.	Other, please record …… …… …… ……			

B5.	**Is your local government planning to implement any new initiatives in the next two years to assist residents to reduce greenhouse emissions?**						
5.a.	Yes						
5.b.	No						
B6.	**Which of the following initiatives do you plan to implement?** (tick all that apply) - (only ask if they responded Yes in B5)						
6.a.	Provide home energy audits for residents		6.g.	Provide energy audit kits for use in homes			
6.b.	Provide recycling services for residents		6.h.	Established 'shop-front' or drop in centre(s) for residents to get more information about ways to reduce GHG emissions			
6.c.	Provide rebates for implementing energy conservation measures in homes		6.i.	Provide physical or technical assistance to install energy conservation measures in homes			
6.d.	Provide rebates for implementing water conservation measures in homes		6.j.	Provide improved access to public transport in residential areas			
6.e.	Provide information about how to reduce GHG emissions in homes		6.k.	Provide improved walking and cycling tracks in residential areas			
6.f.	Conduct forums for community groups – ways residents can reduce GHG emissions		6.l.	Other, please explain …… …… …… ……			
B7.	**Has your local government set a target for reducing greenhouse gas emissions?**						
7.a.	Yes						
7.b.	No						
B8.	**What is this target and when is it to be achieved?**						
A8.a.	Target is……..						
…(record both corporate and community based targets)……							
A8.b.	To be achieved by……						
B9.	**In an ideal world, what process or measure do you think local government needs to implement to make a positive impact on climate change?**						
……							
……							
……							
B10.	**In your opinion, what are the barriers to local government in implementing the process or measure you identified in B9?**						
……							
……							
……							
……							

Participant ID……

B11a. What examples of leadership in reducing greenhouse gas emissions have been demonstrated by elected members of council?

……

……

……

B11b How do you know about this?...……

……

B12a. What examples of leadership in reducing greenhouse gas emissions have been demonstrated by the staff of council?

……

……

……

B12b How do you know about this?...……

……

B13a. What examples of leadership in reducing greenhouse gas emissions have been demonstrated by the citizens in your council area?

……

……

……

B13b How do you know about this?...…… …….

……

B14a In your opinion which local government(s) exhibit best practice in assisting residents to reduce their GHG emissions?

……

……

……

B14b What leads you to this conclusion?…… ……

……

……

B15 Do you have any other comments you would like to make about the role that local government has in supporting its residents to reduce their GHG emissions?

……

……

……

Participant ID……

Section C. Evaluating initiatives to assist households to reduce GHG emissions
(ask the following questions ***for each initiative*** undertaken – indicated in B4)

	Question and Responses *Participant ID……..* Initiative ID……		Tick the box with the answer ✓	Office Use Only
C1.	**What is the name of the initiative?**	……		
C2.	**What has been the cost of this initiative to date?**	£..... (or €……)		
C3.	**When was this undertaken?**	Start date…… End date……		
C4.	**Is the initiative current?**	Yes		
		No		
C5.	**What was the main purpose of the initiative?**	……		
C6.	**Were there any other objectives?**	Yes		
		No		
C7.	**If you answered Yes to C6, please explain these other objectives.**	……		
C8.	**What were the main drivers for undertaking this initiative?**	……		
C9.	**Who from Local Government was involved?**	……		
C10.	**Who from the community was involved?**	……		
C11.	**What were the expected outcomes?**	……		
C12.	**What were the actual outcomes?**	……		
C13.	**Has the initiative been formally evaluated?**	Yes		
		No		

Question and Responses *Participant ID……..* Initiative ID……..		Tick the box with the answer ✓	Office Use Only
C14. If you answered Yes to C13, is there a report available?	Yes		
	No		
C15. If you answered Yes to C13, what were the main findings?	……. ……. ……. ……. …….		
C16. In your opinion, was the initiative considered to be effective?	Yes		
	No		
C17. If you answered Yes to C16, what were the factors that contributed to its effectiveness?	……. ……. ……. ……. …….		
C18. If you answered No to C16, what else could have been done to make it more effective?	……. ……. ……. ……. …….		

Confidentiality: The information you have provided will only be used for the purposes of this study.

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