



The ENWORKS Environmental Sustainability Technical Assistance (ESTA) project is designed to support North West LEPs and their partners to embed sustainable development into their economic development priorities and strategies.

The project is funded by the European Regional Development Fund (ERDF) and delivered in collaboration with the Environment Agency.

The four key work streams are:

Support the strategic input of Local Enterprise Partnerships (LEP) and other local partners – establishing an environmental sustainability evidence base and priorities for sustainable growth to inform the transition to a low carbon and resilient economy.

Support applicants in developing ERDF eligible projects.

Support the delivery of ERDF communications.

Capture lessons learnt and best practice.

This report was commissioned by ENWORKS to support the LEPs to consider behaviour change as an integral part of their

activities targeted at businesses and households. It is accepted that, as part of implementing policies and projects to achieve an LEP's low carbon economy goals, behaviour change will be needed. But it is a complicated subject and not fully understood.

This report takes a critical review of this assumption and presents the evidence base to support how behaviour change could be integrated into the delivery of activities.

The evidence base then forms the basis of developing recommendations for suitable LEP level actions to support behaviour change towards a low carbon economy, which should be relevant for LEP low carbon activities targeted at businesses and households.

The **critical review** of the research evidence is a rich source of information and practical experience and, whilst it is listed in an Appendix at the rear of the report, it should not be looked upon as something ancillary to the report – it is essential reading.



Click here to go straight to the critical review

CONTENTS

Executive Summary	4-7
1 Introduction	8-9
2 CO ₂ Reduction Behaviour Change	10-13
3 Emerging Themes From The Evidence	14
3.1 Behaviour Change Theory And Implementation	14
3.2 CO ₂ Reduction In Households	14-15
3.3 CO ₂ Reduction In Business & Commercial Buildings	15-16
3.4 CO ₂ Reduction In Transport	16
3.5 Comparative Evidence From Health Or Safety Behaviour Change Programmes	17
4 Carbon Savings In Evidence	18-19
5 Key Success Factors For Behaviour Change Initiatives	20-21
6 Cheshire & Warrington's Priorities And Existing Activity	22
6.1 Climate Change Priorities Within Cheshire & Warrington	22
6.2 LEP Policies And Strategies	23
6.3 Local Authority Strategies And Programmes	24-25
6.4 Progress On Reducing CO ₂ Emissions In Cheshire & Warrington	25
7 Recommendations For Further Behaviour Change Activities	26-27
Appendix 1 - Critical Review Of Behaviour Change Research	28-59
Appendix 2 - Case Studies	60-74
The Researchers and ESTA	75

Cheshire & Warrington LEP is investing in business growth, with key strategic initiatives in development sites, improving connectivity and skills.

Introduction

It is also preparing to invest in supporting a shift towards a low carbon economy through the European Structural and Investment Fund. While many of these plans are based on physical changes (e.g. new development, transport infrastructure, superfast broadband) there is an opportunity to develop new markets and enhance the growth of the low carbon economy through behaviour change activities linked to these investments.

This report seeks to identify successful evidence based behaviour change activities that can be implemented as an integral part of development plans, business and community support activities by Cheshire & Warrington Local Enterprise Partnership (LEP) and public and community sector partners to reduce CO₂ emissions.

The questions this research seeks to answer are:

How much could behaviour change activities deliver?

What is the best way to deliver this?

Are current activities missing anything?

CO₂ Reduction Behaviour Change

The behaviours targeted in CO₂ reduction are typically:



Households: reducing energy use from heating, hot water, lighting and appliance consumption.



Businesses: identifying and reducing waste; employee and leadership behaviour.



Transport: reducing car use, the need to travel, fuel use, air travel and freight transport.

CO₂ savings, energy savings and money savings are not the same thing. The motivation behind a project will drive which type of saving is most important, and which is measured.

In many cases, behaviour change activity is incorporated within a wider programme of work, so analysis of the behaviour component alone is difficult. It may be possible to take a staged approach in order to assess the effectiveness of the behaviour change elements, but to date this has generally not been the case.

Learning from... Cardiff, Wales

47,000 households in Cardiff have reduced their car trips by 8% through Sustrans' Personalised Travel Planning programme. These schemes deliver a benefit to cost ratio of around 7:1.

[Click here to view full case study.](#)



Behaviour Change Theory And Implementation

Key findings from the evidence are that:

Activities targeting individuals have been the predominant energy behaviour change mechanism, but have been less successful than expected.

The majority of factors influencing behaviour do not result from knowledge or awareness.

Programmes need to understand and target the context that determines behaviour, rather than focusing exclusively on the behaviour itself.

Contexts include the social norms and aspirations of the peer group, values placed on the service provided by energy, life-stage, world-view, self-image, competences, practices, physical surroundings and materials.

Targeting multiple contexts, moments of lifestyle transition and institutional or infrastructural pressure points is more effective in promoting sustained behaviour change than targeting the individual through information alone.

Change can be effected through less visible mechanisms (producing more efficient equipment/buildings or more renewable energy) and unrelated messages (health, time pressures) without altering 'environmental' attitudes.

Individual behaviour is determined by a complex interaction of external and internal factors: appealing to values is important in addressing climate change, but some value-appeals (particularly financial ones) can be detrimental to action.

Public permission, and an understanding that the change promoted is in some way good, are important factors in success.

Rebound is highlighted as an issue for climate change activities: and is not fully understood.

Robust evaluation of the behavioural element of energy measures is needed but it's difficult to separate out these elements within a co-ordinated programme and methodology has not yet been developed and applied.

Key Success Factors

The starting point for any behaviour change initiative aimed at reducing energy use or CO₂ emissions has to be that, for most people, energy use is not important to them. What is important is the service that energy provides, and the convenience and value of that service to them.

The following key success factors from the evidence could be used as a checklist for developing a programme or project:

1. Understand what you are trying to achieve.
2. Understand the context that drives the behaviour you are trying to change.
3. Understand the change process.
4. Make use of opportunities.
5. Set realistic expectations.

‘The majority of factors influencing behaviour do not result from knowledge or awareness.’

‘Activities targeting individuals have been the predominant energy behaviour change mechanism but have been less successful than expected.’

Cheshire & Warrington Priorities And Existing Activity

The **Cheshire & Warrington European Structural and Investment Funds Investment Plan 2014-2020** aims to support the shift towards a low carbon economy in all sectors by helping businesses to explore and develop low carbon markets and technologies, support SMEs to improve their energy and resource efficiency and by investing in low carbon capital developments. Key priorities for Cheshire & Warrington are to support economic development through reducing transport congestion and improving ICT connectivity. Both of these can contribute to CO₂ reduction through behaviour change activities to maximise opportunities to reduce car travel.

The **Local Authorities** have actively been working towards CO₂ reduction targets for several years and are committed to CO₂ reduction in their own estates and activities and to supporting CO₂ reductions in the community.

All three Local Authorities have **Local Sustainable Transport Fund** (LSTF) support for ‘smarter travel’ initiatives, promoting alternatives to car use alongside infrastructure improvements.

There has also been a strong focus on CO₂ reduction across other areas of the **public sector**, with most of the Health, Education and Emergency Services organisations carrying out their own CO₂ reduction programmes, and engaging with communities on these issues.

Social Housing Providers are engaging residents on energy saving and CO₂ reduction, alongside measures to improve the energy efficiency of their homes. The ERDF-funded CARE project improved over 1100 homes while supporting suppliers to develop new skills.

Finally, there is significant grassroots activity across Cheshire & Warrington, with the **Low Carbon Communities Network** of over 30 community groups, whose energy can be harnessed to support CO₂ reduction activities in households, travel, the workplace, and investment in low carbon solutions.

Recommendations For Further Behaviour Change Activities

Cheshire & Warrington faces some particularly difficult barriers to reducing CO₂ emissions through behaviour change. At the practical level these include:

A relatively wealthy population for many of whom carbon intensive lifestyles are a mark of status, and energy costs are unimportant.

A comparatively large rural area with few alternatives to car use for travel.

The urban draw of Manchester and Liverpool for work, shopping and leisure, primarily dependent on car use.

Heavily energy intensive industries, which can threaten to move away if CO₂ becomes more of an economic burden.

While parts of the area and economy are particularly vulnerable to climate risks, the linkage between this and CO₂ emissions has low visibility, and the focus appears to have switched from mitigation to adaptation.

In reality, little of this is likely to change in the short term. Therefore, the potential to influence carbon behaviour is limited to maximising opportunities push for behavioural change activities alongside priority projects such as transport infrastructure, improving connectivity and improving business competitiveness. The ‘context changing’ activity is likely to remain at the grassroots community level and as leakage from the bolder initiatives in neighbouring Greater Manchester, rather than being led from the top.

Context changing

Promote the CO₂ reduction impacts (not just the economic benefits) of key projects such as heat networks, improving connectivity and transport improvements.

Develop and support a culture in which potential CO₂ reduction opportunities can be exploited for financial as well as social gain.

Promote and celebrate local activities and successes.

Acknowledge and support the activities of community organisations.

Piggy-back onto the climate change agenda, information channels and media activity in other areas.

Retain and build on the existing knowledge base and networks to grow capacity and deliver behaviour change within other initiatives.

Housing

Maximise the behaviour change opportunities associated with housing improvements and regeneration programmes.

Promote take up of smart metering and information/feedback systems.

Identify opportunities for home energy improvements to support the local low carbon economy.

Promote energy measures to home renovators.

Transport

Focus on area-based and workplace travel planning to support the aim to reduce congestion.

Investigate opportunities to incorporate the CO₂ reduction potential of improved connectivity to reduce car travel.

Identify and develop opportunities for car-free transport infrastructure in new and existing developments.

Business & Public Sector

Continue to develop opportunities for low carbon energy for energy intensive industries and new development.

Identify and support market development and skills for the low carbon sector.

Expand the ENWORKS programme to support resource and carbon efficiency in business.

Investigate opportunities to support CO₂ reduction in commercial buildings.

Conclusions

It is clear that widespread context change will be needed to drive the low carbon economy within Cheshire & Warrington, and that behaviour change activities are a key part of this. Behaviour change programmes can also deliver greater CO₂ savings than infrastructure alone, and these savings are likely to be around 5-10% of the CO₂ emissions of the population targeted.

The theory of behaviour change also applies to the LEP and Local Authorities. The challenge will be how the senior leaders of these organisations can overcome the motivational barriers to deliver the cultural change required.

1 INTRODUCTION

This report seeks to identify successful evidence based behaviour change activities that can be implemented as an integral part of development plans, business and community support activities by Cheshire & Warrington Local Enterprise Partnership (LEP) and public and community sector partners to reduce CO₂ emissions.

The findings of this report are based upon a critical review of behaviour change evidence which has been carried out by Quantum Strategy & Technology Ltd and Creative Concern and managed by the Environmental Sustainability Technical Assistance (ESTA) programme.

There is a significant body of evidence on CO₂ reduction initiatives. There is also significant evidence on behaviour change programmes in CO₂ reduction and other fields (particularly in health and safety issues).

In the main, CO₂ reduction programmes have focused on reducing energy use in the home or in business and encouraging reduced car use or air travel.

The evidence reviewed covers studies into the impacts of a range of behaviour change programmes aimed at different audiences. These programmes range in scale from pilot schemes to mass initiatives covering millions of people. In many instances the behaviour change activity has been combined with physical changes (e.g. home improvement or provision of cycling facilities), so it is difficult to separate out the impact of each element.

A further set of evidence covers generic research into behaviour change theory and approaches, and a limited set of research into behaviour change in other fields such as health. The documents reviewed are summarised in Appendix 1.

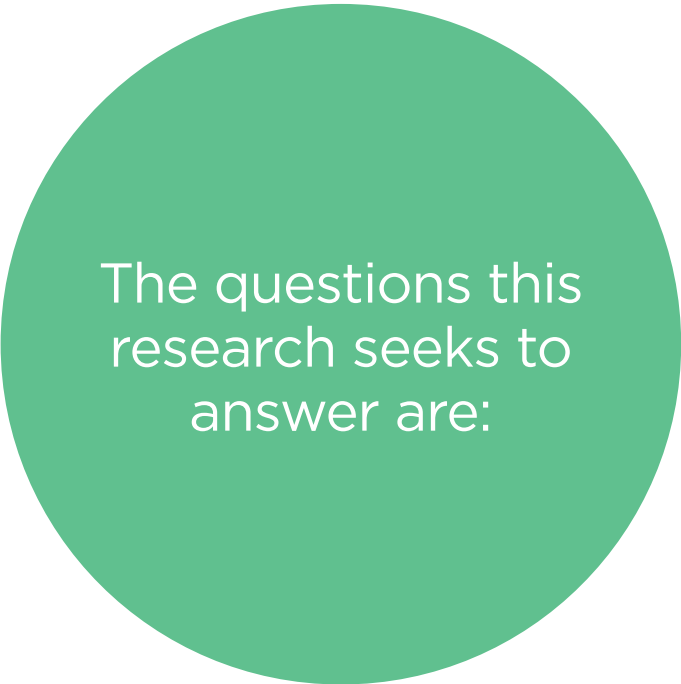
Cheshire & Warrington LEP is investing in business growth with key strategic initiatives in development sites, improving connectivity and skills. It is also preparing to invest in supporting a shift towards a low carbon economy through the European Structural and Investment Fund. While many of these plans are based on physical changes (e.g. new development, transport infrastructure, superfast broadband) there is an opportunity to develop new markets and enhance the growth of the low carbon economy through behaviour change activities linked to these investments.

Learning from... Melbourne, Australia

The Melbourne 1200 Buildings Programme is incentivising energy efficiency in commercial buildings through financed retrofit loan agreements managed by the City of Melbourne through a rates charge. The scheme allows owners and tenants to share the retrofit costs and benefits.

[Click here to view full case study.](#)





The questions this research seeks to answer are:

How much could behaviour change activities deliver?

What is the best way to deliver this?

Are current activities missing anything?

This report covers:

A summary of the types of behaviour targeted by CO₂ reduction programmes (**Chapter 2**).

Emerging themes from the evidence reviewed, looking separately at generic behaviour change theory, initiatives targeting households, businesses and transport, and the comparability of behaviour change initiatives in other fields (**Chapter 3**).

Quantifying CO₂ savings through behaviour change (**Chapter 4**).

Key success factors for behaviour change initiatives (**Chapter 5**).

Current policies and activities targeting CO₂ reduction in Cheshire & Warrington (**Chapter 6**).

Recommendations for future behaviour change initiatives (**Chapter 7**).

Evidence documents reviewed (**Appendix 1**).

Case studies (**Appendix 2**).

2 CO₂ REDUCTION BEHAVIOUR CHANGE

‘Contexts include the social norms and aspirations of the peer group, values placed on the service provided by energy, life-stage, world-view, self-image, competences, practices, physical surroundings and materials.’

The behaviours targeted in CO₂ reduction are typically:

Households

Reducing heating energy through physical changes to the building (insulation, more efficient heating equipment, better controls) and reducing room temperatures.

Reducing hot water energy through taking short showers rather than long showers or baths, lower laundry temperatures, more efficient or reduced use of wet appliances.

Reducing lighting energy through physical changes (low energy bulbs) and switching off.

Reducing appliance consumption through buying more efficient appliances and switching off (particularly stand-by).

Reducing consumption generally (although this is more frequently targeted as ‘green’ or ‘sustainable’ behaviour rather than ‘CO₂ reduction’ behaviour).

Businesses

Identifying and reducing waste through energy audits.
Employee energy behaviour through engagement and permission.

Leadership behaviour through promoting the wider economic benefits of sustainability.

Transport

Reducing car use through increased public transport, car sharing and active travel (walking, cycling).

Reducing the need to travel through video-conferencing, home-working, retail deliveries.

Reducing fuel use through eco-driver training and advice.

Reducing air travel.

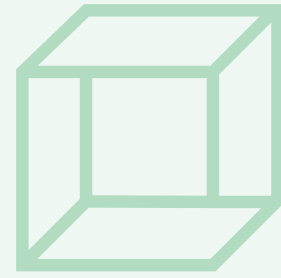
Reducing freight transport through logistics management, vehicle sharing and alternative modes.

Learning from... Manchester, England

The Get Me Toasty scheme promoted free or heavily discounted home insulation to all residents across Greater Manchester. By March 2013, Get Me Toasty had installed 25,000 measures and saved households a total of £3 million.

[Click here to view full case study.](#)





Behaviour change can address two main types of behaviour: **habits and investment decisions**. While these apply to both individuals and businesses, the majority of the behaviour change research has focussed on individuals and their response to initiatives targeting homes, consumption and travel.

Investment decisions can be for major items that have a personal CO₂/energy impact such as a new car, or home, for more minor items (LEDs rather than halogen bulbs), and also items where the impact is more distant, such as how frequently to buy new clothes. For the purposes of this report we are focussing on investment decisions that affect the amount of energy we use. For householders this includes investments such as installing insulation, replacing the boiler, installing a PV panel, buying the most efficient appliances, buying a more efficient car, moving house to reduce car journeys.

These are frequently complex decisions involving time and consideration of a wide range of issues:

What can we afford? Do we need that money for something else?

Do we know what to do? How do we get information we can trust? Do we know how to manage it?

Is it practical? Will it work in our house?
Is there enough space?

How important is it to us? Do we want to do it? Do the emotional and financial rewards outweigh the negatives?

Can we be bothered? How much disruption will there be?
How long will it take? How do we know if the contractors are trustworthy?

Jevons' Paradox

Jevons' Paradox (also known as the rebound effect) is the observation that greater energy efficiency, while in the short term can produce energy savings, may in the longer term result in higher energy use. It was first noted by the British economist W. Stanley Jevons in his book, *The Coal Question*, published in 1865, where he argued that: "It is a confusion of ideas to suppose that the economical use of fuel is equivalent to diminished consumption. The very contrary is the truth." Jevons' Paradox is an observation based on economic theory and long-term historical studies, and its magnitude is a matter of considerable dispute: if it is small (i.e. the expansion of fuel using activities is less than 100% of the improvement in efficiency) then energy efficiency improvements will lead to lower energy consumption; if it is large (i.e. the expansion of fuel using activities is greater than 100% of the improvement in efficiency) then energy consumption will be higher.

A key problem in resolving the two positions is that it is not possible to run 'control' experiments to see whether energy use is higher or lower than if there had been no efficiency improvements - there is after all, only one future. A further problem is that the rebound effect has differing impacts at all levels of the economy, from the micro-economic (the consumer) to the macro-economic (the national economy), and its magnitude at all levels of the economy has not yet been determined.

Nonetheless, there is mounting evidence that, at the national level, it is not uncommon for total resource consumption to grow even while efficiency improves, suggesting at least that improvements in efficiency are not necessarily sufficient for curtailing consumption (although, once again, this does not necessarily demonstrate that resource consumption grows because of improvements in efficiency). Jevons' Paradox therefore emphasises the need to build behaviour change programmes alongside those technical fixes that can reduce energy use.

‘Robust evaluation of the behavioural element of energy measures is needed, but it’s difficult to separate out these elements within a co-ordinated programme and methodology has not yet been developed and applied.’

Energy efficiency investments face the barrier of different ways of mental accounting: an LED lightbulb is considered too expensive when compared with a halogen bulb, while the equivalent value in savings on energy bills is not considered as it is attributed to a different mental budget.

The consideration applied to investment decisions allows multiple decision points to be targeted. These investments can enable greater and more sustained savings than habitual behaviour, but runs the risk of ‘rebound’ (my new boiler is so much more efficient I can keep it on for longer).

Habits are activities that we do often and automatically, are frequently driven by social norms, and as such are difficult to change. Habits are not necessarily the result of rational choices, and research has shown that they are affected by the place or context in which they occur (e.g. smoking while drinking). Information provision has been a mainstay of behaviour change programmes but is not very effective: people tend to remember the first piece of information they learn about a subject, and it is difficult to replace this with updated information. Many programmes aiming to change habits focus on altering the context or environment to provide new cues to prompt a different behaviour. However, these also require the individual to be motivated to change.

Low carbon habits such as walking rather than driving, switching equipment off, reducing washing frequencies or household temperatures can be seen as involving **sacrifice**, which is a difficult context in which to motivate change.

To some extent these practices have developed over time resulting from the availability of materials (e.g. central heating), the ability to use them, the images of normal practice (warm homes, light clothing) and a sense of progress (my house should be warmer than my childhood one). Within this, it is important to recognise that there are opposing forces and social trends that inadvertently increase our energy use (wider uptake of tablet computers). One theory of behaviour states that to change behaviour that is so influenced by external elements, interventions should target the multiple stakeholders that collectively affect the practice, rather than the individual. For example, the practice of daily showering is heavily influenced by norms of cleanliness. Without addressing this norm, attempts to reduce shower use will be seen as conflicting with socially accepted behaviour.

One aspect that runs through behaviour change initiatives in many fields is that **moments of life change** (moving house, changing job, getting married, having children) cause disruption to habits and are associated with investment decisions, so providing opportunities for successful interventions.

Most research into behaviour change suggests that the **supporting infrastructure** is critical to enable the change. This includes public policy, visibility, accessible knowledge and skills, and available products as well as physical infrastructure such as public transport or well-insulated homes.

Learning from... North East England

Charge Your Car was the name given to the Plugged-in Places initiative in the North East. A number of campaigns to promote electric vehicles ran between 2010 and 2013, resulting in a 14% increase in awareness of charging points in the region.

[Click here to view full case study.](#)



Behaviour Change In Businesses And Other Organisations

Some of the behaviour change evidence is relevant to the business context (switching off) but barriers to behaviour change in business can be different to those affecting us as individuals:

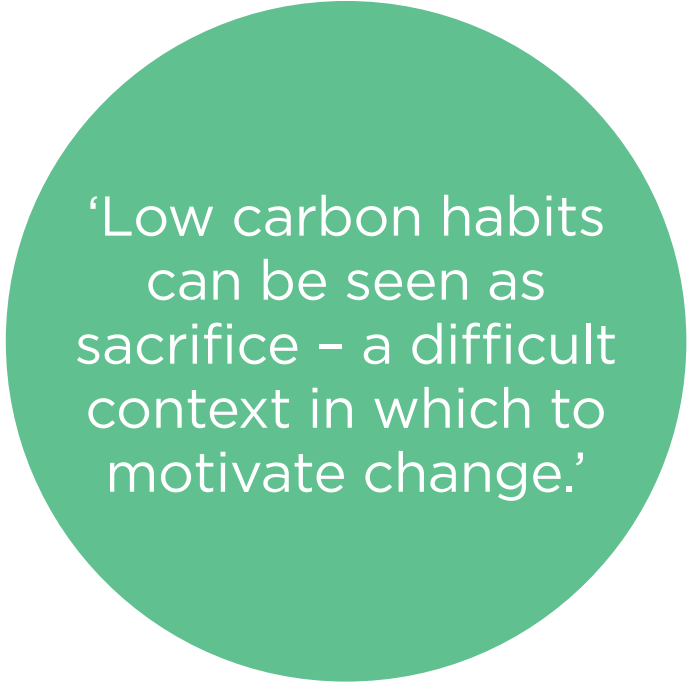
Am I allowed? Is it someone else's responsibility?

Behavioural change among a workforce requires a level of leadership within the company and explicit communication on how workers can help and why.

How important is it to us? Investment decisions on energy saving in business may be more economically rational than for private householders, but still compete with other priorities for available capital. The cost of energy in many small businesses is a tiny percentage of overall costs, and inertia is a major factor in businesses not acting on energy efficiency, even where economically justified.

Do I know enough? Understanding the right solution for the business is essential in developing the business case for investment, so knowledge is critical. Investment decisions in small businesses can still be dependent on an individual's interest, enthusiasm, knowledge and capacity rather than economic rationality.

Programmes aiming to spread low carbon behaviours need to act on the context surrounding the behaviour, and forces that may be acting against the change, rather than focussing on the behaviour alone.



‘Low carbon habits can be seen as sacrifice – a difficult context in which to motivate change.’

3 EMERGING THEMES FROM THE EVIDENCE

The sections below present the key findings emerging from the evidence. Some of these are direct quotes from the research findings where these were deemed to be significant, others are a summary of themes emerging from several sources.

3.1 Behaviour Change Theory And Implementation

Activities targeting individuals have been the predominant energy behaviour change mechanism but have been less successful than expected.

The majority of factors influencing behaviour do not result from knowledge or awareness.

Programmes need to understand and target the context that determines behaviour, rather than focusing exclusively on the behaviour itself. This will involve co-ordinated and complementary measures with a wide range of stakeholders.

Contexts include the social norms and aspirations of the peer group, values placed on the service provided by energy, life-stage, world-view, self-image, competences, practices, physical surroundings and materials.

Targeting multiple contexts, moments of lifestyle transition and institutional or infrastructural pressure points is more effective in promoting sustained behaviour change than targeting the individual through information alone.

Change can be effected through less visible mechanisms (producing more efficient equipment/buildings or more renewable energy) and unrelated messages (health, time pressures) without altering 'environmental' attitudes.

Individual behaviour is determined by a complex interaction of external and internal factors: appealing to values is important in addressing climate change, but some value-appeals (particularly financial ones) can be detrimental to action.

Public permission, and an understanding that the change promoted is in some way good, are important factors in success.

Rebound is highlighted as an issue for climate change activities: and is not fully understood.

Robust evaluation of the behavioural element of energy measures is needed, but it is difficult to separate out these elements within a co-ordinated programme and the methodology has not yet been developed and applied.



3.2 CO₂ Reduction In Households

Attitudes & Context

Energy is used to provide a service: most people do not relate the use of that service to their energy use or energy bills.

Most people do not know how much energy they use, do not understand their home's heating system or controls, and do not really care about their heating bills (although they do say they care about saving money).

Comfort and convenience are of primary importance in the home, and behaviour change activities seen to be asking people to sacrifice these will be resisted.

People do not act on money-saving information alone.

Interest in energy efficiency measures in the home can be prompted at moments of change, and for those planning physical improvements to their home are influenced by social norms and aspirations rather than government policy.

Efficiency measures in the home that help to address the challenges of everyday life are more salient than cost savings.

Setting Realistic Expectations

Achieved energy savings through measures on building fabric and heating systems can be lower than models predict.

Initial energy consumption levels are lower than models predict in poorly-insulated homes and higher than predicted in well-insulated homes.

Electricity consumption for appliances and lighting is higher than predicted.

The behaviours/factors that affect heat demand are primarily a preference for a warm home, length of showers taken and occupancy patterns, none of which appear amenable to change in the short term.

Successful Programmes

Electricity consumption can be effectively targeted through in-home displays and dynamic pricing but these need to be well-designed and provide accessible information (e.g. smartphones, tablets). There may be an issue with trust in the delivery organisation.

Householders targeted with personal support have had more success at changing behaviours related to lighting and appliance use rather than heating.

Personalised behaviour change activities with householders increases energy savings when combined with physical changes.

Community-based behaviour change programmes can be effective without supporting physical changes.

Use of a 'Trusted Messenger' improves uptake of the message: people respond better to information delivered by their peers than from an external expert.

Retrofit programmes are an ideal instrument for introducing behaviour change activities.

Monitoring and feedback of information to householders contributes to the success of programmes.

Opportunities

Redefine the context around energy habits: working with how people actually live.

Promotion of and increasing uptake of smart metering.

Further initiatives targeting electricity use – specifically growth areas such as halogen lighting.

Targeting life-change moments and aspirational homeowners.

Targeting communities connected to regeneration/ infrastructure improvements.

Designing programmes for existing community groups or engaging with existing community groups to design initiatives that respond to their issues.



3.3 CO₂ Reduction In Business & Commercial Buildings

Attitudes & Context

Sustainable behaviour is seen as important for a company's reputation, future growth and ability to retain staff among organisations that already subscribe to it.

Organisations find it easier to start on energy and recycling/waste and then move onto transport behaviour.

Tough policies, including mandatory recycling and limiting travel options, seem to have strong impacts where there is visible leadership.

People respond to peer-based measures in the workplace as well as at home.

Resource efficiency/CO₂ savings are a low priority for medium-size/medium energy-intensity businesses which are a key target group for savings. It is difficult to recruit businesses onto support programmes such as ENWORKS, even with a free service.

There is a lack of knowledge and capacity to deliver savings within these businesses without support.

Information alone is insufficient to drive actions within businesses with relatively small energy bills.

For smaller businesses, the motivation of the owner or a key staff member is critical in initiating and managing change.

Setting Realistic Expectations

Audited savings potential does not readily translate into actual savings.

For most businesses, CO₂ savings are not as important as cost savings: targeting cost savings may not yield the highest CO₂ savings.

Models for predicting energy performance of non-domestic buildings under-estimate their actual consumption and CO₂ emissions, often by over 50% (and particularly for new office and educational buildings).

Continued overleaf...

‘Programmes need to understand and target the context that determines behaviour, rather than focusing exclusively on the behaviour itself.’

There is significant market failure in energy performance of non-domestic buildings, and there is potential for public sector actions to address these while creating economic benefit.

Unpredicted occupant behaviour and inefficiently managed systems can account for 20% of the energy demand of office buildings.

Successful Programmes

Employee engagement programmes are an essential component of sustainability or CO₂ reduction initiatives in business: but generally need to be supported by technical and policy changes.

Where businesses give sustainability a high profile, typically 20-50% of staff will take part in voluntary low carbon activities at work.

The ENWORKS programme has been successful but needs new approaches to increase uptake.

Businesses see CO₂ reduction as beneficial for their reputation and ability to recruit and retain staff as well as for cost savings.

Tough, enforceable policies can be an effective way to establish norms within the workplace.

Opportunities

Behaviour change in business remains an opportunity for significant CO₂ and cost savings, particularly as it frequently targets carbon-intensive electricity use.

Sustainable travel could be incorporated into business support programmes as a means to achieve very large CO₂ savings.

The target business group for resource efficiency remains medium size/energy-intensive businesses. Cheshire & Warrington has the expertise and mechanisms to deliver greater savings in business through the ENWORKS programme.

Office occupants and, separately, commercial building managers and developers represent specific market segments for behaviour change activity. This sector has been insufficiently targeted and has significant savings potential in new and existing commercial developments.



3.4 CO₂ Reduction In Transport

Attitudes & Context

Personalised information is effective in changing travel behaviour, but convenient alternatives to the car need to be available.

Setting Realistic Expectations

The cost of the transport activity frequently falls on the public sector/organising body and is difficult to pass onto the user (individual or business).

Engaging business is difficult, particularly where potential savings are hard to quantify.

Successful Programmes

Personalised travel plans and workplace travel plans (WTPs) provide the highest transport CO₂ savings.

Area-based schemes show significant benefits, and can capture smaller businesses that are unlikely to get involved in WTPs.

Changing how we travel can reduce the need for expensive infrastructure.

Behaviour change measures can be implemented much more quickly than infrastructure projects.

Opportunities

Travel planning offers cost-effective CO₂ reductions.

Social media may have the potential to increase uptake of travel planning schemes.

3.5 Comparative Evidence From Health Or Safety Behaviour Change Programmes

Behaviour change through public policy is possible and evidenced through changing norms on issues such as health, safety, race and sexual orientation. However, this level of normalisation of behaviour should be viewed as a long-term goal, with significant change across the majority of a population unlikely to be seen within a period of 15 years. After many years of campaigning and legislation, these issues are still newsworthy and debated.

While it may be useful to use lessons from health campaigns for CO₂ reduction behaviour change initiatives, there are significant differences that affect their usefulness:

The downside of not adhering to the health guidance is personal and profound e.g. 'smoking kills', while the downside from climate change is not seen as having any personal impact for most people within the UK.

Many of the behaviours that are to be encouraged to reduce CO₂ emissions involve perceived sacrifice, with little perception of the individual benefit: live in a colder house, shower less, have fewer electronic goods, use your car less.

Successful health and safety campaigns have targeted a single, easily understood action (wear a seatbelt, stop smoking) whereas CO₂ reduction involves numerous actions, each of which makes a minor contribution and some of which are not easily understood (e.g. purchasing decisions).

Evidence from health and safety areas (particularly smoking and drink-driving) shows that it is the widespread national activity that has had the most important impact in changing norms, with local action providing a supporting role in making the decisions easier. For CO₂ reduction, the national narrative is not yet in place – there is a considerable and influential 'deniers' lobby, (which can be compared to the position of the pro-smoking lobby of the 1960s) and the national CO₂ reduction 'agenda' has been marginalised. The challenge is whether, in the face of this, it is possible to build up an effective local narrative.

'Public permission, and an understanding that the change promoted is in some way good, are important factors in success.'

4 CARBON SAVINGS IN EVIDENCE

The studies cover a wide range of individual initiatives, many of which include data on CO₂ savings.

However, while some of the data provided is measured, some is estimated from models (which may be based on questionable assumptions). In many cases, the savings quoted reflect the situation at the end of a visible programme, and not those sustained afterwards. While the rebound effect can be estimated in certain initiatives, (particularly home insulation programmes, where potential savings are offset against increased comfort) there is almost no data on the indirect rebound effect in areas not covered by the initiative.

The evidence shows that behaviour change activities are most effective when incorporated with other infrastructure initiatives e.g. home energy efficiency improvement, provision of public transport. Therefore it is difficult to extract the impact of the behaviour change element from the other changes, although this has been attempted in some pilot schemes. Similarly, some behaviour change impacts will be included in the accounting of CO₂ savings of projects not classed as behaviour changing.

A selected range of behaviour change impacts from the evidence is shown on the next page. Where possible this has been drawn from studies of programmes that just target behaviours, without also providing physical changes, such as personalised advice and information initiatives.

The data on initiatives aimed at householders and communities is based on a large number of individual programmes and systematic studies. It is likely to be robust, although the range is wide and depends on the context of the programme.

The data for Travel Planning is also based on studies of a range of initiatives, but is not based on as comprehensive a data set as for Households.

The data for Businesses is limited and the example given is based on two UK programmes. In the case of ENWORKS, this includes the impact of physical changes or efficiency investments as well as behaviour change.

However, it appears that the rule-of-thumb used by energy efficiency professionals, of 5-10% savings from behaviour change, is valid.

Learning from... Germany

The 'Start your brain, not your car' campaign in nine German cities aims to double the distances covered walking or by bicycle. In 2009 and 2010 residents walked or cycled 58 million more kilometres, saving 13,650 tonnes of CO₂.

[Click here to view full case study.](#)



5-10%

‘However, it appears that the rule-of-thumb used by energy efficiency professionals, of 5-10% savings from behaviour change, is valid.’

Intervention	Range of energy savings	Unit	Source
Energy Consumption Feedback Mechanisms (including smart meters)	5-15%	%	EEA
Community-based initiatives (e.g. energy champions, individualised advice)	5-20%	%	EEA
Workplace Travel Planning	11-24	kg CO ₂ /person	WS Atkins
Personalised Travel Planning	2-11%	%	Scally, Harris
Individualised Business Support	133	tCO ₂ /business	ENWORKS
Business Champions	5%	%	Carbon Trust

5 KEY SUCCESS FACTORS FOR BEHAVIOUR CHANGE INITIATIVES

‘Appealing to values is important in addressing climate change, but some value-appeals (particularly financial ones) can be detrimental to action.’

The starting point for any behaviour change initiative aimed at reducing energy use or CO₂ emissions has to be that for most people, and particularly for those people whose daily activities contribute relatively high quantities of CO₂ emissions, **energy use is not important to them.**

What is important is the service that energy provides, and the convenience and value of that service to them. As the President of Pacific Gas & Electricity, California, commented after running a smart-metering pilot, “We thought we were undertaking an infrastructure project but it turned out to be a customer project”.¹

Key success factors from the evidence are presented below: these could be used as a checklist for developing a programme or project. They have been grouped into five themes representing different stages of the development process. The first two are specific to individual initiatives and so are framed as questions. The later themes show the learning to be incorporated. These are generally known as ‘Social Marketing Techniques’.

‘The behaviour change promoted needs to be relevant and practical for the person targeted.’

1 Understand what you are trying to achieve

Why does the behaviour have a carbon impact?

Is the aim to reduce CO₂, energy or cost?

Is behaviour inherent or could CO₂ savings be achieved without behaviour change?

Could the activity support further CO₂ savings by contributing to changing the context, even if no behaviour change is needed?

2 Understand the context that drives the behaviour you are trying to change

Does the context targeted have to be related to energy or climate change to have carbon benefits?

Can it be linked to an external trend that is supporting the behaviour in some other way?

What factors are outside the individual's control?

How conscious is the decision behind the behaviour?

How much is it determined by: social norms and expectations? physical infrastructure? legislation? finance?

What external trends, factors or forces are opposing the change? What or how much does the target group have to lose by making the change?

Can the behaviour required become socially acceptable or desirable without changing attitudes?

¹ VaasaETT, 2011, Empower Demand 1 - The potential of smart meter enabled programs to increase energy and systems efficiency: a mass pilot comparison. European Smart Metering Industry Group.

3 Understand the change process

Change is driven by a mix of policy and activities, and requires clear leadership, a coherent narrative, appropriate infrastructure/facilities, regulation, price signals and information.

More is more: working on many different approaches through different organisations is more effective than targeting the individual alone, and contributes to changing the social context.

Individual initiatives do not need to tackle all parts of the context, but it should be clear which part of the context is being addressed and how other activities support this.

Behaviour does not respond to rational argument: while good information is important, on its own it has limited and sometimes unintended impacts.

Habits are resistant to change, but can be influenced by external changes.

The behaviour change promoted needs to be relevant and practical for the person targeted.

Acting within an identified community and using trusted messengers from that community is more effective than messages delivered by experts or outsiders.

It is important for people to feel they have given permission to be informed or asked to take action, and to feel good about taking part.

4 Make use of opportunities

People are most open to change at moments of life transition (leaving home, moving, having children, changing job, retiring) and these offer opportunities for behaviour change activities.

Measures to improve energy-related infrastructure will achieve greater savings if behaviour is targeted at the same time.

Unexpected trends can provide opportunities to change behaviour and reduce carbon, such as the rapid uptake of smart phones.

Routes into carbon saving behaviour can be found through policies and activities that have no apparent connection to energy use or carbon such as health, cleanliness or IT security.

Publicising and branding activities as 'carbon saving' develops the social argument for CO₂ reduction and contributes to changing the context.

5 Set realistic expectations

Understand how much CO₂ is associated with the activity and what proportion of it can realistically be saved.

Rebound is an issue for CO₂ reduction actions, more so for individuals than businesses: and is not fully understood.

Is there a multiplier effect? How might the new behaviour influence an individual's behaviour in other areas or the behaviour of other people?

Robust evaluation is useful and should be designed in at the start, but it may not be possible to accurately assess the impact of behaviour change initiatives.

Behaviour change is never complete: individual activities may make a valuable contribution but constantly changing contexts and opportunities to use energy will demand very long term programmes.

6 CHESHIRE & WARRINGTON'S PRIORITIES AND EXISTING ACTIVITY

‘Targeting multiple contexts, moments of lifestyle transition and institutional or infrastructural pressure points is more effective in promoting sustained behaviour change than targeting the individual through information alone.’

6.1 Climate Change Priorities Within Cheshire & Warrington

Within Cheshire and Warrington addressing CO₂ reduction for the purposes of tackling climate change remains a significant challenge.

Congestion is identified as a barrier to growth. Smart transport measures and activities to reduce the need to travel, combined with non-car based infrastructure improvements can provide a cost-effective solution to congestion. However, if the infrastructure measures designed to tackle congestion rely on road capacity improvements, this opportunity will be lost.

Connectivity Improvements in ICT connectivity can support the growth of the rural economy, and could have a carbon benefit in reducing the need to travel, and particularly to commute.

The **Low Carbon Economy** is identified as a growth sector. In order to support this growth, there needs to be a demand for low carbon goods and services. Behaviour change activities targeting investment decision points can help to create this growth, particularly among those able to influence business decisions or able to pay for home improvements.

Income Generation and Investment Potential Investment in local renewable energy generation can provide a return for local investors greater than currently offered by many financial institutions, and a long term income stream for businesses, public sector organisations and individuals.

Energy Price Stability and Security For many businesses, investment in or access to low carbon energy can provide a buffer against the volatility of the energy market, and longer term security of supply.

Resource Efficiency and Cost Reduction While larger and resource-intensive industries have the capacity to manage their energy and resource costs effectively, this is not the case for the large number of smaller businesses for whom tailored support can improve profitability.

Climate Risks The LEP has identified that climate risks, and particularly flood risk, could be a significant barrier to investment if not adequately addressed. There is an opportunity to raise the profile of CO₂ reduction behaviour (climate mitigation) within activities targeting climate adaptation.

Fuel Poverty Although outside the remit of the LEP, fuel poverty is a key issue for the Local Authorities and action on energy behaviour can contribute to reducing fuel poverty.

Learning from... Lymm, Cheshire

The voluntary organisation Low Carbon Lymm secured national funding to provide energy audits for 160 homes and Green Deal Assessments for a further 100, training of volunteers to identify savings and a communications campaign to engage other residents. Potential savings of £1.2 million per year were identified.

[Click here to view full case study.](#)



6.2 LEP Policies And Strategies

The Cheshire and Warrington **European Structural and Investment Fund Strategy 2014-2020** contains **Thematic Objective 4: Supporting the Shift towards a Low Carbon Economy in All Sectors, and allocates £13.8m to:**

Support businesses to explore and develop low carbon markets and technologies.

Support SMEs to improve their energy and resource efficiency.

Invest in low carbon capital developments through Evergreen.

“There is a growing drive to deliver whole place low carbon initiatives such as smart cities. In this context a range of considerations need to be planned including low carbon energy, smart meter/smart grid programmes, waste infrastructure, ICT infrastructure (which can minimise the need to travel by allowing flexible working) and low carbon transport. These multi-faceted requirements highlight the need for low carbon considerations to be identified across the 2014-2020 programme as well as through activities supported by other funding sources. The need to maximise the opportunities and minimise the cost of the transition to a green economy also makes this a pressing issue for all businesses across Cheshire and Warrington.”

Thematic Objective 7: Promoting Sustainable Transport & Removing Bottlenecks in Key Infrastructure identifies that transport infrastructure is a barrier to growth and targeted investment can unlock the potential of development sites.

The evidence on behaviour change activities in transport show consistently higher Benefit-Cost performance than infrastructure investment alone, and there is an opportunity to gain higher returns and reduce CO₂ through an integrated approach to smart measures in transport.

Thematic Objective 2: Enhancing Access to, and use and quality of, Information and Communications Technologies can also support a low carbon economy through reducing the need to travel. The objectives of intervention under TO2 include:

Support all businesses, including SMEs and social enterprises, to integrate digital connectivity between housing and workspaces to increase efficiency and reduce the need to commute.

“ICT will also play a significant role in delivering other elements of the programme. For example, it may help business to drive innovation through the eight great technologies, generate sustainable development benefits by further reducing the need for business travel and support the development of Smart Cities and Smart Communities, for example through the use of smart apps that can support advancements in the transport network more widely and utilities as examples.”

Learning from... United States

The OPower energy company introduced personalised energy reports for homeowners, to show them how their energy consumption compares to their neighbours'. Their US customers have saved over \$250 million on their energy bills as a result.

Click here to view full case study.



‘Plan for an economy where people need to travel less and can travel by cycle or walking for many short journeys by ensuring all major developments are located with good access to local amenities, cycle and walking routes.’

6.3 Local Authority Strategies And Programmes

The Local Authorities have been actively aiming to reduce CO₂ emissions for several years, both within their estates and across their areas of influence. The Public Sector Carbon Management Partnership has focussed on behaviour change activities with staff, including the Eco-Reps initiative to reduce workplace energy use, driver training and smart travel to work, as well as home energy improvements.

Warrington Borough Council set out its first Climate Change Strategy in 2007 and in updated this in 2013 with ‘Climate Local: A new Strategy for Climate Change in Warrington’, which commits to:

Continue to take action that will reduce borough-wide emissions.

Create a Warrington Declaration to join with others in Warrington to commit to action on climate change.

Consult on and publish a framework for action that will set out the actions that we will take to help reduce emissions and energy use across the borough.

Publish Warrington’s progress annually in an accessible manner.

WBC has also set itself the target to reduce its own CO₂ emissions by 40% from 2009-2015 through its Carbon Management Programme.

The Council is developing renewable energy projects within and outside their own estate. It has been heavily involved in the Cheshire & Warrington Public Sector Eco-Reps initiative to encourage sustainable behaviour among staff members at work and outside, and supports behaviour change in schools through the Eco-Schools programme.

Cheshire West & Chester Council adopted Vision 2050 in 2009, which set out its sustainability objectives, and in 2012 signed up to Climate Local. In 2013 the Sustainability Commission set out the following priorities for the district:

Energy efficiency and low-carbon technologies alongside behaviour change activities.

Tackling Fuel Poverty and Affordable Warmth.

Supporting Community Energy Services.

Realising our renewable energy generation capacity.

Alternative low carbon fuels for heating and for transport.

Smart grids and smart technology energy (District Heating Networks, and Smart Grids).

Carbon Capture and Storage.

Energy and other sustainability criteria within procurement of goods and services.

Public Sector Carbon Management.

Improved water management through education, metering and policy.

Cheshire East Council’s Sustainable Community Strategy, Ambition for All, sets out a vision for the area and the priority actions over the next 15 years, which include:

Promote energy efficiency and renewable energy measures to households, public, private and community buildings.

Develop a charter promoting environmentally sustainable behaviour in transport, energy and resource use.

Plan for an economy where people need to travel less and can travel by cycle or walking for many short journeys by ensuring all major developments are located with good access to local amenities, cycle and walking routes.

All three Local Authorities have **Local Sustainable Transport Fund (LSTF)** support for 'smarter travel' initiatives, including:

CWaC's Workplace Challenge and travel planning services.

WBC's personalised travel planning programme for 12,000 households.

CE's Smarter Ways to Travel programme in Crewe.

All three Local Authorities successfully bid for funding from the **Heat Networks Delivery Unit** to develop large scale low carbon heat network infrastructure. As these projects develop there will be opportunities to engage with the businesses and householders on low carbon behaviour linked to the physical investments, and to support businesses in the low carbon economy to supply goods and services.

Warrington Borough Council is developing a financing mechanism to invest its own funds in large scale **PV systems** on commercial and industrial roofs owned by other businesses. This has been driven by opportunistic

behaviour: being aware of the potential and prepared to get involved at the right stage. The initial scheme will be 7MW on one new building on the Omega development, and will generate a significant return for the Council. Further schemes are planned once the mechanism has been proved.

There has also been a strong focus on CO₂ reduction across other areas of the **public sector**, with most of the Health, Education and Emergency Services organisations carrying out their own CO₂ reduction programmes, and engaging with communities on these issues.

Social Housing Providers are engaging residents on energy saving and CO₂ reduction, alongside measures to improve the energy efficiency of their homes. The ERDF-funded CARE project improved over 1100 homes while supporting suppliers to develop new skills.

Finally, there is significant grassroots activity across Cheshire & Warrington, with the **Low Carbon Communities Network** of over 30 community groups, whose energy can be harnessed to support CO₂ reduction activities in households, travel, the workplace, and investment in low carbon solutions.

6.4 Progress On Reducing CO₂ Emissions In Cheshire & Warrington

Data on CO₂ emissions has been produced by DECC since 2005 for Local Authority areas². This shows that CO₂ emissions across Cheshire & Warrington increased slightly by 0.6% between 2005-11, although per capita emissions reduced by 15%. This compares with national reductions of 17% in absolute terms and 21% in per capita emissions.

Per capita CO₂ emissions are almost 60% higher than the NW or UK averages, but this is almost entirely due to the concentration of energy-intensive industries within Cheshire West & Chester.

² DECC Local CO₂ Emissions Estimates 2011.

7 RECOMMENDATIONS FOR FURTHER BEHAVIOUR CHANGE ACTIVITIES

Cheshire & Warrington faces some particularly difficult barriers to reducing CO₂ emissions through behaviour change.

At the practical level these include:

A relatively wealthy population for many of whom carbon intensive lifestyles are a mark of status, and energy costs are unimportant.

A comparatively large rural area with few alternatives to car use for travel.

The urban draw of Manchester and Liverpool for work, shopping and leisure, primarily dependent on car use.

Heavily energy intensive industries which can threaten to move away if CO₂ becomes more of an economic burden.

Neighbouring Greater Manchester is attempting to develop a local narrative on carbon reduction and behaviour change. It is not clear that Cheshire & Warrington has a similar brand identity that could be used, or whether it would be possible to make use of the opportunities presented by Manchester's activities.

The Cheshire & Warrington European Structural and Investment Funds Strategy 2014-2020 states that the shift to a low carbon economy is vital, both to promote sustainable economic growth through building the market in low carbon environmental goods and services and associated low carbon innovation, and in order to address the issue of climate change. There is a growing understanding that economic growth must be achieved alongside CO₂ reduction.

There are five key drivers underpinning the Low Carbon Economy Objective:

1. The need to reduce Green House Gas (GHG) emissions;

2. The need to increase the share of renewable energy;

3. The need to increase energy efficiency;

4. The need to ensure resource efficiency (including waste management) and climate change resilience;

5. The need to reduce the carbon intensity of goods and services.

In response to these drivers the Cheshire & Warrington LEP is currently developing a Low Carbon Action Plan which will also embed crossing cutting action on climate resilience and resource efficiency. All of these drivers would benefit from including elements of behaviour change in any projects or programmes that are developed through the Action Plan.

Options For Specific Initiatives

Context changing opportunities

Promote the CO₂ reduction impacts (not just the economic benefits) of key projects such as heat networks, improving connectivity and transport improvements.


Develop and support a culture in which potential CO₂ reduction opportunities can be exploited for financial as well as social gain.

Promote and celebrate local activities and successes.

Acknowledge and support the activities of community organisations such as the Low Carbon Communities.

Piggy-back onto the climate change agenda, information channels and media activity in Greater Manchester to spread a coherent narrative about CO₂ reduction: On the Platform, Manchester Is My Planet, Carbon Literacy, social media trend setting.

Retain and build on the existing knowledge base and networks to grow capacity and deliver behaviour change within other initiatives.



‘Rebound is highlighted as an issue for climate change activities: and is not fully understood.’



Housing

Maximise the behaviour change opportunities associated with housing improvements and regeneration programmes.

Promote take up of smart metering and information/feedback systems.

Identify opportunities for home energy improvements to support the local low carbon economy.

Promote energy measures to home renovators.



Transport

Focus on area-based and workplace travel planning to support the aim to reduce congestion.

Investigate opportunities to incorporate the CO₂ reduction potential of improved connectivity to reduce car travel.

Identify and develop opportunities for car-free transport infrastructure in new and existing development.



Business & Public Sector

Continue to develop opportunities for low carbon energy for energy intensive industries and new development.

Identify and support market development and skills for the low carbon sector.

Expand the ENWORKS programme to support resource and carbon efficiency in business.

Investigate opportunities to support CO₂ reduction in commercial buildings.

It is clear that widespread context change will be needed to drive the low carbon economy within Cheshire & Warrington, and that behaviour change activities are a key part of this. Behaviour change programmes can also deliver greater carbon savings than infrastructure alone, and these savings are likely to be around 5-10% of the CO₂ emissions of the population targeted.

The theory of behaviour change also applies to the LEP and Local Authorities. The challenge will be how the senior leaders of these organisations can overcome the motivational barriers to deliver the cultural change required.

The evidence reviewed covers:

Behaviour change theory and implementation, with some studies specifically investigating low carbon or sustainability behaviours, and others looking into generic behaviour and the implications for public policy responses.

Activity targeting low carbon or energy related behaviour change in households.

Activity targeting low carbon or energy related behaviour change in businesses.

Activity targeting transport behaviour.

Theory, policy and practices targeting behaviour in other areas such as health.

The evidence reviewed is summarised below. This is not an exhaustive review of all available studies but has been selected based on relevance to Cheshire & Warrington, scope and age of study and detail on CO₂ savings. Most of the studies selected have investigated the outcomes of a range of individual programmes, and provide an analysis of the relative merits of different initiatives, and frequently an assessment of

findings on the best methods/approaches to use. Some specifically aim to understand the behaviour element while others focus on the measure as a whole. A few documents present research into the carbon saving potential in specific areas (e.g. electricity use in households) without analysing the behavioural potential in these areas, to provide information on the potential scale of savings.

APPENDIX 1 – CRITICAL REVIEW OF BEHAVIOUR CHANGE RESEARCH

The evidence summaries are classified under “Behaviour Change”, “Householders”, “Business”, and “Transport”, and include:

Report: Study citation.

Location: most accessible weblink for the study.

Subject: an overview of the topics/measures covered.

Key Points: a summary of the main findings.

Policy Relevance: opportunity to use the findings within Greater Manchester.

Evidence: selected relevant data from the study.

Scope: an assessment of the relative size/breadth/depth of the study shown as ticks from ✓ (small/limited study) to ✓✓✓ (large study or combined data from many studies).

Savings Data: an assessment of the validity of the data provided, based on sample size and methodology used shown as ticks from ✓ (limited or estimated data) to ✓✓✓ (measured data / large study or combined data from many studies).

Limitations: issues relating to the usefulness/transferability of the findings to the local context.

The Behaviour Change category covers findings from research into behaviour motivations and approaches to driving behaviour change through policy, built on evidence from a range of policy fields, but also including specific energy/sustainability behaviours.

There is more evidence available for households/individual energy behaviours than for transport and businesses. Within this category are studies investigating the impact of specific measures targeting behaviour such as smart meters/home energy displays as well as physical measures such as insulation accompanied (or not) by advice on behaviour.

For the Transport category, a number of systematic reviews have been referenced that provide combined data on the effectiveness of types of measure.

For the Business category, there is far less evidence available and what exists only covers individual initiatives or studies, rather than systematic reviews.

A number of individual initiatives considered relevant to Greater Manchester have also been investigated and these are summarised as case studies in Appendix 2. While these demonstrate a particular approach, they do not carry as much weight in determining the findings as the more systematic reviews.

Evidencing Behaviour Change Carbon Savings

One of the long-term issues in understanding the impact of behaviour change activities is the lack of good data. In some of the studies, energy or CO₂ savings have been measured, but for many the savings have been estimated or calculated based on assumptions of the changes made. For energy savings in homes in particular, recent evidence suggests that actual savings achieved may be lower than most models predict, and a few of the studies suggest reasons for this. For transport and businesses, there is not yet a sufficient body of evidence to confirm or refute the estimated savings.

It is critical that monitoring is built in at the start of any initiative. However, in most instances, behaviour change

activity is incorporated within a wider programme that targets multiple physical and behavioural issues, so analysis of the behaviour component is difficult. It may be possible in some situations to take a staged approach to allow the effectiveness of the behaviour change elements to be separately assessed, but this has generally not been the case.

A few recent programmes have investigated the impact of housing efficiency improvements with and without supporting advice. These have shown that, in those particular circumstances, the behaviour change element increased savings but these findings are based on small case studies (e.g. Affinity Sutton showed energy savings for

works + advice were 13% compared with 8% for works only). Further research is being carried out by the National Housing Federation into the separate impact of behaviour change activities alongside home energy improvements.³

A final crucial point is that CO₂ savings, energy savings and money savings are not the same thing. The motivation behind a project will drive which type of saving is most important, and which is measured. Initiatives to tackle fuel poverty can increase CO₂ emissions. Initiatives to reduce energy consumption may focus on large savings from a lower-carbon fuel (e.g. gas) while missing lower savings from a higher-carbon fuel (e.g. grid electricity).

³ www.housing.org.uk/policy/greener-neighbourhoods/count-us-in

APPENDIX 1A – EVIDENCE: PROMOTING BEHAVIOUR CHANGE

Dolan, P. et al., March 2010.

MINDSPACE: Influencing Behaviour Through Public Policy, Institute for Government/Cabinet Office.

Location

www.instituteforgovernment.org.uk/our-work/better-policy-making/mindspace-behavioural-economics



Subject

An analysis of what affects behaviour and how public policy can be used to change the context in which people act. The study sets out how the MINDSPACE process can be used in practice.

Key Points

Changing minds or changing the context: most behaviour change activity focuses on changing minds through provision of information (assuming rational behaviour).

While information is important, but also recognising irrationality, policies should focus on changing the environment in which choices are made. Information often has modest and sometimes even unintended impacts.

Changing the context may be more cost-effective than aiming to change people's minds through information. Change is driven by a mix of both broad social argument and small policy steps: it does not mean giving up on conventional policy tools such as regulation, price signals and better information.

Public permission, and an understanding that the change promoted is in some way good, are important factors in success. Short-term triggers can bring about lasting change. Rebound is highlighted as an issue for climate change activities: and is not fully understood.

Policy Relevance

Essential background reading for designers of climate change policy and behaviour change programmes.

Insights into specific CO₂ reduction initiatives: e.g. road speed, comparative energy consumption data for householders, car use for short journeys.

Evidence

Behaviour determinants:

Messenger: We are heavily influenced by who communicates information.

Incentives: Our responses to incentives are shaped by predictable mental shortcuts, such as strongly avoiding losses.

Norms: We are strongly influenced by what others do.

Defaults: We 'go with the flow' of pre-set options.

Salience: Our attention is drawn to what is novel and seems relevant to us.

Priming: Our acts are often influenced by sub-conscious cues.

Influence: Our emotional associations can powerfully shape our actions.

Commitments: We seek to be consistent with our public promises, and reciprocate acts.

Ego: We act in ways that make us feel better about ourselves.

One meta-analysis of pro-environmental behaviours reported that at least 80% of the factors influencing behaviour did not result from knowledge or awareness.

One study evaluating the cost effectiveness of physical activity programmes found that context-

altering interventions (e.g. bicycle and pedestrian trails to encourage healthy behaviours) had the potential to be more cost-effective than more information-based ones.

People apply undue importance to 'anchor' numbers, regardless of their relevance – a starting point against which to assess future data.

Priming (linking words, sights, smells, situational clues to activities) affects actions.

Recommended Actions

Explore: Understanding whose behaviour you are changing.

Enable: Starting from 'where people are'.

Encourage: Applying MINDSPACE to change behaviour.

Engage: Facilitating public debate and gaining approval.

Exemplify: Changing government's behaviour.

Evaluate: Working out what works.

Scope



Wide-ranging assessment based on variety of policy fields.

Savings Data

Not included in the study.

Limitations

Recognises that it will take time for the impact of this method of addressing behaviour change to be fully evaluated.

Chatterton T., 2011.

An Introduction to Thinking About ‘Energy Behaviour’: a multi-model approach, Institute for Sustainability, Health and Environment, University of the West of England, for DECC.

Location

www.gov.uk/government/uploads/system/uploads/attachment_data/file/48256/3887-intro-thinking-energy-behaviours.pdf



Subject

An exploration of the different perspectives from which to understand and interpret behaviour, referencing specifically energy use in the home.

Key Points

Energy behaviour change activities have focused predominantly on the individual, but this has not been as effective as expected. Understanding the context of behaviour may be as, or even more, important in some cases than understanding people’s motives and actions.

Energy behaviour is determined by a wide range of actors, not just the individual: e.g. families, policy makers, producers and promoters of energy using products, housebuilders and the home improvement market.

These cause certain energy ‘decisions’ to be almost inevitable. Providing infrastructure alone does not change behaviour.

Behavioural economics tends to focus on the point of decision making, and does not deal with underlying factors such as values, roles, and self-concept, which represent ‘Identity’.

Interventions need to address the complex interaction of external and internal factors that determine behaviour, and work to influence social practices and involve a wide range of actors, rather than just individuals. A multi-model approach can redefine the problem as well as identify new solutions.

In tackling ‘bigger-than-self problems’, such as climate change, it is necessary to engage with people’s values. Everyone holds similar values to some degree: greater emphasis needs to be given to activating certain values rather than changing them. However, appealing to one set of values (e.g. saving money) may directly suppress another set of values (e.g. concern for climate change) and limit further action/behaviour change.

Policy Relevance

Further evidence supporting the need to understand and address the context surrounding energy behaviours as well as the behaviour itself.

Evidence

Four behavioural theories are investigated and two behaviour models:

Economic Theories: Energy is a commodity and consumers will adapt usage in response to price signals. Energy price rises can affect short-term energy use but external conditions such as cold weather over-ride this. There is little evidence that people respond to price signals over the long term.

Psychological Theories: Energy use can be affected by stimulus-response mechanisms and by engaging attention. People will respond to salient and easily understandable information on their energy usage, that encourages them to reduce their usage.

Sociological Theories: Energy use is largely invisible, energy systems are complex, and daily practices are significant. People do not directly use energy, but carry out activities that lead to energy consumption: keeping warm, clean, fed etc. Each activity will require very particular targeting in order to achieve changes in behaviour.

Educational Theories: Energy use is a skill that is learned through experience in specific situations. Differences in skills, understanding and motives lead to different energy use patterns.

Individualist Model: Focusing on the actor.

Socially Orientated Model: Focusing on the elements within a society that contribute to actions or practices.

Scope

✓✓✓

Savings Data

Not included in the study.

Limitations

An exploration of issues rather than recommendations.

Darnton, A, Verplanken, B, White, P and Whitmarsh, L., 2011. Habits, Routines and Sustainable Lifestyles: A summary report to the Department for Environment, Food and Rural Affairs. AD Research & Analysis for Defra.

Location

randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=Nonone&Completed=0&ProjectID=16189



Subject

Investigation into the role of habits in sustainable behaviour and two different perspectives: as a routine and as a factor in behaviour.

Key Points

Policy recommendations built up from an analysis of habits:

Understand the strength of the habit.

Consider whether the individual is the right target for an intervention.

Identify existing programmes to use as a basis for wider behaviour change techniques: grow rather than start new initiatives.

Draw together resources from different specialisms.

Support community-based organisations to deliver change.

Tie interventions to life change events.

Identify different messages and communications strategies.

Use communication techniques to shift social norms.

Policy Relevance

Useful analysis to understand habits, based on a range of other research, will concluding recommendations for practice.

Evidence

Habits as a factor in behaviour:

“Habit requires frequency, automaticity and a stable context.” Intentional control is passed over to the environment, and changes in the environment can trigger changes in habits.

Habit as routine practice: Habit emerges from a combination of available materials, competences/abilities and images that determine the social norm or aspiration. Individuals are carriers of practices rather than the originators of behaviours.

Different intervention approaches can target the individual, the practice or life events. Each will have an impact, but a combined approach is likely to be the most effective.

Scope



Brings together a selection of other research.

Savings Data

Not included in the study.

Limitations

An exploration of issues rather than recommendations.

Southerton D. et al., 2011.

International Review of Behaviour Change Initiatives: Climate Change Behaviours Research Programme, Scottish Government Social Research.

Location

www.scotland.gov.uk/Topics/Research/by-topic/environment/social-research/Behaviour-Change-Research



Subject

Analysis of the impact and relevance of the context of 30 behaviour change initiatives, six of which are covered in detail. Analysis/commentary on translating these to the Scottish context.

Key Points

Targeting multiple contexts, moments of lifestyle transition and institutional or infrastructural pressure points is more effective in promoting sustained behaviour change than targeting the individual through information alone.

Co-ordinated initiatives across different organisations within a single vision enables single action schemes to complement one another.

Change can be effected through less visible mechanisms (producing more efficient equipment/buildings

or more renewable energy) and unrelated messages (health, time pressures) without altering 'environmental' behaviours.

Robust evaluation is needed – but the methodologies are not yet available.

Context is important: imitation of an apparently successful initiative in a different context is unlikely to be effective.

Who leads the initiative determines how it is perceived and its outcome.

Most initiatives target modest changes – it is doubtful whether further initiatives of this scale will achieve the major savings required.

Policy Relevance

Advice on design of programmes, particularly linking information to structural or legislative change.

Useful analysis of the context of each initiative and how it might be transferable to Scotland – some of these factors will be relevant to Cheshire & Warrington e.g.:

Smarter Choices and Cycle Hire (already planned)

Promotion of community-owned renewable energy

Co-ordination of small-scale local food initiatives into a wider programme

Evidence

Costs and CO₂ savings quantified for some of the case studies (see table below).

Example of the impact of promotion of low energy lightbulbs combined with the increasing trend towards (high-energy) halogen.

Scope

✓✓✓

Wide range of different initiatives analysed.

Savings Data

✓✓

Good where available, but unclear how robust the data is for some of the case studies.

Limitations

Some case study data is now slightly out of date.

Initiative	Aim	Cost	Impact
Durham Water, Ontario	10% reduction in household water use	\$80,000	17% reduction in peak water use, \$945,000 saving
TravelSmart, Western Australia	Reducing private car use	£460,000	Up to 18% reduction in journeys
RECO, Berkely, California	Reducing household electricity use	Legislation – cost borne by householders	13% reduction across the city
Barclays Cycle Hire, London	Encourage cycling for short journeys	£140m over 6 years	Not yet known
Middelgrunden Co-operative Offshore Wind, Denmark	Renewable energy generation	€45m	81,000 tCO ₂ /yr
CoolBiz, Japan	Reduce air-conditioning through changing dress codes	N/A	1.14 mt CO ₂
BRT & Cicloruta, Bogota	Reducing private car use through bus lanes and cycle routes	\$350m	293,000 tCO ₂ /yr
Traffic signal timing, Portland, Oregon	Reduce 'idling' fuel use	\$533,000	15,460 tCO ₂ /yr

Doyle, R., December 2013.

From Behaviour Change to Transforming Everyday Practices: The Latest in Behavioural Science. Sustainable Brands.

Doyle, R., March 2013.

Towards a Future of Sustainable Consumption: A practice oriented, participatory backcasting approach for sustainable washing and heating practices in Irish households. Thesis submitted to the University of Dublin, Trinity College, for the Degree of Doctor in Philosophy.

Location

www.sustainablebrands.com/news_and_views/behavior_change/ruth-doyle/behavior-change-transforming-everyday-practices-latest-beh



Subject

Investigating an approach to re-frame the challenge of sustainable behaviour change as a challenge of innovation in people's everyday practices.

Key Points

Look at everyday practice – not just consumption and production of emissions.

Move beyond a focus on individual attitudes: Check the physical and social constraints to the psychological behaviour change message – people may not be able to easily control their heating and are constrained by social norms of regular washing.

Take everyday practices as units of research and innovation: Looking at the routine behaviours in the household (washing, home heating and cooking) and what shapes them – hardware and expectations.

The four ways to target everyday practices to achieve innovation:

1. **Hardware** (technologies/product).
2. **Skills** (practical know-how).
3. **Norms** (social expectations/meanings).
4. **Rules** (regulations, systems of provision).

Interventions across all four dimensions will ensure they are collectively promoting or 'scripting' more sustainable practices. The Consensus project found collaborative visioning to be effective in this.

Script sustainable norms through hardware, rules & educational interventions: The Consensus project suggested ICT feedback on water use, water saving devices, washing skills to produce new norms of pro-ecological washing practices.

Policy Relevance

Provides a useful holistic checklist to approach challenging problems, such as washing habits; suggest inclusive, collaborative approaches to achieve integrated behaviour change.

Evidence

Detailed investigation into washing and water heating practices in Ireland, alongside an analysis of policy interventions to promote sustainable behaviour.

Descriptions of different washing/heating narratives and the implications of each for a range of sustainability indicators, based on wide-ranging people-centred research methods.

Puts collaborative backcasting into practice and demonstrates a people-focused method of tackling tricky problems. This is demonstrated and documented in the PhD document.

Scope



Limited subject considered but findings relevant to many energy related behaviours.

Savings Data

Not included in the study.

Limitations

This study is about an approach rather than producing.

APPENDIX 1B – EVIDENCE: HOUSEHOLD SECTOR

Fell D., King G., 2012.

Domestic energy use study: to understand why comparable households use different amounts of energy. A report to the Department for Energy and Climate Change. Brook Lyndhurst. DECC.

Location

www.gov.uk/government/uploads/system/uploads/attachment_data/file/65599/6919-domestic-energy-use-study.pdf



Subject

An assessment of the reasons behind different levels of gas consumption in 70 households, all in similar 3-bedroom semis. The research was based on interviews with householders looking into their understanding of heating systems and controls, living patterns, practices and attitudes to heating and aimed to understand the gap between modelled energy consumption and actual usage.

Policy Relevance

Supports the findings from EST and National Housing Federation that electricity is easier to target than heating.

Contrary to many media and political stories, most people do not care about their energy bills: programmes aiming to change behaviour must take this as a starting point.

An understanding of notions of comfort and sacrifice is critical to the design of any behaviour change programme.

Key Points

Comfort is the principal service people expect from being in their home. Virtually all the households were undertaking at least one 'high gas using' behaviour – implying that in virtually all households there is the potential to reduce gas consumption. Education or awareness-raising in this area would need to be done very carefully. Attempts to encourage

householders to reduce gas use could be interpreted as a request to sacrifice their comfort.

The number of behaviours/factors that can have an effect on gas use, and which also appear amenable to change in the short term, is relatively small. Subjective temperature preferences, household composition and building fabric are all somewhat immutable in the short term. More easily changed variables such as the thermostat temperature, the hours of operation of the heating system and the number of baths taken, appear to be entrenched habits that are deeply connected to notions of comfort such that any change would be experienced as a 'sacrifice' to be resisted.

Most of the people in the research do not really understand how their heating system works; and most, it would seem, do not really care.

Awareness of gas use is very low, and the link to 'energy efficiency' is rarely made. Many could not easily say how much it actually cost. In situations where householders have attempted to reduce their gas consumption, they stated that saving money was their principle motivation. But none of the householders knew how much they had saved as a result either of insulation measures or of more 'behavioural' steps they had taken.

Evidence

Heating behaviour is determined by:

Temperature management – how people manage the temperature in their homes and their awareness of the energy implications of their actions.

People in the home – who is in the home, when, and what they are doing.

Physical properties of the home.

Very few householders understood their heating system. Participants did not know how much gas they used either in absolute terms or relative to others – most assumed they were 'about average' and most underestimated their heating use.

The physical properties of theoretically similar homes vary substantially – usually due to internal modifications (e.g. open plan areas), extensions and insulation measures. However, modelling these differences only explained less than a third of the actual differences in energy use between the properties.

Households that use dramatically more gas than average appear to have occupants who simply prefer a warmer home; who are at home for more of the time than average; who are keen on taking long showers; and who happen to live in relatively inefficient properties.

However, numerous other factors did not affect gas use in this study. Notably, this includes attitudes and values: those who hated waste or were environmentally conscious did not use exceptionally little gas.

Scope



Small sample but representative of many 'average' households.

Savings Data

Not included in the study.

Limitations

Only 70 homes but in-depth assessments.

National Energy Efficiency Data Framework, Part 2. Impact of Energy Efficiency Measures in Homes, Department for Energy & Climate Change, November 2013.

Location

www.gov.uk/government/publications/national-energy-efficiency-data-framework-need-report-summary-of-analysis-2013-part-2



Subject

Energy savings achieved through installation of loft and cavity wall insulation and boiler replacements in gas-heated properties, plus solid wall insulation in limited number of homes.

Key Points

Combined measures show greater savings than the sum of individual measures.

Relative savings compared with the control group decrease over time, although after six years, 'intervention homes' still used less gas.

Observable downward energy trend in 'non-intervention homes'.

Wide distribution in energy savings with significant numbers of homes increasing consumption.

Energy/cost savings are lower than predicted in the EST model - shown as demonstrated savings on their website (reviewer observation - not in report).

Policy Relevance

Actual data on energy/carbon savings, incorporating actual behaviours. The data includes homes that have received support on behaviour change as well as those that haven't.

An anonymised data set is expected to be published in 2014, which can be used as baseline data against which the impact of additional behaviour change activities, in conjunction with physical improvements, can be measured.

Evidence

Observed energy savings for households with professionally-installed energy efficiency improvements since 2005, looking at individual and combined measures. Data combines meter point weather corrected gas consumption data, Valuation Office Agency (VOA) property attribute data, the Homes Energy Efficiency Database (HEED) data on energy efficiency measures installed, and Experian modelled data on household characteristics.

A comparator group of 'non-intervention' properties was used to eliminate underlying trends or weather impacts.

Single-measure savings average:

Boiler replacement 9.2%

Cavity wall insulation 7.8%

Loft insulation 1.7%

Combined-measure savings average:

Cavity wall and loft insulation 9.4%

Cavity wall insulation and boiler 15.7%

Loft insulation and boiler 13.1%

Cavity wall, loft insulation and boiler 19%

No underlying analysis of either the underlying trend in non-intervention homes, or behaviour element: the latter could be a factor in the impact of combined measures.

Scope

✓✓✓

All professionally-installed UK loft insulation, cavity wall insulation, boiler replacements since 2005.

Savings Data

✓✓✓

Metered gas consumption data.

Limitations

No analysis of underlying causes.

Smaller sample for solid wall insulation (790).

Costs of measures not included.

Energy Saving Trust, 2012. Powering the Nation: Household electricity using habits revealed.

Location

www.energysavingtrust.org.uk/Publications2/Corporate/Research-and-insights/Powering-the-nation-household-electricity-using-habits-revealed



Subject

Monitoring of actual energy use of appliances and lighting in 256 owner-occupier households over one month or one year in 2010-11.

Key Points

Annual electricity use in studies homes is 10% higher than expected, despite larger than average group of 'positive greens'.

Single person homes use as much or more than families. TVs, clothes washing/drying, dishwashing and stand-by power are all higher than expected.

Homes with tumble driers use these even when it's sunny. Incandescent and halogen lighting is higher than expected.

Standby power use accounts for 9-16% of total electricity. Results contradict previous assumptions and explain increased electricity use findings in other studies.

Participants had homes with higher than average SAP ratings – thought to have no impact on findings, but may be a 'compensation effect' in electricity use.

Policy Relevance

Programmes need to tackle the underlying causes of why appliance electricity usage levels are high.

Behaviour change activities can impact on many of the issues found e.g.:

Purchase of low-energy equipment (including LEDs).

Standby power habits.

Washing and drying habits.

Information can support segmentation – opportunity to address "positive greens"

Evidence

Electricity use per household split by:

Dwelling type: terrace (mid, end, small, medium/large) semi, detached, bungalow, flat.

Equipment types: cold, cooking, lighting, wet, consumer electronics, ICT, water heating.

Detailed equipment types: e.g. iron, laptop, games console, LED lights etc.

Household make-up: single pensioner, single non-pensioner, multiple pensioner, household with children, multiple household with no dependents.

Standby power.

Comparison with UK and EU 'standard' data.

Scope

✓✓

Owner-occupiers only – useful for comparison with social housing studies.

Savings Data

✓✓✓

Monitored consumption. Anonymised data will be made publicly available for further research.

Limitations

Relatively small sample.

VaasaETT, 2013, Empower Demand 2. Energy Efficiency through Information and Communication Technology – Best Practice Examples and Guidance. European Smart Metering Industry Group.

Location

esmig.eu/sites/default/files/final_empower_2_demand_report_final_distr2.pdf



Subject

Learning from different customer-engagement approaches used by energy companies in rolling out smart metering programmes.

Follow-on report from Empower Demand 1.

Key Points

Pre-offering education: preparing consumers for the technology is vital to success.

Step-by-step discovery, experimentation and enlightenment: people like to explore and discover the technology and benefits at their own pace.

Mixed feedback: personalised feedback in a variety of forms maintains interest and long term savings.

Appealing feedback devices:

basic devices can be effective but aesthetic, ergonomic, simple, ambient, intuitive devices are more so.

Empathy and trust: customers need to believe that the utility is trying to help the customer rather than just themselves, demonstrated through the utility's behaviour, promises and guarantees

Motivation and incentivisation: consumers are more motivated when they are in a position they arrived in willingly and when they know they are not trapped there.

Inter-play of automation, self-control and experimentation:

Consumers are not opposed to automation, but need to feel they have given permission, approve of the automation, and can opt out.

Building interaction with and through technologies: in-home displays, combined with supporting education and a good customer experience create a feeling of partnership with the utility.

Policy Relevance

Important findings for the design of smart metering and energy information feedback schemes.

Evidence

Advice on each stage of developing and delivering smart metering programmes, including examples of information programmes, communication methods, devices used and issues dealt with.

Scope

✓✓✓

Qualitative information from nine successful programmes.

Savings Data

Not included in this part of the study.

Limitations

No information on programme cost.
Electricity only.

VaasaETT, 2011, Empower Demand 1.

The potential of smart meter enabled programs to increase energy and systems efficiency: a mass pilot comparison. European Smart Metering Industry Group.

Location

smartgridcc.org/resauth/vaasaett



Subject

Comparison of the impact on energy consumption patterns of energy use information systems (in-house displays, improved bills, web-based data) and dynamic pricing (time-of-use, critical peak price/rebate, real time), both separately and combined. Evidence from 100 large-scale pilots.

Key Points

Consumers react positively to feedback and dynamic pricing mechanisms, and results are maintained over 2-3 years.

Surrounding variables have a substantial impact on program success levels over and above the supportive technology used or program structure: particularly socio-economic factors, participant consumption patterns, and household load sources.

The central difference between pilot success and failure is the ability of the program designers to meet consumer needs through the demand side program. "We thought we were undertaking an infrastructure project but it turned out to be a customer project."

"More is more" at every stage - multiple types of information on a display or a bill tend to achieve higher results than a display or a bill with only one message.

Pricing pilots with large groups were as successful as smaller trials. But information pilots were more successful with less than 1000 participants.

Customer segmentation is key to successful widespread applications.

Providing educational material helps pricing mechanisms achieve savings, but had little impact on the success of in-home displays.

Higher levels of participant interaction produced better results.

Automation of equipment shutdown via smart metering doubles the impact (vs manual switching) but giving customers some degree of control over the equipment to be shutdown makes little difference to the impact.

Policy Relevance

Evidence of behaviour-change only projects i.e. not associated with building improvements.

Combined with findings from EST (that electricity savings potential is higher than previously thought) shows potential for projects targeting electricity demand.

In-home displays are a valuable tool to support savings through behaviour change.

this supports findings from Housing Association trials (e.g. Northwards, Golden Gates - reported on www.claspinfo.org/resources/life-after-cert-and-cesp).

Opportunities to work with energy companies on larger-scale smart-metering projects.

Evidence

Energy savings achieved through information/feedback mechanisms showed energy savings of 5.1-8.7% (averaged across all regions).

Pricing mechanisms showed energy use reductions at peak demand periods of 5-14%.

In-home displays showed the highest level of savings for all feedback/information systems: 10% in EU households (but see OPower report on next page).

Scope



460 sample groups covering 450,000 homes.

Savings Data



Metered savings.

Limitations

Findings may not be directly transferrable to NW homes - a significant proportion of dynamic pricing savings came from air-conditioning.

Electricity only.

OPower, 2013. Unlocking the Potential of Behavioural Energy Efficiency.

Location

www2.opower.com/potential



Subject

Potential for energy efficiency in US households, based on OPower's experience of sending personalised, targeted, multi-channel communications on energy usage to its customers.

Key Points

Behaviour change through energy information provision is significantly lower than found by VaasaETT above.

Policy Relevance

Caution should be applied to any reliance on high levels of saving from such information programmes.

Evidence

Behavioural programmes are cost-effective to the utility company for 79m households in the US (61%).

Energy savings for consumers would be 19,000 GWh or \$2.2bn/year.

This represents only 1.6% of the US household consumption, or 2.6% per household involved.

Scope



218 programmes across eight million households.

Savings Data



Based on metered data from a very large sample.

Limitations

US data.

The VaasaETT report noted that EU programmes showed higher savings than US ones, but also that US homes have greater potential savings due to the prevalence of air-conditioning.

Barbu A-D, Griffiths N & Morton G., 2013.
 Achieving energy efficiency through behaviour change:
 what does it take?, European Environment Agency.

Location

www.eea.europa.eu/publications/achieving-energy-efficiency-through-behaviour



Subject

An analysis of evidence of the energy savings achieved through behaviour change measures targeting householders and businesses.

Key Points

Traditional behaviour change programmes focussing on information and support can achieve short term energy savings of 2-20%, although the mean appears to be around 10% and possibly 2-3% of that will be lost through rebound.

Concerted community initiatives achieve the highest short-medium term savings.

Consumption patterns have largely been ignored by policy makers and in measures targeting behaviour change. These are leading to an increase in resource consumption, led frequently by commercial interests.

Instead of focusing on individual consumption, policy makers should

concentrate on the emergence and transformation of social norms which lock us into consumption patterns affecting resource consumption and the environment.

Changes need to take place in the way energy markets function and are regulated in order to enable the consumer to actively engage with these markets.

Policy Relevance

Indicates that a reasonable target for behaviour change initiatives could be around 5-10% of the energy consumption of the target population.

Evidence

Energy savings achieved through initiatives reviewed (see table below).

It is argued in the review that these savings may not be persistent: measurements are rarely carried out beyond the end of the initiative, and do not take account of rebound.

Feedback measures – combining direct and indirect feedback from energy suppliers has been the most effective.

Audits – there is a direct link between implementing energy audits and achieving tangible energy savings but the extent to which energy audits can trigger real and

persistent changes in consumer behaviour is less clear.

Community initiatives need to be part of a wider programme to be successful; pre-existing relationships or shared views among the community contribute to success.

Unlike the business sector, householders are not driven by economic reasoning.

Adequately assessing the rebound effect is challenging but recent literature suggests it is 20-30% for householders and far lower for businesses.

Scope



Literature review covering a wide range of studies, each of which investigated numerous programmes.

Savings Data



Limitations

Energy savings are frequently not recorded for behaviour measures, with survey data recording attitude changes.

Where energy savings are measured, they are within the programme lifetime and do not reflect long term changes.

Intervention	Range of energy savings
Feedback	5-15%
Direct feedback (including smart meters)	5-15%
Indirect feedback (e.g. enhanced billing)	2-10%
Feedback and target setting	5-15%
Energy audits	5-20 %
Community-based initiatives	5-20 %
Combination interventions (of more than one)	5-20 %

Count Us In, January 2014. Approaches to engaging households with their energy use. National Housing Federation.

Location

www.housing.org.uk/policy/greener-neighbourhoods/count-us-in/



Subject

A review and learning from 70 case studies of activities to help householders reduce energy use. All include advice and guidance with combinations of technologies, campaigns and peer-to-peer support.

Key Points

One-to-one engagement through home visits consistently proved more effective than other means of engagement.

Taking time to understand residents' concerns first enables other important outcomes to be targeted as well as energy saving.

Involving residents in the design and planning of engagement programmes improves participation and tailors activity to the community.

Information on its own is not a very effective means of achieving lasting behaviour change, but is most successful when delivered in succinct, easily understood and visually appealing portions on an ongoing basis.

Resident-led engagement: People are more likely to trust messages delivered by people they can relate to and who are perceived as independent.

Building the capacity of residents to deliver aspects of engagement and making the most of existing community networks and forums is effective at delivering ongoing support in cost effective ways.

This reduces costs and provides residents with new skills and qualifications, improving employment opportunities.

Working on a neighbourhood level, within concentrated geographic areas, helps to develop awareness of projects, recruit households and maintain momentum.

Households have had more success at changing behaviours related to lighting and appliance use rather than heating.

Moments of change (e.g. changing jobs, moving home or major building work) provide valuable windows of opportunity for changing people's behaviour. The changes that people experience at these points can make it easier for them to establish new routines and habits.

Delivering engagement activity

in parallel to retrofit works or the installation of micro-generation technology can increase its effectiveness.

Policy Relevance

This provides useful information on designing behaviour change interventions for residents, especially, but not exclusively in social housing. Useful for those working on Green Deal, ECO and other energy efficiency measures but equally useful for those wishing to tackle electricity use through behaviour change programmes.

Evidence

Fourteen detailed case studies and a review of 70 projects. The report identifies four methods to encourage home energy reduction.

1. Feedback on energy consumption

(on their own use/comparative use) through real-time (monitor/smart meter) or over time (billing).

2. Advice and Guidance, both hints and tips, and through tailored relevant advice and energy audits.

3. Motivational campaigns including incentives, competitions and pledges.

4. Peer-to-peer working including community networks, energy clubs and local energy champions.

Successful behaviour change uses a combination of different approaches and focuses on making small steps over time rather than a radical change.

Feedback studies

CHARM Home Energy Study: historic visual/graphic feedback on energy use delivered 5% electricity saving but was not as effective as real time feedback, and results were greater if the feedback was provided by email rather than online.

OPower Home Energy Reports providing graphics and comparative information reduced the likelihood of low energy using customers increasing their energy use due to receiving feedback by rewarding energy reductions with smiley-faces. It achieved a 2.5% energy reduction over 16 months.

SHIMMER Project found frequent smaller rewards to be useful in maintaining motivated households. Pledge campaigns were more effective if feedback was provided.

Sample CO₂ Savings

Southway Housing/Action for Sustainability: Chorlton, Manchester: engaged with 309 tenants and helped each save an average of

£111 per year – with a projected total of £34,329; 340,000 kWh (units) of energy; and 124 tonnes of CO₂ a year.

Groundwork/Regenda: Warmer Living Project, Rochdale – 12 residents were trained as community champions to provide doorstep information and energy checks. 1,200 homes received doorstep information, with 580 receiving more detailed advice via in-home energy checks. 234 homes received low cost energy efficiency measures. It is estimated that the project delivered 672 tonnes of CO₂ savings per annum (649 tonnes from advice alone).

Five Count Me In pilot projects aiming to reduce energy use by 5-10% through behaviour change will be reporting in spring 2014 and will provide more data on the impact of behaviour change, since they include control groups.

Scope

✓✓✓

Over 8000 homes involved in the 17 detailed case studies.

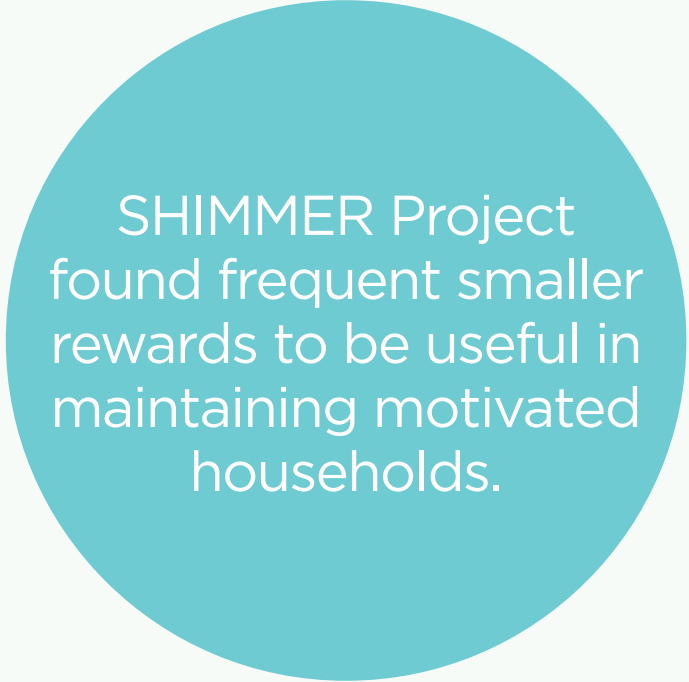
Savings Data

✓✓

Only five case studies contained savings data, but these covered 5,800 homes.

Limitations

Many were in progress or pilots when report written.



SHIMMER Project
found frequent smaller
rewards to be useful in
maintaining motivated
households.

Barwood, T et al., July 2011. The Missing Quarter: Integrating Behaviour Change into Low Carbon Housing Retrofit. Low Carbon Housing Retrofit Greater Manchester.

Location

www.manchesterknowledge.com/leading-change/manchester-is-my-planet



Subject

Evidence, case studies and recommendations on integrating behaviour change into retrofit programmes: specifically related to Greater Manchester programmes and housing stock.

Key Points

It may not be possible to change a householder's mind about investing in energy saving measures and behaviours but it is possible to change the context in which people make these decisions.

Context change can be achieved in a number of different ways, but should be focused on three key mechanisms:

Better information, education and awareness.

Innovative and cost-effective incentives (the 'nudge' element).

Building the capacity of the intermediaries (including community groups) to support and reinforce energy saving decisions (the 'think' element).

Behaviour change activities must be tailored to the specifics of the individual and their community.

No single organisation alone is likely to succeed in delivering the behaviour change component of a retrofit programme.

Community based working is likely to be more effective than relying on large scale campaigns.

Interventions should start with positive messages and continue to emphasise the advantages.

Householder engagement needs to come from a trusted source.

Investment in establishing and maintaining local environmental action should run in parallel with each retrofit programme.

Incentives should include rewards that have sustainable value and can be offered from other public policy strategies such as the health, education and transport.

Targeted information needs to reassure households of the benefit of the activity, and regular feedback should be provided during and beyond the programme.

Behaviour change strategies can have a marked effect on the local and sub-regional economy.

Policy Relevance

Activities/support needs to be area-wide, co-ordinated across a range of delivery partners, visible and focused on changing the local context – showing how improvements in the local area and their buildings can improve people's lives, but individuals need to also be involved to make the most of it.

Trusted sources and use of community champions increases the impact of physical measures.

Information needs to expressly target levels of under-insulation as well as no-insulation.

Monitoring and feedback on impacts plays a crucial role in behaviour change linked to retrofit.

Evidence

Builds on MINDSPACE report, describing methods to help change the decision-making context.

Describes what influences behaviour and behaviour change.

Case study evidence examples:

The Relish project (Worthing, Sussex): showing works+behaviour change achieving 29% energy savings against works-only of 4% and education-only of 18%.

Energy Experts programme, Finland: training local experts achieved electricity savings of 10% and 5% heating savings.

Energy Neighbourhoods Germany: competition between neighbourhood teams achieved average energy savings of 10%.

Claims behaviour change can achieve between 25-50% energy reduction (research not cited).

Scope



Wide-ranging analysis of behaviour drivers and techniques.

Savings Data



Case studies.

Limitations

Focuses on activities around retrofit but doesn't address the possibility of hanging the recommended behaviour change programmes onto other activities if the retrofit uptake is lower than planned.

Wilson C. et al., 2013.

Understanding Homeowners' Renovation Decisions: Findings of the VERD Project. UK Energy Research Centre.

Location

tyndall.ac.uk/sites/default/files/verd_summary_report_oct13.pdf



Subject

Investigation of homeowners' decisions to renovate their property and whether to include energy efficiency improvements as part of that.

Key Points

Energy improvements are typically carried out with other renovations.
Efficiency renovators are no more influenced by policy or promotional business activity than amenity renovators.
Efficiency renovators think their energy bills will come down as a result, but are not initially motivated by cost saving.
Once the decision to renovate has been taken, social norms and external ideas influence what improvements are made.
Renovation decisions are lengthy processes – the 'value' of work proposed becomes more important

towards the end of the process.
Promotion of energy measures to would-be renovators is a major market opportunity – local and personally recommended tradespeople are preferred.

The emphasis should be on the potential for efficiency measures to help address the challenges of everyday domestic life rather than for cost savings.

Financial constraints do not prevent renovation planning, but increase the decision-making time.

Green Deal finance could help widen scope of renovations to include energy measures.

Policy Relevance

Actions targeting private householders or landlords.
Activity promoting finance mechanisms e.g. Green Deal.
Planning advice for renovations/extensions.

Activity to support

Low CO₂ supply businesses.
Local trades directories.
Home renovation businesses.

Evidence

How private householders decide to renovate and what value is placed on energy improvements:

Conditions of domestic life which help explain why the interest in renovating first arises.

External triggers for renovations: primarily because something needs fixing.

Factors influencing the decision.

Length of the decision-making process.

Scope

✓✓

1028 homeowners.

Savings Data

Not part of the study.

APPENDIX 1C – EVIDENCE: BUSINESS SECTOR

IFCGHK, April 2013.

Evaluation of the ENWORKS Project: ‘Embedding Resource Efficiency in Key Sectors’, 2009-2013.

Location

www.enworksinbox.com/sites/default/files/EREiKS%20Evaluation%20FR.pdf



Subject

Evaluation of the economic impact and strategic added value of the ENWORKS programme – to address market failure relating to resource efficiency and environmental risk by providing assistance to businesses.

Key Points

Market failures in addressing resource efficiency and environmental risk remain for most businesses. The ENWORKS programme is an effective and successful means of addressing this market failure and realising high levels of economic and environmental benefits for the businesses and local economy.

The programme, while highly successful, has only engaged with 5,000 of the region's 250,000 businesses.

Policy Relevance

Tried and tested, successful mechanism for business support. Recommendations provided for future activity in the new funding and organisational context.

Future activity needs to address the “less-motivated” businesses: consideration of MINDSPACE approach may be needed.

Opportunities to use ENWORKS as a trusted messenger for transport activities e.g. workplace/area-based travel planning.

Evidence

Selected project outputs to Jan 2013.

Project cost: £8.4m

Business supported: 2413

Applications of low carbon technologies: 331

Cost savings: £85m / £18,000 per business per year

CO₂ savings: 320,871t / 133 t per business

Programme cost: £26 per tCO₂ saved / £0.1 per £1 saved

Economic benefit of the programme: £47.8m

Scope

✓✓(✓)

2413 businesses – quantitative data:
167 businesses – qualitative data.

Savings Data

✓✓✓

Extracted from monitoring data for each business.

Limitations

The programme mainly deals with ‘already-motivated’ businesses.

Carbon Trust, 2014.

Low Carbon Behaviour Change: The £300 million opportunity.

Location

www.carbontrust.com/media/434481/ctc827-low-carbon-behaviour-change.pdf



Subject

Explores opportunity for energy saving behaviour at work.

Key Points

Survey data shows potential for much wider employee engagement in energy saving at work:

Few employers are trying to engage employees.

Wide gap between willingness to act and acting.

Knowledge and licence to act are important.

Praise gets results.

Difference in behaviour at work and at home.

The most significant carbon and cost savings are related to transport.

Policy Relevance

There are significant cost and carbon savings to be made from low-cost measures in businesses: but resources (particularly staff time and external support) are needed to realise these. (See ENWORKS).

The areas of activity for behaviour change match well with the reported priority areas for organisations: reducing waste, energy saving, sustainable travel (See Motivating Millions). Transport measures should be a priority in business interventions. (See business travel planning).

Evidence

Quantification of potential from some behaviour change measures, based on Carbon Trust experience (see table below).

Survey data from 1135 employees

on attitudes and motivation of employees to save energy.

Advice on designing behaviour change interventions.

Case studies from Sheffield University and nationwide.

Scope

✓ (✓✓)

Survey from 1135 employees. Findings based on experience of working with thousands of businesses.

Savings Data

✓ (✓✓)

Unclear where data originates and if based on actual or modelled savings.

Limitations

Unclear whether the list of opportunities is a sample or the main findings.

No information on the cost of engagement activities.

Behavioural opportunity	tCO ₂ e	£/year
Get car drivers to switch to bus once a week	3,727,779	
Get car drivers to share with another driver once a week	4,430,383	
Reduce number of air business trips by 5%	1,528,562	£128,500,000
Reduce small power use by 10%	189,656	£39,028,500
Reduce temperature by 1°C	194,151	£35,170,254
Reduce waste sent to landfill by 5%	114,624	£48,960,000
TOTAL	6,269,863	£306,744,694

John Drummond, Corporate Culture, 2013. Motivating Millions: The 2013 Sustainable Behaviour Change Marketplace Survey.

Location

www.bitc.org.uk/our-resources/report/motivating-millions-2013-sustainable-behaviour-change-marketplace-survey



Subject

Investigation into the priorities, motivations, strategies and challenges of organisations currently acting to achieve sustainable behaviour change.

Key Points

There is almost universal agreement about the importance of sustainable behaviour change.

It is seen as critical to helping organisations achieve future success and as much more of an opportunity than a risk.

Around half are already delivering behaviour change programmes and another quarter are in the planning stages: but there is a clear gap between reported importance of behaviour change and acting

There is a clear gap in knowledge, understanding and buy-in among the most senior colleagues.

Sustainable behaviour change is predominantly owned at the CEO/MD level. There isn't always alignment between the key external

issues that could affect future success and an organisation's behaviour change priorities.

A relatively narrow band of strategies are used to achieve change, and these are dominated by communications: a wider range of methods would improve impact.

A surprisingly large percentage of private sector companies don't measure the effectiveness of their behaviour change programmes.

Governments are seen to have a key role in making it clear to consumers that current consumption behaviours are unsustainable.

Policy Relevance

A large number of organisations are already engaged, and their experience should be used to both support the case for behaviour change strategies, and to help with implementation.

Evidence

94% believe sustainable behaviour change is important to help their organisation improve its impact on society and achieve long term success.

79% view it as an opportunity rather than a risk.

Government is seen as having most responsibility for highlighting issues and providing information. The private sector is seen as having the most responsibility for making it

easy to act.

The public sector is taking more action on behaviour change than the private sector.

The top three motivators are around market opportunities: competitive advantage (**48%**), build stronger relationships (**47%**), create sustainable communities and markets (**33%**).

The top three priorities for staff behaviour change are: reducing waste (**84%**), saving energy (**84%**) and health/wellbeing (**83%**). Sustainable travel came in fourth (**77%**).

Key barriers are: lack of funding (**41%**), lack of senior buy-in (**39%**), lack of skills/knowledge (**34%**).

Scope



328 organisations across a range of sectors, operating in the UK and internationally, **65%** private companies.

Savings Data

Not included in the study.

Limitations

Self-selected sample of businesses already motivated.

Carbon Trust & SPA Future Thinking. November 2012.
Exploring the design of policies to increase efficiency of
electricity use within the industrial and commercial sectors.
Department for Energy & Climate Change.

Location

www.gov.uk/government/uploads/system/uploads/attachment_data/file/66566/7028-design-policies-efficiency-elec-edr.pdf



Subject

Interview-based research into the barriers to energy efficiency and relative impact of different finance and expertise/audit incentives for low and medium energy-intensity businesses.

Key Points

Survey data shows potential for much wider employee engagement in energy saving at work:

Few employers are trying to engage employees.

Wide gap between willingness to act and acting.

Knowledge and licence to act are important.

Praise gets results.

Difference in behaviour at work and at home.

The most significant carbon and cost savings are related to transport.

Policy Relevance

Energy is not a priority at all for small businesses – compared to staying afloat or growth.

Energy is not a top priority for medium-sized businesses: capital for efficiency measures has to compete with core business priorities.

None of the solutions proposed addressed the lack of interest.

Some larger businesses have internal capacity to improve energy performance, but more complex decision-making processes inhibit action.

Contracting out services to ESCOs was not favoured due to loss of control and lack of trust. Landlord/tenant agency issues inhibit energy measures in rented premises.

Simple financial incentive schemes were preferred by smaller businesses e.g. low interest loan, rebate. “No upfront cost” schemes (similar to Green Deal) appeal to capital-constrained businesses, but demand a degree of trust in the managing organisation. Payment based on savings is too complex/uncertain for most smaller businesses.

Audits had broad appeal to address lack of knowledge, particularly if free.

Evidence

Barriers analysed by size and type of business.

Low priority given to energy efficiency by the company.

Capital constraints.

Short investment payback period requirements.

Lack of expertise in energy efficiency.

Complex internal decision making processes that favour simple, compelling propositions.

Other, including fear of disruption of daily business.

Support options/issues investigated:

Finance/incentive payments.

Audits.

Use of third parties.

Measuring and verifying energy savings.

Scope



30 businesses

Savings Data

Not collected in this survey

Limitations

Small study.

Limited options analysed.

CarbonBuzz

Location

www.carbonbuzz.org



Subject

Actual vs. predicted carbon performance of non-domestic buildings: an evidence collection scheme for real buildings, managed by RIBA/CIBSE and set up in 2010 by the Technology Strategy Board in conjunction with industry partners.

Key Points

Modern buildings are under-performing compared with their design emissions as calculated for Building Regulations Part L calculations.

Policy Relevance

Policy assumptions on the contribution that new buildings can make to CO₂ reductions targets need to be re-assessed.

Actions to improve in-use energy performance will need to include behaviour change as well as technical solutions.

Evidence

CO₂ emissions kg/m²/year: predicted, actual, Actual/predicted as % (number studied):

Commercial offices: 45.2, 69.8, **154%** (110).

Education: 33.8, 52.3, **155%** (146).

Case studies of individual buildings.

Scope



Savings Data



Actual data, but pre-and post-construction data not always matched up.

Limitations

Significant data sets are only available so far for offices and education.

Menezes A.C. et al., 2011.

‘Predicted vs. Actual Energy Performance of Non-Domestic Buildings’, Third International Conference on Applied Energy, Perugia, Italy.

Location

dspace.lboro.ac.uk/dspace-jspui/handle/2134/9429



Subject

Analysis of the causes of the Performance Gap as identified by RIBA/CIBSE and demonstrated in CarbonBuzz.

Key Points

Current energy/carbon models for new office buildings underestimate actual usage.

Actual performance is determined by:

Build quality: related to contractors (e.g. gaps in insulation, thermal bridging) and clients (changes in specifications not fed back into energy models).

Management and controls: poor design strategies and poor implementation.

Occupancy behaviour: particularly office/IT equipment but also how they change conditions – e.g. lighting and ventilation.

Policy Relevance

Policy assumptions on the contribution that new buildings can make to CO₂ reductions targets need to be re-assessed. Actions to improve in-use energy performance in offices need to target behaviour change of users (particularly IT strategies) and facilities managers (particularly around heating/ventilation baseload and controls).

Evidence

Detailed monitoring of energy use and occupancy patterns in a London office building: six-floors, 12,000m², plus basements.

Actual energy use/m² was over

three times the predicted level.

The aim was to develop more reliable modelling methods to better match actual performance, but behavioural differences were noted to account for different use patterns:

Tenants with policies to leave computers on overnight used 54-72% more electricity than those with a ‘switch-off’ policy.

Scope



Detailed monitoring but only a single building.

Savings Data



Metered data.

Limitations

Single-building study.

Low Carbon Innovation Co-ordination Group, November 2012. Technology Innovation Needs Assessment, Non-Domestic Buildings Summary Report.

Location

www.lowcarboninnovation.co.uk/working_together/technology_focus_areas/nondomestic_buildings



Subject

An assessment of the level of market intervention required to support carbon savings in non-domestic buildings, including national figures for the carbon savings potential and economic benefits of interventions.

Key Points

Reinstate:

An integrated approach to solving the market failure through a non-domestic low carbon hub.

Collection of further evidence required.

Necessary public sector interventions:

Exemplar buildings, e.g. a target for percentage of new and major refurbishments of public sector buildings to be zero carbon.

Development of new contractual models for procurement of low carbon buildings.

Knowledge Forum to disseminate benefits of different buildings technologies to architects and engineers and others in the value chain.

Convened fora, including major landlords and occupiers, to define new practices that integrate best available buildings technologies combined with knowledge sharing activities.

Development of essential skills using learning modules developed in partnership with learning

from innovation demonstration programmes.

Tighter building regulations for refurbishments.

A transparent market: DEC's for all non-domestic buildings

Greater incentives for landlords and tenants to improve energy efficiency.

Finance for low carbon refurbishment and capitalisation of energy efficient new buildings.

Policy Relevance

Potential to act on several of the recommended interventions at the city/sub-regional level.

Evidence

Innovation in the non-domestic buildings sector represents a significant opportunity to help meet the UK's GHG emissions targets, as well as providing value through avoided energy costs, amounting to savings of 86MtCO₂ and c. £13bn by 2050. Innovation could help create export opportunities that could contribute an estimated £1.7bn to GDP to 2050. Public sector support will be required to unlock this value, as there are significant market failures across the sector to overcome.

The energy used by non-domestic buildings accounts for approximately 18% of UK CO₂ emissions.

Savings through actions on energy management and operation (i.e. behavioural aspects) can generate 50% of the savings potential to 2020, with technological improvements providing an increased share from 2020-2050.

There is a failure of market demand, leading to inertia among all involved. Key factors are:

The landlord-tenant divide provides

no incentive for action.

Energy costs are not seen as material so low-energy does not attract a premium.

Lack of knowledge.

Existing building regulations are not tight enough, sufficiently enforced, or integrated well with planning tools.

Market supply failures also contribute:

A fragmented supply chain, with multiple opportunities for carbon potential to be lost.

A conservative building sector.

Lack of necessary skills.

Conventions around contracting have a negative impact on low carbon outcomes.

Public sector action to counter market failures can have a high-medium impact in:

Integrated design tools and modelling software.

Commissioning building services.

Smart controls and system diagnostics.

Industrialised retrofit techniques.

Carbon management services.

Behaviour change.

Advanced natural ventilation systems.

Scope

✓✓✓

Covers potential interventions in all non-domestic building types to 2050.

Savings Data

✓✓✓

Based on Carbon Trust data.

Carbon Trust, March 2012. Closing the Gap (CTG047).

Location

www.carbontrust.com/media/81361/ctg047-closing-the-gap-low-carbon-building-design.pdf



Subject

Guidance on reducing the performance gap of non-domestic buildings.

Key Points

Recommendations around the design, commissioning and hand-over process for new buildings, based on use of the BSRIA 'Soft Landings' guidance, including:

Regular carbon reviews/assessments throughout the process.

Effective control and metering strategies.

Training the facilities manager.

Ongoing relationship with the client to help understand the building and how it functions.

Seasonal commissioning - to test systems in different weather conditions.

Post-occupancy evaluation.

Policy Relevance

Actively promoting the "Soft Landings" approach for new developments to the development community.

Targeting behaviour change activity at businesses based in new developments - possibly offering a service at hand-over/ start of lease.

More widely targeting behaviour change in non-commercial buildings for senior management and staff.

Promoting uptake of training for facilities managers.

Evidence

Evidence from five case study buildings used to demonstrate the gap between predicted and actual performance: actual energy consumption/predicted ranged between 125% and over 700% for the buildings studied.

Out-of-hours use and occupant behaviour patterns and inefficient management of systems account for 20% of the building's energy demand.

Scope

✓

Savings Data

✓✓

Five case study buildings, but also wider data from CarbonBuzz.

Limitations

Focus on design and build aspects rather than occupation.

Cox, A et al, 2012.

The Impact of Workplace Initiatives on Low Carbon Behaviours, Scottish Government Social Research.

Location

www.scotland.gov.uk/Publications/2012/03/3379/downloads



Subject

Analysis of the activities, approaches and supporting factors that determine what works in changing employees' behaviour: looking at energy saving, waste reduction and recycling, transport and food.

Key Points

Key Learning:

Organisations find it easier to focus on energy and recycling/waste then move onto transport behaviour.

Practitioners estimated that between 20-50% of staff take part in voluntary low carbon activities at work.

Tough policies, including mandatory recycling and limiting travel options, seem to have strong impacts.

Cutting CO₂ emissions has significant benefits for the organisation's reputation, costs and ability to recruit and retain staff.

Organisation size should not be regarded as a barrier to low carbon initiatives.

Detailed explanations of critical success factors:

The active and visible participation of senior managers.

Creating positive perceptions of costs and benefits for employees in terms of personal time and monetary costs or savings.

Minimising initial perceptions of inconvenience.

Creating a sense of shared purpose and meaning for employees and managers.

Using external expertise in the early stages of deciding what to do and how to do it.

Involving staff, consulting them prior to changes and providing feedback on their suggestions

Communicating information face-to-face by peers and line managers, backed up with online resources.

Using multiple influencers across different levels in the company: the number needed is proportionate to the size of the organisation and is therefore more important in larger companies.

Setting up 'green teams' to give staff the chance to devise and implement activities, and to learn from the results.

Establishing employee perceptions of low carbon behaviours as being part of their jobs.

Making use of HR expertise to help influence staff behaviour.

Providing supporting infrastructure and equipment.

Using formal incentive schemes where they fit organisational cultures.

Defining organisational expectations with policies on behaviours where change is most challenging, particularly in relation to travel behaviours.

Beginning low carbon management approaches with initiatives that will be popular with staff.

Making low carbon activities part of organisational routines and allocating time within the working day to enable employees to take part.

Making use of major organisational changes such as relocation, or expansion to introduce behaviour change.

Policy Relevance

Organisational sustainability can be shown to be economically beneficial for businesses: case study evidence can be used to promote this.

Useful guidance on how to start, progress and maintain sustainability initiatives with employees.

Evidence

Case study evidence: see table on the right.

Scope



10 businesses, but several are part of much larger organisation schemes e.g. Coca-Cola, Hilton.

Savings Data



Data on a range of initiatives within each organisation.

Limitations

Case study evidence based on Good Practice examples – potential bias in the savings achievable.

Costs of initiatives not included.

CO₂ savings reported relate to complete package of measures, not just the behaviour element.

Organisation	Activities	Impacts
Aberdeenshire Council	Flexible working to reduce commuter miles.	1000+ staff participating (7%): 137,000 miles, 34,000 tCO ₂ and £47,000 saving in business travel in 6 months.
BT	Energy Champions and Carbon Clubs combined with technical measures.	17% energy saving at HQ. £874,000 saving across 25 buildings.
Coca Cola	Zero waste to landfill, through engaging staff and providing recycling facilities.	Achieved in 2011, down from 200 tonnes in 2006.
	Involving managers in energy monitoring, improved shut down procedures and technical measures.	2 GWh savings in 2012.
Commercial Group	Fuel efficient driver training.	4.8% reduction in fuel use in 2011.
	Green Ambassador volunteers and Green Angels team, plus lighting improvements.	16% electricity and 27% gas savings. Company achieved 75% CO ₂ savings from 2006-10.
EAE	Cycle scheme and public transport policy.	18% regularly cycle to work.
	Switch Off policy plus technical measures and investment in a wind turbine.	70% reduction in CO ₂ .
Halcrow	Recycling activities and provision of facilities.	90% reduction in waste costs plus revenue generated from recycled materials.
	Parking and public transport promotion scheme. Business travel policy. Cycle scheme.	63 tCO ₂ saved from business travel and 40 tCO ₂ from commuting. 200% increase in video conferencing. 12,300 subsidised bus journeys.
Hilton Edinburgh Grosvenor	Green Teams in each hotel led by the Executive Head Chef and involving front line staff. Initiatives on energy, waste and food sourcing.	22% energy saving. 13% CO ₂ saving. 40% waste recycled.
Interface FLOR	Green Energy team, staff suggestion scheme, inter-factory competitive savings scheme, compulsory sustainability training.	80% reduction in manufacturing waste sent to landfill. 48% energy saving through better temperature/ air-conditioning control. Reduced voltage lighting saving 20-30%.
SSE	Transport policy: business travel policy including 'No Fly' months, car parking restrictions, car sharing, dedicated bus services, Commuter Challenges.	848,000 business miles & 96,000 commuter miles saved 3.5million car share miles. £919,000 savings in parking provision.
Wiles Greenworld	Staff training programme and monthly 'green slots' in meetings. Activities on fuel efficient driving, working from home and recycling.	32% CO ₂ reduction since 2008.

Scally, G. et al., 2011.

‘Soft measures – hard facts’ The value for money of transport measures which change travel behaviour: A Review of the Evidence. Department of Health.

Location

www.erpho.org.uk/viewResource.aspx?id=21632



Subject

Critical review of 16 travel behaviour change measures, based on reported data from a range of schemes (pilots and large-scale). CO₂ savings and value for money calculated for each, along with an assessment of the robustness of the evidence.

Key Points

Travel behaviour change measures can provide very high benefits compared to costs, when measured by WebTAG, the Department for Transport’s method for evaluating transport investment. Changing how we travel can reduce the need for expensive infrastructure.

Behaviour change measures can be implemented much more quickly than infrastructure projects.

All measures achieve genuine CO₂ reductions (from 5kg to 1500kg per person per year). Greater impact is achieved from careful targeting of people likely to change their behaviour combined with multi-measure programmes across age groups.

Policy Relevance

Evidence for high-impact schemes: combined area-based activity, workplace-based schemes and car clubs.

Evidence

Sustained reductions in car miles travelled (between 2 and 11%),

and increases in walking and cycling, are achievable through personalised advice and support given to individuals (Department for Transport/Sustrans).

Car club members drive around 5000 fewer miles than a car owner and save around 1500kg of CO₂ a year (Ledbury and Co).

60% of participants in adult cycle training go on to increase their levels of cycling (Lifecycle).

17-41% of people walk more for every day journeys when they are motivated to walk for leisure with walking groups or with information about places to walk (Walking for Health/Doorstep Walks).

Thousands more young people are now walking to school, compared to two years ago across the South West, as a result of schools and local authorities successfully promoting active travel to school (School Travel Health Check).

‘Bike It’ can double the number of young people cycling to school (Sustrans).

71% of patients loaned a step-ometer in their GP surgery were walking more for everyday journeys after six weeks (Walking for Health).

Workplace challenges can be effective at motivating people to change behaviour: the cost of motivating an employee to take up cycling is around £270 (CTC).

Each electrically assisted bike used for short distance business travel can save 500kg of CO₂ per year and considerably reduce company travel costs (Avon and Wiltshire Health Trust).

Each car commute saved through car sharing reduces CO₂ by around 1000kg a year (Liftshare, Devon County Council).

Individual employers can double the proportion of commuting by bus, train, cycling and walking by supporting and motivating their staff and at very low cost to them (Cairns, Newson & Davis).

Area based workplace travel plans can attract small companies, which are often missing from single employer schemes (Highways Agency).

The benefit to cost ratios of saving car trips from the Strategic Road Network from area based travel plans, range from 3.5 to 13.1 (Highways Agency).

Introducing a range of behaviour change measures at the town/city level concurrently can result in: car driver trips down by 9%, cycle trips up by 26-30%, walking trips up by 10-13% and CO₂ reduction per head of population by 50kg per year (Sustainable Travel Towns, Department for Transport).

Scope



Wide range of schemes covered. Most based on reasonably large samples.

Savings Data



Good for Walk to Work and Area-wide schemes. Low for adult cycle training and electrically-assisted bikes. Medium for all other schemes.

Harris J. & Wilkinson J., 2009.
 'Making Smarter Choices'.
 Institution of Highways and Transport.

Location

www.ciht.org.uk/en/publications/smarter-travel/index.cfm



Subject

Development of smarter travel choices and history of evidence gathered up to 2009.

Key Points

Sustainable travel measures can support improving accessibility, equality of opportunity, quality of life, health and well-being, as well as CO₂ reduction targets.

The DfT's 2009 Guidance requires local authorities to consider the opportunities for smarter travel ahead of infrastructure based solutions.

Benefit-cost ratios for sustainable travel interventions are usually at least comparable to, if not better

than, more traditional infrastructure-based approaches, but may need a different assessment method.

Policy Relevance

Confirms evidence from Scally et al of the value of investing in behaviour change measures in transport alongside, or before, infrastructure improvements.

Evidence

Analysis of different smarter travel options with costs, benefits and barriers (detail in Appendix 1):

Workplace travel plans: median cost £47/employee; 18% reduction in single-occupancy car use, reduced car parking costs, better staff retention, lower absenteeism.

Personalised travel plans: cost £20-38/household; average 11% reduction in car use.

Teleworking: highly variable costs; 70% fewer sick days, improved work/

life balance, better productivity and higher staff retention.

Tele/Video conferencing: £5-40k set up cost; 10-30% reduction in workplace travel.

Car clubs: £100k+ set up costs; eventually self-financing, at least 3,600 km reduction in car use per member in trial cities.

Scope

✓✓

Range of examples of different schemes.

Savings Data

✓✓ (✓)

Wide-ranging but unclear where data originates.

WS Atkins, September 2009. ‘An Audit of Smarter Choices Implementation in North West England.’ 4NW.

Location

enviroeconomynorthwest.com/download/climate_change_-_carbon_reduction/research/NW%20Smarter%20Choices%20Implementation%202009.pdf



Subject

Analysis of the Smarter Choices database of 2523 schemes across the North West (over 90% school travel plans).

Key Points

Focus on CO₂ reduction if that is the driver: other benefits such as health, access to jobs, etc might need to be considered as secondary to achieving emissions reduction.

Focus on the areas with the most potential for emission reduction: leisure and commuter journeys, travel plans for existing sites rather than

just new developments.

Smarter Choices interventions need to widen their scope to include vehicle efficiency and driver behaviour as well as modal shift. Smarter Choices interventions need to become part of a ‘Carbon Package’ offered to businesses and individuals.

The importance of Smarter Choices interventions in achieving CO₂ emissions reductions needs to be recognised by demonstrating value for money to shift investment from infrastructure only.

Policy Relevance

Confirms the CO₂ savings value of WTPs, PTPs and teleconferencing, as reported in Scally and Harris & Wilkinson.

Evidence

Modelled CO₂ savings from different smarter travel options, based on reported reductions in car trips

combined with assumption on trip distance and fuel consumption of vehicles (see tables below).

Scope



Relatively few schemes.

Savings Data



Limited actual data.

Limitations

Reliant on DfT assumptions made in 2004. No analysis of linked journeys or rebound. Data limited for schemes other than school travel planning (2341 schemes) and workplace travel planning (158 schemes).

Report completed in the context of 2009 when CO₂ emissions reduction per se was seen as an important driver for national and local government.

Type of measure	Degree of intensity and rurality	Potential carbon emissions saving per person (kg CO ₂)
Workplace travel plan	High intensity in urban area	23.83
	Low intensity in urban area	13.24
	High intensity in rural area	10.59
School travel plans	High intensity in any area	4.73
	Low intensity in any area	0.95
Teleconferencing	High intensity in any area	28.51
Home shopping	High intensity in any area	5.75
Personalised travel planning	High intensity in urban area	51.75
	Low intensity in urban area	10.35
	High intensity in rural area	2.1
Travel awareness campaigns	High intensity in any area	12.42
Public transport, walking and cycling marketing	High intensity in urban area	9.31

Type of measure	Carbon savings identified in Smarter Choices database	
	Total savings (ktCO ₂)	Savings per scheme (tCO ₂)
Workplace travel plans (WTP)	3.8	24.04
Car sharing (CSH)	0.89	178.97
Primary school travel plans (STP)	1.19	0.62
Secondary school travel plans (STS)	0.93	2.22
Personalised travel plans (PTP)	2.07	296.2
Travel awareness campaigns (TAC)	0.25	126.79
Car clubs (CCL)	0.0002	0.09
Public transport information & marketing (PIM)	0.02	10.87
Walking information & marketing (PIM)	0.06	56.92
Network improvements (NET)	0.13	64.69
Total CO₂ savings identified	9.48	

The following documents have been reviewed, but not summarised, for this report:

'Behaviour change: the principles for effective interventions', National Institute for Health and Clinical Excellence.

publications.nice.org.uk/behaviour-change-the-principles-for-effective-interventions-ph6

Swann C. et al., 'Health systems and health-related behaviour change: a review of primary and secondary evidence', Centre for Public Health Excellence, National Institute for Health and Clinical Excellence.

www.nice.org.uk/media/OE6/62/SpecialReportHealthSystemsAndHealthRelatedBehaviourChange.pdf

French & Mayo, 2006, 'It's our health! Realising the potential of effective social marketing', National Social Marketing Centre.

www.nsmcentre.org.uk

The behaviour change wheel: A new method for characterising and designing behaviour change interventions.

www.implementationscience.com/content/6/1/42

Anderson NB, Bulatao RA, Cohen B., Behavioural Health Interventions: What Works and Why? National Research Council (US) Panel on Race, Ethnicity, and Health in Later Life.

Washington (DC): National Academies Press (US); 2004.

www.ncbi.nlm.nih.gov/books/NBK25527



Initiative Get Me Toasty

Location

www.getmetoasty.com



Subject

The 10 Local Authority areas of Greater Manchester have grouped together to offer domestic residents free/subsidised home insulation.

Key Points

The Get Me Toasty scheme is managed by the Greater Manchester Energy Advice Service (GMEAS) hosted by Manchester City Council. The GMEAS supports all of the 10 Greater Manchester Local Authorities. Creative Concern developed the campaign strategy with GMEAS and the Energy Saving Trust, designing and rolling out the brand and all associated collateral.

The Get Me Toasty campaign was developed to promote the Energy Saving Trust's new offer of free or heavily discounted home insulation to all residents across Greater Manchester. The objective of the campaign was to signpost individuals to GMEAS so that the service could assess their eligibility and begin the process of installation.

Policy Relevance

Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 – 2020: Buildings Thematic Objective 4: Supporting the Shift towards a Low Carbon Economy in All Sectors: 'Building retrofit and energy efficiency, especially whole building solutions exemplifying next phase technologies which are near to market.

Evidence

Able to evidence the take-up of the campaign, but not the overall carbon saved. The initial campaign generated over 8,000 enquiries.

The marketing drive delivered over 15,000 unique visitors to getmetoasty.com

Coverage was obtained in Manchester Evening News, Stockport Express, Salford Advertiser, Bolton News, South Manchester Reporter, Bury Times, Sale and Altrincham Messenger, Stretford and Urmston Messenger, and Rochdale Observer. In addition, through partnerships and networking opportunities, we have secured exposure on most of the local authority websites and enlisted the support of the Lesbian & Gay Foundation via their website, and successfully posted on Martin Lewis' Money Saving Expert website.

Key 103 played a run of the Get me Toasty advert for one week. Response rate directly from the advert was low, but the point of running the advert was always focused more on building recognition of the campaign to help support responses through other areas. Given the low response rate it was decided to only run the advert for this period.

Using MEN online, Get Me Toasty purchased 100,000 impressions to test value of online local ads. The adverts appeared on the main pages and on the property pages. However, the results were disappointing and traffic increase to the site was not increased to any great effect with this method.

Google Ads were trailed with a budget of £200 max, the advert had 51 click throughs at approximately £3 per click, the search has been

amended to narrow down the search field and this has led to a decrease in click throughs – this is a positive step as the search should now be more specific to the customer need

The campaign was highlighted by EST as a best practice approach in their annual review.

At March 2013 the campaign, financed through CERT and local authority funding, has handled over 46,000 referrals, delivering nearly 25,000 installed measures and realising annual energy bill savings for GM households estimated at £3m.

In 2013/14, the Get Me Toasty campaign aims to utilise the Energy Company Obligation to support 4,500 fuel poor households and to 40 priority neighbourhoods. These interventions are being delivered through a one year framework which is seen as a transition to the GM Green Deal and ECO partnership.

Scope



Savings Data



Limitations

Only targets domestic properties, relies on a significant investment in marketing.



[Click here to return to the main text.](#)

Initiative

Personalised Travel Planning (PTP), Cardiff

Location

www.keepingcardiffmoving.co.uk/travelsmart



Subject

Sustrans has been working to deliver the UK's largest programme of Personalised Travel Planning, providing individually tailored travel information to 100,000 households, enabling people to make smarter, healthier and greener travel choices.

Key Points

Sustrans' research has shown that lack of information is one of the biggest barriers to sustainable travel. Most people simply do not know the times of the buses from their nearest bus stop, nor do they know where the nearest safe cycle route is or where it connects to. Personalised travel planning provides households with tailored information for their specific transport needs.

Policy Relevance

Warrington's LSTF programme is the 'Sustainable Travel Triangle' which seeks to give a boost to cycling levels through infrastructure, bike hire and behavioural change.

In Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 - 2020, Thematic Objective 7 is 'Promoting Sustainable Transport and Removing Bottlenecks in Key Network Infrastructures'.

Evidence

In Cardiff and Penarth 63,000 households will be targeted over a 15 month period in three delivery phases, as follows (see table below).

After 47,000 households in Cardiff were engaged, results showed an 8% reduction in car trips made by drivers, a 13% reduction in car trips made by passengers, and a tripling of cycle journeys.

Overall, Sustrans' PTP projects are proven to be effective. The

organisation has worked on projects targeting more than 280,000 households and have consistently achieved:

An 11% reduction in car driver trips.

Increases in walking, cycling and public transport trips of between 15% and 33%.

Scope

✓✓

Savings Data

✓✓



Click here to return to the main text.

Stage	Period	Target population (households)
North	Autumn 2011	19,000
South/West	Spring 2012	30,000
West	Autumn 2012	14,000
TOTAL		63000

Initiative

Low Carbon Lymm

Location

lowcarbonlymm.wordpress.com



Subject

Low Carbon Lymm (LCL) is a voluntary, not-for-profit body established by a group of Lymm residents. The main purpose of the group is to work with all areas of the Lymm community to address the challenges of climate change and to cut CO₂ emissions, reducing reliance on fossil fuels and saving money.

Key Points

LCL runs a number of campaigns and has successfully bid for funding to support their work. Partnerships with Energy Projects Plus and Warrington Borough Council are critical to delivery of some of their projects, as well as the commitment and time of members.

Projects include:

Local Energy Assessment Fund

(LEAF) project to identify the potential for energy savings in homes: energy audits of 160 homes combined with training of volunteers to identify savings and communications campaign to engage other residents.

Pioneer Places Project to promote uptake of Green Deal and ECO: providing free Green Deal Assessments to 100 homes in Lymm and supporting villagers to access funding for home efficiency improvements, communication campaign to explain the schemes plus analysis of barriers to feed back to DECC.

Community events to help residents understand their energy bills, switch suppliers, make efficiency improvements or install renewable energy.

Plastic bag free Lymm:

encouraging shoppers to use their own canvas bags and avoid single-use carrier bags.

Wood Allotments: working with the Woodland Trust and Mersey Forest to train up members of the community (felling, first aid) to look after trees on their assigned patches. Gives members of the community a sense of satisfaction and brings woodland into management, and provides free wood fuel to participants.

Green Trail: following a real green trail when 11 Lymm homes were opened to the public to allow people to see low carbon measures in use, LCL has begun a virtual green trail that matches people with questions up with those who have carried out those specific measures at home.

Policy Relevance

Potential to maximise community and volunteer engagement in CO₂ reduction and sustainability issues, through relatively small amounts of public sector support. Committed community groups can create and deliver local projects and grow ground-level interest in taking action.

Evidence

LEAF project evaluation:

Total domestic fuel bill for Lymm is currently about £7.5 million/year. Total domestic CO₂ emissions are 25,000 tonnes per annum. The average domestic SAP rating is 60

and average spend on energy is £1,473/year.

The project identified potential savings of about £1.2 million/year in energy bills and 6,800 tonnes CO₂/year based on installation of:

Cavity wall and loft insulation.

High efficiency boilers and heating controls.

Double glazing and solid wall insulation.

Pioneer Places Project: final evaluation not yet available but several properties received ECO funding for measures including external wall insulation (EWI), and Golden Gates Housing Trust identified five properties to include in their ECO bid for EWI.

The **Wood Allotments scheme** will reduce CO₂ emissions through use of wood fuel – amount not yet calculated. LCL is about to join Oxford University's 'Monitoring and Evaluation for Sustainable Communities' to collect information on the experiences and impact of such groups.

Scope



Savings Data



Limitations

Volunteer-led so can be time-constrained. Dependent on grant funding and partner organisations for larger projects.



Click here to return to the main text.

Initiative

People Power Wrexham

Location

www.peoplepowerwrexham.org



Subject

Wrexham County Borough Council commissioned a staff and resident-focused engagement campaign that would 'promote the Council's activities to reduce its own carbon footprint and encourage schools, staff, members and the community to follow suit'.

Key Points

Wrexham County Borough Council identified cutting CO₂ and energy as one of three council priorities for 2009-2012:

Specifically, the objectives were to:

Raise awareness of the Council's priorities and aims.

Promote the Council's actions to reduce CO₂.

Position the Council as a leader.

Increase understanding of climate change issues.

Reduce the Council's carbon footprint and energy use.

Inspire!

The campaign devised and implemented a communications plan, which included a standalone branded website with its own interactive pledge wall. A campaign toolkit was developed and disseminated and three pilot areas were identified.

Carbon Literacy: In addition, People Power addressed individual CO₂ literacy, particularly amongst council employees with an extensive internal communications campaign around personal carbon footprints, carbon pledges and straightforward carbon reduction activities.

Policy Relevance

Supports Local Authority carbon management plans, Climate Local and the Low carbon Communities network.

Opportunity to address commercial workplace CO₂ emissions.

Evidence

Internal: Key findings showed incremental but significant impact among staff for a six-month campaign:

61.3% are aware of the People Power campaign, with 75.6% recognising the logo, and 70% having seen posters.

77% of people are doing a lot, or everything they can, to reduce energy at work.

Concern over the issue has risen from 79.4% to 83.6%.

Knowledge of climate change issues has risen from 72.1% to 76.6%.

Awareness of the Council's priority to reduce CO₂ is at 90.2%.

87% feel the Council is doing a lot, or everything it can to reduce energy.

71.8% feel this action is having an impact.

Over the months of the campaign, savings were made across the main council offices compared to the same period in the previous year: £20,454.30 & 158.2 tonnes CO₂.

Schools: Five schools completed the campaign. One school cut total gas and oil consumption by a massive 80%, and electricity by 44%.

Average savings

£3040.85 | 24.3 tonnes CO₂

Darland High School

£1719.33 | 19.7 tonnes CO₂

What went well? (Heads)

School power saving activities.

Whole school involvement.

Stimulation of ideas and discussion.

Pupils taking leading roles.

Made whole school more aware.

We enjoyed being part of this project - many thanks!

We were able to share information with parents.

We've had comments from parents about their children being very eco-aware!

What did you enjoy? (children)

Learning about recycling.

Fun exciting and enjoyable!

I thought it was amazing.

When the earth is gone, it's gone! You have really made me think.

We learnt things we didn't know.

I learnt about the effects of global warming.

Helping the school to be more green.

I learned how we can save the environment.

Website and online:

About 3000 pledges were made (often people would make more than one).

The Pledge Wall was a draw - the second most popular page (after the homepage).

There was a big spike of web hits on Power Day, highlighting the success of that event.

Over 2000 visits to the site during the first phase of the campaign and 15,000 page visits.

Scope

✓✓

Savings Data

✓✓

Initiative OPower (USA)

Location

opower.com



Subject

OPower works with energy providers and their customers to reduce consumption and bills. The company sends personalised energy reports to homeowners, to show them how their energy consumption compares to their neighbours'. The reports also include targeted recommendations to help them save, and OPower now operates a mobile web application and controllable thermostat to further empower home owners to reduce their consumption.

Key Points

OPower was founded following a university experiment. One hot summer, a group of graduate students asked a neighbourhood to turn off their air conditioning and turn on their fans by hanging signs on the doors to their houses.

The houses were given different messages:

One group were told they'd save money (\$54 per month).

One group were given an environmental message.

One group were told they would be good citizens for doing this and preventing future blackouts.

One group was told what their neighbours were doing ('when surveyed, 77% of your neighbours said that they turned off their air conditioning and turned on their fans - will you join them?') and it was this group that demonstrated a marked decrease in energy consumption.

Policy Relevance

Potential to combine with Improving Connectivity work programme.

Evidence

OPower cites that their project is working - US residents have saved over \$250 million on their energy bills. Working within six countries and with 80 utility companies, two terrawatt hours of electricity savings will have been made between February 2012 and February 2013 - that's the equivalent of powering all the homes in Saint Louis and Salt Lake City for more than a year. (or half what the US solar industry generated last year).

OPower now have offices across the world, and work with 93 utility partners, including 27 of the 50 largest U.S. electric utilities.

Scope

✓✓✓

Savings Data

✓✓✓



Click here to return to the main text.

Initiative

DECC, July 2012, Low Carbon Communities Challenge Evaluation Report

Location

www.gov.uk/government/uploads/system/uploads/attachment_data/file/48458/5788-low-carbon-communities-challenge-evaluation-report.pdf



Subject

Evaluation of the impact of the £10m Low Carbon Communities Challenge funding provided to 22 community-based projects to install renewable energy technologies.

Key Points

Community energy projects can influence the antecedents to change (generating conversations, providing demonstrators), but do not tend to achieve wide-spread behaviour or attitude change. (Although this was not generally their aim).

One-off grants can enable community groups to become self-sustaining over the longer term by investing in renewable energy to provide an income stream.

Even though 'local' plays a critical part in terms of knowledge, trust and confidence, the role of partners like local and central government provide a badge of legitimacy, a range of financial and non-financial resources, and the means to brand local initiatives in the context of a collective effort.

The funded programme helped improve dialogue between community groups and policy makers and develop further initiatives. Support in delivering a specific project provides wide-ranging community benefits including higher levels of volunteering and greater capacity to develop future projects.

Policy Relevance

Demonstrates the value of providing initial support to community initiatives.

Evidence

Projects collectively achieved:
8206 low carbon measures installed.
3062 tonnes carbon saving per year.

Recorded increased awareness of renewable energy and energy efficiency in several project areas.

Lead to installation of further measures and development of groups' capacity to deliver further initiatives.

Scope

✓
 22 projects, 18 of which provided final data.

Savings Data

✓
 Estimates based on theoretical output of renewable systems.

Limitations

Relatively few organisations, and grant was only given to existing and motivated groups.

Initiative

Melbourne 1200 Buildings Programme

Location

www.melbourne.vic.gov.au/1200buildings



Subject

A programme to incentivise 1200 commercial buildings in Melbourne to improve their energy efficiency through financed retrofit agreements called Environmental Upgrade Agreements (EUAs).

Key Points

Building owner, bank and City of Melbourne enter into a EUA to allow the building owner to implement energy saving measures through a retrofit loan. Loan repayments are collected by the City of Melbourne through a rates charge, and the City then passes the loan repayment back to the bank.

The scheme allows owners and tenants to share the retrofit costs, and repayment periods of 10 years or more are available. The loan stays with the property if the owner decides to sell, too.

Policy Relevance

Cheshire and Warrington LEP
European Structural and Investment Funds Strategy 2014 – 2020:
Buildings Thematic Objective 4:
Supporting the Shift towards a Low Carbon Economy in All Sectors:
‘Building retrofit and energy efficiency, especially whole building solutions exemplifying next phase technologies which are near to market.

Opportunity to support cost reduction in commercial buildings.

Evidence

Melbourne aims to be carbon neutral by 2020 and commercial buildings are estimated to generate 50% of the municipality’s greenhouse gas emissions.

It is estimated that if 1200 commercial buildings improve their energy efficiency by approximately 38%, Melbourne will save 383,000 tonnes of CO₂ each year. The first four buildings in the programme have invested AU\$5.6m in retrofitting initiatives, estimated to save almost 6,000 tonnes of CO₂ emissions and AU\$500,000 in energy costs per year.

Scope

✓✓✓

Savings Data

✓

Limitations

The estimations from the first four buildings looks good, though the project is in the early stages at present.



Click here to return to the main text.

Initiative

The New York City Energy Efficiency Corporation (NYCEEC)

Location

www.nyceec.com



Subject

Large public buildings in NYC can be signposted to the Energy Efficiency Corp, which can provide loans, information or broker partnerships with energy providers.

Key Points

The NYCEEC has three main methods:

It provides direct loans to building owners who want to implement energy savings measures .

It gives information to building owners about funding and grant options with regards to retrofit.

It connects building owners to energy providers that will enter into energy saving agreements (ESAs) to accept loan repayments over time by deducting the payments from buildings' energy savings.

Policy Relevance

As above for Melbourne 1200 Buildings.

Evidence

If the ESAs scheme is successful, CO₂ emissions from the largest public buildings in the city, which currently account for a third of the city's total, could be reduced by 5%, or roughly 10% of the city's goal to reduce emissions by 30% overall.

Scope

✓✓

Savings Data

✓

Limitations

No real evidence as yet: the pilot deal was agreed in November 2011 for 125 Maiden Lane, a 320,000 square foot commercial condominium office building in Lower Manhattan. The building is home to the US Fund for UNICEF, the Guttmacher Institute for Women's Reproductive Health, the Lower Manhattan Cultural Council, and the Consulate General of Trinidad and Tobago, amongst others.

\$950,000 in third party financing was made possible by a \$190,000 credit enhancement facility funded by NYCEEC. The retrofit measures are expected to save the building 24% in total energy usage.

Initiative

Energy saving partnerships in Berlin

Location

www.berliner-e-agentur.de/en/consulting-information/energy-saving-partnerships-berlin

cityclimateleadershipawards.com/berlin-energy-saving-partnerships/



Subject

Berlin's Energy Savings Partnerships (ESP) programme, a joint effort between the city and the partly state-owned Berlin Energy Agency (BEA), is an initiative whereby private companies improve the energy efficiency of large public buildings, with both the contractors and the city benefiting from the cost savings.

Key Points

Retrofitting of large public buildings is expensive, so this partnership allows the private contracting company (the Energy Saving Company, or ESCO) to finance energy saving measures with an

agreement by the building owner to pay back the costs over a concrete payback period (often 8-12 years).

The rate of return for the project is more than the cost of the ESCO's investment and less than the value of energy savings to the building owner, thus producing a win-win for both parties.

Focus is on buildings owned by public authorities, hospitals, and trade and commerce housing associations.

A number of cities have followed suit, including in Slovenia, Bulgaria, Latvia, Poland Mexico and Estonia.

Policy Relevance

As above for Melbourne
1200 Buildings.

Evidence

25 energy saving partnerships have been established in Berlin.

This model has been in operation since 1996. By 2011 the scheme had led to €60 million in private investment and brought down CO₂ emissions by 600,000 tonnes (an average of 64,000 tonnes per year).

Scope

✓✓

1300 public buildings, 500 domestic properties.

Savings Data

✓✓

Limitations

Project partners have developed solutions to overcome financing barriers. For example, to make projects viable for all parties, the annual energy bill must be at least €250,000. This meant that Berlin has established a system allowing building owners to pool buildings together. This also allows unprofitable buildings to be covered.

APPENDIX 2 – TRANSPORT

Initiative

Kopf an: Start Your Brains, Not Your Car

Location

www.kopf-an.de/



Subject

'Kopf an' is a campaign to encourage the residents of nine German cities – Hamburg, Berlin, Braunschweig, Dortmund, Freiburg, Halle an der Saale, Herzogenaurach, Karlsruhe and Kiel – to avoid using their cars for short journeys, instead choosing to walk or cycle: 'Kopf an: Motor aus. Für null CO₂ auf Kurzstrecken.' (Direct translation: 'Start your brains, not your car. For zero CO₂ on short routes.')

Key Points

The aim of the campaign is to double the distances covered walking or by bicycle. In Germany this would amount to 1km walking and 2km by bicycle. The campaign's objectives hope to contribute to the federal government's target to reduce CO₂ emissions by 40% by 2020.

The campaign was funded in 2009 and 2010 by the Federal Environment Ministry and implemented by Bonn agency, fairkehr.

In 2011 and 2012, the city of Karlsruhe has continued to implement the campaign with its own funds, while

Kiel went heavier on the climate change aspect in 2011.

The campaign uses provocative, amusing messages and images at key 'interception' points for motorists: commuter routes, near schools, shopping. The campaign enforces the benefits of active transport to the individual – health, money-saving – backed up by messages about the wider benefits: less congestion, improved air quality.

The campaign has since been adopted by 110 other German cities and towns.

Policy Relevance

Warrington's LSTF programme is the 'Sustainable Travel Triangle' which seeks to give a boost to cycling levels through infrastructure, bike hire and behavioural change.

In Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 – 2020, Thematic Objective 7 is 'Promoting Sustainable Transport and Removing Bottlenecks in Key Network Infrastructures'.

Evidence

88% of German people think that they can significantly contribute to climate change prevention through environmentally conscious everyday behaviour.

96% people surveyed agreed that short journeys should be made by bike or on foot.

700 cyclists and pedestrians were made happy with free hugs from Alina and Kathi.

In 2009 and 2010:

Kilometres saved by bike: **35 million.**

Kilometres saved on foot: **23 million.**

13,650 tonnes of CO₂

Scope

✓✓

Savings Data

✓✓



Click here to return to the main text.

Initiative

The Co-operative Group: staff car sharing

Location

co-operative.carbonheroes.com/Co-operative.aspx



Subject

Introducing members of staff so that they might share car journeys to work; encouraging participants to rate their journeys to work to prove how reliable their colleagues are and instil confidence in those thinking about switching to sharing.

Key Points

The campaign website gives staff information about the 'real cost of cars': leading with information about the price of fuel and parking, backed up by environmental messages. Participants are then encouraged to link up with others.

'The benefits of sharing your car journey to and from work, even just once a week, are:

- Save money on fuel and parking.
- Reduce CO₂ emissions.
- Meet new colleagues.

Car sharing arrangements differ according to each individual's needs and preferences and the 'carbon heroes' software can help you find a suitable car share match.

The site compiles FAQs about the scheme – how to ensure safety when sharing lifts, how insurance is affected, and the environmental benefits of sharing car journeys – 'Most cars cost between 25 pence and 40 pence per mile to run, so a person living 10 miles from work, who leaves their car at home twice a week can save between £500 and £800 per annum' – as well as safety tips and smart driving tips.

The real economical impact of cars is compared to public transport and lift sharing here:

www.co-operative.coop/greentravel/greener-travel/reduce-carbon-emissions/ which is localised specifically to Manchester residents, making it more persuasive and effective in its messaging.

Travel planning, live public transport information and walking maps are also signposted on the site:

www.co-operative.coop/greentravel/travel-planning/

Policy Relevance

In Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 – 2020, Thematic Objective 7 is 'Promoting Sustainable Transport and Removing Bottlenecks in Key Network Infrastructures'.

Evidence

A small number of case studies are used as evidence:

www.co-operative.coop/greentravel/Case-studies/

For example, Katie who travels in from Congleton every day:

Round trip distance: 55 miles

Daily CO ₂ emissions:	Cost of daily travel:
Car: 18.4 kg CO ₂ e	Car: £19
Train: 5.0 kg CO ₂ e	Train: £12.10

Scope

✓

Savings Data

✓✓

Initiative

Multicity Carsharing

Location

www.multicity-carsharing.de/en/



Subject

Multicity Carsharing is a Berlin-based initiative to get Berlin residents and visitors to hire electric vehicles – to prevent petrol car ownership, and to promote Citroen’s electric vehicles: ‘The driving experience of the future is 100% electric, 100% flexible. Simply get in and drive away. Discover CITROËN Multicity Carsharing in Berlin. 350 CITROËN C-Zeros are already available in the city zone of Berlin and waiting for you, charged with green electricity from 100% renewable energy sources.’

Key Points

Multicity Carsharing aimed to raise its profile and gain new customers through an accompanying marketing campaign by Ontop Media. The campaign used outdoor advertising on main thoroughfares, while 50,000 branded coffee cups were

distributed in 50 targeted district cafes, each with coupons to allow people to hire cars for free (for allotted amounts of times). Coffee cups and coupons were also taken to 100 driving schools to attract new drivers. Branded stickers were placed on photocopiers in student copyshops and posters and flyers were also distributed throughout student residences. 50 sport clubs and gyms were also asked to display posters and flyers.

Target audiences include residents of the city, visitors and tourists, students and those who do not own a car but would benefit from using one for infrequent trips (business trips).

350 new electric cars are available to hire throughout Berlin.

Policy Relevance

In Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 – 2020, Thematic Objective 7 is ‘Promoting Sustainable Transport and Removing Bottlenecks in Key Network Infrastructures’.

Evidence

To date, no CO₂ savings are available.

‘Due to the matched environments Multicity Carsharing achieved multiple contacts throughout the target group at different daytimes and also gained an intensive penetration of the campaign circuit area. Promotion campaigns which were executed at the same time achieved a noticeable increase of new customers and therefore made it a successful multichannel campaign overall.’

Scope



Savings Data



Initiative

Plugged-in Places: GMEV

Location

ev.tfgm.com



Subject

In 2009 the Government created the Office for Low Emission Vehicles (OLEV) to promote the adoption of Electric Vehicles in the UK. Alongside funding the Plug-in Car Grant (and now Plug-in Van Grant), to ensure manufacturers increase production of electric vehicles and to make the purchase cost comparable to conventional cars, OLEV selected eight areas in the UK to share £30 million funding to pilot new charging infrastructure projects and to spearhead the roll-out of vehicles.

The eight Plugged-in Places (PiP) areas are London, Milton Keynes, the East of England, the Midlands, Greater Manchester, Northern Ireland, the North East and the Glasgow-Edinburgh corridor in central Scotland.

GMEV is the Greater Manchester Plugged-in Places programme.

Key Points

The Greater Manchester Electric Vehicle (GMEV) programme is administered by Transport for Greater Manchester (TfGM). Its aim is to encourage Greater Manchester residents – those who drive frequently, and businesses with their

own fleets – to consider the switch to electric vehicles.

The GMEV brand promise is ‘electric vehicles make your life simpler’: it’s easier than ever, and cheaper than a conventional car in the long run. A film, informational brochure, website and series of events (breakfast networking, exhibition stand at the Trafford Centre, soft and public launches) plus targeted PR and marketing.

Policy Relevance

In Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 – 2020, Thematic Objective 7 is ‘Promoting Sustainable Transport and Removing Bottlenecks in Key Network Infrastructures’.

Evidence

No carbon data is available. However, engagement and reach figures can be reported:

Events:

50+ high level stakeholders including Lex Vehicle Leasing, Siemens, Office for Low Emission Vehicles, AGMA members and Manchester Airport Group.

Established a contact list to build on for future communications and events.

Raised awareness of the event to those that attended and all that received the invitation.

Opportunities created for follow-up contact via invitation to a number of key organisations including ITV and Lex Vehicle Leasing.

Exhibition stand:

Over 175,000 people visited the Trafford Centre over the two days.

Over 9,000 people came to the stand and talked to the team.

Over 4,500 information cards handed out.

26 test drives of the Renault Zoe.

Tesla sold three cars over the weekend at a cost of £55,000 for the basic model – demonstrating a definite appetite for EVs!

PR coverage gained: BBC North West Tonight, BBC Radio Manchester, BBC Online, Oldham Chronicle, MEN, Fleet News, ITV, My Green Car.

Scope



Savings Data



Limitations

A key limiting factor well documented in the PiP programmes is the provision conundrum with EV charging infrastructure in that there are low current levels of domestic EV ownership – partly due to the emerging nature of the infrastructure.

Initiative

Plugged-in Places: rolled out in the North East of England (Charge your car)

Location

www.gov.uk/government/publications/plugged-in-places
chargeyourcar.org.uk/



Subject

In 2009 the Government created the Office for Low Emission Vehicles (OLEV) to promote the adoption of Electric Vehicles in the UK. Alongside funding the Plug-in Car Grant (and now Plug-in Van Grant), to ensure manufacturers increase production of electric vehicles and to make the purchase cost comparable to conventional cars, OLEV selected eight areas in the UK to share £30 million funding to pilot new charging infrastructure projects and to spearhead the roll-out of vehicles.

The eight Plugged-in Places (PiP) areas are London, Milton Keynes, the East of England, the Midlands, Greater Manchester, Northern Ireland, the North East and the Glasgow-Edinburgh corridor in central Scotland.

Charge your car is the initiative that took place in the North East.

Key Points

Launched in April 2010, the objectives of the programme were to install charge points, ensuring that drivers were never too far away from a point, and to understand the needs of electric vehicle drivers and the infrastructure needed to support them.

The programme also sought to raise the profile of electric vehicles and promote the benefits of the switch. A number of campaigns ran throughout the project including Why Not Electric? which was launched in 2012 aimed primarily at businesses and the early adopter market.

Policy Relevance

In Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 – 2020, Thematic Objective 7 is ‘Promoting Sustainable Transport and Removing Bottlenecks in Key Network Infrastructures’.

Evidence

The project began with a Memorandum of Understanding signed by all twelve local authorities and a range of other partners – all declaring their interest in being involved in. In the early stages, 40 partners signed up to be involved but it was clear that more was needed to encourage organisations to get involved.

From the start to the finish of the project (March 2010 – June 2013), the figures were as follows:

120 partners involved.

740 public standard charge points.

A network of **12** quick charge points.

500 electric vehicles on the road of North East England (more per head of population than any other region).

30,000 times the public charge points had been used amounting to:

190,000 kwh of energy delivered by the posts.

£90,000 fuel savings of EV drivers from switching to electric.

800,000 electric miles driven.

150,000,000 grams of CO₂ saved.

The visibility of charge points in North East England has also prompted a positive response by the public.

An independent survey of a random sample of the population showed that:

34% of people stating they knew about Charge Your Car and 60% of the sample having seen a charging post prior to taking the survey.

When asked if they believed there were charge points in their area, 46% of people said yes. This figure has risen from 14% in 2010.

Currently, the proportion of people that would consider Electric for their next vehicle is only 19% in comparison to 57% who have suggested they would be quite/very unlikely.

The main justifications for not being likely to purchase an electric vehicle include: expense/cost, range of journey and charging posts (44%, 23% and 20% respectively).

Scope



Savings Data



Click here to return to the main text.

Initiative

Bike Experience, Belgium

Location

www.bikeexperience.be/



Subject

Since 2010, the Bike Experience initiative has been working in Belgium to convert car users to get on their bikes, to reduce GHG in the Brussels region and to promote healthier, sustainable transport choices.

Key Points

Bike Experience is part of a global policy to promote biking in the European capital, with the objective of 20% of the mobility in 2018, in order to reduce CO₂ emissions. At this stage, bikers represent 3%, with an annual growth of 24%.

People interested in making the switch from car to bike can benefit from cycle training and three days of free accompaniment, where trained Coaches can accompany new or nervous cyclists around the city.

Bike maintenance and cycle hire is also on offer, thanks to partnerships with providers in the city.

Using the key messages of budget, efficiency and health, the campaign is promoted by traditional communication tools such as outdoor advertising, radio ads and social media. Videos have been especially useful, and the Bike Experience YouTube channel hosts ten videos, one of which shows a flash mob at work:

www.youtube.com/watch?v=53BbTC2sGdw

Policy Relevance

Warrington's LSTF programme is the 'Sustainable Travel Triangle' which seeks to give a boost to cycling levels through infrastructure, bike hire and behavioural change.

In Cheshire and Warrington LEP European Structural and Investment Funds Strategy 2014 - 2020, Thematic Objective 7 is 'Promoting Sustainable Transport and Removing Bottlenecks in Key Network Infrastructures'.

Evidence

Every year, more than 300 Brussels residents are switching to bikes. No carbon savings data is available.

Scope



Savings Data



About Quantum

Quantum Strategy & Technology Limited has internal quality procedures which are registered with Certified Quality Systems Limited as compliant with BS EN ISO 9001 (Registration No: GB2002499). All work conducted by Quantum and its subcontractors is carried out in accordance with these in-house procedures and documentation systems.

For more information contact

Quantum Strategy & Technology

Halton Mill
Mill Lane
Halton, Lancaster
Lancashire
LA2 6ND

Tel (Office): +44 (0)1524 542857
Tel (Mobile): +44 (0)7870 193053
Email: gill.fenna@quantumst.co.uk

About ESTA

The Environmental Sustainability Technical Assistance (ESTA) project is funded by the Environment Agency (EA) and ERDF to support the five North West LEP areas to embed environmental sustainability into their economic development priorities and work streams; it runs from April 2012 to December 2014.

For more information visit

www.enworks.com/ESTA-intro

Project Name: Building the evidence base for behaviour change interventions to reduce GHG emissions in businesses and households

Project Reference: ENBC

Unit Approval

Written By: Gill Fenna

Issued By: Quantum Strategy & Technology

Reviewed By: Louise Marix Evans - 11/04/14

Revision History Records

Revision 0: 04/04/14 - Gill Fenna

Revision 1: 10/04/14 - Gill Fenna

Revision 2:



Environmental Sustainability
Technical Assistance

This briefing note has been produced from
research undertaken for the ESTA project.

ENWORKS



EUROPEAN UNION
Investing in Your Future

European Regional
Development Fund 2007-13