Carbon Management Plan

2017- 2021

Building a resilient future

Herefordshire Council

Contents

Tables

Figures

Foreword

Dear Reader,

It is with great pride that I present to you the latest version of our Carbon Management Plan. The work and results described in the following pages show enormous progress towards our goals as a Council both in cost saving, as well as from implementing environmental best practice across many service areas. Good carbon management is a 'win-win'.

As a human race, climate change presents us with one of our greatest challenges and in order to address it we need to be willing to change some of our conventional ways of operating. That's not always easy! It's not all about 'big policies' done by others – it is very much about what we can all do better as individuals.

Whilst changing climate and the additional stressors of volatile fuel prices and security of supply add risk and uncertainty when we desire stability, these changes bring new opportunities. These opportunities can lead to multiple benefits for the Council and our residents.

This document is refreshing as it has a dual function of informing us of past, present and planned events as well as serving as a change agent which helps guide us towards a more sustainable approach in operations, and as individuals.

I hope you will agree that the plan's new straight-forward readability enables the reader to gain a great deal of information and learning in a very short space of time. I thoroughly enjoyed reading this document and trust you will too!

Finally, I know at first hand just how persuasive the Energy and Environment Team is: listening to them last year caused me to install solar panels at our home. I wish the team all the best in this important work, making the Council and the County a better place to live, work and play.

Yours sincerely

Alistair Neill

"At Herefordshire Council we are taking the threat of climate change seriously. We have to act rationally, responsibly and robustly in order to address the challenges that lie ahead."

Alistair Neill, Chief Executive,
Herefordshire Council, 2017

Overview

The Climate Change Act 2008 is the UK's first long-term, legally binding framework to tackle the challenge posed by climate change and aiming to reduce CO_2 emissions by 80% by 2050 based on 1990 levels. This document, Carbon Management Plan 2017-2021 (CMP-17) builds upon and takes forward the plans and work as described in the Carbon Management Plan 2011-2015 (CMP-11). CMP-11 remains the foundation upon which CMP-17 is built and provides the launchpad for attaining the goals stated in this document.

The aim of this document is fourfold:

1. To **showcase progress** made since the start of CMP-11.
2. Establish a **pathway towards achieving a 40% reduction** in CO_2e by 2021 (based on 2008/09).
3. Establish the **financial business case** for managing greenhouse gas emissions.
4. To act as an **information sharing portal** and to engage readers through the use of infographics and summary details.

The reader is encouraged to use the information in this document to gain a greater insight into the breadth and depth of activities aimed towards driving efficiencies in energy use and creating opportunities for further cost and emissions savings through the use of appropriate technology and smarter ways of working.

William Deming said: "In God we trust; all others must bring data." He is also credited with the saying "you can't manage what you don't measure". Both of these quotations are apt when it comes to our approach towards improving the way in which we record data, manage our fuel and energy-use and establish actions.

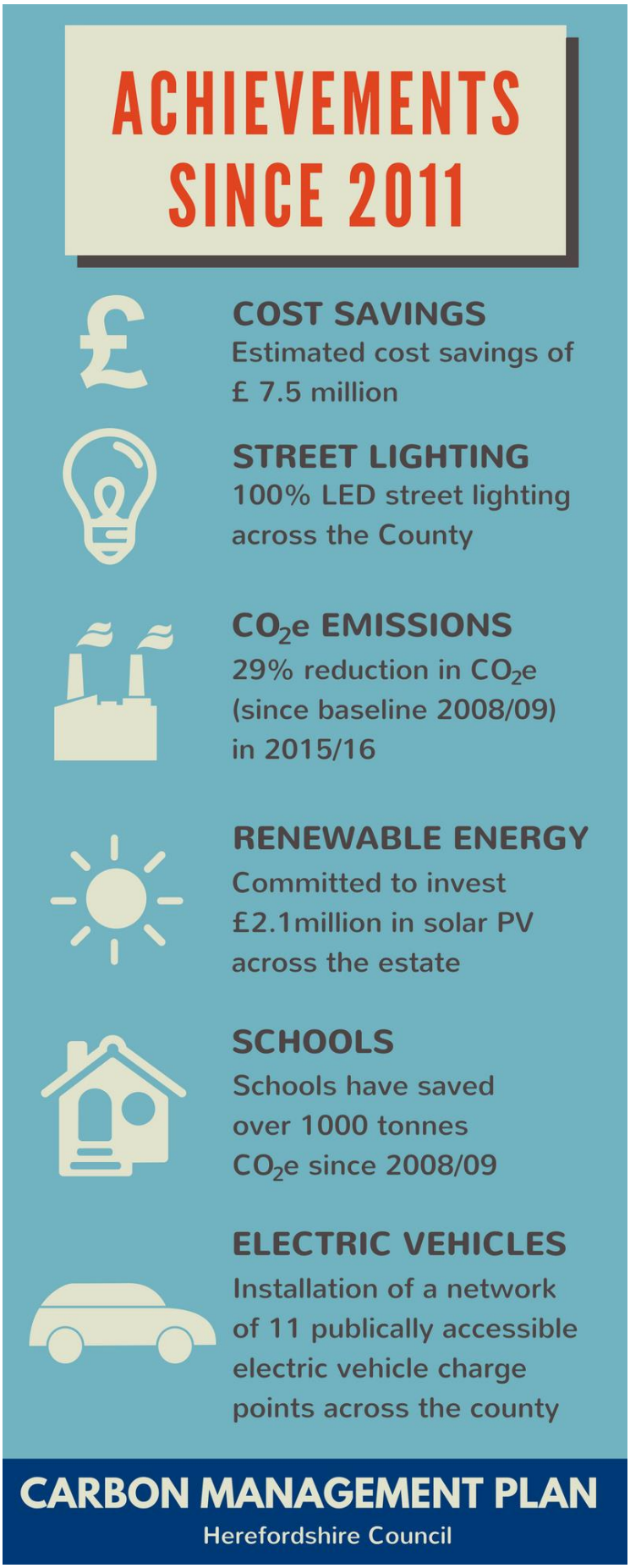
Actions based on sound information are more likely to lead to the desired outcomes of reduced emissions and costs. To this end, we are in the process of installing bespoke software to better manage our energy and carbon information and, in turn, reduce consumption.

The CMP-17 has been designed to present information in an engaging way. It moves away from the more traditional management plans in an attempt to increase the usage and reach.

The headlines include:

- The value at stake (VAS) for achieving the target is estimated to be a potential financial **savings or cost avoidance of £9.5 million** over 5 years;
- LED street lighting project saving emissions and costs: **£231,650 per annum during the period**;
- Targeting **1.1MWp of installed solar PV** in the first year;
- Target: **40% reduction** in CO_2e emissions from baseline (2008/09) by 2021;
- Measured **21.7% reduction** (5 965 tonnes CO_2e) in emissions since 2008/09 baseline;
- Measured **29% reduction** from baseline in 2015/16 year.

1. Achievements



In 2012 we embarked on an ambitious plan to convert all of the County's street lights to LEDs.

Today, we believe that Herefordshire is the *first* county in the UK to have 100% LED street lighting.

Understanding why this project succeeded places the team in a great position to replicate successes in the future.

Figure 1: Achievements

1.1 Achieving Success

The key to the success of Herefordshire Council's reduction of Greenhouse Gas (GHG) emissions is due to the multi-disciplinary approach. Whilst reducing GHG emissions is the goal of any carbon management plan, the key to achieving a sustainable outcome is based upon developing a variety of initiatives which result in emission reductions. These initiatives do not necessarily have, as their primary objective, emission reductions.

Our achievements cover initiatives that contribute to positive outcomes for the community, help to inform and raise awareness of environmental issues, improve health and safety across the county and make better use of limited resources. During the first period (2011-2015) emissions reduced by 21.7% from the baseline measurement in 2008/09, with a 29.4% reduction achieved against the baseline in the 2015/16 year.

1.2 Street Lights providing massive savings

Herefordshire Council embarked on replacing the County's street lights with Light-emitting diodes (LEDs) in 2012. The aim is for all of Herefordshire Council's street lights across the county to be converted to LED The estimated financial savings are significant and are in the order of £1.6 million in the first eight years.

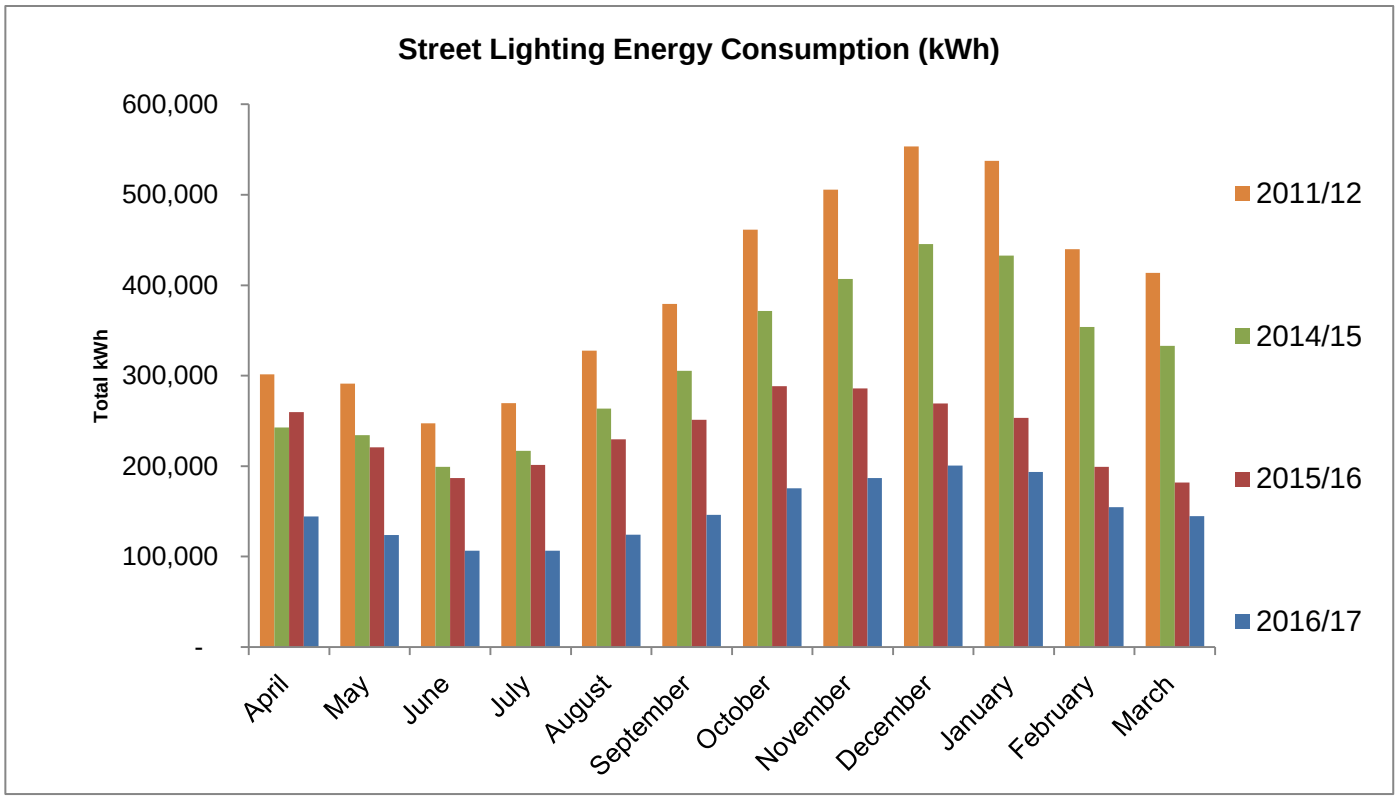


Table 1: Carbon Reduction Progress estimate against Target

The following observations can be made:

- Baseline of 4.7 million kWh in 2011/12 down to a level of 1.8 million in 2016/17 equating to a reduction of approximately 40%.
- An estimated £1.7 million in savings are projected over the period 2016/17 – 2020/21.

1.3 Investment in renewable energy

The main focus is on solar power and the Council has committed to invest £2.1 in solar photovoltaic (PV) across its estate. This project will deliver zero carbon energy on site and an income stream to support the delivery of the carbon management action plan. Additional benefits include the cost savings, countering the predicted rise in energy costs and increased security of supply.

The Council acted swiftly to take full advantage of the Feed in Tariffs (FiTs) before the FiTs dropped significantly in early 2016. As the market reacts to the pressure from falls in government subsidy the authority will continue to install solar PV on its estate.

1.4 Schools

Schools (maintained schools) make up a large proportion (20% in FY-16) of Herefordshire Council's GHG emissions inventory whilst academies account for a further 13%. The potential for cost saving measures through implementing energy reduction initiatives is significant. This has been demonstrated by Herefordshire Council's School Energy Programme where participating schools have reduced energy consumption by an average of 10% through behaviour change alone, with some achieving as high as a 25% reduction.

In Herefordshire, 100% of schools are registered with the international Eco Schools Environmental Award Scheme. Energy is a compulsory topic that is supported by participation in the Energy Programme. Schools receive awards for reducing their environmental impact in the following nine areas:

The number of schools achieving Green Flag status in Herefordshire is declining, in part, due to a charge introduced by Eco Schools, England. This appears to be a country-wide issue.

Engaging learners at an early stage is fundamental to change management and addressing carbon management.

Education is the most powerful weapon which you can use to change the world.

Nelson Mandela

CASE STUDY 1 | ENERGY SAVING | LIGHTING UPGRADE | FINANCIAL SAVINGS THROUGH SAVING ENERGY

SCHOOL LESSON IN ENERGY MANAGEMENT

Background

Herefordshire Council identified schools to take part in a Carbon Trust programme aimed at reducing energy consumption. The Bishop of Hereford's Bluecoat School was selected and implemented a general switch-off initiative to ensure that lights and equipment that was usually left on, or on standby, were switched off when not required. A typical classroom contains an interactive whiteboard, an overhead projector, a desktop computer and multiple laptops, a trolley for charging laptops as well as banks of lights and occasionally a printer. These items are regularly left on, or on standby, for extended periods when not required.

"The main reason that our consumption has gone down over the years is due to ensuring all power is turned off at night and over the holidays. In addition security lighting has been upgraded to LED".

Site Manager Mark Hawkins

This was identified as one of the key saving measures that could be improved by an awareness strategy. A rolling programme of upgrading lights has also been implemented since the pilot, where lights have gradually been replaced by LED's and compact fluorescent tubes. For example 2D fluorescent lights replaced with LED 12v 2D lights.

It was noted by the site team that electrical equipment was not being turned off at the end of a school day causing an unnecessary use of electricity.

The process

Staff were consulted through the Health & Safety Committee that items being left operational were not only a fire risk but also increases the power consumption for the school. Various students and members of the Eco-Council were encouraged to switch off any lights that were not being used.

Lights switches were labelled to remind staff and students to ensure lights were only used as necessary and always switched off when vacating a room.

A traffic light coding system has been used for electrical sockets by labelling with stickers as follows:

- **Green** indicates equipment which should be switched off when not in use.
- **Amber** highlights equipment which should be switched off after ensuring that no-one is using it.
- **Red** is allocated to equipment which should not be switched off such as fridges.

Results

The site team ensure that all computers are turned off on lock up. Students took responsibility for turning off classroom and corridor lights. Sensor switches were fitted in cupboards and toilets reducing the risk of fire occurring in cupboards out of hours.

Exterior security lights have been replaced by extra low voltage 12W LED's and compact fluorescent lights. The hours of use were also reduced, which also reduced incidences of vandalism interestingly. Car park lights are now only used when required.

Following participation in the Collaborative Low Carbon Schools Service pilot the school reduced its electricity consumption by approximately 10%. It is estimated that this initiative will save at least £5,000 and 20 tCO_2 per annum delivering annual savings of about 11% on the school's electricity bill.

This programme was then rolled out to approximately 45 schools across Herefordshire.

"It is good to see financial savings but also that we are doing a small thing to contribute to the environment".

Head teacher

3. Overview

What our objectives mean to us

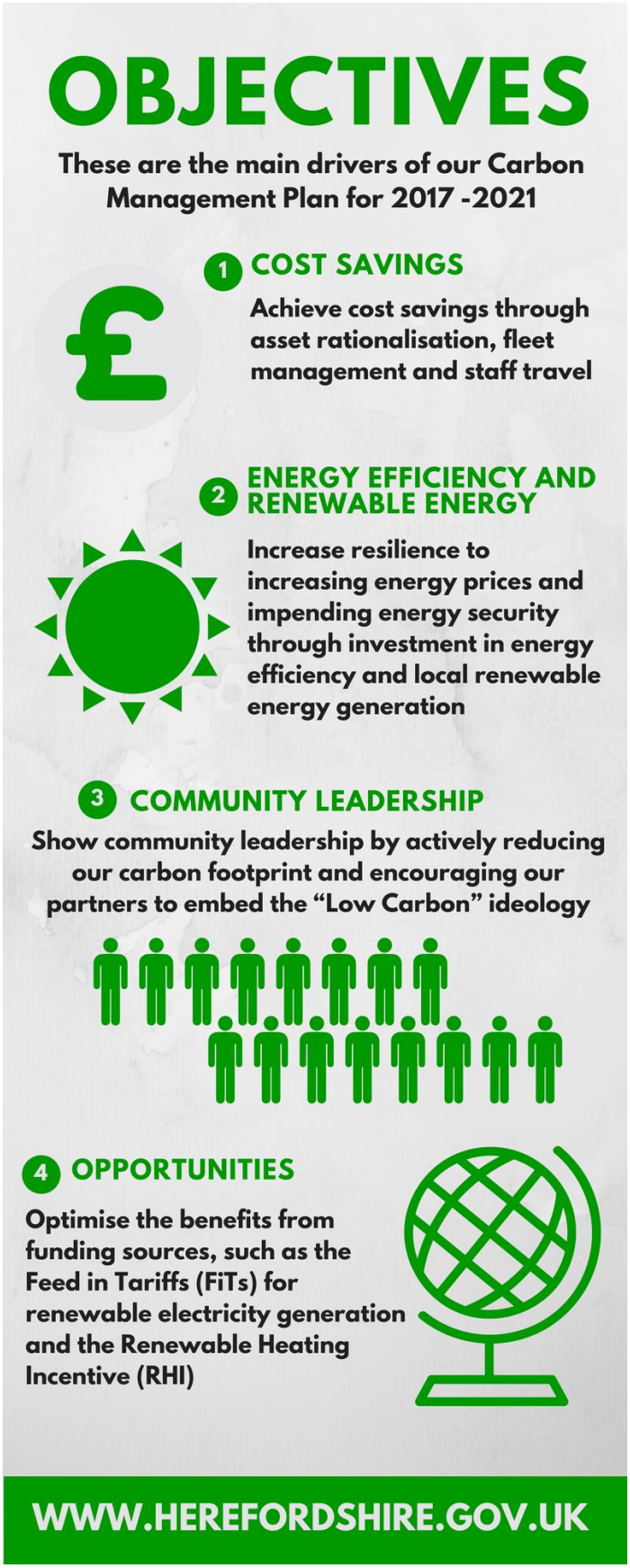


Figure 2: Objectives

Our main objectives for this Carbon Management Plan form the foundation of our work and are the main drivers for our work.

These also form guidance for actions and we aim to keep these at the core of our activities when trying to achieve our goals.

Actions will sometimes fall into more than one of these more groups although this will not necessarily be the case for every action, nor is it a requirement.

3.1 Our Strategic Themes: 2017-2021

Figure 3: Strategic Themes

Campaigns like this are important as they raise awareness of good practice, begin to change behaviours and result in financial savings.

Better ff

The "Better Off" campaign has been successful in raising the awareness of how much money and is saved by vigilantly switching off electrical items which do not need to be on.

3.2 Drivers for Carbon Management

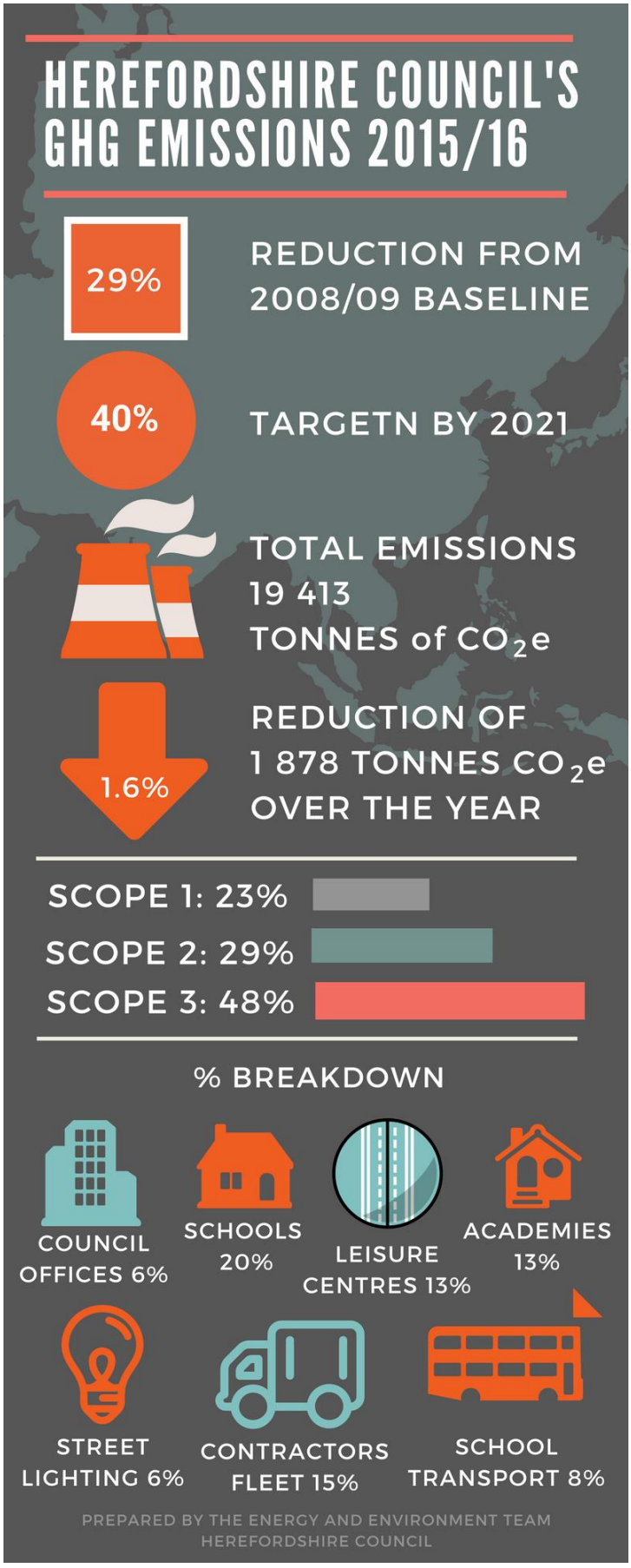
Our drivers underpin our objectives and help guide the process of carbon management in line with our strategic themes.

- The main drivers for managing our greenhouse gas emissions can act alone or in combination with others to gain the greatest effect.
- Herefordshire Council is looking to be ahead of legal compliance in order to avoid unnecessary costs in the future.
- The “invest-to-save” model plays an important role in our carbon management plan.
- Where large investments reap strong return on investments a business case will be developed.

The diagram below illustrates the way in which each source combines to form a holistic approach to managing carbon within the Herefordshire Council.

Figure 4: Carbon Management Drivers

4. Herefordshire Council GHG Emissions 2015/16



There are a number of projects, such as the LED street lighting project, where the CO_2e savings will only start to be realised in future years.

Therefore, whilst the initial 30% target for the 2014/15 year was not reached, the 29.4% reached in 2015/16 is a positive indicator for reaching the longer term target of 40% by 2021.

Figure 5: GHG Emissions (2015/16)

4.1 Carbon Footprint

The carbon footprint is calculated on an annual basis and is used to benchmark progress against the 2008/09 baseline year. The carbon footprint assertion is published every year and reported to the Department of Energy and Climate Change (DECC) before the end of July. The footprint covers Scope 1, 2 and 3 emissions as outlined and described below:

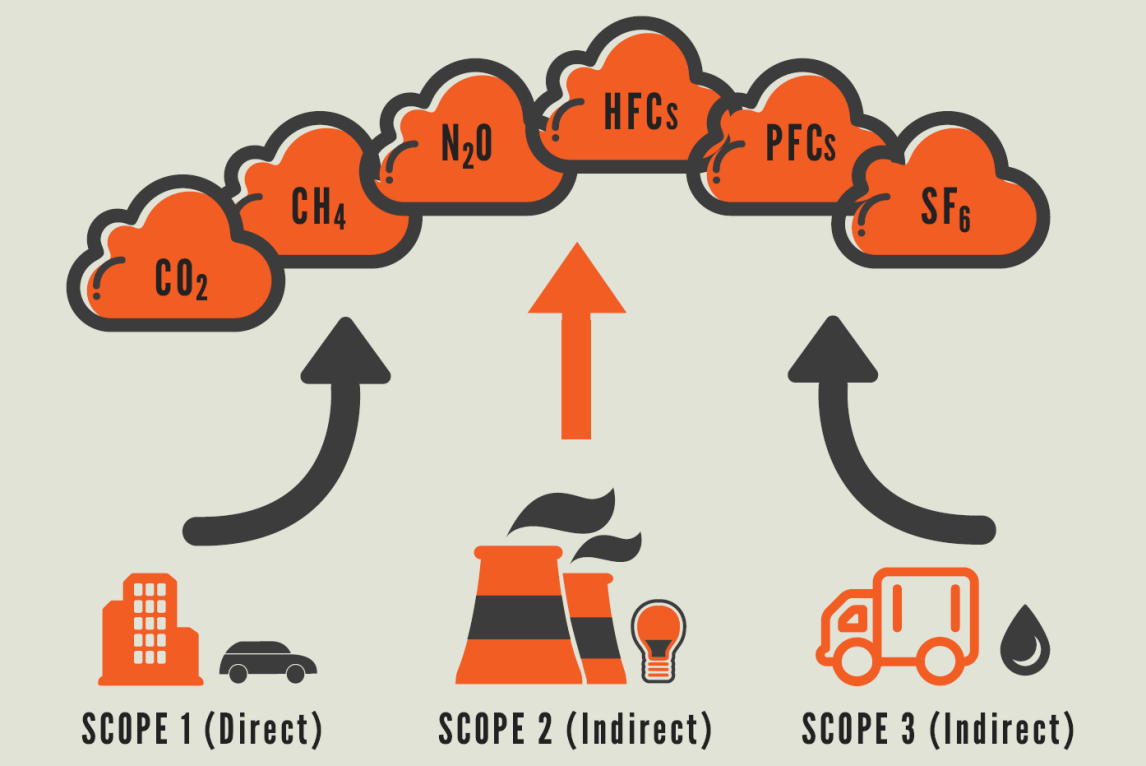


Figure 6: Scopes, greenhouse gases and example emission sources across the value chain

Note: CO_2, CH_4 and N_2O make up the majority of measured emissions.

Summary of emission sources measured:

SCOPE 1	SCOPE 2	SCOPE 3
Council owned/controlled mobile combustion sources (e.g., petrol and diesel fuel consumed in buses and cars for transportation purposes). On site combustion of fuels in stationary sources (e.g., Natural gas, burning oil, gas oil and LPG consumed within Herefordshire Council buildings, boilers).	Emissions from the generation of purchased electricity, heat or steam.	Business Travel (staff mileage, rail travel by HC staff for business purposes) Electricity, gas, burning oil and LPG consumption in buildings operated by outsourced services (e.g. waste management, highways, leisure, and education (academies)) Petrol and diesel consumption by contracted fleet vehicles Fleet and staff mileage by key outsourced contractors on behalf of Herefordshire Council.

4.2 Progress to date against the Baseline

Herefordshire Council	Baseline 2008/09	FY 2015/16	% Change
Scope 1	6,531	4,379	-30.4%
Scope 2	8,517	5,663	-22.5%
Scope 3	12,465	9,371	-16.6%
Total GHG Emissions	**27,498**	**19,413**	**-29.4%**
Cumulative Tonnage reduction	0	8,085	-
Percentage reduction (from baseline)	N/A	-29.4%	-
Target reduction by 2020	N/A	-40.0%	-

Table 2: Summary progress against baseline and target (emissions in tonnes CO_2e)

- Total emissions for FY 2015/16 were 19,413 tonnes CO_2e.
- In the recent measurement (FY-2016) a **29.4% reduction** had been achieved. This equates to a significant reduction of **8,085 tonnes CO_2e** from the baseline.
- There was a total decrease **of 1,878 tonnes of CO_2e** from the 2014/15 year, which equates to an **8.8% decrease** from the previous year.

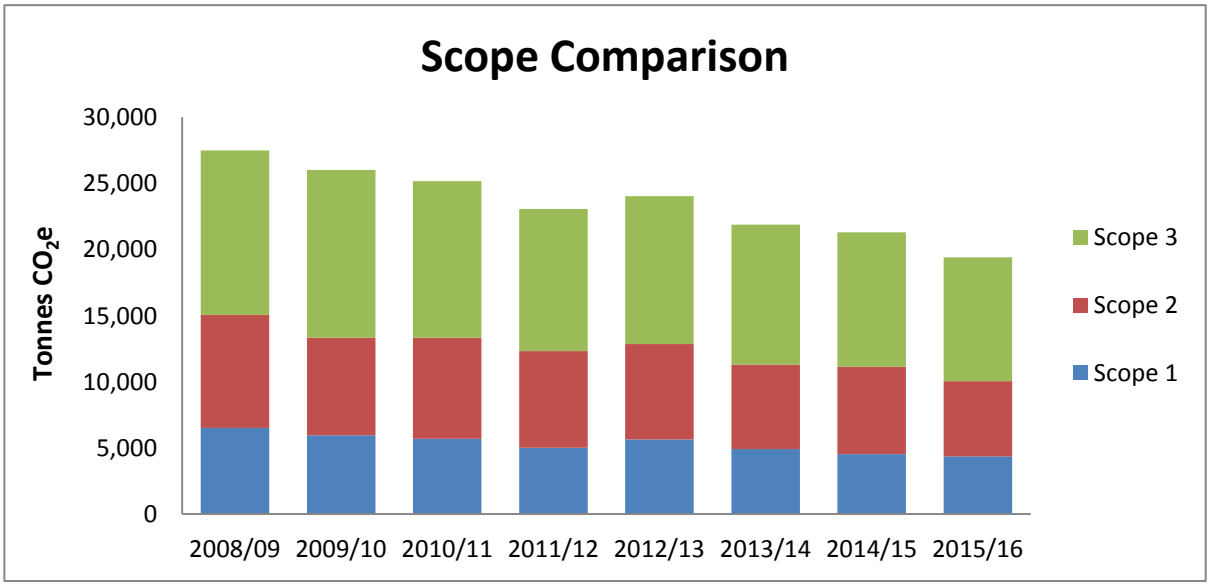


Figure 7: Scope comparison

4.3 Emissions profile

The profile of Herefordshire Council has not changed significantly over the years since the baseline was measured in 2008/09. One noticeable difference is that absolute emissions have decreased across every single emission source, which is an outstanding achievement. In percentage terms, schools and academies still make up about one third of emissions with the next significant contributor being contractors' fleet all of which have seen a growing proportion of total emissions since the baseline. Leisure centres, Council offices and school transport still contribute substantially to total emissions but have remained proportionately relatively stable.

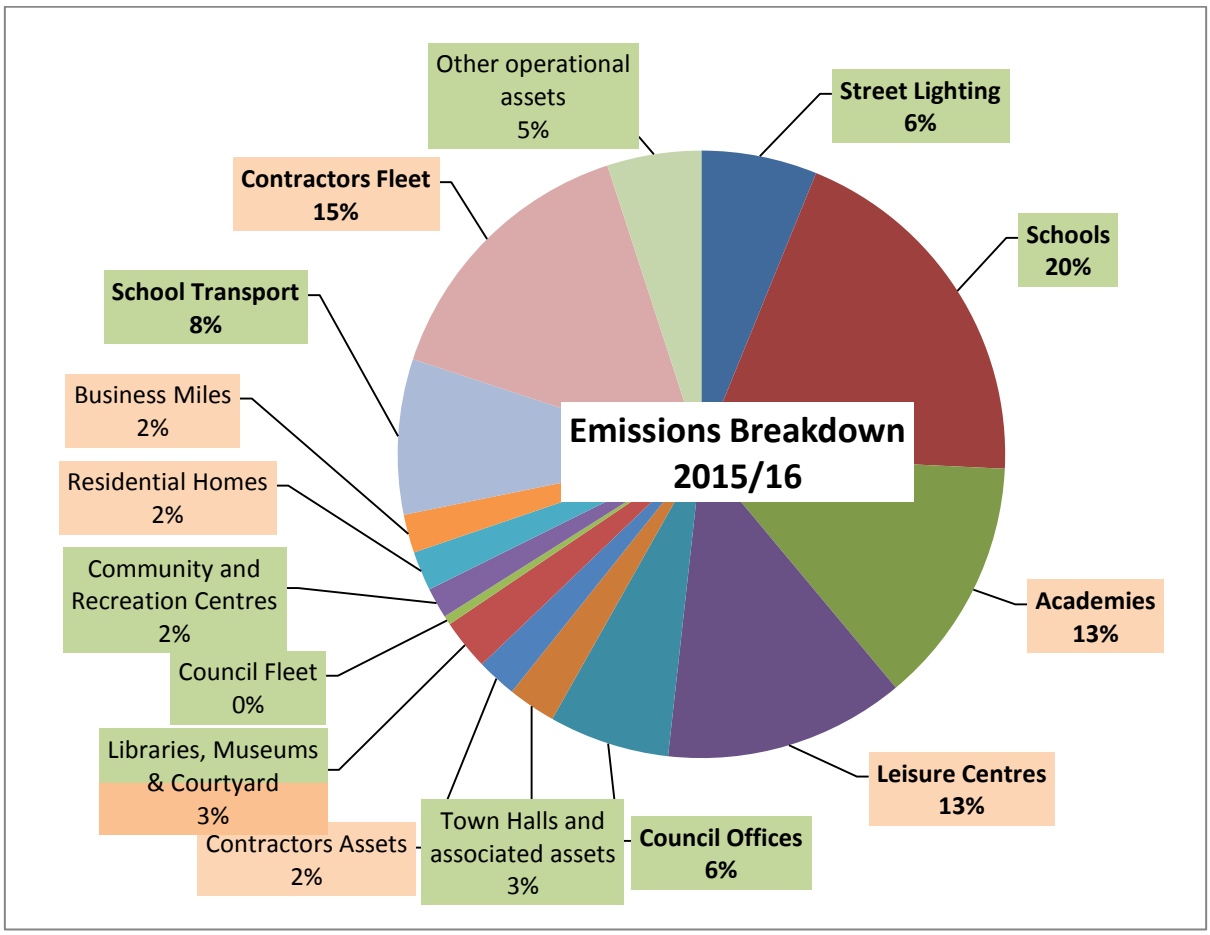


Figure 8: Herefordshire Council GHG emissions breakdown (FY: 2015/16)

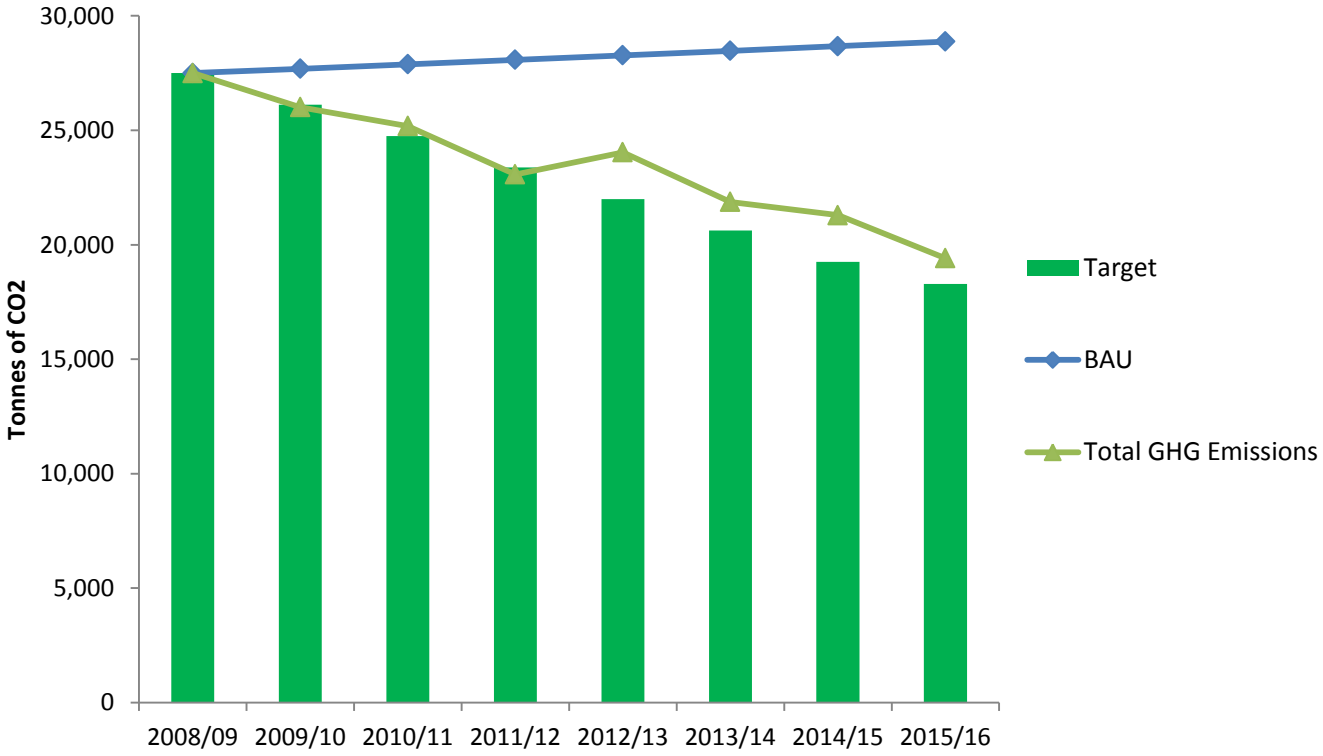
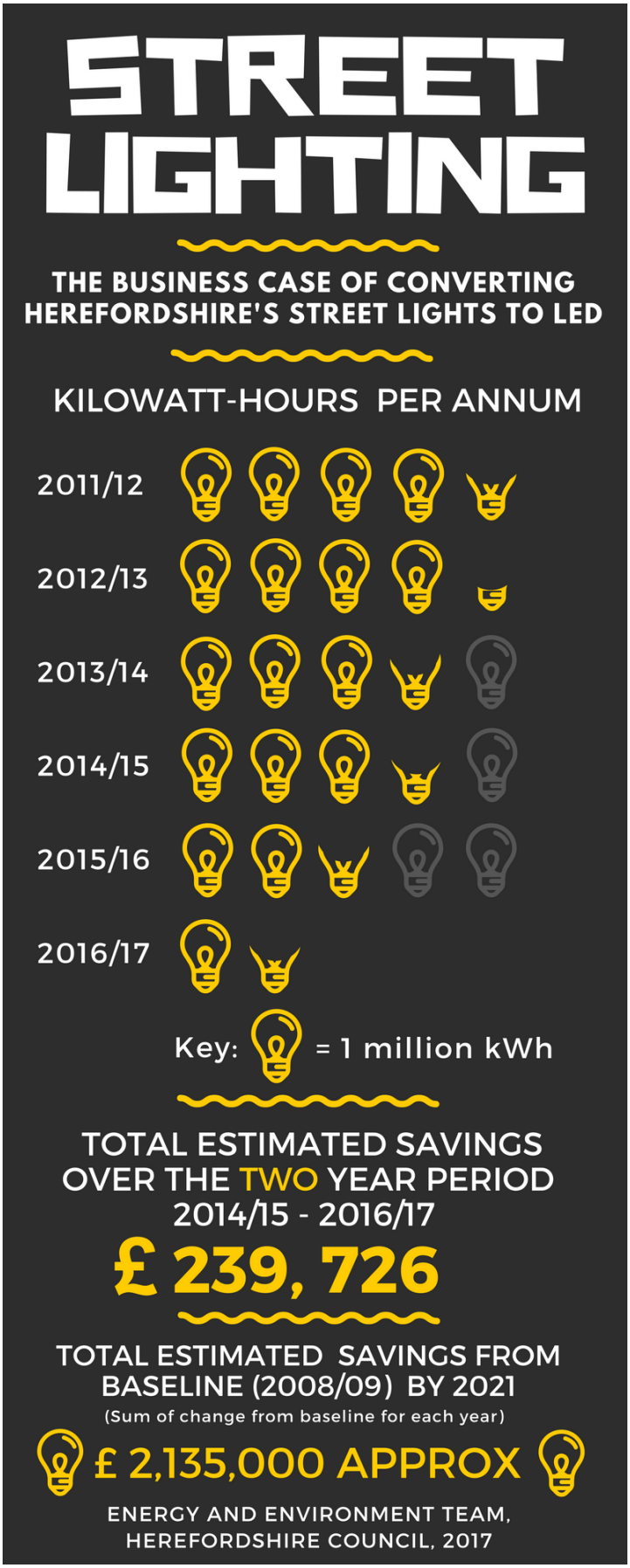


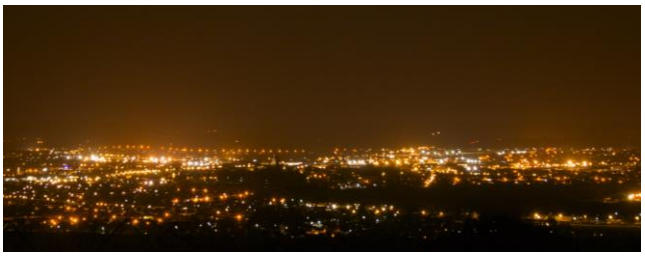
Figure 9: Tracking emissions over time against the baseline and targets

5.Street Lighting

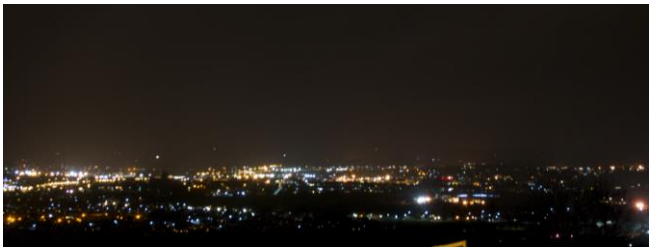


The Street Lighting Project has also had a positive impact on light pollution

2015 BEFORE LED Street Lighting Project



2016 AFTER LED Street Lighting Project



Information on the photographs

Information	2015	2016
Location:	Dinedor Hill	Dinedor Hill
Date:	29th January	1ST February
Time:	23h52	23h29
Camera settings:	F11 ISO 800 10.0 sec exposure	F11 ISO 800 10.0 sec exposure

Figure 10: Street lighting

5.1 Street Lights: Flagship Project

Street lighting accounts for a significant proportion (often the second largest) of the council's carbon emissions and the number of street lights is growing with adoptions from new developments. A business case was developed for an "Invest-to-Save" flagship project for street lights using a phased approached as depicted below.

Phase	Project summary	Cost	20 year £ saving	20 year CO_2e saving
1	Upgrading 2000 street lights	£ 1.3 m	£ 3.2 m	
2	Additional 1,468 street lights and 959 traffic signals			12,153 tonnes
3	Upgrading 460 traffic bollards, 1,070 sign lights and 13 signal heads	£ 195 k	£ 677 k	
4	Upgrading ~9,000 street lights to LED (with pre-set dimming) and replacing ~3,000 lighting columns	£ 5.5 m	£ 13.3 m	17,200 tonnes

Figure 11: Street lighting costs, financial and emissions savings summary

- The Street Lights "Invest-to-Save" Project aimed to replace approximately 12,500 street light lanterns with LED lanterns. Additionally, these lanterns are dimmed by 30% between 10 pm and midnight, and by 50% between midnight and 5.30am. Dimming times are approximate as they are based on the mid-point of the hours of darkness.
- Approximately 3,000 street lighting columns have been replaced that were considered at risk of failing and posed a risk to public health and safety.

Figure 12: Street lighting – flagship project

6. Value at Stake

6.1 The business case behind managing CO_2e

The Council's 2013/14 CO_2e emissions and energy spend has been used as the basis for calculating the Council's financial and carbon value at stake (VAS). The VAS is the difference between the 'do nothing' or 'business as usual' (BAU) scenario and the benefits that could accrue to the Council if it achieves its 40% carbon reduction target.

The VAS is underpinned by the assumption that energy and fuel demands will rise in line with national trends at 0.7% annually[1]. The figure below outlines the financial savings or cost avoidance that could be attained if the Council achieves its 40% carbon reduction target.

The VAS for achieving Herefordshire Council's 40% carbon reduction target is estimated to be cumulatively 35,000 tonnes CO_2e with an associated potential financial savings or cost avoidance of £9.5 million over five years.

Important note: These figures are based on projections and estimates using an input tool and are for indicatives purposes only.

Herefordshire Council has already delivered 56% of the 2021 target and is in the process of delivering a further 28% through existing projects. Moreover, an additional 14% is accounted for in identified and quantified projects which are under development.

The process of identifying, quantifying, exploring funding opportunities, implementing and monitoring carbon reduction projects will continue to ensure that the benefits of achieving the Council's 40% carbon reduction by 2021 is optimised. The figure below summarises Herefordshire Council's progress towards achieving its 40% carbon reduction target.

Target: 40% reduction (11,005 tonnes CO_2e)				
56% Achieved	44% Potential CO_2e at risk			
Delivered Projects: 56% 6161.73 Tonnes CO_2e	Existing Projects: 28% 3073.17 Tonnes CO_2e	Projects under development 14% 1510.29 Tonnes CO_2e	Proposed Projects: 2% 214.74 Tonnes CO_2e	**Gap CO2e** **0%** **45.19** **Tonnes CO_2e**

Figure 13: Projected emission target and associated project phase

1 Source: Department for Business Enterprise and Regulatory Reform (DBERR).

6.2 Unlocking the savings

Managing GHG emissions effectively results in efficient use of resources. Resources include both financial and energy/fuel resources. Invest-to-save projects are a key part of addressing the business case behind GHG emissions reduction strategies. The street lighting project is a clear example of where a large investment was made and the savings, both financial and GHG emissions, are significant in terms of returns and reduction.

One aim for this period of the CMP is to identify a number of new projects in order to further improve the current business case and which may help to exceed our proposed target. Currently, we are in the process of trying to establish the next flagship project, such as the street lighting project was in the previous period, which will focus attention and bring significant cost and emissions savings in one project. There are a number of possibilities but we are always willing to hear new ideas.

6.3 State-of-the-Art Data Management

A data management software programme is going to be installed and used to increase the efficiency and accuracy of our data collection and monitoring. The idea behind the system is to enable “real time” monitoring of key energy users such as large buildings across the estate.

The most critical improvement is the enhanced strategic ability to accurately monitor energy use and react almost instantaneously to anomalies thereby increasing energy performance.

7.Solar Photovoltaic

Solar Photovoltaic

1 CONTEXT

In 2007 there was 67 kWp installed across the County. By the end of 2015 there was 928 kWp. By 2021 the aim is to have installed 2500 kWp.

67 kWp (2007)
928 kWp (2015)
2500 kWp (2021)

2 BY THE END OF 2017

1.1MWp of solar PV should be installed across Herefordshire Council's estate generating 793,000 kWh of electricity per annum at its peak and avoiding 366 tonnes of CO_2e

3 SCHOOLS

There are currently 450 kWp of renewables (mainly solar but with some small wind) installed on schools which is likely to generate 382,000 kWh of electricity per annum avoiding a predicted 176t of CO_2e

450 kWp installed

366 tonnes CO_2e avoided

4 GENERATION

An additional generation of 1,700,000 kWh per annum would save an estimated 800 tonnes CO_2e

5 BY 2021 WE AIM TO HAVE IN PLACE ...

3.5MWp generating 2.8 GWh of electricity per annum and avoiding 1328 tonnes of CO_2e (including schools)

By 2021:
3.5 MWp installed
Generating 2.8 GWh

Figure 14: Solar Photovoltaic

7.1 Powered by the Sun

There is a significant amount planned for harnessing energy from the sun across Herefordshire over the next five years. The details of how the roll out will take place and estimated costs, financial savings and energy generation are shown below. This gives a more in depth view of the details behind the infographic on solar photovoltaics.

7.1.1 Initial stage – a successful start in PV

The successful installations at the Crematorium and Plough Lane Annex, where an estimated average of £6, 000 per annum net-benefit over 20 years and approximately 20 tonnes CO_2e is currently being realised. This forms a solid foundation upon which to build for the future. These successes are based upon our successful approach to projects:

Identify a project → Develop a clear business case → Monitor results → Expand project

7.1.2 Early stage: 2016-2017

This early period of CMP-17 and is defined mainly by the installation of the first wave of solar photovoltaic (solar PV) arrays.

Figure 15: Solar photovoltaic arrays from around the County.

By the end of this period we have installed approximately 1.1MWp of solar PV generating about 793,000 kWh of electricity per annum at its peak and avoiding 366 tonnes of CO_2e.

In addition to the Authority's own installations there are currently 450 kWp of renewables (mainly solar but with some small wind) installed on schools which is likely to generate 382,000 kWh of electricity per annum avoiding a predicted 177t of CO_2e. This brings the total installed capacity to over 1.5 MWp generating 1,174,643 kWh per annum and avoiding an estimated 543 tonnes of CO_2e per annum.

7.1.3 Next stage: 2018 – 2021

This next period represents the period beyond the outlined sites to the end of the current carbon management plan – March 2021. This period is harder to forecast with the same level of accuracy. It is likely that some major events will influence the project in the next few years.

These include the likelihood of the exploration of shale gas in the UK which could affect electricity prices. Electricity prices are generally going in an upward trend, roughly around 7% per annum according to DECC (2014).

Feed in Tariffs (FiTs) impact return on investment calculations and the degression of FiTs (some of which have seen a cut of *circa* 50-70%). We will continue to monitor the situation and install PV on a case-by-case basis.

We plan to install a further *circa* 800 kWp of solar PV. Investment in solar farms is still strong currently and a further 1MW solar farm should be feasible in this period.

In addition to this target the authority is aiming to install a further 400kWp of renewable energy across its estate in this period, whether it is from other ground mounted arrays, solar car parks, Academies or additional buildings on the Rotherwas Estate.

This additional 2MWp of solar PV could increase the Councils generation capacity by a further 1,700,000 kWh of electricity generation, bringing the total installed capacity (including schools) to 3.5MWp generating 2.8 GWh of electricity per annum and avoiding 1328 tonnes of CO_2e per annum.

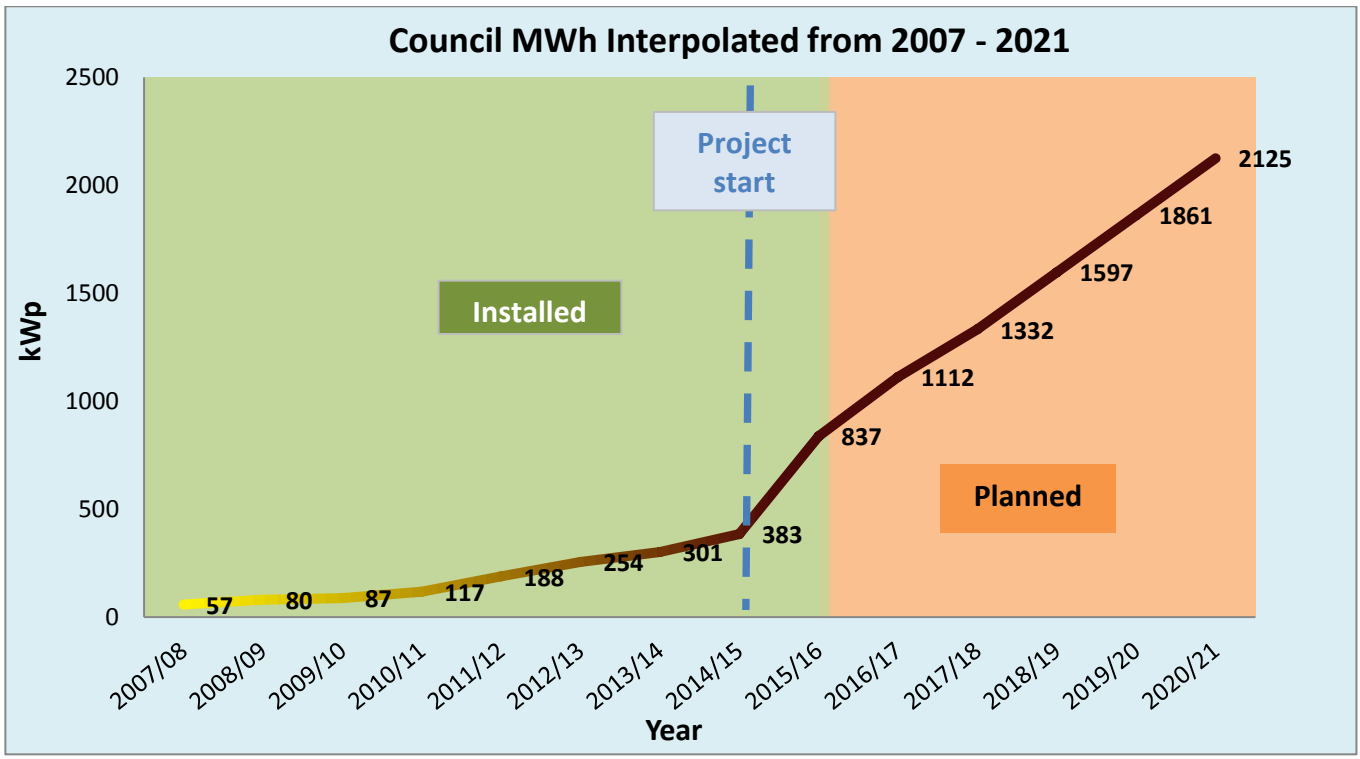


Figure 16: Megawatt-hours potential by 2020

The Council has an assumed generation capacity of 837,054 kWh in 2015/16, which is equivalent to approximately 4% of the electricity used by the Council. In the UK, renewables accounted for approximately 18% of electricity generation[2] (2015, Q1). In 2013, renewables accounted for approximately 15% of electricity usage on a global scale (Source: International Energy Agency: http://www.iea.org). These global and UK figures represent a lag position for Herefordshire but the projections show that this situation is likely to change where by 2021 we are expecting to be generating in the order of 13% (assuming usage reduces by 5% p/a).

Year	Assumed Generation Total MWh p/a	Total Electricity Used MWh/a	% of electricity generated by renewables	Status
2007/08	57	25,722	0.2%	Installed
2008/09	80	25,722	0.3%	
2009/10	87	25,575	0.3%	
2010/11	117	24,743	0.5%	
2011/12	188	24,064	0.8%	
2012/13	254	23,680	1.1%	
2013/14	301	22,708	1.3%	
2014/15	383	22,669	1.7%	
2015/16	837	21,590	3.9%	Planned
2016/17	1112	20,561	5.4%	
2017/18	1332	19,582	6.8%	
2018/19	1597	18,650	8.6%	
2019/20	1861	17,762	10.5%	
2020/21	2125	16,916	12.6%	

Table 3: Actual and predicted percentage of Solar PV

7.2 Solar in the car parks

Finally, there has been progress in the use of space in car parking lots to place solar arrays. This is not only part of a strategy to generate renewable energy using space efficiently but also, in some cases, provides additional shelter for the vehicles. Coupled with the fact that some of the parking areas also contain electric charging points, this collaboration with renewable energy and energy efficiency provides an exemplar case for the public to view first-hand good practice at work in the County.

Every hour the sun beams onto Earth more than enough energy to satisfy global energy needs for an entire year.

National Geographic[3]

2 Renewable sources of energy: Chapter 6, Digest of United Kingdom Energy Statistics (DUKES), 30 July 2015

3 Source: http://environment.nationalgeographic.com/environment/global-warming/solar-power-profile/

8. Heat Networks

8.1 What is a Heat Network?

A heat network is simply two or more buildings (residential or commercial) connected by a series of insulated pipes (normally underground) to a shared heat source. The heat source is often in the form of one or more energy centres (depending on the size of the network). Some common fuel sources used to create the heat include natural gas and biomass.

Figure 17: Example of a heat network

Source: https://commons.wikimedia.org/wiki/File:2006-02-15_Piping.jpg

A heat network in Hereford is currently under a full feasibility study. Should it prove feasible, would address each of the four key aims of the CMP-17 through:

- Providing an investment opportunity
- Improving security of supply through local generation
- Reducing the carbon footprint of the customers of the heat network through the delivery of zero or low carbon heat and electricity
- Utilising support from the governments Heat Network Delivery Unit (HNDU) and Heat Network Investment Project (HNIP)

8.2 The Proposed Heat Network in Herefordshire

The figure over page shows the proposed heat network for Hereford City centre, which is centred on the proposed Urban Village development. The heat network would serve key anchor loads of the industrial area to the west of the city, home to Heineken and Cargill's and to the County Hospital in the east, the heat network would also service the Old Market shopping centre and has potential to service high town.

The yellow, orange and red patches on the map identify heat loads in the city, the darker the colour the higher the intensity of heat required

8.3 The Proposed Heat Network

Figure 18: Proposed heat network for Hereford

8.4 Timeline

Should the heat network prove feasible then the timeline below will give an indication of timescales.

- 2017: Full feasibility
- 2017/18: Commercialisation exercise
- 2020: Energy centre commissioned as early as 2020

9 The Target

9.1 Targeting change and achieving a 40% reduction in CO_2e emissions by 2021

The ones who are crazy enough to think they can change the world are the ones who do.

Steve Jobs

Co-founder, chairman and chief executive officer (CEO) of Apple Inc.

Change is central to the delivery of CMP-17. In order to achieve many of the targets a certain level of change will be required. Change, although not always liked by organisations and individuals, is important if we are to improve. Part of being prepared to improve is also being prepared to fail.

Therefore, CMP-17 is bold in its efforts to achieve financial and emissions savings and to achieve those which improve the way we conduct our operations to the benefit of those who work for Herefordshire Council as well are those for whom we work.

Change is a choice which we believe is critical to making Herefordshire Council more effective at delivering quality services at reduced cost by using energy efficiently.

9.2 Five key focus areas:

This change covers five key areas to deliver cost savings and emissions.

1. **Information:** Improve how we capture, record, calculate and report energy and carbon information.
2. **Partners:** Work more collaboratively with our partners on delivering targets.
3. **Change behaviours through awareness and education:** Enabling the Council, its partners and Schools to make informed, evidenced-based decisions, based on robust data and information through initiatives such as the Better-Off Energy campaign.
4. **Technology:** Change in our use of technology in order to provide accurate and timely information upon which evidence-based decisions can be made.
5. **Further embed sustainability and carbon management across Herefordshire Council's activities:** Achieve cost savings and promoting invest-to-save initiatives in order to improve finance and energy performance.

9.3 Success is planned

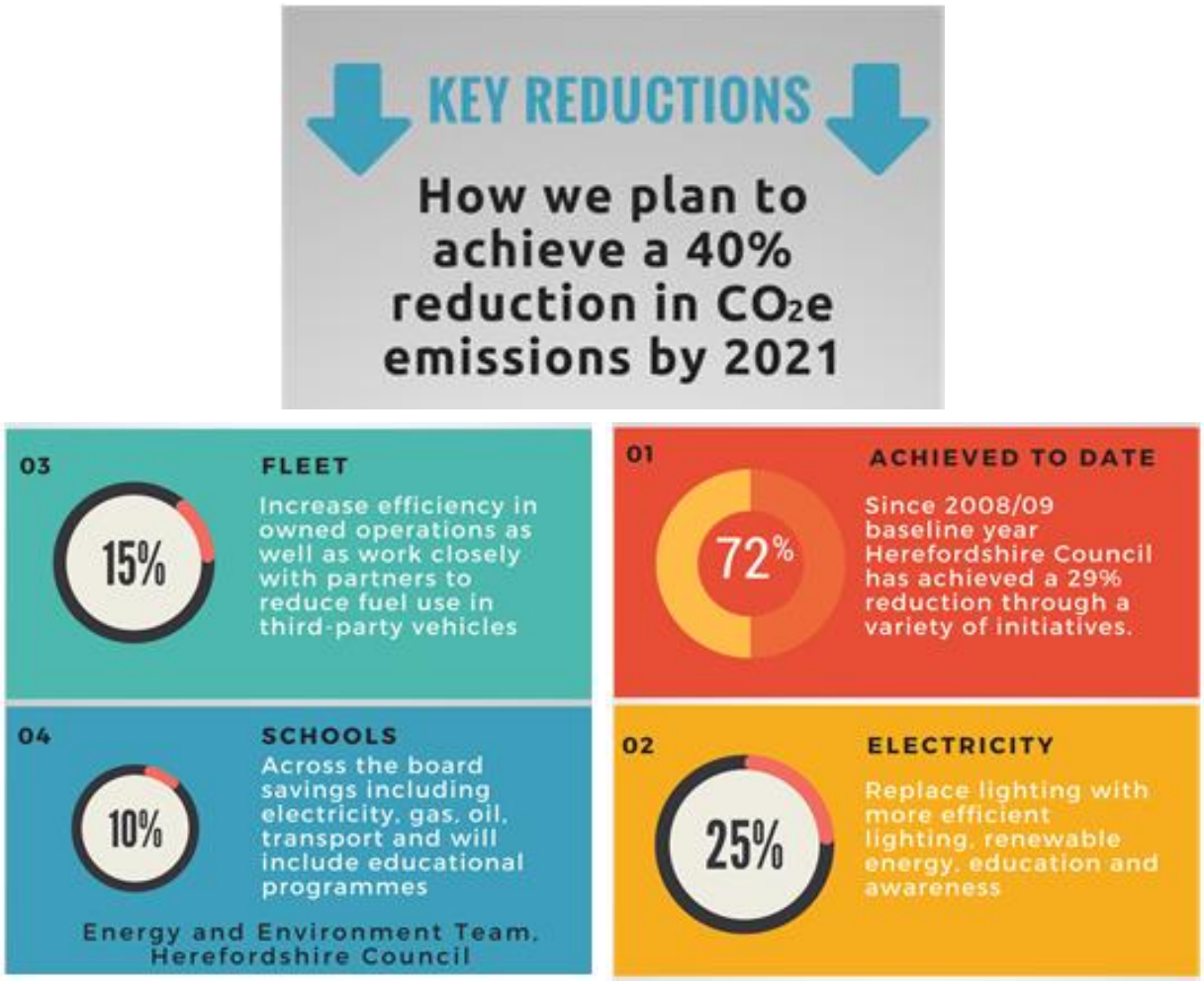


Figure 19: Achieving the 40% reduction target

9.4 Success factors

There are several important success factors which will all play a critical role in the determination of the degree of success of this CMP. Each factor has a foundational function and will be the building blocks upon which this CMP will be delivered.

The success factors which are believed to be the most important to a successful achievement of the targets, goals, aims and aspiration contained within this document include:

Management Commitment & Support → Energy & Carbon Management Software → Data Integrity → Informed Decisions → Appropriate Allocation of Resources → Annual Progress Reports → Motivated Team

10 Adaptating to a changing climate

We plan to address adapting to climate change as part of our work and in parallel to this CMP. There is strong evidence to suggest that Herefordshire, being a rural county, is vulnerable to the predicted changes in climate and the associated weather-related impacts.

Adaptation to climate change needs to form part of an integrated risk management strategy in order to increase our resilience to and mitigate the impacts of severe weather events and the associated human and economic costs. Our adaptation policy is being developed but will be broadly following the National Adaptation Programme (NAP) action priorities of:

- Raising awareness of the need for climate change adaptation
- Increasing resilience to current climate extremes
- Taking timely action for long-lead time measures
- Addressing major evidence gaps.

In addition, the policy will consider the local context of Herefordshire and the impact that climate change may have on our County which is more specific and relevant.

Intelligence is the ability to adapt to change.

Stephen Hawking

Theoretical physicist, cosmologist, author and Director of Research at the Centre for Theoretical Cosmology within the University of Cambridge

BUILDING FLOOD RESILIENCE IN HEREFORDSHIRE

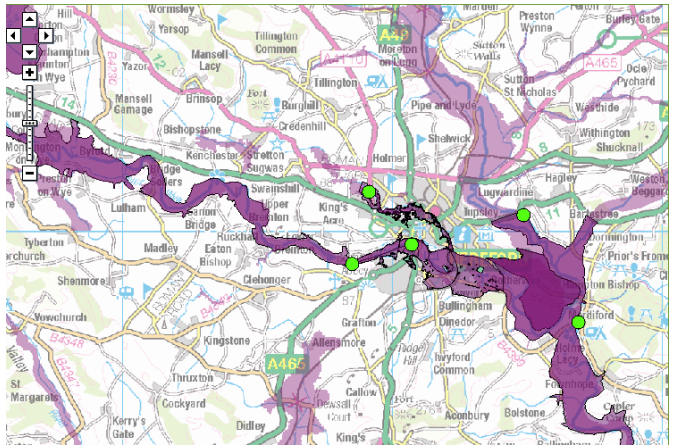
Scenarios and predictions

Climate impacts are likely to affect the way we live, work, “school” and play in Herefordshire.

In fact, they have already.

Increased levels of flooding, rising energy prices, carbon taxes, insurance costs and severe weather warnings are all symptoms of a changing climate.

The link with climate change can be difficult to assess but the scientific evidence is very clear that we can expect more frequent and more intense severe weather events with increased climate variability.



"An ounce of prevention is worth a pound of cure."

Benjamin Franklin, 1706 – 1790

Challenges

The warmer climate enables the atmosphere to retain increased levels of moisture. The result is that the severity of precipitation is likely to increase and as a result flooding frequency and severity are also likely to increase.

December 2015:

WARMEST and WETTEST on record

Temperature: 7.9°C (4.1°C above average)

Rainfall: 230mm (191% of average)

In order to prepare for the mounting and mountains of evidence of change in climate, businesses, farmers, communities and individuals need to begin to adapt.

Key challenges:

1. Safety: risks to human life; driving hazards, human health, damage to property, effects on businesses.
2. Increasing cases of flooding: frequency and intensity of flooding.
3. Increased variability in climate affecting planning and resilience measures.
4. Lack of climate change adaptation information and planning.

Solutions

There is a need to reduce and manage the risks of flooding to increase resilience.

- Identify risks of climate variability and change in Herefordshire.
- Conduct a risk and vulnerability analysis.
- Develop an adaptation management plan to increase awareness and information about how businesses can prepare for climate impacts.
- Engage the Environment Agency’s engineering expertise to reduce flooding risks such as clearing blockages from storm water pipes, replacing damaged drains, carrying out surveys of key drainage systems.
- Survey local farm fields for compacted soils which reduces the capacity to absorb rainfall and exacerbates runoff.
- Act upon the results of the survey.

11.1 Timeline – The story so far

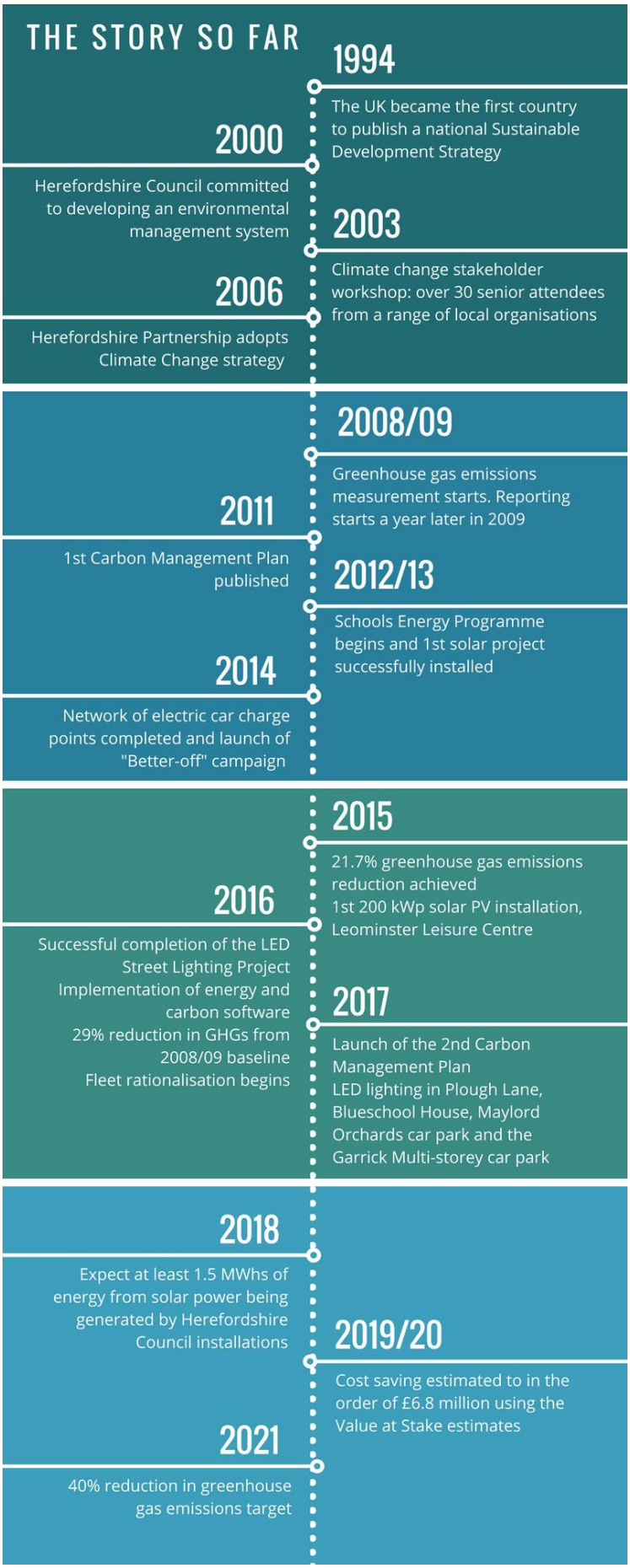


Figure 20: Timeline

12 Appendicies

12.1 Appendix 1: CMP Action Plan Summary

Area of Operation Five-year timeline: 2017 - 2021	Estimated total cost	Estimated energy cost savings per annum	Estimated emissions savings (Tonnes CO_2e) 2017-2021	Year commenced	First full year of savings	Stage	Confidence interval
Office and car park lighting: To upgrade the lighting at the council's Plough Lane Offices, Blueschool House offices, Garrick House multi-storey car park and Maylord Orchard underground car park with energy efficient LED lighting.	£ 321,000	£ 69,000	1325	2016	2017	3	70%
LED Street lighting: Replacing the County's approximate 12,500 street lights with Light-emitting diodes (LEDs) as well as the replacement of 3000 columns which are at risk of failing.	£ 7,000,000	£ 231,650	4461	2012	2017	5	90%
Accommodation Strategy: Reviewing the needs of the operational estate over the next three years and planning to match demand and supply giving regard for sufficiency, suitability and value for money.	£ 1,750,000	£ 175,000	46	2016	2018	4	80%

Key for RAG Analysis

Stage	Confidence interval
1	10%
2	20%
3	30%
4	40%
5	50%
	60%
	70%
	80%
	90%
	100%

Area of Operation Five-year timeline: 2017 - 2021	Estimated total cost	Estimated energy cost savings per annum	Estimated emissions savings (Tonnes CO_2e) 2017-2021	Year commenced	First full year of savings	Stage	Confidence interval
Contractor Fleet review: The plan is to streamline the fleet which will result in reduced rental and running costs. The costs/savings shown are "per annum" estimates.	£ 301,416	£ 43,031	103	2016	2017	4	80%
Herefordshire Council fleet review: We plan to improve efficiencies through a rationalisation of rental fleet. Emissions saving have been estimated to be in the order of 10%.	£ 142,514	£ 67,486	215	2016	2017	3	60%
Pool car review: A review with recommendations to better manage pool cars in order to generate financial savings from staff mileage costs is underway.	£ 40,000	£ 8,500	83	2015	2018	1	30%
Solar PV project: Aiming to install enough solar PV in order to generate 2.8GWh of electricity per annum by 2020.	£ 1,200,000	£ 95,117	1832	2012	2017	3	50%
Staff Travel Plan: A Workplace Travel Plan has been developed.	£ 307,300	Still to be determined	Still to be determined (Note: commuting currently does not form part of the footprint assertion.)	2012	2013 onwards	1	10%

Area of Operation Five-year timeline: 2017 - 2021	Estimated total cost	Estimated energy cost savings per annum	Estimated emissions savings (Tonnes CO_2e) 2017-2021	Year commenced	First full year of savings	Stage	Confidence interval
Joint Sustainability Action Plan (JSAP): To innovate to ensure that we are as carbon efficient as practicable through: 1a) Develop Joint Energy Saving Plans to allow Operations to Reduce Operational Emissions Footprint /£Million service and 1b) Deliver reduced Consumption of Fossil Fuels for the Public Realm Logistics in normalised terms (including subcontractor).	Still to be determined	Still to be determined	Still to be determined	2013	2020	2	40%
ICT rationalisation: A strategy to replace the current dual data centre with a single data centre at Plough Lane with separate disaster recovery capability at a second site within the county. Energy saving forms only a small part of the overall aim of this strategy.	£ 1,200,000	£ 50,000	578	2016	2018	1	60%
Schools programme: Raise awareness of energy reduction opportunities and encourage best environmental practices within schools and academies across Herefordshire through a dedicated council officer.	£ -	£ 150,377	618	2016	2020	1	40%
TOTAL/Average	**£ 12,262,230**	**£ 890,161**	**9259**			**2.5**	**55%**

Table 4: Summary Action Plan

IMPORTANT NOTE: The above action plan is a snap-shot in time. The actual document is a working document which will be updated and changed as time goes on in order to accurately measure and reflect progress towards our targets.

12.2 Appendix 2: Abbreviations and Definitions

Abbreviations

Business as Usual	BAU
Carbon Dioxide	CO_2e
Carbon Management Plan	CMP
Carbon Reduction Commitment and Energy Efficiency Scheme	CRC
Deputy Project Lead	DPL
Display Energy Certificate	DEC
Department for Energy and Climate Change	DECC
Feed-in-Tariffs	FiTs
Good Environmental Management	GEM
Herefordshire Public Services	HPS
Hydrofluorocarbons	HFCs
Joint Management Team	JMT
Joint Venture Company	JVCo
Integrated Care Organisation	ICO
Local Authority Carbon Management Programme	LACM
Methane	CH_4
Nitrous Oxide	N_2O
Officer in Charge of Building	OiC
Perfluorocarbons	PFCs
Project Lead	PL
Rapid Assessment of Potential	RAP
Return on Investment	ROI
Sulphur Hexafluoride	SF_6
Value at Stake	VAS
West Mercia Supplies	WMS

Definitions

VAS:	Value at stake: The total value of the cost savings realised by pursuing the 'Reduced Emissions' scenario instead of the 'Business as Usual' scenario. It is made up of cost avoidance and actual financial savings. VAS excludes the capital and operational cost of carbon saving projects that would need to be invested over this period to achieve our target.

There are also definitions (IPCC, 2007) which are helpful when understanding adaptation in the context of climate change. Some of these include the following:

Adaptation:	Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation.
Adaptive capacity:	The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.
Anticipatory adaptation:	Adaptation that takes place before impacts of climate change are observed.
Adaptation assessment:	The practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency and feasibility.
Adaptation costs:	Costs of planning, preparing for, facilitating, and implementing adaptation measures, including transition costs.
Planned adaptation:	Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

Thanks

Special thanks to the Energy and Environmental Management Team for their efforts in helping to guide and produce the Carbon Management Plan 2017 - 2021.

Infographics were created using the free online software: https://www.canva.com