BikeRight!'s Carbon Footprint

September 2015

1 Executive Summary

On top of the well-known environmental benefits of reducing energy usage, saving energy also saves money which can be used for other needs and often results in lower maintenance costs and improved reliability (Carbon Trust, 2004).

By thoroughly investigating current energy usage (36.35 tCO^2e/yr) it has been possible to suggest a number of generic and specific energy saving measures across the three sites. These recommendations have been ranked in order of CO_2e energy saving capabilities with the top recommendation being listed below.

1.1 Top Recommendations

Recommendation	Location	Cost savings (£/yr)	CO2e savings (tCO^2e/yr)	Cost of implementation (£)	Estimated payback (Years)
Install Solar Panels	Birmingham/ Manchester	10,043	27	60,000	6
Replace Vehicles with Electronic	All Offices	5,501	14	101,349*	18.4*
Modernise Lighting	Manchester	502	3	183	0.4

**The cost and payback time of replacing the vehicles is calculated assuming all new stock is bought outright with no capital from sales of previous vehicles and with lease agreements. In reality this could be much more affordable, see the 4.1 recommendations for BikeRight!*

2 The Carbon Footprint

A company's carbon footprint is the total amount of greenhouse gasses created in support of the organisations activities. In reality it is almost impossible to calculate the true impact that an individual or organisation has on the environment as collating the required data from the supply chain and the suppliers supply chain along with the waste and travel practices of all clients and customers is unrealistic. However, by measuring the scope 1 (direct emissions), scope 2 (indirect emissions) and a carefully selected portion of scope 3 (emissions that fall outside the organisations control but that are indirectly caused by them e.g. travel to site), it is possible to recommend improvements and measure changes in emissions. As different activities emit differing combinations of the greenhouse gasses that are so damaging to the environment it is best practice to calculate emissions as Carbon dioxide equivalent (CO^2e) using figures provided by the Carbon Trust. CO^2e is calculated by multiplying the emissions of each of the six greenhouse gases by its 100 year global warming potential (GWP) and this carbon footprint, following guidelines set by the Carbon Trust, considers all six of the Kyoto Protocol greenhouse gases: Carbon dioxide (CO^2), Methane (CH^4), Nitrous oxide (N^2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

For this study, scope 1 and scope 2 emissions are calculated to CO^2e and compared across the regional offices. Below is a table showing the breakdown of energy consumption and CO^2e emissions across BikeRight! as an entire organisation and graphs showing emissions breakdown by regional office.

In the financial year 2014 – 2015 BikeRight! consumed over 46 tonnes of CO^2e.

	Resource	Consumption	Units	Cost £	kg CO^2e	tCO^2e
Scope 1	**Natural Gas**	62897	kWh	3081.95	11548	11.55
	Company Vehicles	61123	Miles	9168.45	23930	23.93
Scope 2	**Electricity**	20725	kWh	4145.00	10872	10.87
						46.35

Table 1: Total Energy Consumption of BikeRight!

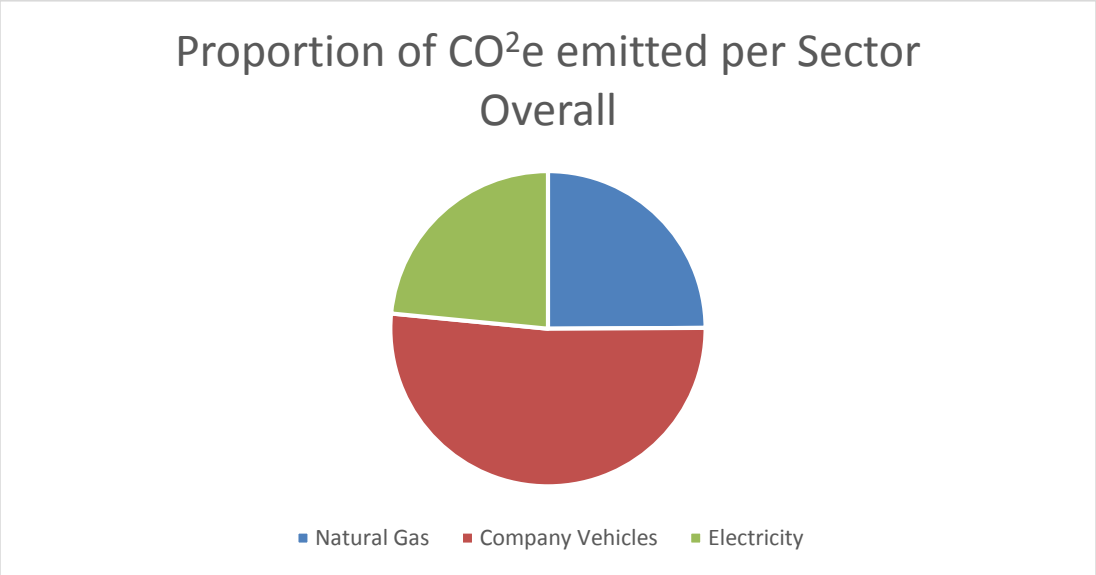

Figure 1: Proportion of CO^2e emitted per Sector for BikeRight! as an organisation

Just over half of all CO^2e emitted by BikeRight! comes from the use of company vehicles with around one quarter each apportioned to natural gas and electricity consumption. The picture in Manchester is very similar but regionally these figures differ with vehicles accounting for 68% of emissions in Birmingham and 35% in Liverpool and natural gas for only 5% in Birmingham and 46% in Liverpool.

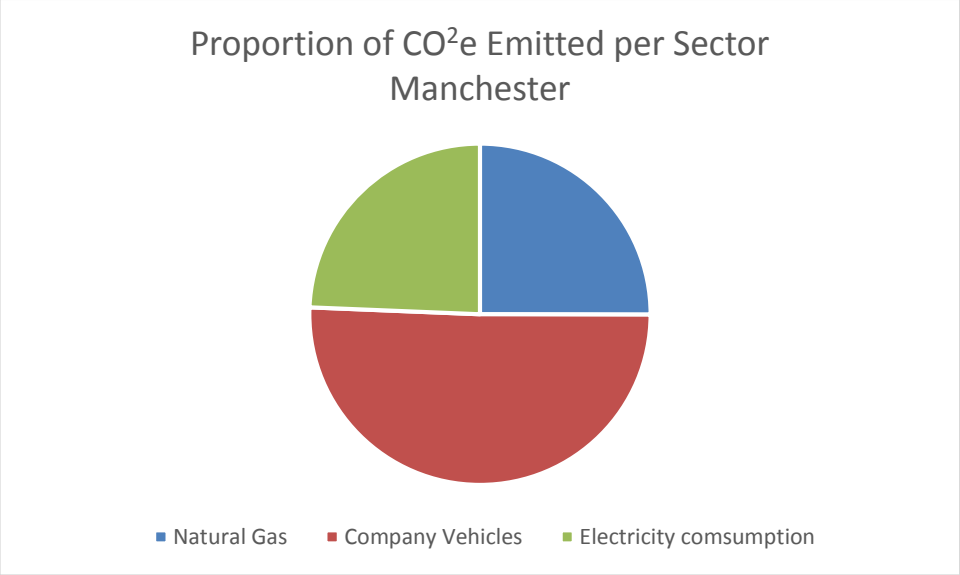

Figure 2: Proportion of CO^2e emitted per Sector in the Manchester Office

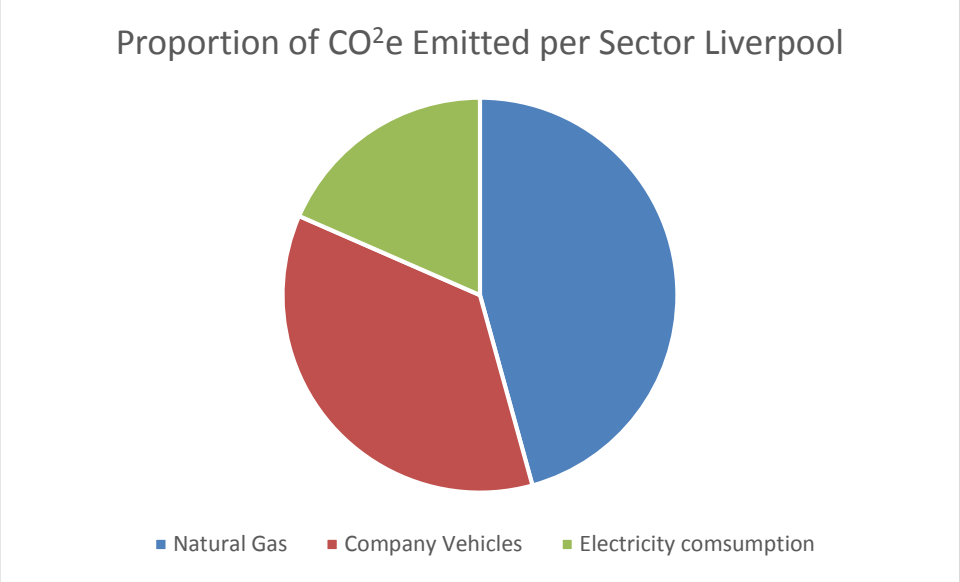

Figure 3: Proportion of CO^2e emitted per Sector in the Liverpool Office

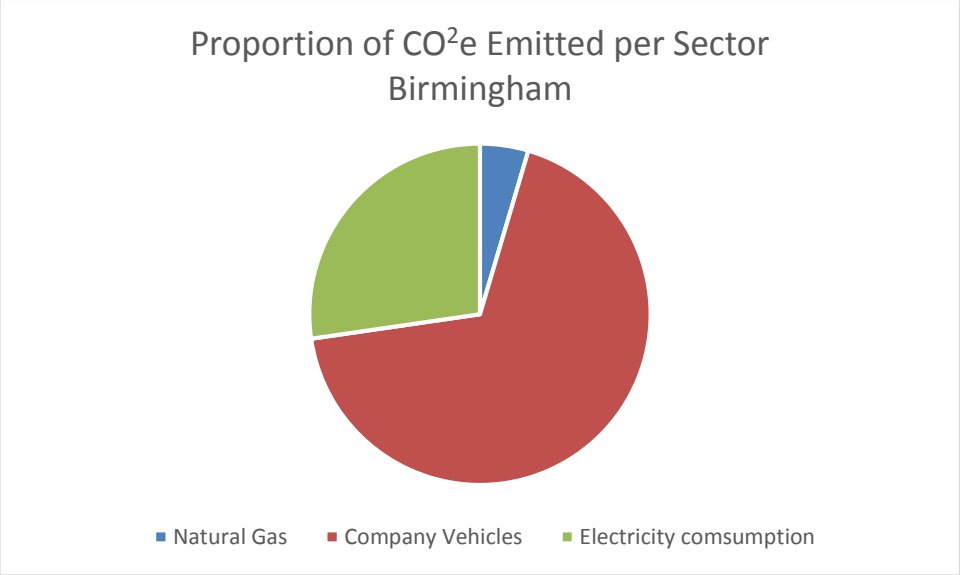

Figure 4: Proportion of CO^2e emitted per Sector in the Birmingham Office

3 Bench Marking

Energy Benchmarks are in place to allow a comparison of energy consumption with a baseline permitting annual changes in energy efficiency to be assessed and areas for action identified. Below is a comparison table of actual performance figures for the three BikeRight! offices calculated using the floor area of each building. The data takes into account the variation in heating needed in different parts of the country by using degree day data and in some instances hot water for heating is removed from this calculation but as the amount of gas used for water heating is deemed insignificant with this building use it is not separated out at this stage.

	Manchester	Liverpool	Birmingham
Weekly gas usage kWh	451.0	688.0	123.0
Annual gas usage kWh	23452.0	35776.0	6396.0
Weekly electricity usage kWh	319.0	202.0	308.0
Annual electricity usage kWh	16588.0	10504.0	16016.0

Table 2: Comparisons of Actual Energy Consumption at BikeRight!'s offices

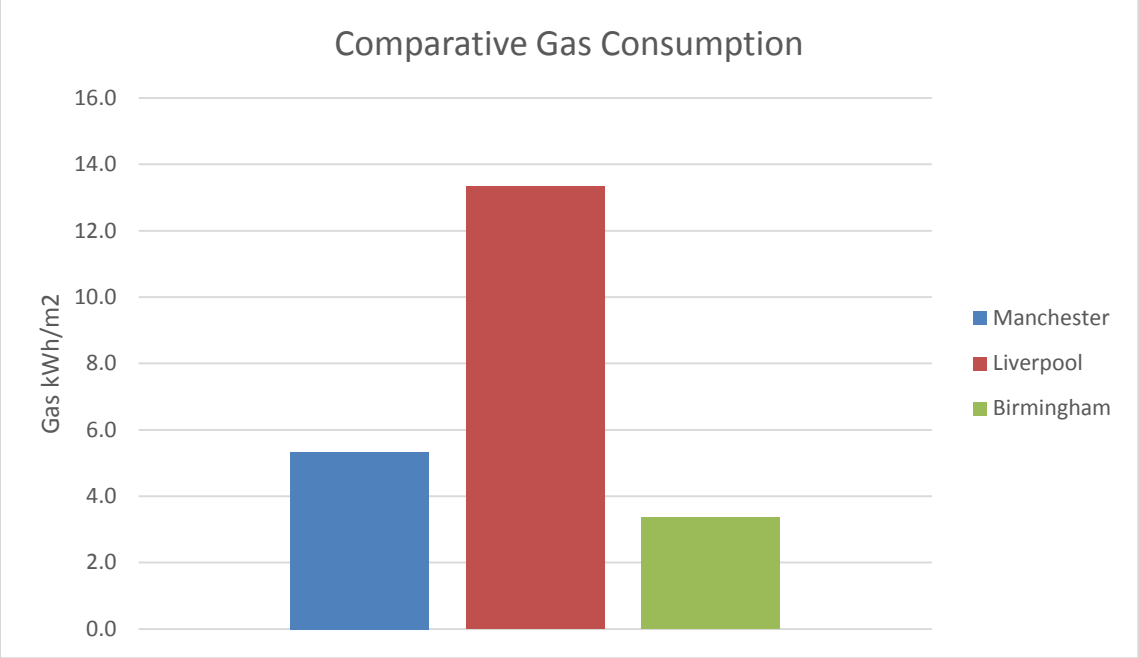

Figure 1: Comparisons of Actual Gas Consumption Rates per square meter in BikeRight! offices.

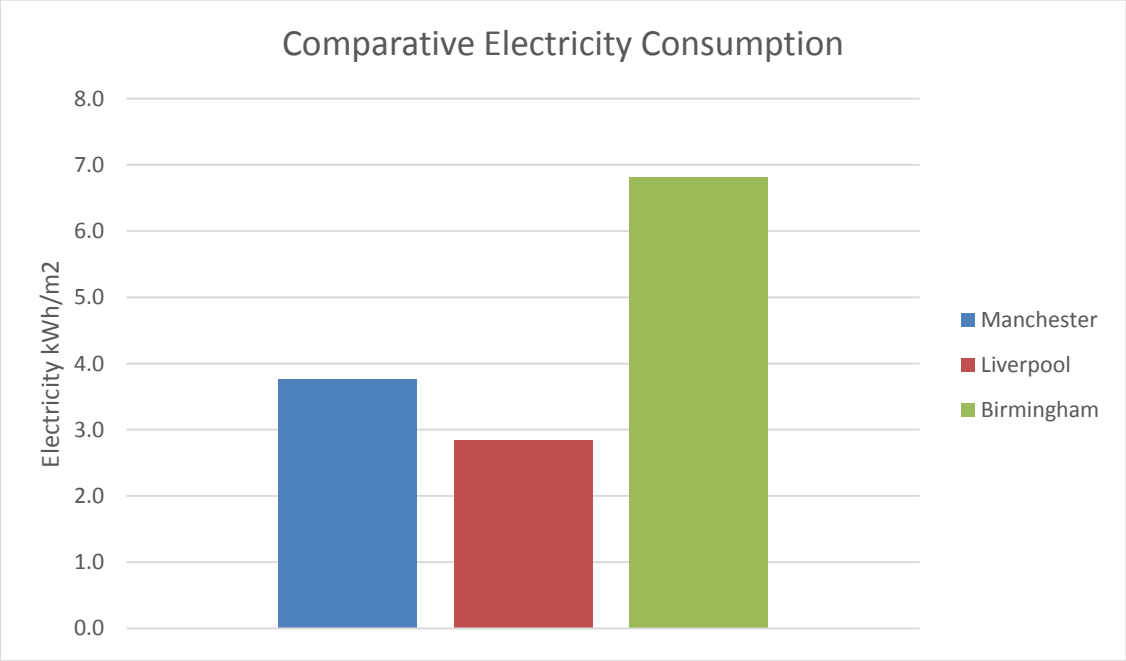

Figure 2: Comparisons of Actual Electricity Consumption Rates per square meter in BikeRight! offices

4 Recommendations

Each of the following recommendations has been calculated as a standalone measure, should more than one be implemented the savings would not be cumulative as a percentage saving on current electricity usage would be less following the replacement of the light fittings for example. Recommendations have been tailored to the site and its current energy usage, the Liverpool office reported a widespread usage of energy saving lightbulbs and this can be seen in its low comparative electricity consumption recommendations on reductions in this area have not been made.

As this is an energy saving exercise the recommendations have been ranked in order of CO_2 equivalent savings with CO_2 equivalent being calculated using carbon dioxide factors listed by The Energy Saving Trust (Energysavingtrust.org.uk, 2015).

4.1 BikeRight!

Replace Vehicles with Electric Equivalent				
Cost savings (£/yr)	**CO2e savings (tCO2e/yr)**	**Resource savings (kWh/yr)**	**Cost of implementation (£)**	**Estimated payback (Years)**
5501	14	61123	101349	18.4
Commercial vans which run on electricity can significantly reduce the carbon footprint in all three BikeRight! offices. There are a number of electric vans on the market but research would suggest that the Nissan E-NV200 van would be a suitable equivalent for the majority BikeRight! vehicles, taking 8 hours to charge (overnight) the vans have a maximum range of 106 miles and can travel at up to 76mph. Many of the journeys conducted by BikeRight! are very short with travel between the Liverpool and Birmingham office being the longest at 98miles. Electric vehicles can now be charged up rapidly (30 mins) at most motorway service stations at no cost to the user should longer journeys need supplementary electricity. The payback figures here are calculated assuming that all 9 electric vehicles are bought outright, the monetary cost could of course either be recouped by selling current vehicle stock or spread monthly through lease agreements making the CO2e savings achievable at a much cost.				

Other Recommendations	
Improve lagging on hot water pipes	Information is limited as the percentage of hot water pipes that are lagged in the Birmingham and Liverpool offices although it is believed that some have no insulation at all. Pipe lagging is low cost and easy to fit and can help to prevent unwanted heat loss from pipes.
Set up a maintenance check list for boilers and lagging	A regular maintenance schedule should be set up and recorded to ensure that not only are the boilers in good working order but they are also working at their most efficient.
Think about the layout of the building	As areas that contain a large number of PC and electrical equipment generare heat it can be advantageous to situate these in cooler areas of the building where to limit the amount of heating required.
Apply basic loft insulation	The Manchester workshop and storage area and the storage to the side of the upstairs office space currently have no loft insulation meaning that a reduction in gas usage would be seen if this were incorporated.
Install a Voltage Power Optimiser	Whilst most electrical equipment in Europe is designed and optimised to run on 220volts it is often the case that much more than this is actually supplied and around 90% of businesses in the UK will be using more electricity than they need to. By installing a VPO fluctuations in supply are smoothed out and consumption reduced.
Use timers to control appliances	Whilst there is limited information on the types of appliances used in some of the offices it is likely that many such as water coolers do not need to be kept on overnight. Timer plugs (like the ones used to control lamps at home) can be purchased from most hardware stores and set to come on shortly before the office is occupied.

4.2 Manchester

Install Solar Panels (Manchester)

Cost savings (£/yr)	CO2e savings (tCO2e/yr)	Resource savings (kWh/yr)	Cost of implementation (£)	Estimated payback (Years)
3,667	9	9,416	20,000	5

The calculations above have been completed a using Kk solar data prediction chart which uses the location of the building along with the slope and orientation of the roof to provide a Solar Radiation Kk that can be expected should an array be fitted on the roof.

Some assumptions have been made including: electricity usage will stay the same meaning that 10% of electricity produced could be fed back into the national grid; module efficiency will drop by 1% each year; energy costs will increase by 3% each year and the current export rate of 4.85p will be utilised.

Replace lights with more modern units (Manchester)

Cost savings (£/yr)	CO2e savings (tCO2e/yr)	Resource savings (kWh/yr)	Cost of implementation (£)*	Estimated payback (Years)
502	3	5,017	183	0.4

Currently there are a wide selection of different lights and fittings throughout the Manchester office. It would be possible to change the majority of the strip lamps (bulbs) and the spot lights to their modern equivalent and reduce the wattage required. These changes would cost just under £200 and estimating that electricity costs around 10p per unit there would be a payback time of 0.4 years. It would also be possible to change the units to more modern ones but the initial outlay would increase.

On top of this, further savings could be made by installing Passive Infrared Sensors (PIR) to those rooms where occupation is sporadic such as toilets, corridors and staff areas and photodetectors on all units to ensure they switch off when daylight is sufficient. This could lead to a further 40% reduction in electricity usage (Hill, 2015).

*Please note: this is a cost to purchase the lamps and does not include installation or PIR units which start around £35 per sensor (Energybulbs.co.uk, 2015).

Run a switch off campaign (Manchester)

Cost savings (£/yr)	CO2e savings (tCO2e/yr)	Resource savings (kWh/yr)	Cost of implementation (£)	Estimated payback (Years)
360	1.9	3318	0	0

By running an extensive switch of campaign for staff it will be possible to see a massive reduction in electricity bills. Previous switch off campaigns have seen a 20% reduction in electricity usage (Apps.warwickshire.gov.uk, 2015).

4.3 Liverpool

Following the survey it would appear that the Liverpool office exceeds the other two in energy saving measures already in place, low energy lightbulbs and appliances are already in use along with movement sensors within a modern and fairly well designed building. However, the figures suggest that Liverpool uses double the amount of gas per m^2 of office area than the other two sites and there does not appear to be an obvious reason why. The modern building (less than 10 years old) will meet all of the current insulation regulations and be constructed from suitable materials that would be difficult to upgrade at the present time.

Whilst it is not possible to make any specific recommendations at this time the gas usage at the Liverpool site should be carefully monitored and possibly queried if a behavioural reason for the high usage cannot be found.

4.4 Birmingham

Install Solar Panels (Birmingham)

Cost savings (£/yr)	CO2e savings (tCO^2e/yr)	Resource savings (kWh/yr)	Cost of implementation (£)	Estimated payback (Years)
6,376	18	18,200	40,000	7

The calculations above have been completed a using Kk solar data prediction chart which uses the location of the building along with the slope and orientation of the roof to provide a Solar Radiation Kk that can be expected should an array be fitted on the roof.

Some assumptions have been made including: electricity usage will stay the same meaning that 50% of electricity produced could be fed back into the national grid; module efficiency will drop by 1% each year; energy costs will increase by 3% each year and the current export rate of 4.85p will be utilised.

It is possible to fit a 50% smaller array designed to cover current electricity usage but not provide scope for expansion, the charging of electric cars or re-sale to the grid. This would have an outlay of around £20,000, a payback period of 4.5 years and save 9 tCO^2e/yr.

Replace lights with more modern units (Birmingham)

Cost savings (£/yr)	CO2e savings (tCO^2e/yr)	Resource savings (kWh/yr)	Cost of implementation (£)*	Estimated payback (Years)
225	2.1	2,249	837	3.7

Currently almost all of the lights in the office are single 5' fluorescent tubes of the T8 type which use 65 watts each. It would be possible to change these to their modern equivalent and reduce the wattage to 28 per tube (24LED, 2015). It was reported that the office has 22 lamps of this type switched on for 8 hours, 300 days a year and pays approximately 10p per unit of electricity the initial financial outlay of £837 would have a payback time of 3.7 years.

On top of this, further savings could be made by installing Passive Infrared Sensors (PIR) to those rooms where occupation is sporadic such as toilets, corridors and staff areas and photodetectors on all units to ensure they switch off when daylight is sufficient. This could lead to a further 40% reduction in electricity usage (Hill, 2015).

*Please note: this is a cost to purchase the lamps and does not include installation or PIR units which start around £35 per sensor (Energybulbs.co.uk, 2015).

Run a switch off campaign (Birmingham)

Cost savings (£/yr)	CO2e savings (tCO^2e/yr)	Resource savings (kWh/yr)	Cost of implementation (£)	Estimated payback (Years)
320	1.7	3203	0	0

By running an extensive switch of campaign for staff it will be possible to see a massive reduction in electricity bills. Previous switch off campaigns have seen a 20% reduction in electricity usage (Apps.warwickshire.gov.uk, 2015).

4.5 General Recommendations

The following changes can be made to most buildings to help the occupants to use less carbon, and in many cases save money.

General Recommendations for Energy Saving	
Label light switches	Label all of the light switches so that individuals only use the lamps that are required and do not switch them all on for ease.
Separate Recycling from other waste	Provide a number of different well labelled bins or large bins with different sections to encourage people to separate their waste for recycling.
Centralised printer stations	When people have the facility to print at their work stations the temptation is to print everything out, by changing to a system where individuals must move to a central location to print things out there is less paper wasted as well as a reduction in electricity. Settings can also be put in place default to double-sided printing.
Fit tap aerators, movement sensors and cistern displacers	Water aerators can be easily retro fitted to taps for less than £5 and they can provide up to 50% saving in water usage (SaveMoneyCutCarbon, 2015), alternatively replacing taps with sensor operated ones can help to prevent water wastage. Installing cistern hippos can reduce the amount of water used with each flush by around 3 litres (Anon, 2015).
Change paper to a 100% recycled alternative	A ream of 100% recycled paper can cost as little as £2.49 (Thegreenoffice.co.uk, 2015) meaning there is very little or no expense to making the shift.
Install automatic heating controls	As is the case with lighting it is possible to install automatic heating controls that change automatically switch off the heating when the desired temperature is reached.