6F6Z3001 Third Year Project

Impact of Carbon Literacy training at HOME arts centre, Manchester

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Declaration of originality

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Manchester Metropolitan University or to any other institution for assessment or for any other purpose.

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Abstract

Climate change is of increasing concern and urgent action is required if the government are to achieve greenhouse gas reduction targets in the UK. There is a significant challenge in changing concern for climate change into action. This study evaluates Carbon Literacy as a tool to increase engagement with climate change at a workplace level and to inform the development of a carbon management plan. The research uses a case study approach and draws on the results of questionnaire responses within an arts and culture organisation in Manchester, UK. The study uses a mixed method approach with the emphasis on the qualitative data to interpret the effectiveness of the training and the actions identified. The findings show Carbon Literacy is a useful tool to increase an individual's ability to both influence others on climate change and to identify actions in the work place to reduce carbon. The study is an example of involving employees in the earliest stages of designing a carbon reduction plan and how this leads to positive engagement in the workplace.

1. INTRODUCTION

Climate change is a critical challenge which calls for immediate action where reducing greenhouse gas emissions will be the basis for prosperity and security for generations to come (Ki-moon, 2016). Carbon emissions are linked to global warming and delaying action will make it much more difficult to limit global warming to below 2°C (Intergovernmental Panel on Climate Change, 2014). This was also outlined in the Stern Review, an independent report produced for the UK government in 2006 which analysed the risks and costs of climate change (Stern, 2007). The report called for international, national and regional collaboration and argued the benefits of immediate action, far outweigh any delay and to postpone action would be dangerous and very costly (Stern, 2007). Furthermore, Stern (2007) reinforced the need to educate and inform individuals on how to respond to climate change.

Although there is a general awareness of climate change amongst the public (Lorenzoni *et al*., 2007), promoting individual responses to climate change remains difficult (Sapiains *et al*.,2016). Given that recent changes in carbon emissions are driven by human influences (Intergovernmental Panel on Climate Change, 2007), research into changing attitudes and behaviours is of paramount importance if the challenges of climate change are to be met.

The following literature review discusses the international, national and local response to climate change. It outlines the barriers to individual behaviour change and the challenges faced by organisations in promoting a low-carbon culture and bringing about systematic change.

This project focuses on a novel approach where Carbon Literacy training is used by an organisation as an innovative way to bring about behaviour change and develop a carbon reduction plan. The case study takes place at HOME in Manchester, which is an arts, film and theatre venue (HOME, 2015). Culture and arts organisations are also well placed to inform and influence the public through media (Manchester: A Certain Future, 2016). The study evaluates the effectiveness of Carbon Literacy training within an arts organisation and the development of carbon reduction actions in the work place.

2. LITERATURE REVIEW

2. 1 Climate change

The Intergovernmental Panel on Climate Change (IPCC) stated that global warming is unequivocal since the mid-20th century. More than half of the recent increase in global surface temperature from 1951 to 2010 was extremely likely to have been caused by anthropogenic increases in greenhouse gas emissions (IPCC, 2013). This has led to global changes with reductions in snow and ice, sea level rises and climate extremes (IPCC, 2013). The scientific community overwhelmingly agrees that anthropogenic activity is the main cause of global warming (Cook *et al.,* 2013; Doran and Zimmerman, 2009). As climate change is driven by human activities, solutions must be based on changing those behaviours (Gifford *et al*., 2011).

The development of these solutions will involve all levels of human involvement such as government policy, industry and public engagement (Lorenzoni *et al*., 2007). There are two key responses to climate change – mitigation and adaptation. Mitigation is a human intervention to prevent or reduce emissions and adaptation is the system response either natural or human to moderate harm (IPCC, 2014). Countries face different challenges and have varying capacities to address climate change and international co-operation will be required to achieve effective mitigation and adaptation. Policy design must take into account perception of risks and uncertainties alongside social and economic considerations such as cultural values and economic wealth (IPCC, 2014).

An example of such international co-operation is the United Nations Framework Convention on Climate Change (UNFCCC) which formed in 1992 as countries joined an international treaty to combat climate change and to limit global warming and the impacts of climate change(UNFCCC, 2014a). 1995 saw the first conference in Berlin and two years later the Kyoto Protocol was adopted (UNFCCC, 2014a). The Kyoto Protocol is a legally binding agreement which set emission targets with the responsibility placed on developed countries. This recognised that the high levels of greenhouse gases were due to industrial

emissions. Due to a complicated ratification process, it did not come into force until 2005 (UNFCCC, 2014b). However, even with climate mitigation policies, greenhouse gas emissions have continued to grow from 1970 to 2010. 78% of the increase has been attributed to CO_2 emissions from the use of fossil fuels and other industrial processes (IPCC, 2014).

The Kyoto Protocol failed at achieving emission reductions as key governments such as the United States of America (USA) did not sign (Prins and Rayner, 2007; Rosen, 2015). Furthermore, den Elzen *et al*. (2013) stated that the Kyoto Protocol target of a reduction of 5% by 2012 did not go far enough when a 50% reduction was needed by 2020 in order to achieve a medium chance of limiting warming to 2°C. It was also suggested that the more parties there were to negotiate with, the harder it was to reach an agreement (Prins and Rayner, 2007). Rosen (2015) argued that the Kyoto Protocol was essentially a flawed agreement with short sighted actions which failed to make an impact on climate change as developing countries such as China and India were not required to cut emissions at all. The Conference of the Parties (COP) 17 in Durban, 2011 brought about the realisation that a new agreement was required which would be universal and legally binding to tackle climate change beyond 2020 (UNFCCC,2014c). This has led to the UNFCCC reaching a universal climate agreement in Paris in 2015.

The Paris agreement brings all nations together and also assists developing countries to combat climate change. Currently 197 members have signed the agreement and 142 states have ratified the agreement, including China and the USA (UNFCCC, 2016). The agreement came into force when at least 55 of the ratified states accounted for 55% of the total greenhouse gas emissions (UNFCCC,2016). The Paris agreement aims to keep the global temperature increase to below 2°C compared to pre-industrial levels. Above this level there is greater risk of serious climate impacts and dangerous interference with the climate system (UNFCC,2014c). Rogeli *et al.* (2016) states that there would need to be significant enhancement and over delivery of the proposals in the

Paris agreement in order to meet the challenge of limiting warming to 2°C. Furthermore, global emissions urgently need to reduce if warming is to stay below 2°C. Greater delay will result in the need for much higher emission reduction rates to be implemented (Rogelj *et al.,* 2013; Luderer *et al.,* 2013).

The action by countries at the Paris agreement, together with recent increased engagement from business and citizens alike has led to greater momentum on climate change action (Rogelj *et al*., 2016). Since the UNFCCC convention in Copenhagen in 2009, international climate laws and policies have almost doubled from 429 in 2009 to 804 in 2014 but there is extreme urgency for the remaining countries to act (Globe International, 2015). Further research is also needed into the role of social communities and not just policy makers, incorporating social science as well as the physical science of climate change as this will support both government and non-government actions (Rogelj *et al*., 2016).

2. 2 UK Climate change

The UK responded to climate change by passing the Climate Change Act in 2008 which had a target of an 80% reduction in greenhouse gas emissions from 1990 levels by 2050 (Climate Change Act, 2008). To ensure regular progress towards the target, the Act requires carbon budgets to be periodically set (Climate Change Act, 2008). The UK has met the proposed first carbon budget and is set to meet the second and third, however the UK is not on track to meet the fourth carbon budget of 1,950 MtCO2e (50% reduction) in 2023-27 (Committee on Climate Change, 2016). For this to be achieved the UK must reduce domestic emissions by 3% per year and this will require more challenging measures to be adopted (Committee on Climate Change, 2016).

The UK has been seen as a leader in climate change politics and economics (Lorenzoni *et al.,* 2007; Nordhaus, 2007). However political problems have emerged working towards the fourth carbon budget as there was concern environmental policies and regulations were increasing energy bills and the

Climate Change Act alone was not creating the inward investment needed (Lockwood, 2013). There has also been criticism of UK climate change targets (Anderson, *et al.,* 2008; Pielke, 2009). Anderson *et al.* (2008) reported the long term targets fail to address the need to reduce emissions and energy demand rapidly. Furthermore Pielke (2009) calculated based on population growth and Gross Domestic Product per capita, the UK would need decarbonization rates of 4 to 5% per year in order to achieve the targets set by the Climate Change Act. Challenges arise when government policy needs to be not only technically achievable but also socially and politically accepted (Pielke, 2009).

The UK government has recognised the significant challenge ahead and have responded with the intention to prepare a carbon reduction plan which reduces carbon emissions without preventing economic growth. This will involve working closely with relevant stakeholders including the business sector and industry (Department for Business, Energy and Industrial Strategy, 2016a). Ultimately everyone is required to respond to climate change and there will need to be radical changes in values and behaviour at all levels, including government, national and local level (Lorenzoni et al.,2007).

2.2.1 Cities and climate change

The International Energy Agency reports half the global population are city dwellers and cities are responsible for 70% of carbon emissions coming from the energy sector (International Energy Agency, 2016). Cities are therefore pivotal in a reduction of carbon emissions. At a more local level cities are seen as an appropriate area to address climate change as they are able to regulate energy supply, land use and transport (Betsill and Bulkeley, 2006). Cities are also more vulnerable to the effects of climate change such as sea level rises, extreme weather patterns, floods and water scarcity (Carter *et al*., 2015; Rosenzweig et al., 2010). For this reason, many cities have developed their own plans for climate change adaption and mitigation, for example London has a climate change adaption strategy published in 2011 (Greater London Authority, 2011).

Cities although bound by international and national regulation, are more able to act autonomously (Betsill and Bulkeley, 2006). Furthermore, local governments can facilitate action with relevant stakeholders and encourage public participation in climate change responses (Betsill and Bulkeley, 2006). However, government policy seems to have had little effect on changing individual behaviours and there appears to be a gap between public concern for climate change and actions to reduce carbon emissions (Lorenzoni et al.,2007).

2.3 Public opinion on climate change

Public opinion is critically important in the transition to a low-carbon economy as scepticism and ambivalence will hinder any move towards a more sustainable society (Poortinga *et al.* 2011). Stoutenborough *et al*. (2014) compared the results of three surveys in the USA between 2004 and 2013 which suggest the economic collapse in 2008 and also the Climategate scandal in 2009, where emails between scientists were leaked to the public, were both responsible for the lack of public support for climate change. However, the effects of Climategate are far more long lasting as the general public still distrust climate information. Furthermore, a UK study by Lorenzoni *et al.* (2007) found distrust of information on climate change and mixed messages were a barrier to public engagement.

The majority of the public in the UK attribute climate change to anthropogenic activities (Whitmarsh *et al.,* 2011; Poortinga *et al.,* 2011). However, a proportion still express uncertainty about climate change (Whitmarsh, 2011). A national study in the UK with 1822 participants by Poortinga *et al.* (2011) found that the majority of people agree climate change is happening. There was however a split in the perceived seriousness of climate change, with 40% believing the impact to be exaggerated. Individual perception of climate change may be reflected in personal experiences (Brulle *et al.*, 2012), for example, a recent study by Konisky *et al*. (2015) tested the theory that individuals exposed to extreme weather events will be more concerned about

climate change. The study in the USA combined extreme weather events with public opinion. This did show a positive relationship between extreme weather events and concern for climate change. However, this tended to occur after recent events and not over long periods of extreme weather, suggesting the change in attitudes was short-lived.

A study by Whitmarsh (2009) identifying how the public responds to climate change concluded there should be improved information and engagement with the public concerning climate change. Furthermore education should illustrate how individuals can mitigate climate change and identify actions that will have the most impact. Stern (2000) outlined the factors affecting environmental behaviour as, values and beliefs, personal capabilities, contextual factors such as social norms and habits. These factors affecting pro-environmental behaviour and attitude are discussed in more detail below.

2. 4 Behaviour change

As climate change is driven by human influences it is of utmost importance to understand the factors affecting environmental behaviour and the barriers to changing those behaviours (Gifford *et al*., 2011). Environmental behaviour research has focussed on three main areas, intrapersonal, interpersonal and external factors. Intrapersonal factors are defined as person's values and motivations, interpersonal are seen as social norms and external factors are, for example rewards or punishments (Gifford *et al*., 2011).

Earlier research focused on the 'deficit model' whereby increased knowledge and information led to changes in behaviour but it is actually dependant on many other factors (Burgess et al., 1998). The deficit model which follows a linear path assumed that knowledge would lead to environmental concern and then to behaviour as illustrated in Figure 2.1 (Kollmuss and Agyeman, 2002). Extensive research now suggests whilst information on climate change is useful, it does not extend to environmental action (Owen, 2000; Kollmuss and Agyeman, 2002; Lorenzoni *et al*., 2007).

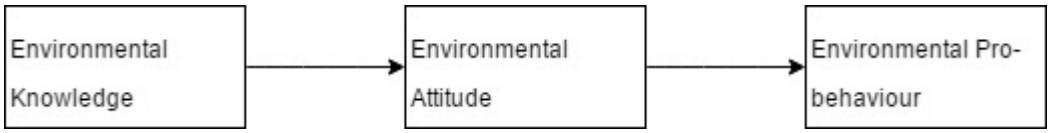

Figure 2.1 An example of the deficit model in pro-environmental behaviour (after Figure 1 in Kollmuss and Agyeman, 2002)

Other theories have attempted to explain the gap between intention and action. An example of a widely used model is the theory of planned behaviour, developed by Ajzen (1991) as illustrated in Figure 2.2. This theory has three factors which lead to intention and behaviour. These are the attitude of the individual either positive or negative, the subjective norm, for example the social pressure and the perceived control (Ajzen, 1991). Perceived control maybe affected by external factors such as time and money (Ajzen, 1991).

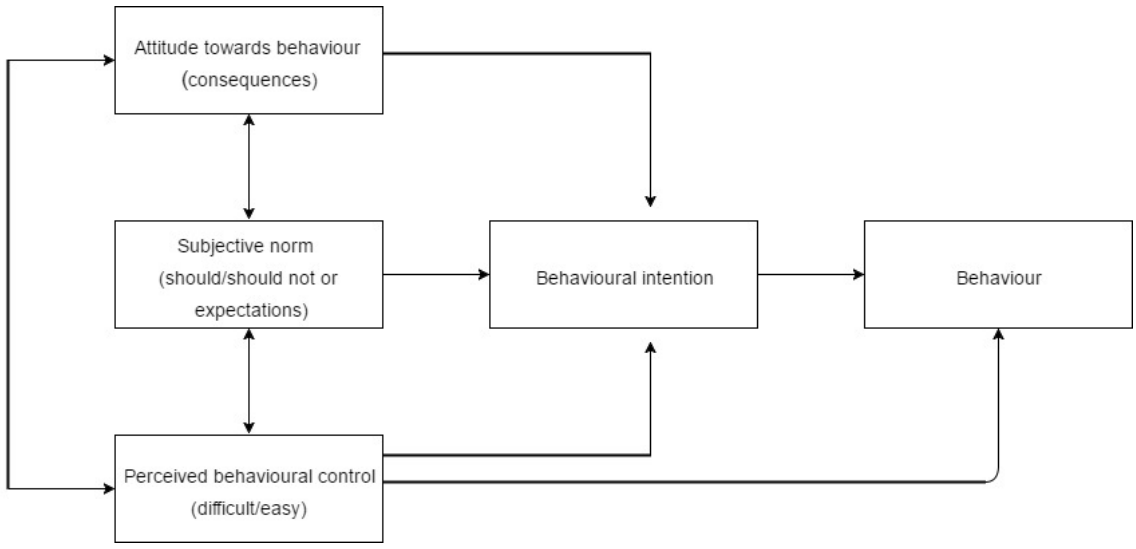

Figure 2.2 The theory of planned behaviour, adapted from Gifford *et al,* (2011).

However, these models and others do not explain the gap between knowledge, intention and action, meaning it is far more complex (Kollmuss and Agyeman, 2002). For example, people who are concerned about climate change continue to drive a car and there has been no correlation shown between attitude and behaviour in this instance (Kollmuss and Agyeman, 2002).

Many studies have attempted to explain the gap between pro-environmental attitudes and pro-environmental behaviour (Kollmuss and Agyeman, 2002; Gifford *et al.,* 2011; Whitmarsh *et al*.,2011). Gifford *et al.* (2011) describes how individuals face barriers to pro-environmental behaviour which may be social, institutional and cultural. This was also found in research by Lorenzoni *et al*. (2007) using three mixed method studies in the UK. Individual barriers include distrust of information, scepticism, a reluctance to change or having other priorities. Social reasons include a lack of action at political and business level and a lack of enabling initiatives by governments.

A study in 2003 in Hampshire, England with 589 participants by Whitmarsh (2009) found that individuals conserve energy in the home or when travelling for self-interests such as saving money, which is an example of an external factor rather than environmental reasons. This was also found in a more recent study in the USA by Ohler and Billger (2014). They found the motivating factor for saving energy tended to be the need to reduce the electricity costs and not for reasons of social responsibility.

Whitmarsh *et al*. (2011) further describes the gap between environmental value and action and discusses the carbon capability of an individual. Whitmarsh (2011) reports there are three key areas of knowledge and awareness, individual behaviour and public engagement that would need to be improved simultaneously in order to maximise an individual's ability to make low carbon lifestyle choices.

More recent studies seem to suggest a link between an individual's group membership. This is known as the social identity theory whereby an individual's environmental behaviour is very much shaped by the environmental group behaviour and a sense of belonging (Fielding and Hornsey, 2016; Sapiains *et al*.,2016). Fielding and Hornsey (2016) describe how the social grouping a person identifies with, influences their environmental attitude positively or

negatively. Therefore social identity strategies could be used to encourage pro-environmental behaviour. An example of interpersonal factors and social identity strategies is reported by Nolan *et al.* (2008) whereby normative messages stating the majority of householders in the area saved energy, influenced other people in the neighbourhood to save energy also. This reason was greater than other reasons such as protecting the environment, saving money or social responsibility (Nolan et al., 2008).

Sapiains *et al*. (2016) study showed that place identity and place attachment had positive influences on pro-environmental behaviour. This was also found in an earlier review by Bott *et al.* (2003) whereby attachment with both people and places had a positive influence on land management and environmental behaviour. This suggests relating climate change to local environmental concerns and personal circumstances may also encourage action (Lorenzoni *et al*., 2007).

It is evident no single change can mitigate climate change but interventions at ground level can lead to significant changes over time and further citizen engagement (Mulugetta *et al*., 2010). While the effects of climate change are world-wide, they are caused by the actions of individuals and businesses (Ostrom, 2009). There will therefore need to be significant changes in lifestyle and how products are produced and consumed if the carbon emission targets are to be met. Environmental management within organisations is discussed in more detail below.

2. 5 Corporate environmental management

Corporate environmental management is part of Corporate Social Responsibility (CSR) which encompasses business ethics, corporate citizenship, sustainability and stakeholder management (Matten and Moon, 2004). The benefits of an organisation being sustainable can be environmental, social and economic (Jamali, 2006). Environmental benefits for example, include reducing waste and emissions which leads to economic benefits of reduced costs and improved

resource management. Social benefits include healthy environments, and more positive impacts on wider society (Jamali, 2006).

However, there are challenges to implementing sustainable principles within an organisation. Fenwick (2007) reported employees may lack understanding of sustainable principles. There may be lack of support from management and from a business perspective strategies may seem too costly, problematic or time consuming. However, Montabon, *et al*. (2007) studied environmental management practices and company performance and found a positive relationship between environmental practices and measures of company performance. Montabon, *et al*. (2007) identified specific environmental practices which were associated with increased company performance such as recycling, waste reduction, incorporating environmental designs and pro-actively looking for opportunities to increase sustainability. Studies have also reported how combining sustainability and organisational learning can be a catalyst for change (Jamali, 2006; Fenwick, 2007).

2.5.1 Sustainably focussed organisational learning

Jamali (2006) and Fenwick (2007) describe how sustainable knowledge and learning at an organisational level can promote long-term changes in systems and processes and equip organisations to deal with the challenges of the future. Jamali (2006) reports that sustainable businesses are constantly reviewing processes and are open to change. Sustainably focussed organisational learning principles include adopting a commitment to sustainable practices together with a learning culture where information is shared. Learning can take place by taking actions and reflecting on results (Ibid).

Furthermore Fenwick (2007) describes a knowledge gap where organisations want to incorporate sustainable values but management, employees and external stakeholders lack practical skills. As part of the training Fenwick (2007) recommends employees take responsibility for designing projects in organisations. Learning may also take place through everyday interactions as people share sustainable approaches (Ibid).

2. 5.2 Carbon reduction in the workplace

A report by Cox *et al.* (2012) commissioned by the Scottish Government, outlined key principles to a successful carbon management plan in the workplace. This includes involvement of employees and management at the earliest stage in planning and decision making. Assessing the impacts of the low carbon activity and providing feedback to employees. This increases knowledge and identifies actions with the greatest impact. These strategies help to achieve systemic changes and promote a long lasting low carbon culture Ibid).

A further study conducted by Markey *et al*. (2015) supports the importance of employee participation in reducing carbon emissions in the workplace. They found a strong correlation with activities at organisational level and the resulting employee participation in ongoing implementation of carbon reduction schemes. Moreover, a literature review of 'Green employee empowerment' by Tariq *et al.* (2014) found that employees that are empowered and eco-conscious have a positive effect on production and profitability. However in order for organisations to become sustainable, their activities need to be measured against objectives (Edwards, 2009).

2. 6 Carbon accounting

Carbon accounting is necessary for an organisation to identify sources of greenhouse gas emissions and to prioritise areas where they can be reduced (Franchetti and Apul, 2013). Furthermore it provides a framework for documenting effects and organisations can then account for their impact on climate change (Schaltegger and Csutora, 2012). CO_2 is a major contributor to climate change but there are other greenhouse gases which also need to be taken into account such methane (CH_4) and nitrous oxide (N_2O) (IPCC, 2007). Therefore, the indicator used in carbon accounting is CO_2 equivalent (CO_2e) to account for the global warming potential of the other greenhouse gases (Schaltegger and Csutora, 2012).

The Greenhouse Gas Protocol (GHG) is the main international standard for carbon accounting, which was developed by the World Resources Institute and the World Business Council for Sustainable Development. It provides an international standard and accounting tools for measuring and accounting greenhouse gas emissions (GHG Protocol, 2012a). The GHG Protocol divide emissions into three categories: scope 1 direct emissions for example from onsite boilers, scope 2 indirect emissions, for example purchased electricity and scope 3 which are indirect emissions not under company control, for example purchased materials (GHG protocol, 2012b).

Schaltegger and Csutora (2012) describe carbon accounting for sustainability as a process to support management on effective and economical improvements by identifying and implementing carbon reduction plans. Melville and Whisnant (2014) outlined some of the challenges faced by organisations in implementing carbon management systems. They faced challenges in data capture and quality, for example scope 3 emissions require information regarding purchased goods which may be difficult to obtain from other organisations and assessing procurement requires accurate records of office supplies. Accounting for business travel also requires accurate logs to be maintained (Melville and Whisnant, 2014). However Huang *et al*. (2009) reported that for some sectors, scope 3 emissions are the most significant and there is a need for further support, information and training in carbon accounting for the business community.

2.7 Summary

The literature review supports the need for urgent action on climate change. It has however outlined the importance of changing human behaviour and the challenges faced in turning concern for climate change into actions in the real world. Evidence has shown that knowledge and awareness alone are not sufficient. The next section introduces a training tool in Carbon Literacy developed to enhance awareness of climate change and to create behaviour change within organisations.

3. MANCHESTER AND THE CARBON LITERACY PROJECT

The City of Manchester is committed to acting on climate change and 2009 saw the first climate change strategy with a target of 41% reduction in CO_2 by 2020 from 2005 levels (Manchester: A Certain Future, 2016). The city now benefits from a climate change strategy for 2017-50 with a target of becoming a zero carbon city by 2050 (Manchester Climate Change Agency, 2016). Other key objectives of the strategy include creating a sustainable economy, healthy communities, resilience to climate change and creating low carbon culture change (Manchester Climate Change Agency, 2016). According to Manchester: A Certain Future's annual report in 2016, the city has achieved a 22% reduction in CO_2 emissions since 2005 levels and is projected to achieve 32% by 2020 but this is far below the original 41% target. (Manchester: A Certain Future, 2016). This highlights the need for more urgent action.

As Manchester is one of the first cities to be committed to reducing the impacts of climate change, it recognises the need to engage citizens and business in novel ways (Manchester: A Certain Future, 2016). As part of the key objective to promote a low carbon culture change, Manchester is aiming to educate all its citizens in Carbon Literacy but as of March 2016, only 2,688 are certified carbon literate (Manchester: A Certain Future, 2016). Carbon Literacy training is offered throughout the Northwest and organisations which have already undertaken the training include Manchester Universities, Manchester Arndale, Council staff and schools in the area (CLP, no date b). It is also recognised that culture and arts organisations are in a position to educate and inform the public through arts and media (Manchester: A Certain Future, 2016). This has led to the employees of HOME participating in the Carbon Literacy Project (CLP). The CLP aims to train the citizens of Manchester in Carbon Literacy and also empower them to engage with others in an innovative way (CLP, no date a). The project defines Carbon Literacy as:

> An awareness of the carbon costs and impacts of everyday activities and the ability and motivation to reduce emissions on an individual, community and organisational basis (CLP, no date b: online).

The standard for CLP developed by Cooler Projects Community Interest Company has core elements to ensure a consistent approach however, content can be customised to the organisations specific needs. The standards are outlined in Table 4.1

Table 4.1 CLP core elements
Source: CLP (no date c)

Area	Standard
Learning method	Relevant to participant's environment Delivered by peers Group learning Focus on achievable actions
Knowledge	Greenhouse gases Climate change evidence Climate change effects Impact of actions Advantages and disadvantages of actions Local and national actions How to obtain help Motivating others
Values	Individuals make a difference Working together Outcomes lead to a better future Equity and fairness
Actions	Create a personal action Create a group action

3. 1 Carbon Literacy project delivered at HOME

The CLP delivered at HOME incorporated an e-learning package developed by Cooler Projects Community Interest Company to cover the knowledge base element of the course. This was followed by a half day workshop developed by Manchester Metropolitan University researchers and conducted at HOME in order to cover the group and peer learning element of the standards. On successful completion of the course the participants were awarded a certificate (CLP, no date d).

The main elements of the half day work shop are outlined according to J. Mörk (personal communication, 26th July 2016, see Appendix C). Bespoke elements of the training including examples of how other organisations in the cultural sector are influencing climate change. Case studies were used to demonstrate the carbon footprint of activities within arts organisations and examples of carbon management within these organisations were discussed. As part of the novel approach to this training, participants were asked to identify two work place actions within their relevant departments in order to develop carbon management plans.

The participants used an ease/effect matrix to assist them in determining which actions could realistically be achieved to reduce carbon in the workplace. The CLP encompasses principles discussed such as involving employees in the decision process at the earliest stage of planning and identifying achievable actions. These actions will inform the development of a low carbon plan at HOME.

4. AIM(S) AND OBJECTIVES

4. 1 Aim(s)

To evaluate the effectiveness of the Carbon Literacy Project at HOME arts centre in terms of employee outcomes and the development of a carbon management plan. The research project focusses on the Carbon Literacy training provided for the employees at HOME arts centre in Manchester. The training differs from previous Carbon Literacy training as the workshop motivates the employees to prioritise actions to be implemented in the workplace and form a carbon management plan.

4. 2 Objectives

1. To analyse participant engagement with the Carbon Literacy training based on employee outcomes and make recommendations to improve Carbon Literacy training.

2. To evaluate the actions pledged by employees to inform the development of a carbon management plan at HOME.

5. METHODOLOGY

This study uses a case study approach for the research as it represents a real world example within a cultural organisation. Case studies allow the researcher to study a question in a practical way and within a particular industry and are particularly useful for exploratory research (Farquhar, 2012).

A variety of data collection methods may be used such as surveys or interviews for in depth investigation (Farquhar, 2012). However, questionnaires are useful for identifying attitudes and opinions where there are more than 20 respondents (Farquhar, 2012). Questionnaires which use rating scales are particularly useful for measuring attitudes and values. The most commonly used is the Likert scale to evaluate attitudes using a five point scale. It is considered effective and high in reliability (Crano *et al.,* 2015). This type of quantitative data uses a choice of constructs which can be measured on an ordinal level. This makes it possible to analyse using numeric and statistical approaches (Montello and Sutton, 2006).

Qualitative data in contrast is not structured and may just be broad questions (Montello and Sutton, 2006). Qualitative data is more difficult to code and can be referred to as not as reliable as quantitative data (Ibid). However Philip (1998) suggests quantitative data may need to be investigated further using qualitative methods and this allows for greater reflection and understanding of a person's perspective. When both methods are used together, they provide a more general approach to an issue (Montello and Sutton, 2006).

5.1 Location

The case study took place at HOME which is located in the centre of Manchester. It is a venue for visual art, film and theatre which opened in April 2015. HOME has two theatres and five cinema screens. The venue also has 500m^2 of gallery space and a bar, café and bookshop. HOME presents both films and drama productions as well as art displays and creative learning programmes (HOME, 2015). HOME has previously been awarded the gold

award in Manchester City Council's Environmental Business Pledge Scheme (HOME, 2015).

5.2 Participants

76 participants carried out Carbon Literacy training delivered at HOME. Each participant completed e-learning on climate change and then attended a workshop within their workplace in five small groups supported by a Carbon Literacy trainer. A self-administered questionnaire was used before the workshop began and also on completion of the training. The pre-course and post-course questionnaire is shown in Appendix A and B.

5. 3 Questionnaire design

The questionnaire was designed by Manchester Metropolitan University researchers and uses a mixed method approach of both closed and open-ended questions as recommended in Montello and Sutton (2006). The design uses pre-course and post-course questions as used by White *et al*. (2013) to test participant knowledge and satisfaction of a training workshop. The questionnaires (Appendix A and B) were constructed to establish:

a) The participant's prior knowledge of climate change initiatives in the cultural sector.
b) The impact of the training on the participant's ability to identify carbon reduction actions in the workplace.
c) The impact of training on the participant's confidence and their likelihood of discussing climate change with others.
d) The participant's views of the training style and activities.

An example of a Likert scale question used in the pre-course and post-course questionnaire is shown in table 5.1 to assess the impact of the workshop on the participants ability to identify actions in the workplace.

Table 5.1 Likert scale example question

How confident do you feel about identifying actions that will reduce your department/organisations carbon impact?	[ ] Not at all confident [ ] Slightly confident [ ] Somewhat confident [ ] Very confident [ ] Extremely confident

Open-ended questions in the post course questionnaire were used to identify the actions chosen to implement in the workplace and the participant's role. They were also used to identify which parts of the training were most useful and why. An example of an open-ended question used to identify the first action chosen is given below in Table 5.2

Table 5.2 An example open-ended question from the post course questionnaire

From your team action plan, please identify the 1st action you are either responsible for, accountable for, or involved with:
What is your role?
Please briefly explain how/why this action will make a significant difference:

5.4 Data analysis

The data was entered onto Survey Monkey software. SPSS version 22 was used for data analysis. Paired questionnaires were anonymised and identified with a number. Pre-course and post-course quantitative data was coded using scales 1-5. Pairs of identical pre-course and post-course questions were tested for difference using Wilcoxon signed-ranks test used by Wheater and Cook (2000) to test for differences in attitudes using ordinal data. Tests for relationships between questions were analysed using cross-tabulation and chi-square test for association (Ibid). Qualitative data for identifying actions and evaluating workshop activities was interpreted using content analysis. Data was

analysed and grouped into categories and then condensed into smaller groups as described by (Matthews and Ross, 2010).

The high ranking actions pledged by employees were then preliminarily assessed for their likely carbon impact using the following criteria:

1. The emissions reduction potential
    1.1. Red-low
    1.2. Amber-moderate
    1.3. Green-high
2. Costs
    2.1. Red-high
    2.2. Amber-neutral
    2.3. Green-savings
3. Time/effort required
    3.1. Red-high
    3.2. Amber-moderate
    3.3. Green-low
4. Stakeholder engagement
    4.1. Red-high staff / public resistance
    4.2. Amber-moderate
    4.3. Green-positive staff / public engagement

6. RESULTS AND DISCUSSION

The following sections discuss the results from the training evaluation questionnaire and also discuss the actions chosen by the participants. The final section provides a list of potential actions to be included in a carbon management plan for HOME.

6.1 Training Evaluation

The participants were asked a series of closed questions to determine the impact of the workshop on their confidence in identifying actions to reduce the organisations carbon impact. They were also asked about their ability to talk about climate change to staff at HOME, visitors to HOME and friends and family, see Appendix A and B for full list.

Wilcoxon signed-rank tests showed the increase in confidence scores from pre-course to post-course questionnaire was significant for all four questions, see Table 6.1. Results indicate the training improved the participant's ability to identify actions and they were more confident talking about climate change to friends and family, staff and visitors to HOME More than 40 participants increased their scores across all four questions with the greatest increase (51) participants in their ability to talk about climate change with visitors to HOME.

Table 6.1 Training evaluation questions and percentage scores (codes: 1 = not at all confident to 5 = extremely confident)

Question	Participants pre-course							Participants post-course							Wilcoxon signed-ranks		
	1	2	3	4	5	Average & S.D.		1	2	3	4	5	Average & S.D.		*T*	*n*	*p*
How confident do you feel about identifying actions that will reduce your department/organisations carbon impact?	2 3%	18 25%	38 52%	10 14%	5 7%	3.0	± 0.9	0 0%	3 4%	22 30%	44 60%	4 5%	3.7	± 0.7	991	71	<0.001
How confident do you feel talking about climate change with friends and family?	1 1%	21 28%	30 40%	19 25%	4 5%	3.1	± 0.9	0 0%	2 3%	20 26%	46 61%	8 11%	3.8	± 0.7	974	75	<0.001
How confident do you feel talking about climate change with staff at HOME?	2 3%	21 28%	35 47%	14 19%	3 4%	2.9	± 0.9	0 0%	2 3%	18 24%	51 67%	5 7%	3.8	± 0.6	1288	75	<0.001
How confident do you feel talking about climate change with visitors to HOME?	7 9%	27 36%	27 36%	11 15%	2 3%	2.7	± 0.9	0 0%	4 5%	26 34%	43 57%	3 4%	3.6	± 0.7	1431	74	<0.001

The percentage increase in scores are also shown in Figure 6.1 for each question. The results suggest this type of training has had a significant positive influence on the ability to influence and inform others on climate change and identify actions in the workplace.

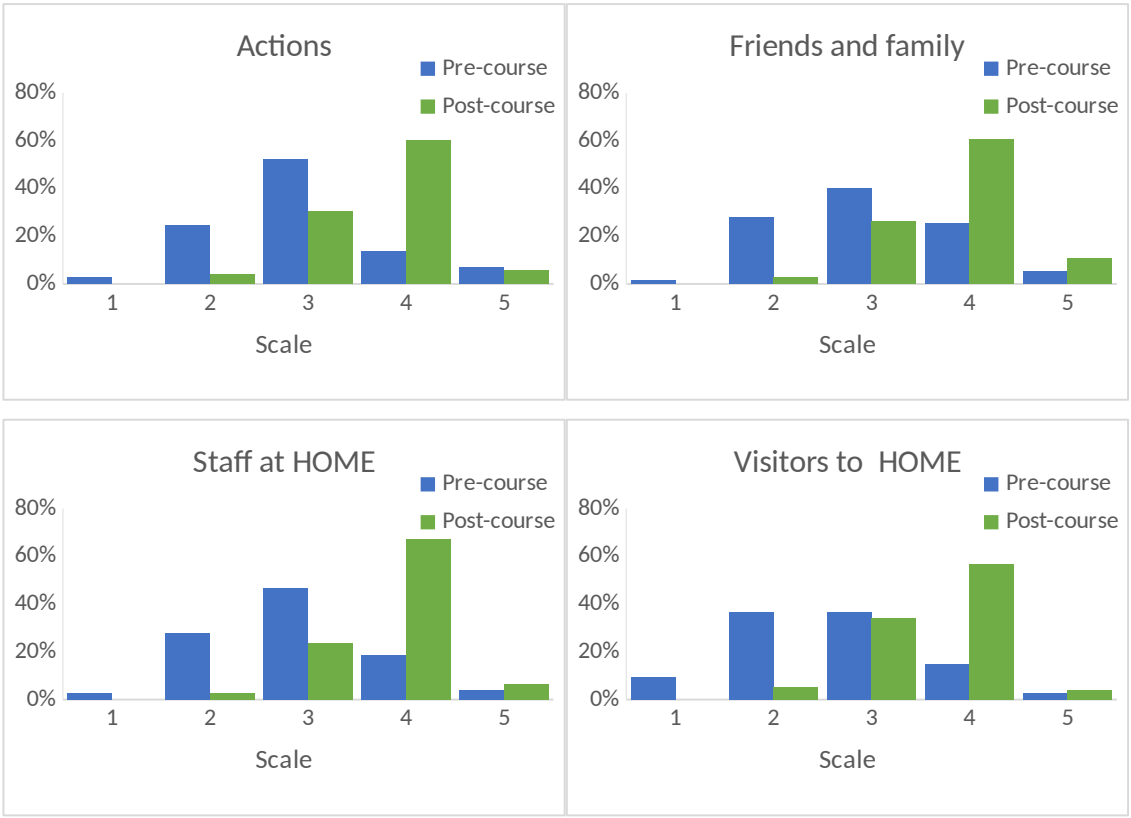

Figure 6.1 Percentage scores for closed questions pre-course and post-course (codes:1 = not at all confident to 5 = extremely confident).

The participants were also asked how likely they were to talk to friends and family, staff at HOME and visitors to HOME about climate change in the pre-course questionnaire with Likert scale answers ranging from never to very often. Following the workshop, they were asked the same question with answers ranging from much less frequently to much more frequently. Table 6.2 cross tabulation of the results shows the majority of participants (63.5%) would talk more frequently to friends and family following the workshop although there was no significant association shown between the pre-course answers and the post-course answers (p=0.380).

Table 6.2 Training evaluation, talking to friends and family, cross tabulation and percentage total scores (X^2=8.572, df=8, p=0.380)

		Post-course: Compared to before the training, how likely are you to talk to Friends and Family about climate change?						
		Much less frequently	Less frequently	About the same	More frequently	Much more frequently	**Total participants**	**Total percentage**
Pre-course: How often do you talk about climate change with Friends and Family?	Never	0	0	1	4	0	**5**	**6.8%**
	Rarely	0	0	3	5	0	**8**	**10.8%**
	Sometimes	0	0	6	22	6	**34**	**45.9%**
	Often	0	0	9	12	1	**22**	**29.7%**
	Very often	0	0	1	4	0	**5**	**6.8%**
	Total participants	**0**	**0**	**20**	**47**	**7**	**74**	**100.0%**
	Total percentage	**0**	**0**	**27.0%**	**63.5%**	**9.5%**	**100.0%**	

Table 6.3 again shows the majority of participants (66.2%) would talk more frequently to staff at HOME with only one participant saying they would speak less frequently to staff (no significant association shown *p=0.168)*.

Table 6.3 Training evaluation, talking to staff at HOME, cross tabulation and percentage total scores (X^2=16.531, df=12, p=0.168)

		Post-course: Compared to before the training, how likely are you to talk to staff at HOME about climate change?						
		Much less frequently	Less frequently	About the same	More frequently	Much more frequently	**Total participants**	**Total percentage**
Pre-course: How often do you talk about climate change to staff at HOME?	Never	0	0	1	3	0	**4**	**5.4%**
	Rarely	0	1	1	13	3	**18**	**24.3%**
	Sometimes	0	0	10	18	5	**33**	**44.6%**
	Often	0	0	1	15	1	**17**	**23.0%**
	Very often	0	0	1	0	1	**2**	**2.7%**
	Total participants	**0**	**1**	**14**	**49**	**10**	**74**	**100.0%**
	Total percentage	**0**	**1.4%**	**18.9%**	**66.2%**	**13.5%**	**100.0%**	

When participants were asked how often they spoke to visitors at HOME about climate change (Table 6.4) 58 participants said they never or rarely spoke about climate change, however following the workshop 48 participants (64.9%) said they would speak more frequently to visitors about climate change (no

significant association shown *p=0.789)*. The results do show a positive influence on the likelihood of talking about climate change in the future.

Table 6.4 Training evaluation, talking to visitors at HOME, cross tabulation and percentage total scores (X^2= 5.499, df=9, p=0.789)

		Post-course: Compared to before the training, how likely are you to talk to visitors at HOME about climate change?						
		Much less frequently	Less frequently	About the same	More frequently	Much more frequently	**Total participants**	**Total percentage**
Pre-course: How often do you talk about climate change to visitors at HOME?	Never	1	0	10	21	1	**33**	**44.6%**
	Rarely	0	0	7	16	2	**25**	**33.8%**
	Sometimes	0	0	4	11	0	**15**	**20.3%**
	Often	0	0	1	0	0	**1**	**1.4%**
	Very often	0	0	0	0	0	**0**	**0**
	Total participants	**1**	**0**	**22**	**48**	**3**	**74**	**100.0%**
	Total percentage	**1.4%**	**0**	**29.7%**	**64.9%**	**4.1%**	**100.0%**	

6. 1.1 Evaluation of activities

Participants were asked in the post-course questionnaire an open-ended question to identify which activity they found most interesting and/or useful and why. A description of the activities is given in Appendix C. Content analysis grouped the most useful activities into eight categories. Table 6.5 presents the results ranked from most popular to the least popular. The most popular activities are discussed in more detail.

Table 6.5 Activities participants found most popular ranked in order.

Activity	Participants (n=72) #	(%) Total
Action plans	24	(33%)
Influencing others	12	(17%)
Carbon footprint	10	(14%)
Ease/effect matrix	9	(13%)
Group work	7	(10%)
All activities	4	(6%)
Case studies	3	(4%)
Climate change information	3	(4%)

6.1.1.1 Action plans

More than a third of the participants (Table 6.5) found developing the action plans for their organisations was the most beneficial activity with responses such as:

'Creating an action plan because it's something I can actually act on'

'Action plan, could think of and contemplate real immediate actions.'

However one participant suggested that actions may not be implemented by management.

'Identifying changes we can implement at HOME -but will be backed by management?'

This is consistent with Garavan *et al.* (2010) whereby employees are more likely to have a positive attitude towards environmental actions if they are supported by management. Engagement with environmental schemes is more likely if employees are given a substantive role in developing the actions (Markey *et al*., 2015). Furthermore, employees that feel involved in decision making and planning are going to be more productive and engaged (Cox *et al*., 2012; Tariq *et al*., 2014).

6.1.1.2 Influencing others

Twelve participants found the activities relating to influencing others useful, particularly when they may experience negativity or apathy towards climate

change. There are different approaches to communicating about climate change and although basic knowledge training increases awareness (Whitmarsh *et al*., 2011; Lorenzoni *et al*., 2007). Other approaches are required such as relating sustainability to local environmental issues and also emphasising personal benefits to the individual and offering further support (Lorenzoni *et al*., 2007).

6.1.1.3 Carbon footprint

Ten participants found the carbon foot printing activity interesting with responses such as:

'Grading different objects as how much carbon they emitted. Revelatory!'

Weidema et al. (2008) discuss how carbon footprint calculations are a good starting point for creating awareness about environmental impacts. There are now many on-line tools for the general public to use to calculate their own carbon footprint and make comparisons. Although they are simple they help to focus on the importance of carbon emissions in everyday life (Ibid).

6.1.1.4 Ease/effect matrix

The ease/effect matrix activity proved popular with nine participants with responses such as:

'The ease/effectiveness scale - interesting to see how something might work great but prove difficult.'

They are a useful tool to quickly identify which actions are worthy of further analysis (Franchetti and Apul, 2013). Actions which are not feasible or possible can be quickly eliminated. This saves time and a further more detailed evaluation can be carried out on the most appropriate actions (Ibid).

6.1.1.5 Summary

Participants were also asked overall, how they rated the workshop and the results are shown in Table 6.6. The overwhelming majority of participants found

the training session either good, very good or excellent (97%) which is a positive response. Interestingly the most enjoyable and useful activities were brainstorming and developing actions, whilst the least popular activities were the information related parts of the workshop. This is also supported by Fenwick (2007) where employees are more enthusiastic if they are responsible for designing projects and learning takes place through sharing of sustainable approaches.

Table 6.6 Participants rating of workshop

		Participants (n=74) #	(%) Total
Overall, how would you rate the quality of today's session?	Poor	0	
	Fair	2	(3%)
	Good	19	(26%)
	Very good	38	(51%)
	Excellent	15	(20%)

6. 2 Actions identified by participants

Participants were asked via two open-ended questions in the post-course questionnaire to commit to two actions following on from the development of their team action plan (n=75). They were also asked to explain their role and how the action would make a significant difference. Content analysis grouped the actions into six major categories (Table 6.7). The largest category of actions was for paper and printing, then travel, energy, carbon awareness, resources and finally actions related to food. Each of the major categories are discussed separately below:

Table 6.7 Areas of action

Actions	Participants (n=75) #	(%) Total
Paper and printing	44	(59%)
Travel	24	(32%)
Energy	19	(25%)
Carbon awareness	18	(24%)
Resources	18	(24%)

Food	9	(12%)

6.2.1 Paper and printing

The actions chosen by the most participants were paper and printing with 40 participants wanting to print less and 24 participants wanting to reduce paper use (20 participants chose both actions). Printing was split into three subcategories with the majority of participants referring to internal printing (Table 6.8).

Table 6.8 Paper and printing actions

Actions	Participants (n=75) #	(%) Total
Paper and printing	44	(59%)
Print less	40	(53%)
Internal print general	23	(31%)
Internal print specific	14	(19%)
External print	4	(5%)
Reduce paper	24	(32%)
Alternative non-printed media	14	(19%)

Fourteen participants identified specific actions such as paperless ticketing and reducing printed promotional materials and script printing, for example:

'Reduce brochure print'

'Reduce promotional print quantities'

Participants also explained how their action would make a difference such as:

'We waste a lot of paper printing multiple scripts'

'We print & waste large volumes of weekly listings and must act to reduce this wastage.'

Fourteen participants specifically chose actions to use alternative non-printed media of which 3 chose online ordering and invoicing. Crosno and Cui (2014) surveyed the events industry to understand the potential challenge and barriers

to paperless ticketing. Barriers included perceived complexity and risk of the new technology. However Crosno and Cui (2014) discussed how companies can overcome this by advertising the environmental benefits of paperless ticketing and reducing the complexity of transactions to buyers. Many of the actions to reducing paper were consistent with good environmental practices discussed by Orantes-Jiménez (2015) such as encouraging email use, printing double sided and recycling paper as notebooks. Furthermore Orantes-Jiménez (2015) discussed how brochure advertising can be done through email rather than printing and creating waste and may encourage purchases online.

6.2.2 Travel

Travel was the second largest category of actions with 12 participant's actions relating to the use of low carbon transport to HOME for staff, visitors and visiting artists (Table 6.9).

Table 6.9 Travel actions

Actions		Participants (n=75) #	(%) Total
Travel		24	(32%)
	General low carbon	12	(16%)
	Business	10	(13%)
	Freight and courier	7	(9%)
	Work practices	2	(3%)

Within this category 5 participants were promoting cycling for staff for example:

'Lobbying for individual discounted / free/ salary-trim bike scheme (pool bikes not effective)'

Three participants actions were aimed at making visiting artists aware of public transport options and one participant specifically mentioned working with the wider cultural sector:

'Working with Greater Manchester cultural sector colleagues on a project to increase the use of low carbon transport to arts events.'

The next subcategory of actions were related to business travel with 4 participants actions specifically relating to the use of Skype for meetings and 4 participants actions relating to international travel for example:

'Reduce European Flights taken by Theatre Team Members & Freelancers.'

Tait *et al.* (2014) evaluated low carbon transport initiatives in a city in Scotland and found the public perceived public transport as expensive, unreliable and increases journey time. Cycling was seen as dangerous in the city and fragmented. Greater Manchester have produced a transport strategy up to 2040 to overcome these barriers by providing an expansion of the Metro link, and a more integrated bus system. They plan to increase rail capacity and make fares more affordable with integrated ticketing. 20 mph zones are to be introduced to make cycling and walking safer (Transport for Greater Manchester, 2017).

Tait *et al.* (2014) argues that raising awareness of the positive benefits of sustainable transport must be part of travel initiatives. However, Howarth and Polyviou (2012) argue information alone is not enough to shift travel behaviours as it is affected by many factors including attitude, normality and beliefs. In order to achieve a shift in travel behaviour, public transport would need to be seen as cost-effective, timely and frequent (Ibid).

Stewart *et al*. (2015) conducted a systematic review of interventions to increase commuter cycling and found little evidence to support effective interventions including smaller 'bike to work schemes and larger programmes such as English Cycling Cities and Towns. However, some schemes may have had public health benefits (Ibid). In contrast Cairns *et al*. (2010) found that

workplace travel initiatives can be successful if they integrate all forms of transport such as walking, cycling, bus, train and car sharing but only if they are appropriately supported by staff and management. Many organisations also included business travel within the travel plan and were encouraging initiatives such as videoconferencing. Successful travel plans also require sufficient staff resources allocated to the implementation of the plan and to monitor the progress of targets (Cairns *et al*., 2010).

6.2.3 Energy

Table 6.10 shows the largest group of actions related to switching off power (8) participants, whilst 6 participants wanted to use rechargeable batteries, for example:

'Ensure, only use rechargeable batteries on torches/radios'

Only a small number of actions related to the infrastructure of the building where two participants wanted to investigate the use of solar power and one participant also mentioned turbines. Four participant's actions related to the implementation of Light-emitting diode (LED) lighting.

Table 6.10 Energy related actions

Actions	Participants (n=75) #	(%) Total
Energy	19	(25%)
Switch off equipment	8	(11%)
Rechargeable batteries	6	(8%)
LED lighting	4	(5%)
Renewable	2	(3%)
Hand dryers	1	(1%)

The Greenhouse gas protocol advocates switching off equipment when not in use and purchasing timers for equipment such as photocopiers and printers so they switch off automatically (Putt del Pino and Bhatia, 2002). These interventions can provide the greatest emission savings and are the lowest cost to the organisation (Ibid). LED lighting is one of the fastest growing electronic

industries (Loiselle *et al*., 2015). Studies have found them to be a viable technology with improved environmental and economic benefits (Arik and Setlur, 2009; Loiselle *et al.,* 2015). Furthermore Arik and Setlur (2009) conclude they should result in reduced lifecycle costs, improved safety and illumination.

6.2.4 Carbon awareness

As previously discussed, culture and arts organisations such as HOME are in a good position to inform the public on climate change. This reflected in the choice of actions with 18 participants choosing to promote carbon awareness and 12 participants directing actions specifically towards visitors and/or other businesses (Table 6.11) with actions such as:

'*To develop on 'Arts/Ecology/Climate change' themed strand which runs throughout the whole of HOME's public programmes.'*

'more global warming awareness arts projects with our young people'

Table 6.11 Carbon awareness actions

Actions	Participants (n=75) #	(%) Total
Carbon awareness	18	(24%)
Visitors and businesses	12	(16%)
Staff	7	(9%)

There are a number of organisations in the cultural sector such as Julie's Bicycle and Creative Climate Coalition recognising that creative industries have the ability to transform discussion on climate change into actions. Julie's bicycle seek to use their creativity to influence audiences and also provide green tools to help the creative industries become more sustainable (Julie's Bicycle, 2017).

6.2.5 Resources

Resource use and recycling was reflected in the actions of 18 participants with recycling as the highest subcategory (Table 6.12). Five participants specifically mentioned the re-use of sets for example:

'Encourage designers, creatives & producers to use sustainable, carbon neutral and recyclable sets, costumes & props'

Two participants actions were specifically related to sharing resources, for example:

'*Networking with other Theatres to see whether we can borrow equipment instead of hiring or potentially buying equipment*.'

Eight participants actions were related to material reduction such as reducing the use of polyvinyl chloride (PVC) tape and banning the use of medium-density fibreboard (MDF).

Table 6.12 Resource based actions

Actions		Participants (n=75) #	(%) Total
Resources		18	(24%)
	Recycling	10	(13%)
	Reduce materials	8	(11%)

6.2.6 Food

Food security and sustainability is of global concern along with climate change and unsustainable food systems (Prosperi *et al*., 2014; Moustafa, 2015). Food related actions was the smallest category (Table 6.13).

Table 6.13 Food related actions

Actions		Participants (n=75) #	(%) Total
Food		10	(13%)
	Staff initiatives	6	(8%)
	Business initiatives	4	(5%)

However, food contributes significantly to the greenhouse gas emissions with meat and dairy foods producing the most greenhouse gas emissions (Garnett, 2011). Furthermore Garnett (2011) concludes if we are to keep within emissions targets, eating habits will have to change. This was reflected in the actions with 5 participants referring to an increased vegetarian diet and two participants specifically directed towards vegan diets for example:

'Vegan week at work - promote to all depts. Organise a staff buffet - so awareness is increased.'

Interestingly one participants action was to form an allotment. Turner (2011) concludes community gardens potentially encourage and promote sustainable living in urban areas and may reinforce connection with environmental issues. One participants action related to food waste by encouraging staff to bring in surplus food from home to share. Food waste is a considerable problem with an estimated 7.3 million tonnes of food wasted in the UK in 2015 (Waste Resources Actions Programme, 2017). Waste Resources Actions Programme (WRAP) works with business, governments and communities to reduce food waste and also works with individuals with campaigns such as the Love Food Hate Waste initiative (Ibid).

6.3 Priority list of actions

As a result of the qualitative analysis, Table 6.14 shows a list of potential actions with preliminary assessment. The criteria used is as previously described in the methods section, for example likely carbon emission reduction potential using red, amber and green ratings to assign low, moderate and high carbon reduction. The costing criteria is based on high cost, neutral costs and potential savings and the time required is based on high, moderate and low requirements.

Table 6.14 Priority list of actions with red / amber / green ratings for assessment criteria where green indicates a positive outcome and amber and red indicate potential barriers

	Criteria				
Action description	**Emissions reduction potential**	**Costs**	**Time/ effort required**	**Stakeholder engagement**	**Comments**
Paperless ticketing					Potential public resistance
Double sided printing					Potential staff resistance
Reduce brochure print					Potential public resistance
Reduce reprinted scripts					Potential staff resistance
Reduce business travel/flights					Cost/benefit analysis required
Travel ticket offer					Cost/benefit analysis required
Salary-trim bicycle scheme					Cost/benefit analysis required
Use rechargeable batteries					Cost/benefit analysis required
Phase in LED lighting					Cost/benefit analysis required
Switch off equipment when not in use					Potential staff resistance
Show / events on climate change	N/A				Potential staff resistance
Re-use of sets					Potential staff resistance
Share equipment with other theatres					Requires stakeholder engagement
Vegetarian business catering					Potential staff resistance

HOME now need to carry out detailed feasibility analysis for the actions including technical, operational and organisational requirements (Franchetti, and Apul, 2013). Assessment would need to be conducted on carbon reduction impact, cost justification and payback time, together with feedback from stakeholders (Franchetti, and Apul, 2013). These actions could then form part of a carbon management plan.

7. RECOMMENDATIONS

Recommendations for further research, training design and implementation of Carbon Literacy training are outlined below:

- Following the successful trial of a novel approach to Carbon Literacy training, this training model should be adopted by other organisations.
- Training should be specific to organisations as this is useful in aiding the identification of actions related to a specific business.
- The main emphasis of the workshop should be in identifying achievable actions as providing information alone has proven ineffective in creating change.
- HOME should promote carbon awareness throughout the business plan
- Further research should evaluate the annual carbon reduction savings resulting from the implementation of the actions in the workplace. This would also show the long-term benefits of Carbon Literacy training.
- HOME should involve employees and management in the planning and decision process of a carbon management plan as this is important for a successful outcome.

- HOME should provide regular feedback of carbon reduction initiatives to continue to keep employees motivated.
- HOME should continue to implement Carbon Literacy training for new employees.

8. CONCLUSIONS

The study was limited to the participants of one organisation in the culture sector in Manchester and therefore only represents a specific cohort of employees. Further research should compare the results within other organisations. However, the findings in this case study indicate Carbon Literacy is effective in identifying a diverse range of work place actions and motivating employees. This is also supported in the literature where carbon management plans are more successful if employees and managers are involved at the earliest stage in the development of carbon reduction initiatives. The training within an arts and culture organisation also has the potential to influence wider audiences on climate change. This was identified in the choice of participant's actions on promoting carbon awareness. Further study should evaluate the long-term impacts of the training and the resulting carbon management plan, together with annual carbon emission reductions.

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10. ACKNOWLEDGEMENTS

I would like to thank Dr Rachel Dunk and Jane Mörk at Manchester Metropolitan University for their invaluable assistance and also to my family Zoe, John and Neil.

Appendix A: Carbon Literacy pre-course questionnaire

Name:..... Training Date:

Job role/team:.....

	Never heard of it	Aware of it	Familiar with it / Have used it	Very familiar with it / Use it frequently	Directly involved with it / Use it extensively
Julies Bicycle					
Albert (carbon footprint calculator)					
Creative Climate Coalition					
Cape Farewell					

1. How familiar are you with the following organisations/initiatives?

2. If you know of any other examples of what the cultural sector (or specific cultural organisations) is doing to tackle climate change, please note them below:

3. How confident do you feel about identifying actions that will reduce your department /organisation's carbon impact?

Not at all confident | Slightly confident | Somewhat confident | Very confident | Extremely confident

4. How often do you talk about climate change with the following people?

	Never	Rarely (annually)	Sometimes (semi-annually)	Often (monthly)	Very often (weekly)

Friends & Family					
Staff at HOME					
Visitors to HOME					

5. How confident do you feel talking about climate change with the following people?

	Not at all confident	Slightly confident	Somewhat confident	Very confident	Extremely confident
Friends & Family					
Staff at HOME					
Visitors to HOME					

Evaluation of e-learning

6. How useful did you find the e-learning?

Not at all useful	Slightly useful	Somewhat useful	Very useful	Extremely Useful

7. How informative did you find the e-learning?

Not at all informative	Slightly informative	Somewhat informative	Very informative	Extremely informative

8. How user-friendly did you find the e-learning?

Not at all user-friendly	Slightly user-friendly	Somewhat user-friendly	Very user-friendly	Extremely user-friendly

Appendix B: Carbon Literacy post-course questionnaire

Name:..... Training Date:

Job role/team:.....

From your team action plan, please identify the 1st action you are either ***responsible for, accountable for, or involved in implementing***:

What is your role?

Please briefly explain how/why this action will make a significant difference:

From your team action plan, please identify the 2nd action you are either ***responsible for, accountable for, or involved in implementing***:

What is your role?

Please briefly explain how/why this action will make a significant difference:

1. How confident do you feel about identifying actions that will reduce your department /organisation's carbon impact?

Not at all confident	Slightly confident	Somewhat confident	Very confident	Extremely confident

2. How confident do you now feel talking about climate change with the following people?

	Not at all confident	Slightly confident	Somewhat confident	Very confident	Extremely confident
Friends & Family					
Staff at HOME					

Visitors to HOME					

3. Compared to before the training, how likely are you to talk to the following people about climate change?

	Much less frequently	Less frequently	About the same	More frequently	Much more frequently
Friends & Family					
Staff at HOME					
Visitors to HOME					

4. Please tell us which exercise you found most interesting and/or useful, and why:

5. Is there anything you would change in today's session?

6. Is there anything (to do with climate change or reducing carbon emissions) you would like further information or support on?

7. Overall, how would you rate the quality of today's session?

Poor Fair Good Very good Excellent

8. Would you recommend this training to others?

Yes No

Opportunity to become a Carbon Literacy Trainer

HOME's aim in line with Manchester City Council KPI is to have 100% of staff trained in Carbon Literacy. As part of this, we would like to incorporate this training into new starter inductions. We are keen to hear from anyone who

would be interested in becoming a Carbon Literacy Trainer to deliver this (training would be given).

Are you interested?

Yes No

Appendix C: Description of workshop activities

Table 1. Description of workshop activities in Carbon Literacy project at HOME.

Section	Activity	Timing
Part 1	Introduction to the course & outline of today's activities Pre-course questionnaire	2 min
	Activity:- Find your Greenhouse gas: or quick go around asking for name and favourite season	10 min
	Morgan Freeman film	3.5 min
Part 2	**3 mins Brief verbal recap:** How will we (society) be affected by climate	15 min

	change? (This will be accompanied by a rolling slideshow with climate related images) **Activity - How will our organisations be affected by climate change?:** In groups of 4-5, participants will be allocated a particular aspect of the organisation and asked to consider how it will be affected by climate change. Ideas will be shared with the whole group. The choice of aspects may vary according to the organisation and/or participants, but may include: Buildings/spaces Functions (performances, exhibitions) Stakeholders (staff, volunteers, participants, visitors etc.) 5 mins brainstorming: Hand out 2-3 cards with an aspect+ matrix, ask group to complete matrix with their aspects 7 minutes feedback: ask groups to share their different findings	
Part 3 What do we mean by carbon? What a carbon footprint is and the carbon impact of everyday things.	**Brief presentation (5 mins):** In this presentation, we will explain what we mean by carbon – carbon as a useful unit of measure - and what a carbon footprint is. The term "carbon dioxide equivalent "will also be introduced and explained. This is followed by a visual representation of a tonne of carbon (e.g. double decker buses, bathtubs, or similar) – and a comparison of carbon footprint of everyday activities in a series of infographics. **5 mins Activity: Higher/lower** A higher/lower game in which participants guess the carbon footprint of everyday things (e.g. latte from the café, water from the tap, orange juice) and place them in rank order from highest to lowest.	10 min
Part 4 The UK's and Manchester's position on climate change (short background / context session)	**Brief presentation:** The International context (including fairness, equity & responsibility). This includes a quick discussion of the carbon footprint of four different countries: Who is responsible for climate change? Who is being most affected by climate change? Which leads us on to: UK Climate Change Act – 34% by 2020, 80% carbon reduction by 2050 Manchester: A Certain Future – 41% by 2020, zero carbon by 2050 COP21 and why this is an important step forward. The responsibility of Manchester will be framed in the context of Manchester as the birthplace of	5 min

	the Industrial Revolution. As a wealthy city in the developed world, Manchester has both historic responsibility and high capability to take action on climate change. Is it time to forge a new cultural identity around a modern zero carbon city? **Video clip: Future scenarios:** This section is wrapped up with a 2.5 min long video clip created by Phil Korbel from the CL project. The clip describes a potential future scenario in which Manchester actively responds to climate change: • The Upward spiral: https://www.youtube.com/watch?v=75-XcctXBd4	
Part 5 How is the sector contributing to climate change? What is the carbon impact of the cultural sector / your organisation? What is and can the sector do?	**5 mins Presentation: What is the sector doing?** • Funding requirements, Julies Bicycle, Bafta/Albert, Creative Climate Coalition • What is the carbon footprint of the sector?- carbon footprint of a gig or something • What are the two main ways in which the sector can respond to climate change? (Carbon reduction and spheres of influence) • What are other organisations already doing? A presentation of what other organisations in the cultural sector are doing both locally and nationally. The case studies in this section can be tailored according to the participants in the session. Use one example i.e footprint of a gig **Activity- How does your organisation impact on climate change?:** • Following on from the introduction of carbon footprints in previous section, participants are asked to discuss and identify the sources of greenhouse gases within their department/organisation. The discussion will be aided by a sheet of guiding questions. • 5-10 mins identifying • 10 mins feedback	25 min
Part 6 How can your organisation	**Activity 1- Spheres of influence:** This section is very much framed around the notion of the role of the sector i.e. “reflecting our	30 min

act on climate change?	world back to us". Spider diagram activity (similar to the one we did in the brainstorming session!). Participants are asked to identify stakeholders that their department can influence to take action on climate change. They are also encouraged to think of <u>how</u> stakeholders could be influenced. **Activity 2 - Carbon reduction:** Building on from the activity in section 5, participants are asked to discuss and brainstorm ways in which they can reduce the carbon impact within their department/organisation. - Put down as many ideas as possible on post its. (state this is part of their action plan so they should primarily focus on their department) - Add these to the banners on the wall. - They can choose ideas from spheres of influence diagram as well.	
Part 7 Action planning	**Prioritising options and developing action plan:** brainstorm and prioritise actions (both individual and team based) that will form the basis for their team's climate action plan. Explain the actions will feed in to HOMES action plan. Prioritise actions: Ask participants to take the actions they have just brainstormed and put them in the ease/effect matrix (if they want to they can add more) We will prioritise actions by using the ease effect matrix Tell them about the criteria Add actions to the template - Each action needs to identify who is responsible and accountable etc.	35 min
Part 8 Communicating and influencing action on climate change	**PowerPoint presentation (5 mins long):** - Climate change communication approaches: a presentation of various known approaches used for communicating and influencing action on climate change. - In groups of 4-5, participants are asked to choose a stakeholder from the "spheres of influence activity". They need to identify the stakeholder's barriers and driver for acting on climate change and create a pitch (How would you influence the stakeholder to act on climate change) to present to the rest of the group.	30 min

	Optional: feel free to create a poster presenting the pitch	
Part 9 Wrap up	Q&A Completion of relevant forms	10 min

Appendix D: Ethics checklist

ETHICS CHECKLIST

This checklist must be completed **before** commencement of **any** research project. This includes projects undertaken by **staff and by students as part of a UG, PGT or PGR programme.** Please attach a Risk Assessment.

Manchester Metropolitan University

Please also refer to the University's Academic Ethics Procedures; Standard Operating Procedures and the University's Guidelines on Good Research Practice

Full name and title of applicant:	Rachel Dunk on behalf of Helen Shaw (student)
University Telephone Number:	0161 247 1185
University Email address:	r.dunk@mmu.ac.uk
Status: All staff and students involved in research are strongly encouraged to complete the Research Integrity Training which is available via the Staff and Research Student Moodle areas	Undergraduate Student ☑ Postgraduate Student: Taught ☐ Postgraduate Student: Research ☐ Staff ☐
Department/School/Other Unit:	School of Science and the Environment
Programme of study (if applicable):	BSc (Hons) Environmental Science
Name of DoS/Supervisor/Line manager:	Supervisors: Dr Rachel Dunk and Jane Mork
Project Title:	Evaluation of carbon literacy training at HOME
Start & End date (cannot be retrospective):	07/07/2016 to 01/05/2017
Number of participants (if applicable):	120
Funding Source:	N/A
Brief description of research project activities (300 words max): attached	

	YES	NO
Does the project involve NHS patients or resources? If 'yes' please note that your project may need NHS National Research Ethics Service (NRES) approval. Be aware that research carried out in a NHS trust also requires governance approval. Click here to find out if your research requires NRES approval Click here to visit the National Research Ethics Service website To find out more about Governance Approval in the NHS click here	☐	☑
Does the project require NRES approval?	☐	☑
If yes, has approval been granted by NRES? Attach copy of letter of approval. Approval cannot be granted without a copy of the letter.	☐	☐

NB Question 2 should only be answered if you have answered YES to Question 1. All other questions are mandatory.	YES	NO
1. Are you are gathering data from people?	☑	☐
For information on why you need informed consent from your participants please click here		
2. If you are gathering data from people, have you:	☐	☐
a. attached a participant information sheet explaining your approach to their involvement in your research and maintaining confidentiality of their data?	☑	☐
b. attached a consent form? (not required for questionnaires)	☐	☑
Click here to see an example of a participant information sheet and consent form		
3. Are you gathering data from secondary sources such as websites, archive material, and research datasets?	☐	☑
Click here to find out what ethical issues may exist with secondary data		
4. Have you read the guidance on data protection issues?	☑	☐
a. Have you considered and addressed data protection issues – relating to storing and disposing of data?	☑	☐
b. Is this in an auditable form? (can you trace use of the data from collection to disposal)	☑	☐
5. Have you read the guidance on appropriate research and consent procedures for participants who may be perceived to be vulnerable?	☑	☐
a. Does your study involve participants who are particularly vulnerable or unable to give informed consent (e.g. children, people with learning disabilities, your own students)?	☐	☑
6. Will the study require the co-operation of a gatekeeper for initial access to the groups or individuals to be recruited (e.g. students at school, members of self-help group, nursing home residents)?	☐	☑
Click for an example of a PIS and information about gatekeepers		
7. Will the study involve the use of participants' images or sensitive data (e.g. participants personal details stored electronically, image capture techniques)?	☐	☑
Click here for guidance on images and sensitive data		
8. Will the study involve discussion of sensitive topics (e.g. sexual activity, drug use)?	☐	☑
Click here for an advisory distress protocol		
9. Could the study induce psychological stress or anxiety in participants or those associated with the research, however unlikely you think that risk is?	☐	☑
Click here to read about how to deal with stress and anxiety caused by research procedures		
10. Will blood or tissue samples be obtained from participants?	☐	☑
Click here to read how the Human Tissue Act might affect your work		
11. Is your research governed by the Ionising Radiation (Medical Exposure) Regulations (IRMER) 2000?	☐	☑
Click here to learn more about IRMER		
12. Are drugs, placebos or other substances (e.g. food substances, vitamins) to be administered to the study participants or will the study involve invasive, intrusive or potentially harmful procedures of any kind?	☐	☑
Click here to read about how participants need to be warned of potential risks in this kind of research		
13. Is pain or more than mild discomfort likely to result from the study? Please attach the pain assessment tool you will be using.	☐	☑

Click here to read how participants need to be warned of pain or mild discomfort resulting from the study and what do about it.		
14. Will the study involve prolonged or repetitive testing or does it include a physical intervention?	☐	☑
Click here to discover what constitutes a physical intervention and here to read how any prolonged or repetitive testing needs to managed for participant wellbeing and safety		
15. Will participants to take part in the study without their knowledge and informed consent? If yes, please include a justification.	☐	☑
Click here to read about situations where research may be carried out without informed consent		
16. Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?	☐	☑
Click here to read guidance on payment for participants		
17. Is there an existing relationship between the researcher(s) and the participant(s) that needs to be considered? For instance, a lecturer researching his/her students, or a manager interviewing her/his staff?	☐	☑
Click here to read guidance on how existing power relationships need to be dealt with in research procedures		
18. Have you undertaken Risk Assessments for each of the procedures that you are undertaking?	☑	☐
19. Is any of the research activity taking place outside of the UK?	☐	☑
20. Does your research fit into any of the following security sensitive categories: • commissioned by the military • commissioned under an EU security call • involve the acquisition of security clearances • concerns terrorist or extreme groups If Yes, please complete a Security Sensitive Information Form	☐	☑

I understand that if granted, this approval will apply to the current project protocol and timeframe stated. If there are any changes I will be required to review the ethical consideration(s) and this will include completion of a 'Request for Amendment' form.

☑I have attached a Risk Assessment
☑I have attached an Insurance Checklist

If the applicant has answered **YES** to **ANY** of the questions **5a – 17** then they must complete the MMU Application for Ethical Approval.

Signature of Applicant: _____ Rachel Dunk 2016.07.06 16:42:35 +01'00' Date: 06/07/2016 (DD/MM/YY)

Independent Approval for the above project is (please check the appropriate box):
Granted
☑ I confirm that there are no ethical issues requiring further consideration and the project can commence.

Not Granted
☐ I confirm that there are ethical issues requiring further consideration and will refer the project protocol to the Faculty Research Group Officer.

Signature: Konstantinos Tzoulas Digitally signed by Konstantinos Tzoulas DN: cn=Konstantinos Tzoulas, o=Manchester Metropolitan University, ou=School Science & Environment, email=k.tzoulas@mmu.ac.uk, c=GB Date: 2016.07.06 19:23:51 +01'00' Date: 06/07/2016 (DD/MM/YY)

Print Name: Konstantinos Tzoulas Position: Senior Lecturer

Approver: Independent Scrutiniser for UG and PG Taught/ PGRs RD1 Scrutiniser/ Faculty Head of Ethics for staff.

Appendix E: Risk assessment

Manchester Metropolitan University

RISK ASSESSMENT

FACULTY/DEPARTMENT School of Science and Environment	**BUILDING** John Dalton East	
1) ACTIVITY Delivery of carbon literacy training at HOME, 2 Tony Wilson Place, Manchester, M15 4FN. 6 x sessions to be delivered in period July-September 2016. Each session will have ca. 20 participants. Working off site with use of AV equipment.		
2) PERSONS AT RISK Rachel Dunk (staff), Jane Mork (staff), Helen Shaw (student)		
3A) HAZARDS Risk of electrocution from electrical equipment. Potential risk of tripping over cables. Working off site. **3B) Hazard Rating** **Low** ☒ **Med** ☐ **High** ☐		
4A) RISK CONTROL METHODS Ensure all equipment is PAT tested. Ensure no trailing cables and that all walkways in room are clear of trip hazards. Ensure colleagues are informed when working off site, with correct use of myHR system. Helen Shaw (student) will only be present when accompanies by a member of MMU staff (either Rachel Dunk or Jane Mork) **4B) Hazard Rating with control methods** **Low** ☒ **Med** ☐ **High** ☐		
5) FURTHER ACTION REQUIRED None		
NAME AND TITLE OF ASSESSOR Simon Caporn	**SIGNATURE** Simon JM Caporn 99902672	**DATE** 06/07/16
		REVIEW DATE
SIGNATURE OF DEAN/HEAD OF DEPT. E. Price 99900633		**DATE** 07/07/2016
		REVIEW DATE