

# Climate Change Strategy for Coventry City Council United Kingdom (Mitigation and Adaptation)

Anusha Kanuganti\*

Department of Environmental Management, University of Wolverhampton, West Midlands, Wolverhampton, United Kingdom

\*Corresponding author: Anusha Kanuganti, Department of Environmental Management, University of Wolverhampton, West Midlands, Wolverhampton, United Kingdom, Tel: +919666364385; E-mail: [anusha.kanuganti2811@gmail.com](mailto:anusha.kanuganti2811@gmail.com)

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## Introduction

### Background of the study area (Coventry City Council)

Coventry is located in the South Eastern most corner of the West Midlands, occupying an area of 38 square miles in the middle of England (Figure 1) and has grown to be the 11th largest city in England and 13th largest city in the UK Office of National Statistics [1].

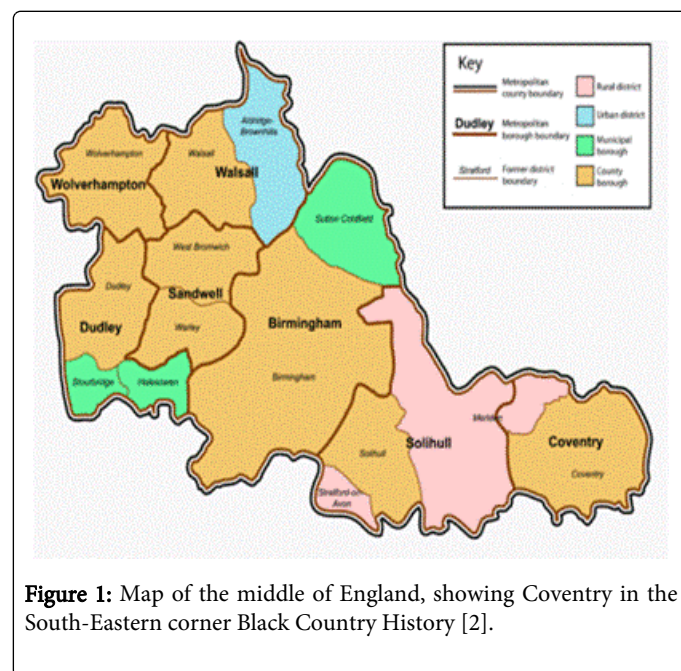


Figure 1: Map of the middle of England, showing Coventry in the South-Eastern corner Black Country History [2].

	Coventry (numbers)	West Midlands (numbers)	GB (numbers)
All People	315,700	5,455,200	60,462,600
Males	157,500	2,684,000	29,758,900
Females	158,200	2,771,200	30,703,700

Table 1: Coventry's demographic population compared to the West Midlands and Great Britain [1].

Coventry has a population of over 315,000 people (Table 1) with two thirds of the population being within working age. The average age of a person living in Coventry is 35, which is much lower than both the West Midlands, and the English average Office of National

Statistics [1]. There are a further 1.14 million people within a 30-minute drive of the city centre, with Coventry's catchment area including Warwick, Leamington Spa, Solihull and the South of Birmingham Met Office [3].

In the last five to ten years the population of Coventry has been changing with the highest growth rates seen for decades. Whilst population projections are an imprecise science, latest projections estimate that the population will grow to 370,000 by 2033 [1].

### International, National and Region/Local context

The evidence that human activities are having a profound effect on our climate is overwhelming. Avoiding the most serious consequences of climate change will require all of us to make changes to how we live our lives Climate Change Strategy for Coventry [4]. The UK has, therefore, positioned itself to take a lead in responding to the threat from Climate Change. The seriousness of the situation has resulted in the UK being the first country to set legally binding targets to reduce its carbon emissions through the Climate Change Act 2008. These targets will be achieved through a succession of five-year carbon budgets set well in advance to provide a clear, credible, long-term framework for the move to a low carbon UK economy, and give businesses and individuals the direction and certainty they need to play their part. The first three carbon budgets were set in spring 2009, and covers the period from 2008 to 2022; the fourth, running from 2023 – 2027, was set in law at the end of June 2011 [5].

### International context

The EU Renewable Directives [6] mandated levels of renewable energy use in the EU since the EU has their target to reduce Green House Gases (GHG) emission by at least 20% and increase their energy consumption from renewable energy resources by 20% by the year 2020 [6].

The Kyoto Protocol is a protocol of the United Nation Framework Convention on Climate Change (UNFCCC) directed at controlling global warming Climate Change Conference in the Durban [7]. In December 1997, UNFCCC was adopted in Kyoto, Japan and signed into action on February 2005 and September 2011 about 191 states have signed and ratified to protocol but the decision was made to adopt the 2nd commitment period of the Kyoto Protocol in 2012 to run to 2017-2020, at 2011 Climate Change Conference in Durban. The UK's commitment is to reduce its GHG emissions by 12% below 1990 levels [7].

### National context

Climate Change Act 2008 [8], was established purposely to help nations how to reduce the impact level of Green House Gases (GHG),

it was set as a legally bind target of the United Kingdom to reduce their GHG emissions by at least 80% before or by 2050. Greenhouse gas emission base line of 1990, make it possible for the UK to reduce the quantity or level of their GHG emissions by 34% before 2020 and largest target of 80% by 2050, this is what make the UK to become the 1<sup>st</sup> long-term legally binding target of GHG reduction. The UK also seeks to encourage Carbon-Management and help the low-carbon economic transition and also introduced the Carbon-reduction commitment scheme in the same Act Climate Change Act 2008 [8].

### Regional/Local context

Coventry council is one of the signatory members of the West Midland’s Climate Change Declaration and is committed to mitigate their climate change through reducing GHG emissions [9]. Taking strategic steps to manage the impact of a climate change and working together as a team in partnership with their communities to respond to climatic change [9].

The Climate Change Act 2008 [8] issues a number of public duties on Coventry to act in response to climate change by reducing GHG emissions, adapting the effects of a climate change and delivering the council programme of work in a sustainable way [8]. Coventry also recognises that it has a vital role as a manager of its own estate, as an employer, as a service provider and as a leader of the community.

### Definition of the terms

“Coventry council plan to tackle climate change in two ways; firstly by reducing our carbon dioxide emissions to avoid making the problem worse (Mitigation) and, secondly by preparing the city for the inevitable changes in the climate (Adaptation).

**Adapting to a changing climate:** Coventry need to adapt to our changing climate and this means planning to avoid the risks associated with these changes before they happen. Every organisation in Coventry needs to understand and manage these risks in order to ensure that their assets, services and infrastructure continue to function appropriately and that the city is resilient to unexpected weather events [9].

### Target

The Coventry’s target to reduce carbon dioxide emissions by 27.5% by the year 2020, using 2005 as the baseline year. Climate change must be addressed in two ways: mitigation and adaptation. Mitigation is about tackling the causes of climate change - the emission of greenhouse gases from human activities, adaptation is recognizing that we are committed to some degree of climate change from humankind’s activities to date and that we must plan to adapt to these inevitable changes [9]. The Strategy contains a series of action plans addressing both climate change adaptation and mitigation.

The Climate Change Act 2008 [8] sets legally binding targets on the UK to reduce greenhouse gas emissions by at least 80 per cent by 2050, based on 1990 levels. The Council plan to tackle climate change in two ways; firstly by reducing our carbon dioxide emissions to avoid making the problem worse (Mitigation) and, secondly by preparing the city for the inevitable changes in the climate (Adaptation) [10].

### Coventry’s future climate change scenarios

The emissions of carbon dioxide made over the past two hundred years mean that some changes to the earth’s climate are inevitable [5].

There are basic needs to adapt to this changing climate and this means planning to avoid the risks associated with these changes before they happen [5]. Every organisation in Coventry needs to understand and manage these changing climate risks, to ensure that their assets, services and infrastructure continue to function appropriately and that the city is resilient to unexpected events [5].

### Predictions

Global average temperatures (Figure 2) are on an upward trend as a result of carbon dioxide emissions to the atmosphere. The Intergovernmental Panel on Climate Change IPCC has modelled a number of scenarios with the worst case scenario leading to a predicted 5.7°C rise which could bring dramatic changes in global weather patterns. Cutting carbon dioxide emissions to limit the rise to 2°C would avoid the worst of the predicted effects [5].

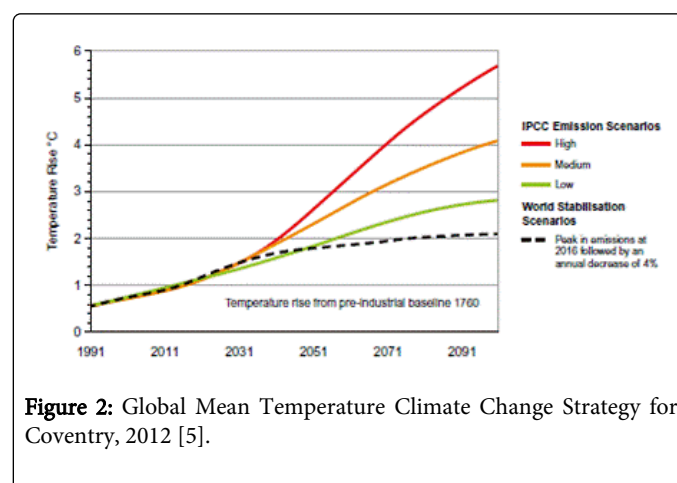


Figure 2: Global Mean Temperature Climate Change Strategy for Coventry, 2012 [5].

Weather variable	Projected Change in Weather Variable		
	2020	2040	2080
Summer temperatures	↑ 1.5C	↑ 2.2C	↑ 3.7C <small>Temperature on hottest day could increase by up to 10C</small>
Summer rainfall	↓ 6%	↓ 11%	↓ 20%
Winter rainfall	↑ 5%	↑ 11%	↑ 18% <small>Rainfall on the wettest day could increase up to 30%</small>

Table 2: Projected Future Climate Change Scenario for Coventry [5].

Table 2 outlines the projected changes in the climate for the West Midlands over the coming decades. The table shows that the climate change projections for Coventry predict that mean temperatures in both summer and winter will increase throughout this century and that heat waves will become more common and more severe. Patterns of rainfall are likely to be altered; summer rainfall amounts may decrease significantly; whereas during the winter large increase in precipitation is likely which will result in a heightened risk of flooding.

**Changes in Temperatures and Rainfall in Coventry:** It is predicted to be 1.5 degrees in the 2020's scenario and increase to 2.2 degrees by 2040's scenario and 3.7 degrees by 2080's but temperature on hottest day could increase by up to 10 degrees [5].

**Summer Rainfall:** The forecast is 6%, 11% and 20% in the 2020's, 2040's and 2080's scenarios respectively [5].

**Winter Rainfall:** In the 2020 scenario is only 5% and is gradually increasing in the 2040's and 2080's by 11% and 18% but rainfall on the wettest day could increase up to 30% [5].

## Description

### Coventry's climate change strategy (Mitigation and adaptation)

The Council is committed to tackling climate change and to making a major contribution to reducing greenhouse gas emissions for the city [9]. The Strategy recognizes the challenge we all face, and the action that they needs to take for the wellbeing of the city now and in the future.

Coventry was one of the first cities to produce a climate change strategy in collaboration with its Local Strategic Partnership, Coventry Partnership. In working jointly on the strategy the council were able to connect with the key partners in the city, private, public and voluntary, to ensure that tackling climate change is a common goal [4]. The challenge of reducing the city's carbon emissions is significant and will need the concerted effort of everyone in Coventry to achieve their goals [9]. The Climate Change Strategy was widely consulted upon prior to publishing. Consultation exercise was reviewed and where appropriate incorporated into the final document.

Mitigation and adaptation are the two basic methods via which effects of climate change are managed and the strategy aimed at stabilizing and reducing the greenhouse gases to avoid causing any effect to the atmosphere is called Mitigation while the strategy aimed in adjusting the human to cope with the effect of the climate change is called Adaptation [11].

The Council aims to influence and empower resident, community groups, schools and businesses in the area in order to help them to mitigate and adapt to climate change by reducing their carbon-emission and help them to implement carbon-reduction projects [4].

## Mitigation

The UK has, therefore, positioned itself to take a lead in responding to the threat from climate change. The seriousness of the situation has resulted in the UK being the first country to set legally binding targets to reduce its carbon emissions through the Climate Change Act 2008 [8,12].

Coventry council make effort and aims to reduce carbon-emission by 21% between 2013 and 2020 over 2011-2012 baseline and achieve the target of the carbon management plan 2013-2020, a programme of projects and actions are needed to be implemented [4].

**Reducing our Carbon emissions:** Using fuel and energy more wisely in our homes, workplaces & schools and while travelling will reduce carbon emissions and lessen the impact of climate change in the future. For this approach to be effective it requires action on three main fronts [9]:

- Modifying our behavior so we use energy less wastefully
- Improving buildings and infrastructure so that energy is used more efficiently
- Investigating how we can generate our own energy from renewable sources

## Emission from transport

The aims of using electric Cars is to enable the council to reduce their emission from vehicles via transport planning and the use of alternative fuels and technologies like E-vehicle to ensure that, new development is located and designed to encourage the use of public transport, walking and cycling [13]. The council obtained two hybrid electric cars and charging point on long-term lease in 2011/12 assisted by the government [13]. The council encouraging the utilization of E-vehicle to reduce petrol consumption or total reliance on petroleum and CO<sub>2</sub> emission and as at then there were many electric tricycle on the move in the cities which are funded by the government [13].

## Renewable energy

Coventry council in their effort to reduce the emission to the minimal level, council had installed renewable energy technologies of 14,071 kW capacity and are considered to be a near carbon neutral fuel as the trees that are cut down for fuel use are re-planted, maintaining a continuous carbon cycle [4]. Biomass boilers have been installed to replace carbon intensive oil and electric based heating system which are previously installed in buildings which are off the gas grid and the table1 below shows the renewable energy of high capacities that were installed by the Coventry council [4].

## Energy efficiency

The council is enable to reduce their carbon emission from their buildings which include schools, residents etc. as well as to support the communities of the council area to reduce energy consumption by using the low electric bulb and mitigate climate change, also to commits fully in advising and supporting residents to help them with affordable heating system to their houses as well as using the best efficiency practice in all the residential and commercial buildings by producing current coal-based electricity which double the present efficiency [4,14].

## Adaptation

The council need to adapt their climate condition and this means planning to avoid the risks associated with these changes before they happen [5]. Every organisation in Coventry needs to understand and manage these risks, to ensure that their assets, services and infrastructure continue to function appropriately and that the city is resilient to unexpected weather events [9,12].

Despite efforts to avoid dangerous climate change, the levels of greenhouse gases in the atmosphere are already sufficient to guarantee some level of climate change, indeed we are already locked into around 40 years of unavoidable change [12].

Coventry might look in 2020 if weather they can capitalised on the opportunities to create a low carbon, resilient city with a high quality of life for its residents. Over 100 experts and partners participated in seven themed seminars to produce a vision for 2020 and also to recommend key action areas on the transformation journey [9]. The key themes explored during the inquiries included:

- Transport
- Energy Use
- Employment
- Local Food Economy
- Climate Change Adaptation
- Buildings, Houses and City Centre
- Resource Recovery

This strategy incorporates both mitigation and adaptation to deliver Coventry's objectives and relies and supports many other citywide plans and strategies. The main ones are listed below:

### Sustainable community strategy

This strategy helps to deliver a vision for Coventry to be a growing, accessible city where people choose to live, work and be educated and where businesses choose to invest. It aims to achieve this vision through seven key themes plus two cross-cutting themes, of which one is making a positive environmental contribution and the other is tackling climate change [9,12].



Figure 3: Flooding in Coventry [8].

### Local Transport Plan (LTP 2011 – 2026)

This West Midlands's strategy highlights the important connection between reducing carbon emissions, the health and wellbeing agenda and projected creation of new jobs and economic prosperity within the transport sector [9].

Using fuel and energy more wisely in their homes, workplaces & schools and in how they travel will reduce carbon emissions and lessen the impact of climate change in the future. This will help to ensure that global temperatures rise by no more than 2°C, which is thought to be the maximum before severe weather effects which will affect millions of people around the world become likely [12].

### Forest and forestry

Design and managing forest and woodlands in order to adapt with and help the community to cope with climate change, woodlands can help to prevent flooding, cool cities and creates wildlife corridors

[4,12]. Trees can help the Council to cope a climate change since they provide shade, alleviate flooding and create a valuable wildlife habitat according to Department for Environment, Food and Rural Affairs (Defra) when appropriately located can help community and biodiversity to adapt to the harmful effect of climate change and when the trees are planted in a suitable way, they can reduce the risk of soil erosion as well as help to cool towns and cities this is because they absorb and reduce air pollutants, which are often highest in the city areas [4].

### Flooding

The Flood and Water Management Act (FWMA) came into effect in April 2010 and implemented a number of recommendations from the Pitt Review into the widespread flooding which occurred throughout the UK in 2007 [4]. It clarified the responsibilities for tackling flooding in an area and placed new responsibilities on the Environment Agency, local councils and property developers (among others) to manage the risk of flooding [8].

Flooding can occur in two ways; from rivers bursting their banks or from surface water where the ground is so saturated that rainfall cannot effectively drain away [4]. Coventry is particularly vulnerable to surface water flooding which occurs when heavy rainfall overwhelms the local drainage systems (Figure 3). Increases in winter precipitation and in the frequency, duration and intensity of heavy downpours will mean sewer systems and carriageway drainage may be unable to cope, resulting in flash flood events Climate Change Act 2008 [8].

It is important to plan developments so that the risk of flooding is reduced from the start. National planning guidance on flood and risk development is provided through Planning Policy Statement PPS25. This document makes the Environment Agency a statutory consulted on all planning developments in flood risk areas with critical drainage problems, and for any developments on land exceeding 1 hectare outside flood risk areas [12]. The risk of surface water flooding is reduced by replacing green space (parks, grass verges and front gardens) with impermeable surfaces which prevent rainwater from naturally draining away into the ground [4]. Coventry has a low risk of river flooding; it has two rivers flowing through its boundaries, the River Sherbourne and River Sowe, which have not historically been subject to significant flooding [4]. The flood map below (Figure 4) was produced by the Environment Agency and indicates areas susceptible to river flooding [4]. Dark blue shows the area that could be affected by a river flood that has a 1 per cent (1 in 100) or greater chance of happening each year, if there were no flood defences. Light blue shows the additional extent of an extreme flood from rivers. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year [4].

### Drought

Changing patterns of precipitation will have significant implications for water resource availability [4]. In the summer, higher temperatures will mean that demand for water grows just as supply declines due to lower rainfall, So Coventry council captured extra winter rainfall and stored and then run the risk of the council demands for water exceeding supplies [4]. Quite simply, less water needs to be used while also increasing the amount of water in supply. For those receiving their water through a water meter using less water also means saving money [4].

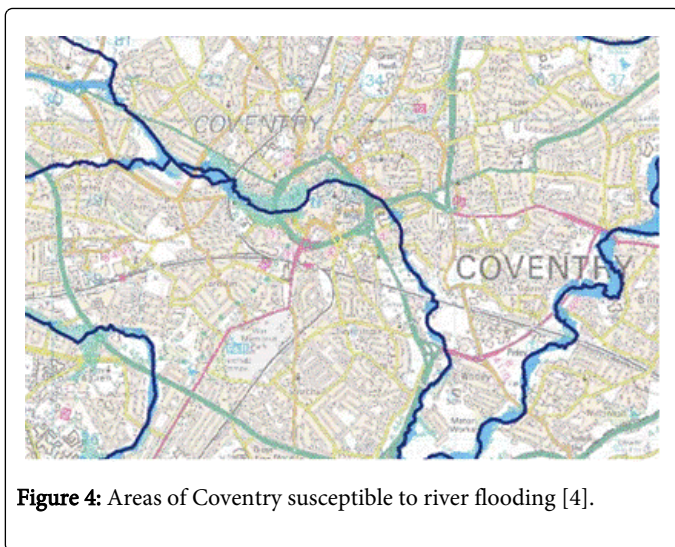


Figure 4: Areas of Coventry susceptible to river flooding [4].

## Evaluations

Coventry council plan to tackle climate change in two ways; firstly by reducing our carbon dioxide emissions to avoid making the problem worse (Mitigation) and, secondly by preparing the city for the inevitable changes in the climate (Adaptation).

**Reducing our carbon emissions:** Using fuel and energy more wisely in their homes, workplaces & schools and while travelling will reduce carbon emissions and lessen the impact of climate change in the future. For this approach to be effective it requires action on three main fronts: Modifying their behavior so they make use of energy less wastefully, improving buildings and infrastructures that energy is used more efficiently as well as investigating how the council can generate their own energy from renewable sources [9,12]. The mitigation sub-themes include:

**Adapting to a changing climate:** Coventry need to adapt to our changing climate and this means planning to avoid the risks associated with these changes before they happen. Every organisation in Coventry needs to understand and manage these risks, to ensure that their assets, services and infrastructure continue to function appropriately and that the city is resilient to unexpected weather events.

In order to tackle climate change in the Coventry, recycled materials are expected to be used in manufacturing companies or use less energy compare to the energy required for creation of new raw material product; some amount of methane and greenhouse gases are cutting down through recycling waste adaptive strategy which help in reducing the amount of waste sent to landfill [9]. The Council made action to support and encourage the resident and community to reduce the quantity they consume as well as re-use materials that are sent to waste and recycle them [9]. Electric cars are used in some areas of the city centre in the council to ease reliance on crude oil and cut back some amount of CO<sub>2</sub> which is a welcome technological development. However, the council comprises of both urban and the rural areas and it's very difficult to have the same option in the local area, therefore the council should provide as much as possible e-vehicle across its landmass [9].

Developing green spaces and woodland, heath land for biodiversity by Coventry city council is an important aspect of climate change

mitigation and adaptation because green spaces improves air quality, provides protection against heat wave, natural carbon sink and artificial cooling there by reducing air conditioning and consequently increase energy efficiency (Oliveira et al, 2011). Protecting the heath land and woodland is equally important as predicted future climate change will have significant impacts on species and habitat [15,16].

Woodlands reduce the impact of heavy rains and floodwaters and this indicates that trees can have a vital game to play in Sustainable Urban Drainage Systems (SUDs) and when trees are planted along riverbanks, it can create shade, helping to maintain low water temperatures which can help limiting the effect of climate change on fish population.

Encouraging community residents to use energy efficiency bulbs from both domestic and business energy use is remarkable effort to reduce greenhouse gases because according energy use in buildings and tackling fuel poverty is an important measure in climate change mitigation. However, most local authorities have policies in place to either mitigate or adapt to climate change but those polices lack proper follow up and implementation. The Council's commitment to encourage the use renewable energy sources and installing low energy bulbs in houses is credible in response to the UK's commitment to certify that by 2020 all the energy necessity is met from renewable energy origins [7]. In addition, the use of renewable energy in buildings could potentially reduce CO<sub>2</sub> emission as stated that energy usages in buildings contribute about a quarter of UK's aggregate greenhouse gas emissions. Moreover, the Council's effort to increase energy efficiency and tackle fuel poverty at homes within the borough is also a laudable struggle because it is in line with the government effort to tackle fuel poverty in homes by the year 2016 [17].

The target set by Coventry City Council of achieving greenhouse gas reduction of 27.5% by the year 2020, using 2005 as the baseline year indicates that the council has responded to the statutes set in the Climate Change Act, 2008 [8] which requires all local authorities to formulate Climate Change Mitigation and adaptation strategies as well as set out target to reduce emissions. The act which was adopted from the European Union (EU) climate change and the Kyoto protocol that forms framework to decrease emissions therefore set target of 26-32% reduction in carbon dioxide emissions by 2020 and 80% target by 2050 measured against 1990 levels Climate Change Act, 2008 [8].

The effort of Coventry City Council to embark on water management is credible because issues surrounding water will become one of the most common effects of climate change in terms of both quality and quantity of water resources UK Water briefing, 2008. In addition, as climate change affects water quality it will eventually affect human health, water use and the ecosystem [18].

Furthermore, installation of sustainable drainage system, providing flood defence system and draught resistance plant species by Coventry City Councils is highly commendable needs rewording to cope the changes brought about by climate change because anticipated climate changes for the region include temperature increase together with increase in winter rainfall which will mean greater risk of drought, heat wave and flooding [19]. Coventry city council encourage sustainable business within the council which is commendable because climate change has impacts on the economic sector therefore is good for the council to prepare for risks and opportunities in business and to be resilience to changing climate in their businesses [19].

The council has been accredited with Carbon Trust Standard (CTS) for its action on climate change by measuring, managing & reducing

carbon-emissions since 2009. Climate change provides some opportunities to the council, for example, longer growing season and ability to grow new crops, increased tourism opportunity for outdoors related activities and reduces heat demand during period and improved health and wellbeing due to increased opportunity to exercise outdoors activities. E-vehicles is used in the city centres of the council but is a great challenge to the citizens that shrinks in the rural areas, therefore this is a big challenge to the council.

Developing a local transport plan can assist the Council in achieving reductions in the amount of carbon dioxide emitted from the transport sector. However, there is a need for the Council to encourage low emission transport system such as Cycling and working. In 2009 domestic emissions from car and taxis in the UK accounted for about 58% greenhouse gasses. This implies that sustainable transport system will significant reduce greenhouse gasses as urban communities consumed more than 65% of the world energy and emits about 70% greenhouse gasses Chavez-Baeza and Sheinbaum-Pardo, 2014 [20]. However there does not appear that the council is engaged in any transport infrastructural development such as road maintenance, cycling track and foot path infrastructural development as stated that the government provides fund to local authorities to develop their transport services [21].

Coventry was one of the first cities to produce a climate change strategy in collaboration with its Local Strategic Partnership, Coventry Partnership. In working jointly on the strategy the council were able to connect with the key partners in the city, private, public and voluntary, to ensure that tackling climate change is a common goal [4]. The challenge of reducing the city's carbon emissions is significant and will need the concerted effort of everyone in Coventry to achieve their goals [9]. The Climate Change Strategy was widely consulted upon prior to publishing. Consultation exercise was reviewed and where appropriate incorporated into the final document.

The council has no separate document dealing with the strategies for the climate change separately which could make researchers and students very difficult to find the requirement of the comprehensive resource achievement of the council area towards tackling of climate changes. The council should set a body responsible to monitor their water efficiency and utilization in order to determine where and how the council can make use of water more efficient, to look on how to reduce water wastage to identify the specific area of high water consuming and potential inefficiency and they should develop their action plan in order to identify an area of improvements.

The tool will allow actors in the council to identify if mitigation and adaptation are needed to best cope with climate variability. It was observe that mitigation and adaptation might be complementary at some point. Therefore, methodology and a tool will help the Coventry, West Midlands and the UK in the decision making process towards the best way to respond to climate change is required. Climate Changes is really happening, and have direct impact to various economic sectors especially on water resources, human health, ecosystem and biodiversity. However, by putting energy efficiency,

renewable energy and paying more attention to the environment, working together globally to reduce the contribution to global warming while creating a stronger, healthier and more secure sustainable world.

The European Environment Agency (EEA) identifies limited scientific knowledge, uncertainty about the local impact of future climate change and lack of long-term planning strategies, coordination and use of management tools that consider climate change at regional, river-basin and cross-sectorial levels.

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