

Climate Change

“The warming of the global climate system is unequivocal, as is now evident from observations of increases in global air and ocean temperatures, widespread melting of ice and snow and rising global sea level”
(Intergovernmental Panel on Climate Change)

Climate change refers to changes in climate on a local and global level over long term timescales. One of the reasons people worry about climate change is because it is warming the Earth to levels not experienced before which can have far reaching and devastating effects. There are natural and human causes of climate change, the main human cause being accelerated ‘greenhouse gas’ emissions. Greenhouse gases are gases such as carbon dioxide which is created mainly from the burning of fossil fuels for uses such as electricity in houses.

Climate Change Act

The Climate Change Act was introduced by the government in 2008. It set a legally binding target to reduce greenhouse gas emissions by at least 80% by 2050. This was so that they can stay below a 2°C increase in global temperature as going beyond this increase will have seriously harmful effects. For example, an increase in global temperature of over 2 degrees will see increasing amounts of land becoming uninhabitable due to drought and heat. Also, hurricanes will increase in power to levels beyond the top-level measured at current times, making them extremely dangerous with much higher destruction levels. World food levels will become critically endangered meaning increasing poverty and higher death rates due to starvation.

One of the specific things in the Climate Change Act was a carbon budget for the UK. The carbon emission levels are to be reviewed every 5 years to make sure that the limits are being met. The first budget was set for between 2008 and 2012 and had a limit of 3,018 megatons of carbon. The UK met this budget with only 36 megatons under the limit. The next budget will be reviewed in 2017 and has a limit of 2,782, much less than the first
(Department of Energy and Climate Change, 2015).

If these limits weren’t in place and we were left to continue the way we have been doing, then by 2035 there would be an increase in the average temperature in East Anglia by 1.5 degrees. By 2065 this would increase to 2 degrees and by 2100 up to 3 degrees, just in the winter months. The summer months would see the temperature rising by a maximum of 4 degrees by 2100, way beyond the dangerous level. Precipitation levels will also change. In the winter months there is likely to be an increase by up to 10% by 2065, rising to 20% by 2100. This would see a higher risk of flooding to the East Anglia area. In the summer months the precipitation levels may decrease by as much as 20% by 2065 and even 30% by 2100. This would see a much higher risk of droughts and water shortages in the East Anglia region *(IPCC, 2013)*.

Sea Level Rise

Climate Change also contributes to sea level rise. Sea level rise is caused by thermal expansion of the sea water due to the warmer climate. Melting land ice is also a cause, as is postglacial rebound. Postglacial rebound is when the plates are returning to equilibrium once a heavy ice load has been lifted. For example the north of the UK once had huge amounts of land ice which weighed down that land. This meant the south of the UK rose to a higher level. Now the land ice has melted, the north of the UK is slowly rising and the south of the UK is sinking, eventually returning the UK to equilibrium. It's like someone lying on an inflatable bed. Their weight makes the middle of the bed sink and the edges of the bed will rise up around that weight. When the person gets off the bed it will return to its original equilibrium state. The equilibrium state for the Earth happens much slower.

Estimates of sea level rise vary but experts have said that it's been rising at a rate of 3.5mm per year since the early 1990s. Predictions say that this is expected to accelerate, seeing the ocean rise by between 0.8 to 2 meters by 2100 (*National Geographic*). This rise would have a devastating effect on Norfolk. Low lying settlements such as Kings Lynn will be under threat and settlements along the coast such as Cromer and Happisburg will be lost unless sea defences are modernised. Valuable agricultural land like the Fens will be lost to flooding and salinisation and the Norfolk Broads will be threatened which may cause a decline in the local economy.

The rise would also cause a loss of over 40% of the current Essex salt marshes (*Boorman, 1992*). The salt marshes get eroded by the rising sea level but they are prevented from migrating inland because of fixed flood defence walls, this is called coastal squeeze. This would mean a reduction in many salt marsh species including the Redshank, a popular British wading bird. Other coastal habitats such as coastal grazing marshes and sand dunes will also be affected by the rising sea. Soft cliffs, such as those in Suffolk, are eroding at a rate of 4.7 meters per year and will continue to increase as the sea continues to rise. The problem with trying to prevent sea level rise is that the sea warms more slowly than the air, so even if we were able to stop the trend in air temperature increase now, the sea temperature rise would still continue for decades (*Norfolk Coast Partnership, 2014*).

Environment

Climate change will have a significant impact in all areas, especially the environment. It will have an impact on the migration and distribution of many marine species, mobile invertebrates and birds such as wildfowl and wading birds (*NCP, 2014*). It is estimated that coastal floodplains, grazing marshes and saline lagoons will lose up to 50 hectares in the East of England alone. This is the greatest loss for any region in the UK. This especially applies to fen, purple moor grass, rush pasture and reed bed habitats which will lose up to 20 hectares in this region (*ClimateUK, 2012*). In the AONB's rivers and other water bodies, Brown Trout and Sea Trout are likely to decline as the water temperature rises. Also amphibians such as the Great Crested Newt are likely to lose potentially suitable climate space under the higher temperature rise scenario. With the decrease in area of salt marsh, there is

likely to be a decline in the number of bird species, such as Brent Goose which fell from a population of approximately 9,000 in 2003 to a population of approximately 5,000 in 2011 (Harley, 2012).

Agriculture

More than 75% of the East of England is used for farming, with farmers in Norfolk, Suffolk and Cambridgeshire farming well over half of the country's entire sugar beet crop. The East of England is one of the most vulnerable regions highlighting the importance of protecting the agricultural and horticultural industries in the region. The drier summers will only increase the pressure on water for irrigation purposes, leading to water shortages throughout the region. It will also mean a higher soil moisture deficit and an increase chance of soil erosion when there is eventually rainfall (*ClimateUK, 2012*). This will wash away nutrients essential to the crops, reducing the quality. However it has been thought that there is a potential for an increase in crop yield in current crops and even potential for new crops to enter production in the region.

Tourism

One of the many industries in the East of England is the tourism industry. It has been estimated that visitors to the East of England spend a total of around £5 billion per year (*Office for National Statistics, 2014*). A threat to the tourist industry along the coast is sea level rise causing erosion and flooding. This could damage essential infrastructure, destroy beaches and could damage attractions such as historical monuments. This may all reduce visitor numbers which could cause a decline in the local economy. Another tourist area which might be under threat is the Norfolk Broads. The Broads have over 7 million visitors a year contributing £469 million to the local economy (*Norfolk Rural Development Strategy, 2013*). The risk of flooding and sea level rise raises the threat of salt water incursion, destroying rare ecosystems and so potentially decreasing visitor numbers which could lead to damage to the local economy.

It has been suggested that a changing climate in the area (warmer, with drier summers) may cause visitor numbers to increase in the future. This would benefit local businesses and the economy greatly but it may also potentially put increasing pressure on sensitive habitats and species. For example, walking and cycling activities have been known to cause trampling and erosion among the dunes and saltmarshes and water sports, popular along the North Norfolk coast, have been known to cause disruption to seal colonies in breeding and feeding areas (*Wilson, 2006*).

Housing

More intense rainfall and sea level rise caused by climate change increases the risk of localised flooding and erosion. This increases the risk of damage to property because of flooding. The Norfolk County Council has 4 priority groups based on the potential number of people at risk from flooding. The top priority is Norwich with over 22,000 people at risk and 1,909 non-residential properties at risk. The next priority group includes Kings Lynn with 3,707 people and 686 non-residential properties at risk. The third group includes

towns like Cromer and Sheringham and the final category includes smaller settlements like Winterton and Wells (*Norfolk County Council, 2011*). Around 40% of the people at risk of flooding in North Norfolk are in South Creake with another 20% in Mundesley. Mundesley has more danger from deep, fast flowing water and so with the increase in risk of flooding there will also be an increased risk to life (*Environment Agency, 2009*).

Health

The south and east areas of the UK are the most vulnerable to the changing temperatures cause by climate change. Heat-related mortality is expected to increase steeply by around 70% by the 2020s and is expected to continue rising. Cold-related mortality is much higher than heat-related mortality with a rate of 68 deaths per 100,000 as opposed to 4 deaths per 100,000 in the East of England. Cold-related deaths are likely to see a decrease however of around 2% by the 2020s. Climate change may also have an effect on those who suffer with hayfever. The changes in temperature can affect plants by making them flower earlier and so, because of this, people who suffer with an allergy to pollen could experience a longer allergy season. Exposure to increasing levels of ultraviolet radiation is harmful to people. With climate change increasing the levels of ultraviolet radiation, people will be at a higher risk of non-melanoma skin cancers (*Health Protection Agency, 2012*).

Future

In 2012 Norfolk County Council secured funding from the Energy Saving Trust's Local Energy Assessment Fund to develop an energy education programme for students to see them test their skills as green energy assessors. In 2013, Norfolk County Council created a Business Travel Pack to help companies and their staff find more sustainable ways to travel by cycling or using the bus. This is one of the measures of their Better Bus Area Initiative which was created using a £2.6m grant from the department for transport.

The Norfolk County Council set an example for creating a greener future by installing 200 solar panels in 2015 on the roof of County Hall. This helps to reduce its carbon emissions and also saves money. They have also installed fully insulated windows to reduce its heat loss. Norfolk County Council do recognise the dangers that climate change poses and are trying to tackle the problems. This can only be done with the involvement of everyone from local councils and businesses right down to individuals.

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