

Climate Change

A Sustainability Case Study

Colin Dewsnap

**SUSTAINABLE
DORSET**



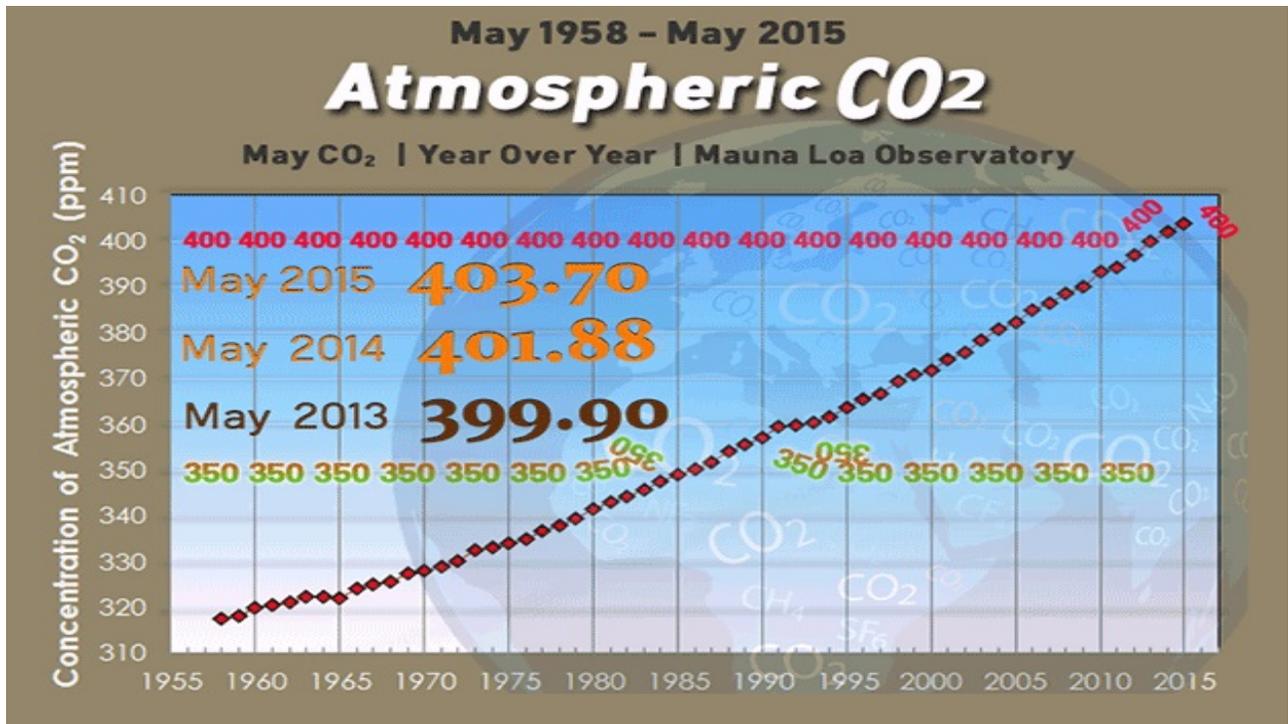
**Connecting Communities
and Nurturing Resilience**

A Sustainability Case Study – Climate Change

Of the 9 planetary boundaries established by Rockstrom et al., 3 have already breached the inner sustainable circle safety level, 3 are deteriorating significantly, 2 have not yet been measured and the 9th (Stratospheric Ozone Depletion) is actually a comparative success as the problem (the emission of chlorine gas into the stratosphere) was identified early enough for global action to be agreed.

However, of these 9, Climate Change is an issue that is more complex, more noticeable on a daily basis and developing at an exponential rate; it is proposed therefore to examine treat this as a case study.

The safe limit calculated by Rockstrom is that greenhouse gas emissions should be no greater than 350ppm (This limit has subsequently been accepted by the IPCC (see later) as the limit to prevent the global atmospheric temperature rising above 2⁰C. It will be seen that the limit in the diagram has only just been exceeded but that was prior to 2009 and in 2015 that level has already risen to over 400 and rising rapidly (see below)



NOTE: the level in July 2017 was 407.25 ppm

Levels of 350ppm and 400 may not seem overly significant but the Earth has been in equilibrium within the bounds of 190/280ppm for over 400,000 years, and these levels have encompassed the extremes of the various ice ages and the interglacial periods in between.

A Short History of the Science of Climate Change

This report is not one that explains this science in detail, there are many other such reports and books referred to in the Appendix but one in particular is recommended – “Climate Change” by HRH the Prince of Wales, Tony Juniper and Emily Shuckbergh published in the Ladybird Expert series for adults.

As long ago as 1831, a French scientist, Joseph Fourier discovered that increasing the amount of CO₂ into the Atmosphere also increased the temperature, although not in direct correlation. More recent scientists such as John Tyndall in 1869 and Svante Arrhenius in 1896 developed the original discovery so that now we understand that the Earth’s lower atmosphere – the troposphere - allows the Sun’s high intensity ultra violet energy rays to enter but then acts as a blanket to prevent a good proportion of them, low intensity infra red rays, escaping back into space –“ The Greenhouse Effect”

For the past at least 400,000 years, the level of CO₂ in our troposphere has varied with astonishing consistency between 190 and 280 ppm (**parts per million**), the former when the Earth experienced Ice Ages and the latter when more warmer periods prevailed called Interglacials.

The next major milestone on this journey was not until the United Nations Earth Summit in 1992 in Rio de Janeiro agreed a Climate Change Framework Convention to tackle the problem signed by 170 countries. Shortly before this, the UN and the World Meteorology Organisation had established the Intergovernmental Panel on Climate Change (IPCC) with the specific mandate to **advise governments on how to deal with the problem**. Since then, 5 reports have been published all with an ever increasing degree of alarm being raised. Regrettably, in parallel with the work of the IPCC, a colossal denial ‘industry’ developed largely funded by the major oil companies, which recognised only too well the threat to their future profits.

In addition to the 5 reports of the IPCC, intergovernmental meetings, **conventions**, of the parties involved (COPS) took place but it was not until COP 21 in December 2015 in Paris that 195 countries signed the agreement to limit the increase in global temperature as a result of burning fossil fuels to a maximum of 2⁰C; as a rider it was agreed that every attempt should be made to keep this to 1.5⁰C. This agreement was only achieved as a result of the overwhelming scientific evidence available, a massive lobbying campaign by green NGOs and it has to be said by the skilled diplomacy of the French over the months leading up to the Convention. Even though President Trump has avowed to pull the US out of this agreement, no other country has followed so the Paris Agreement remains the best hope so far that the world will rise to the challenge.

The way that IPCC functions is that there are thousands of specialised scientists working in universities and other organisations around the world devoting their expertise to the reports, all of which efforts are supplied free of charge; there is in addition an equal number of scientists who ‘peer-review’ all contributions in the true scientific tradition of attempting to reach the truth.

The irony is that this whole tradition has been turned on its head by the sceptics who promote the ‘post-truth’ attitude of denigrating scientific research because any restrictions on our life-styles that climate change action might suggest necessary will threaten the neoliberal dream that people should be able to do what they want without interference from government. In other words, scepticism, doubting something until it is proved correct is turned into cynicism by the rejection of the motives of those giving us their best professional advice).

6 The Effects of Climate Change

One of the main problems with climate change is that it does not introduce anything new into the climate system, you cannot point at any single adverse weather event and claim that it is due to climate change. The problem is not with the emission of greenhouse gases into the atmosphere, these are actually beneficial up to a certain level, they create an hospitable climate. **The problem is the emitting into the atmosphere quantities of greenhouse gases above the ‘safe’ (see the work of Rockstrom et al and the planetary boundaries – Point 8) This enhanced level destabilizes the whole system; in the process it creates an increase in the frequency and intensity of weather conditions, droughts and floods, heat waves and colder periods, hurricanes and typhoons, forest fires, etc.** For the past 400,000 years and possibly as long as one million years, a period of astonishing stability has been enjoyed that has encompassed several ice ages and the interglacial periods in between when the CO² varied consistently from between 190ppm and 280ppm. Currently it is up to 407.25ppm, an increase of 43% over just short of 160 years

7 The Climate Change Denial Industry

Reference has already been made to those who deny there is a problem with our relationship with Nature and argue that there should be no inhibitions on us using to the full all the resources available. Whilst though this is the basic attitude of neoliberalism and the consumption society it is climate change that has attracted the most attention and is now the focus of a virulent denial movement.

This movement was originally established by the tobacco industry to counter the official advice in the 1970’s that smoking was a major contributor to the development of lung cancer. This Industry, lead by the Phillip Morris Co created a massive counter advertising campaign to try to offset the threat to profits (subsequent freedom of information requests have proved this beyond any doubt), the effect was that millions of pounds were spent in the process and a massive ‘grass roots’ organization was developed to create the impression that opposition to the cancer threat notion had equally massive public support. Eventually the advice of the medical profession was accepted and the major bans on smoking became the accepted norm.

It might seem rather bizarre, but as the advice mounted throughout the 1990’s that the burning of fossil fuels as the main cause of the increase in the level of CO² in the atmosphere, this time the

fossil fuel industry reacted just as the tobacco industry had some 20 years earlier, the same network of the denial industry was converted to the CO² threat denial.

Once entered into, this debate proceeds by suggesting there is such confusion about the issue that it unsafe to pay too much regard to those who are claiming that our relationship with Nature is at crisis point (this is despite the fact that there is a degree of unanimity amongst climate scientists not evidenced in any other branch of science, that human activity is the main cause of global warming). The only way this argument can be solved is by waiting to see what the future has in store. But this is the precise motive of the denial lobby, to take no action now but wait and in the meantime carry on as though there is no problem. In effect, by thus arguing, the purpose of the denial lobby is achieved, it does not have to prove that climate change is a threat.

The intensity of the denial propaganda from this industry is staggering. One incident concerning the University of East Anglia (UEA) was based on thousands of freedom of information requests being analysed in minute detail, then cut and pasted to produce documents that bore no relation to the originals. The UEA was accused of distortion of the facts which all hinged on the use of one word – trick, as in the expression – “the trick is”. Interestingly, the dictionary definition of ‘trick’ is

- a) an action or scheme undertaken to fool, outwit or deceive, or
- b) a special technique; a knack or special way of doing something

As respectable scientists, those at the UEA had used the word meaning a special technique whilst the deniers claim it proved that the whole of climate change science was a hoax

The accusation went viral and created the event called “Climategate” thus arousing suspicion of wrongdoing equivalent to the infamous “Watergate” scandal. This triggered 5 independent investigations, including one by the House of Commons Select committee on Science and one by the Royal Society, all 5 clearing the UEA completely of the accusation. However, the damage had been done, the slur had been documented and is maintained to this day. There are many reasons why climate change creates scepticism (see the book by George Marshall in Appendix 1) but that by the denial industry eclipses all of them.

Climate Change – Future or Present?

Despite all the evidence to the contrary, the general impression gained is that the problem of climate change is in the future. However, the destabilization process has already happened, the climate has changed to the extent that the worst predictions for the globe are actually occurring in many parts of the world. Extreme weather events such as heatwaves, droughts, floods and storms have occurred, causing major damage and disruption, with large financial costs and often loss of life. In 2016, India recorded its highest temperature (51⁰C). A severe heatwave in Europe in 2003 led to tens of thousands of premature deaths, especially amongst the elderly. In Australia, recent intense bushfires have destroyed thousands of properties and led to scores of deaths and a similar situation has arisen in Portugal in 2017. Parts of the UK have repeatedly seen devastating flooding in the years since the start of the 21st century and in Pakistan floods

affected 20 million people. Around the world extreme weather conditions are leading to temperature and rainfall records being broken, with even more serious consequences, as what were once extreme conditions are starting to become normal.

In the longer term, climate change threatens food and water supplies, crop yields, human health, national security and the risk of humanitarian crises.

The juxtaposition of, on the one hand, the gravity the climate change situation, with, on the other, the existence of the denial industry must be one of the greatest tragedies in the history of mankind.

Stop Press - 03 September 2017

To re-inforce the above message this is a typical weekly release by **Greenpeace** of the adverse weather conditions being suffered by millions in the world RIGHT NOW

Afternoon everyone! You may have noticed we've been a little quiet this week, but we do have a good excuse, promise. We're working on something big that will more than make it up to you. So watch this space and in the meantime, here's our hand-picked selection of this week's most important environmental and climate change news from across the media, as always.

Here's what you need to know this week

Floods, floods and more floods

Two weeks ago a mudslide hit Sierra Leone, killing at least 499 people. And now this past week, we've seen even more devastating disasters across the globe – monsoon rains devastate parts of India, Bangladesh and Nepal, Storm Harvey leaves heavy floods across parts of Texas and flooding in Niger kills more than 40 people. And it's not over yet, we're still waiting to see what will come of Hurricane Irma and Storm Lidia. And if this is all news to you, it's not your fault. The [global media has been criticised over its focus on the disaster in Texas](#), forgetting the other tragic weather events taking place across the globe. So, in an effort to balance the reporting, here's my attempt to cover what's going around the world disaster-wise.

South Asia floods kill 1,200

The worst flooding to hit South Asia for years has [killed more than 1,200 people and has also left about 1.8 million children unable to go to school](#). The International Federation of Red Cross and Red Crescent Societies (IFRC) estimates more than 41 million people have been affected by monsoon rains and severe flooding as of June this year. Whilst the numbers are massive, the stories to come out of this disaster are just as tragic. Several people are reported to have died from falling into open manholes, a two-year-old has lost her life to a wall collapse and many are reported to be missing.

Niger floods force thousands from their homes

Serious flooding has led the authorities in Niger to [order thousands of people to leave their homes](#) in the capital Niamey. While many are sheltering in schools, others have nowhere to go. Already the torrential rains are reported to have killed at least 44 people in Niamey and other parts of the West African country since June, and has caused [the destruction of hundreds of houses](#).

Harvey aftermath: 44 dead, houses ruined & chemical explosions

The damage caused by Hurricane Harvey, now downgraded to a tropical depression, is finally beginning to become more clear, with some experts saying it [will cost more than Katrina and Sandy combined to repair](#). The disaster led to 44 people dead in southern US, and caused hundreds of thousands of people to flee their homes. There have also been reports of [two explosions at the Arkema chemical plant](#) in Crosby, Texas, which was caused by flood damage to the units that were refrigerating the explosive chemicals.

Storm Lidia arrives with heavy rain & wind

Tropical Storm Lidia hit the southern tip of Mexico's Baja California peninsula with heavy rain and high winds on Thursday evening. While not projected to reach hurricane strength, authorities in the state of Baja California Sur [suspended classes and flights](#) until conditions were deemed safe.

Hurricane Irma: the next weather disaster?

This powerful hurricane is rapidly intensifying in the open Atlantic and poses a major threat to the Caribbean and potentially the United States next week, [reports CNN](#). Initially labelled a tropical storm on Wednesday morning, Irma strengthened into a large Category 3 hurricane by Thursday afternoon in a process known as "rapid intensification". Forecasters are monitoring the high-pressure system, but [only time will tell where exactly the storm will go](#) and what damage it will do.

Time to talk about climate change?

The hurricanes, the torrential rain, the floods... In the words of climate change writer Mark Lynas: "This is what climate change looks like." Lynas believes the recent events described above are now why we need to talk about the highly politicised issue of climate change and global warming. Read what else he has to say [here](#).

The UK National Perspective

The [2008 Climate Change Act](#) introduced an ambitious legally binding commitment to reduce the UK's [greenhouse gas emissions](#) by at least 80% by 2050, relative to 1990. To put the country on the path to this long-term goal, a system of [carbon budgets](#) was introduced to limit emissions in successive five-year periods. Budgets have been fixed up until the fourth, which requires a cut of 50% relative to 1990 levels in the period 2023–27.

Against this target of 50% by 2023-27, the UK's achievement up to 2013 was a reduction of 21%, well below the target (**the strategy of front-loading the targets for the earlier years is that CO² emissions remain in the atmosphere for at least 100 years so their effects are cumulative; by reducing a greater quantity in the earlier years, both helps to reduce the impact and avoids the situation whereby the longer you leave the task, the harder it is to achieve it in a shorter time-scale left).**

An integral part of the 2008 Act was the establishment of an independent Climate Change Committee with the duty to monitor and report back directly to Parliament on the progress being made to achieve carbon reductions; in its latest report, it heavily criticizes the Government for its inadequate and often conflicting actions.

As regards renewable energy, again the UK is falling behind targets. By 2020, the EU has set the target for all countries at 20% by 2020, the UK having set its own comparable target of 15%: up to 2016 the UK's achievement was 8.9%. 5 EU countries have already achieved the full 20% already but the UK is one of only 3 to be on course to fail.

The latest Government Action is the plan to eliminate the use of fossil fuel vehicles from 2040

However, in reality, the most important element in this task of searching both for ways of reducing consumption and increasing renewable energy sources, is completely unrelated to energy sources, but requires a sea-change in our current use of energy.

The Solution

One solution has come from the Centre for Alternative Technology (CAT) based in Wales with its project "ZERO CARBON BRITAIN" (ZCB). Work on this started in 1977 under the title of "An Alternative Energy Strategy" for the United Kingdom. Over the following 33 years it has evolved into the current "ZCB" which takes 2010 as its base.

Its simple concept is that the UK can play its part to the full in the fight against global climate change in three ways –

- 1 reduce the 2010 energy consumption level by 60%
- 2 replace the use of fossil fuels for the remaining 40% by renewable energy sources
- 3 only use completely tested and tried sources, in particular, resist the development of nuclear energy.

Against the UK national target of a reduction of greenhouse gas emissions by 80% by 2050, the ZCB scenario is for the UK to achieve the status of zero carbon by 2030.

Stage 1 – energy use reduction, referred to as ‘Powering Down’

In 2010 the energy demand for the UK was 1750 TWh/yr. A 60% reduction brings this down to around 665 TWh/yr. However, a new energy source is recommended, ground and air pumps requiring an additional 105 TWh/y of priming energy bringing the total energy requirement to 770 TWh/y.

The national profile of energy demand in 2010 was as follows

	%	%
Buildings – heating	34	
- cooking	11	
Industry	15	
Transport (exc. aviation and shipping)	<u>27</u>	87
(aviation and Shipping)	40	<u>13</u>
Note: total all Transport = 40%		<u>100</u>

It will be seen that energy use in buildings and industry accounted for 60% of energy use (and 54% of GHG emissions in 2010). High standards for new building and retrofit of all existing buildings can reduce energy demand for heating by around 50%. Efficiency improvements in cooking, lighting and electrical appliances can significantly reduce their demand. Industry can also be made more efficient, but with a growing population and the need to build infrastructure mean industrial energy is expected to remain similar to existing. Most heating and hot water, all appliances and most of industry needs to be powered by electricity but will also require some biomass, geothermal and solar thermal. Industry is also expected to need carbon neutral solid, liquid and gaseous fuels.

One example of the changes to lifestyles needed is in transport (the 27% that excludes aviation and shipping). In 2010 it was assessed that British people travelled around 6,500 miles a year by car or van. As a result of fuel efficiency improvements, improved communication technology, living closer to work, increased vehicle occupancy, increase in walking and cycling, it has been calculated that emissions can be reduced by 42% (with the added advantages of healthier living and an improvement in air quality)

A major part of the ZCB project concerns land use. Over two-thirds of our land in the UK is dedicated to food production in some way (despite our importation of about 42% of what we eat. Almost 70% of agricultural land in the UK is used to graze livestock for meat and dairy products. Even half our cropland is used for livestock production – to grow feed. The agricultural use of land, and land use changes associated with it, contribute the largest portion of our GHG emissions after energy – roughly 10%.

Waste Situation on climate Change

Waste contributes to GHG emissions. Recycling of house hold waste could save significantly on emissions. The following is the hierarchy of waste –

Prevention

Reuse

Recycling

Recovery

Disposal

Measures at the top of the triangle are the most effective. (Adapted from DEFRA 2011b)

Land Use

The previous sections show that most of the country's (county's) emissions can be reduce significantly. However, there are still emissions associated with agricultural food production, and those from land use changes and land management practices – about 10% of current emissions.

There are therefore now two new demands on land in the ZCB scenario, aside from food production. One is the need for biomass to fuel some parts of our transport system, and to provide back up for our energy system. The other is to 'balance' the impact of our remaining emissions by capturing carbon – removing CO₂ from the atmosphere every year in equal measure to this impact.

This is the last element in our jigsaw. Our use of land will provide food, energy resources and carbon capture, which allows us to be truly net zero carbon.

The 22.5 milliard hectares of UK land currently used for food production (excluding the urban content 1.5mha) as shown in the following diagram is reduced to – 8 mha for food, 4,25mha for fuel and energy and 9.25 mha for carbon capture.

The land use change proposed by the ZCB project is summarized on the next page

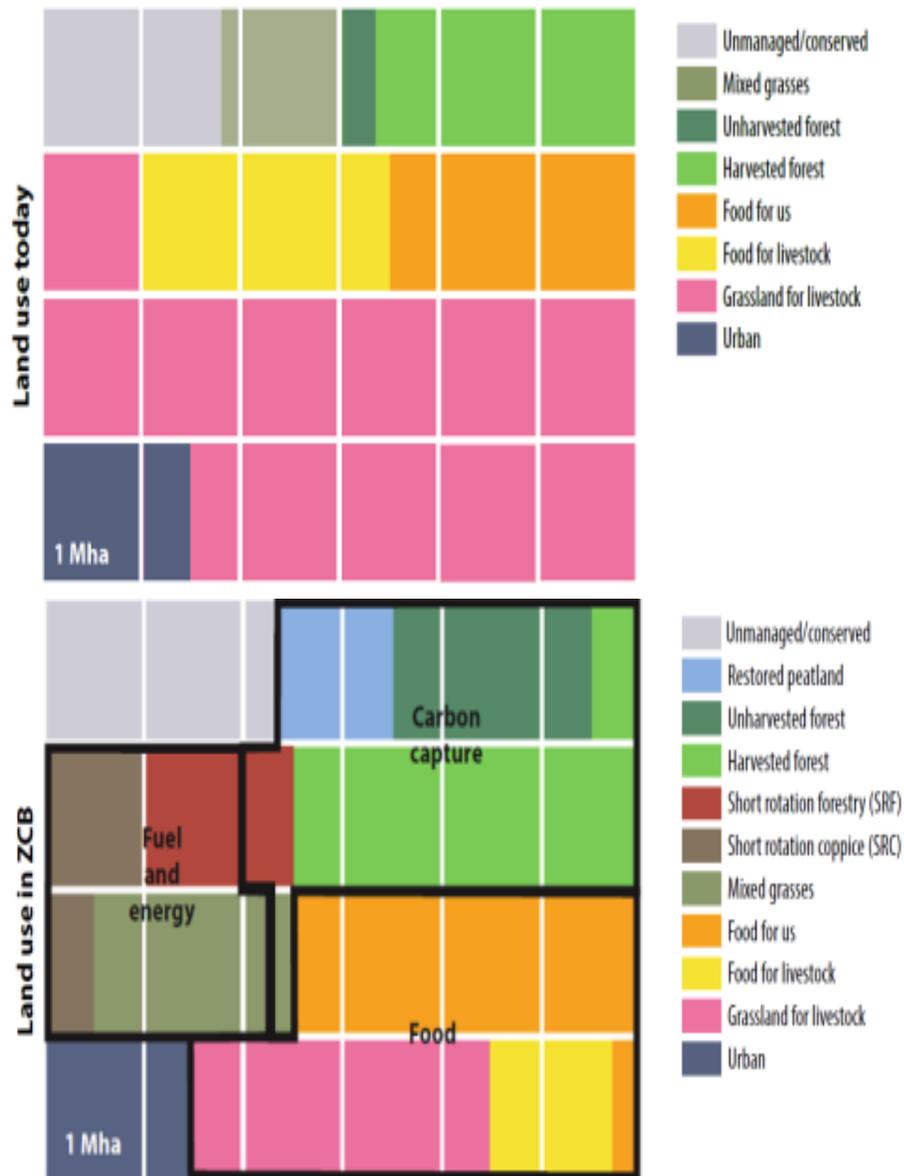


Figure 3.37: Approximate land use in our scenario (not including water courses and coastal areas).
‘Mixed grasses’ includes hemp, Miscanthus and other energy grass crops.

Stage 2 – fossil fuel energy with 100% renewable energy sources, referred to as “Powering Up”

In terms of the proportion of renewable energy that European countries achieved in 2015, the UK is lagging well behind the other countries. Of the 28 countries, the highest is Sweden with 54.1%, the lowest is Luxemburg with 5%, the average is 16.4%, and the UK is 24th/28 with 8.2%.

The ZCB solution is to deploy all the proven renewable energy resources available to the UK (avoiding nuclear) i.e wind (onshore and off-shore), wave, solar, geothermal, hydro, biogas and biomass.

We saw in the Powering Up stage above that the reduced energy demand under the ZCB scenario is for 770TWh/y. The proposed energy mix to provide this is from entirely renewable resources is -

	TWh/yr
Electricity	404
Synthetic Biogas	61
do Liquid	110
Biomass	36
Hydrogen	14
Solar	25
Geothermal	15
Ambient	<u>105</u>
	<u>770</u>

As has been explained, the original project was for an Alternative Energy Strategy for the UK but a significant part of the evolution to Zero Carbon has been to diminish the focus from just energy and to develop an approach that is more holistic. The evolution process started with the change of use of land and the consequential need for a change to a more vegetarian diet. This in turn introduced health and well-being into the project, this then triggered a discussion into changing how we think about human beings and energy and finally to thinking about communities, education, young people and happiness, quite an evolution!

Final Assessment

If we had reacted to the problem of climate change 25 years ago at the time of the Rio Summit, the task would have consisted of avoidance measures; now, avoidance is too late, the effects of climate change are here and right now as this is written all around the world, e.g

- extreme heatwaves predicted in India unless CO² emissions are cut sharply and soon,
- bodies being discovered after 75 years in the melting glaciers of the Swiss Alps.
- the worst floods in Texas and Louisiana ever recorded.

- matched by the worst floods in India and Bangladesh for a century

Therefore the vital task now is MITIGATION.

The implications as to how this would need to be achieved when applied to Dorset are set out in the separate report -

“The action needed from Dorset to achieve the state of Zero Carbon – based on the report from The Centre for Alternative Technology “Zero Carbon Britain”

Recommended Films and Videos

		Running Time mins.
Chasing Ice	James Balog	76
The Age of Stupid	Stars Pete Postlethwaite	89
The Truth About Climate Change	David Attenborough	118
A Crude Awakening	Basil Gelpke & Ray McCormack	82
An Inconvenient Truth	Al Gore	93
Every Action Counts	DEFRA	5
Before the Flood	Leonardo DiCaprio	96
Years of Living Dangerously	National Geographic	95
The Day After tomorrow	Roland Emmerich	128

1.

2. **Useful Internet Sites –4**

https://wikipedia.org/wiki/List_of_environmental_films

[www.theguardian.com/Environment/One Minute to save the world](http://www.theguardian.com/Environment/One_Minute_to_save_the_world)