One million climate jobs

Solving the economic and environmental crises

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right: wind mill at dawn by John Northrup

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One million climate jobs

Solutions to the economic and environmental crises

A report by the
Campaign against Climate Change
trade union group in conjunction with
the Communication Workers Union (CWU),
Public and Commercial Services Union (PCS),
Transport Salaried Staffs Association (TSSA)
and the University and College
Union (UCU)

Contents

Introduction

We are facing a global environmental crisis and a global economic crisis. We need solutions to both – now. Many climate activists, and several national trade unions, have decided to fight to make the government create one million green, climate jobs. This report explains how we can do that and why we must.

Building new wind turbines near Amsterdam
Photo: Jules Stoop

Sooner or later gradual climate change is going to turn into swift catastrophe. So we need drastic cuts in the amount of carbon dioxide, methane and other greenhouse gases we put into the air.

This will take government regulation and international agreements. It will also take a lot of work – jobs. We have to build wind, wave, tide and solar power. We have to renovate and insulate our homes and buildings. And we have to provide a network of cheap buses and trains.

There are officially two and a half million unemployed people in Britain. Many more are not counted in government figures. We may be facing a long recession, or the economy may 'recover' sales. But the experience from many countries now is that business has to sell a lot more, for a long time, before jobs start to recover. We will have mass unemployment for many years.

We have people who need jobs and work that must be done. A million climate jobs in the UK will not solve all the economy's problems. But it will take a million human beings off the dole and put them to work saving the future.

The cuts proposed by the current government will add hundreds of thousands of public sector workers to the dole queues. Even more private sector workers will lose their jobs. The result will be another plunge into recession.

We cannot halt climate change only by action in the UK. But if we act, people all over the world will know, and take hope and courage to act themselves.

Chapter 1

What do we mean by ‘climate jobs’?

This chapter explains what we mean by climate jobs. It’s different from what politicians usually mean when they talk about ‘green jobs’.

We mean climate jobs, not 'green jobs'. Climate jobs are jobs that cut down the amount of greenhouse gases we put in the air and thus slow down climate change. ‘Green jobs’ can mean anything – jobs in the water industry, national parks, landscaping, bird sanctuaries, pollution control and many more things. All these jobs are necessary. But they do not affect global warming.

We mean jobs that tackle the main sources of emissions. The three main greenhouse gases are carbon dioxide (CO_2), methane and nitrous oxide. In Britain CO_2 is the most important. We are putting CO_2 into the atmosphere by burning coal, oil and gas – these are called CO_2 ‘emissions’. We need to cut emissions as fast and deeply as possible. (Chapter 3 explains why).

In the UK, we emit about 11 tonnes of CO_2 equivalent greenhouse gas emissions a year for each person (see box on the right).

Most of this report (and most of our jobs) focusses on the first 8 tonnes – electricity, buildings and transport. But about 20% of our emissions are CO_2 from industry and other gases from farming and putting waste in landfill. Here the solutions are more complicated. Chapter 7 covers these sectors, and also deals with ‘other energy’, education, research and training.

Round numbers

A note to explain how we use numbers in this report. We use round numbers- for example, 170 not 173.4. We do this because round numbers are easier for the reader to make sense of.[1] We make a lot of assertions and estimates about numbers here. You can find the calculations behind these in the technical backup papers on our website: **www.climate-change-jobs.org**. They are effectively appendices to this report.

Sources of greenhouse gas emissions per person in the UK [2]

Electricity	3 tonnes
Transport	3 tonnes
Heating buildings	2 tonnes
Industry	1 tonne
Farms	1 tonne
Landfill	0.5 tonnes
Other energy manfacture	0.5 tonnes
Total	**11 tonnes**

We mean a million new jobs, not ones people are already doing. We don't want to add up existing and new jobs and say that now we have a million climate jobs. We don't mean jobs with a climate label, or a climate aspect. We don't want old jobs with new names, or ones with 'sustainable' inserted into the job title. And we don't mean 'carbon finance' jobs.

We mean new jobs now. We want the government to start employing 83,300 workers a month in climate jobs. Then, within twelve months, we will have created a million jobs.

We mean government jobs. This is a new idea. Up to now government policy under both Labour and Conservatives has been to use subsidies and tax breaks to encourage private industry to invest in renewable energy.

The traditional approach is to encourage the market. That's much too slow and inefficient. We want something more like the way the government used to run the National Health Service. In effect, the government sets up a **National Climate Service (NCS)** and employs staff to do the work that needs to be done.

Government policy has also been to give people grants and loans to insulate and refit their houses. Instead, we want to send teams of construction workers to renovate everyone's home, street by street. And we want the government to construct wind farms, build railways, and put buses on the streets.

Direct government employment means secure, flexible, permanent jobs. Workers with new climate jobs won't always keep doing the same thing, but they will be retrained as new kinds of work are needed.

For instance, we are going to need about 400,000 workers in renewable energy within three years. But we can't start with that number. There are shortages of skills, materials and factories. It will take time to gear up.

However, we can start on refitting buildings in a big way. We have an army of unemployed construction workers, and enough of them have the necessary skills to teach other people. Once renewable energy is up and running properly, some of them can retrain for that.

In transport, we can start with people making and driving new buses and building railways. But after ten years the building workers will have finished most of the renovation, and many of them can retrain to drive buses and trains, fix electric engines, paint railway carriages, or work on ships.

If we tried to do all this with private companies it would take years to get up and running. Large amounts of money would be wasted, and workers would constantly lose their jobs.

Of course we will have to be flexible. For instance, the National Climate Service will need the offshore wind technology that private companies have now. The obvious solution is a royalty agreement to pay the company a percentage for technology and advice. And the experience in Denmark and Spain is that onshore wind power is more popular, and much more gets built, when farmers and local communities run the wind farms and share in the profits.

Even the conservatives have lived for decades with national services like education, health and defence. What we are proposing is another such service.

No one will lose out. Of course some people are going to lose their jobs in a low carbon economy. But a National Climate Service can have a simple policy. Anyone who loses their job because of the new economy will be offered work in the NCS, with retraining and their old wages guaranteed.

This is the right thing to do. It is also necessary. Important groups of workers now fear for their jobs in a new economy. We need their support. They are intelligent and informed people. They too worry about the threat of climate change. At the moment they are torn between needing their jobs and what the planet needs, and they don't like being in that bind. Guaranteed new jobs will cut that knot. But we have to mean it, and they have to be very sure we will all fight for their jobs.

A million climate jobs will create other new jobs - in two ways. First, there will be many more jobs in the supply chain. The National Climate Service will employ people directly in making the components for wind turbines, putting the components together, installing and maintaining the turbines, and building and working the ships we need for offshore wind. These will all be part of the one million new jobs.

Then there will be the workers who make the supplies and services the NCS needs – steel for the turbines and ships, the hammers and saws for the building workers, the paint for the buses. A reasonable estimate is that for one million new jobs there will be another half a million 'indirect jobs'.[3]

The second way is called 'induced jobs'. A million and a half new workers will spend more money than they did on the dole. They will buy shoes, clothes, cinema tickets, meals, cameras, fishing rods, tickets to gigs, and so on.

More people will then have jobs supplying these things. The workers at those new jobs will have money to spend, too, and that will create more jobs. A reasonable estimate is that will mean an extra quarter of a million jobs.

In all, we estimate the NCS will take 1.75million people off the dole. However, we will be losing some jobs too. Most of these jobs will be lost after the first ten years of the programme. Even then, we estimate that after 20 years there will a net gain of 1.33 million jobs.[4] And everyone who has lost a job will get another.

Climate jobs will be decent, fair, safe jobs. The government will decide where jobs go. Building and transport jobs will go where people live. But manufacturing jobs can be sited where people need them most, to save communities. And that can be done without wasting money on tax breaks for private companies.

Workers who traditionally would not be hired for some of these jobs, like women and people with disabilities, would get a fair chance. Apprenticeships could give school leavers a decent start in life.

We also want jobs with fair wages and decent conditions. Many climate jobs are dangerous. Much of it is factory work, often with toxic chemicals. Working at sea, on offshore wind or anything else, has always been risky. No amount of contract language will ensure decent wages, conditions or safety. Trade union organisation, on the job, can do that. If people work for the NCS, and if they have won those jobs through a mass movement, they will be able to organise themselves.

Chapter 2

How will we pay for these jobs?

This chapter argues two things. First, we can afford climate jobs. They won't cost a great deal, and the money is there. Second, the government is now saying the economic crisis means they have to cut public expenditure. They are mistaken and their policies are the road to ruin. We need to create jobs, not cut them.

In some ways, the model for what we want to do is what happened in World War Two. Then all the great powers of the world took control of their economies and directed industry to make as many weapons as possible, as fast as possible, to kill as many people as possible and win the war.

One example will give the scale of this. When the US entered World War Two in December 1941, government expenditure exploded. GDP had doubled in three years.[5] The car factories in America closed in January and they made no more cars for the rest of the war. By the end of March, the car factories reopened, making tanks, weapons and, by the end of the war, 66,000 bomber aircraft.[6]

The Soviet Union, Germany and Britain all did the same. This rearmament boom did not bankrupt the governments. Instead, it created jobs and lifted the whole world out of the Great Depression. We need to do the same thing now, but in order to save lives.

Climate jobs, come rain or come shine
Photo: Solid Ether

After all, governments do things that 'cost too much' when they really care. The war in Iraq is one example. The banks are another. When the credit crunch hit, we discovered that governments could spend hundreds of billions of dollars or pounds by lunchtime. They will get some of that money back, but no one knows how much. The IMF estimate that the British government has lost at least £200 billion.[7]

We estimate that we can employ a million workers for ten years for less than the government gave the banks in one year. This is because a million climate jobs won't really cost the government all that much.

At first sight, the figures for a year look roughly like this:

- £27 billion in wages for one million jobs over one year.[8]
- £5 billion in employers' national insurance and pension contributions.[9]
- £20 billion in costs like materials, fuel, supplies, rent and interest.

Total cost £52 billion

But these figures are deceptive because:

The government will save money on taxes and benefits. When you lose your job, you pay the government a lot less tax and you collect more benefits. In the same way, every unemployed worker costs the government money. The government gets less tax and they have to pay out more in benefits.

Individual cases vary. But on average, every time the government employs someone on £27,000, they save £13,000 on that person's taxes and benefits.[10] **That's £13 billion saved** on a million jobs.

The government will save on indirect jobs. Remember, we will have one million people directly employed. But that will create another half a million 'indirect' workers.[11] The government will save on the taxes and benefits of those half a million workers too. Again, they will save about £13,000 a job. That's £6.5 billion saved on half a million jobs.

Moreover, all those new workers will be spending their pay on burgers, books, shoes for the kids, organic parsnips and so on. That will create another quarter of a million jobs. Many of them will be lower paid but the government will still save at least £1.5 billion. So the government has saved:

- £13 billion on directly employed workers' taxes and benefits
- £6.5 billion on 'indirect' workers' taxes and benefits
- £1.5billion on 'induced' workers' taxes and benefits.

Total: £21 billion saved.

The National Climate Service will get money back. They will build wind turbines, and people will pay electricity bills. They will build railways and drive buses, and people will pay for tickets.

If a private company was spending £52 billion a year, it would expect to get more than £52 billion back each year to pay for profits, loan interest and dividends. The government doesn't have to do any of that. They could eventually decide to make public transport free, or not charge people for insulating their homes.

So let's assume the government only gets back 25% of what they spend. That means they will get back £13 billion a year.[12] Add that to the £21 billion the government saves on taxes and benefits, **and the government has saved £34 billion a year.**

We started with the government spending £52 billion. They have saved £34 billion. In other words, they spend £52 billion up front every year, but they get back £34 billion. So **the real cost of one million climate jobs is only £18 billion a year.**

The money is there. Remember, when the banks were in trouble, the government came up with £850 billion in one year in loans and gifts to the banks. At least £200 billion of that is lost forever.

In 2009 they spent another £200 billion. This was called 'quantitative easing' but was really the same as printing money.

We were told this money would 'stimulate the economy' and create jobs. In fact, the money disappeared down black holes in the accounts of banks and hedge funds. And the banks loaned less money, so businesses could not create more jobs.

If you want to create jobs, it is far more efficient to do it directly. Sixteen billion pounds a year will create jobs and start to save the climate.

The government found the money for the banks because they thought it mattered. The big banks, they said, were 'too big to fail'. They meant the consequences would be catastrophic. We think the planet is too big to fail.

There are several ways the government can find £18 billion a year:

If the richest 1% each paid 5% more income tax, that would raise £5 billion a year. The richest 1% of taxpayers all make more than £100,000. Their average income is £225,000 a year. With tax breaks, they now pay 27% of that in income tax. If they paid 5% more, they would still pay only 32% of their income in tax.[13]

Close the 'tax gap'. Closing the tax loopholes to curb avoidance, investing in rather than cutting jobs in HM Revenue and Customs and chasing the criminals engaged in massive tax evasion could generate an estimated £120 billion annually. Moving to a more progressive tax regime that raises taxes from the profits of major companies, particularly the energy, banking and retail sectors would generate billions more.

A Robin Hood Tax - on banks and financial transactions could raise an estimated £400 billion a year and fight poverty, protect public services and tackle climate change.[14]

We could make extra jobs by borrowing money. During the depression of the 1930s the economist John Maynard Keynes argued that in bad times governments should create all the jobs they could. His example was that it was worth it even if the government hired people to dig holes one day and fill them in with earth the next.

What was needed was to get the economy moving. Earth diggers and hole fillers buy goods and services.

Governments have done this kind of thing for generations - in two ways. One way is that the government borrows the money to create jobs and pays the money back when things get better. We can raise part of the £16 billion this way.

The government could just spend the money. The other way is that the government just spends the money without borrowing it. This used to be called 'printing money'. That sounds bad, so now it's called 'quantitative easing'.

People always say that if you print money, then inflation explodes like it did in Germany in the 1920s or Zimbabwe today. That's what happens if you print far too much money. In 2009-10 the Bank of England spent £200 billion on 'quantitative easing'. The world has not come to an end. We are only looking for £18 billion a year.

In any case, governments have long subsidised conventional energy and transport. The provision of free roads and bridges for cars is a subsidy. The aviation industry has been supported by untaxed fuel, orders for the military versions of most planes, and subsidies for airports. The oil, gas and coal industries are backed by governments, as are pipelines. There are literally hundreds more examples. But the largest subsidies of all have gone to nuclear power, all over the world.[15]

But what about the cuts?

So we can afford climate jobs. But even if the money weren't there, we would still have to act now to prevent climate change. The next chapter will give the reasons why. But right now the British government is not expanding jobs. Instead, they have proposed public spending cuts of 25% over five years.

They argue that the country is bust, that national debt is out of control, and sacking public sector workers will solve the problem. The rest of this chapter lays out what's wrong with their arguments.[16]

First, we are not bust. Britain's national debt is now about 75% of our national income. David Cameron and George Osborne now warn that if a country's national debt exceeds 75% it is 'bust'.

By that yardstick Britain has been 'bust' for most of its history since the 1750s. In the early nineteenth century the debt was not 75% of our national income. It was almost 200%.

As the economist Will Hutton puts it:

> ***"From 1750 to 1870, Britain won wars, assembled an astonishing navy, built an empire and launched the Industrial Revolution, yet the national debt was consistently above 80 per cent of GDP. Nobody cared. High national debt was a precondition for winning two world wars in the 20th century. Periods when the over-riding preoccupation has been lowering the national debt have coincided with industrial, economic and strategic decline. So it will again."*** [17]

1956 was a very good year. The debt was just under 150% and the conservative Harold Macmillan was Chancellor of the Exchequer. He quoted the liberal historian Lord Macaulay:

> ***"At every stage in the growth of that debt it has been seriously asserted by wise men that bankruptcy and ruin were at hand; yet still the debt kept on growing, and still bankruptcy and ruin were as remote as ever."*** [18]

Japan has had a debt of over 75% since the 1970s. In 2009, Japanese government debt was 189% of their annual GDP. There is a reason Japanese government debt is so high. For many years, the Japanese government has run big public works programmes in order to keep unemployment down. That is what we want our government to do. Japan has almost the same income per person as the UK, and only two thirds the unemployment rate. If we had Japanese levels of unemployment, 800,000 more people in the UK would have jobs.[19]

The cuts won't save much. We have already showed that it will be cheap for the government to employ new climate workers because they stop claiming benefits and start paying taxes. It works the other way round too. When the government sacks a worker, she stops paying taxes and starts claiming benefits. The exact amount varies depending on her rent and family status. But on average it costs the government £12,000 in taxes and benefits every time they lay off a worker on £25,000.[20]

Only it's worse than that. Because when public sector workers lose their jobs, they spend less much less money on goods and services. That means other people lose their jobs, and they too pay stop paying taxes and start claiming benefits.

Cutting public spending in the middle of a recession starts a spiral downwards. This has been seen many times before. In the depression of the early 1930s, the British coalition government under Ramsay MacDonald cut benefits and spending. The next decade was spent in a bitter depression. In the US President Herbert Hoover cut spending, stoked the Great Depression, and was swept out of office in a landslide. In Weimar Germany, the same policies led to the rise of the Nazis.

In the 1970s, many African governments had borrowed heavily when the world economy was expanding. When Western banks suddenly raised interest rates, they could not repay their debts. The International Monetary Fund (IMF) and the World Bank insisted that the African countries had to slash food subsidies, health, education, jobs and spending. The result was economic disaster, and most of Africa has not recovered to this day.[21]

The IMF and the World Bank did the same thing in Latin America in the 1990s. Latin Americans now call it the 'lost decade' [22]

The IMF is now pushing the same sort of cuts in Britain and across Europe. The result will not be pretty. The government say that 'the markets' are requiring them to cut. But 'the markets' will see deep cuts as a sign that something is deeply wrong.

'The markets' are not things, of course. They are human beings who run banks, hedge funds, and corporations. Some of them want cuts in public spending now. Some don't, because they think it will lead to disaster. But once the economy starts to spiral downwards, the same greed will lead all of them to move their money out of the pound, out of government bonds, and out of the country. Then a sudden economic crisis is likely.

In any case, public spending is not the problem. The economic crisis is real. It was not caused by high public spending.

As you may remember, the banks and hedge funds got into a spot of trouble. They had loaned more money than they had. In many cases, they loaned thirty times as much money as they had, or more. That was fine as long as everyone thought the party could go on forever. But when one big bank lost its nerve, so did the rest. The banks and hedge funds suddenly had debts they could not pay. All over the world, governments stepped in to give them money.

The banks and hedge funds did not loan more money after they got the handouts. They loaned less. And that's why the economy is in trouble. Banks, hedge funds, corporations and rich people are still nervous about loaning or investing money. The rest of us are nervous too, and being careful about our spending.

Someone has to start spending money. That has to be the government. And we need jobs now.

Chapter 3
The danger

We turn now to look at the science of climate change and explain why we have to act so quickly and on such a large scale.

The global climate is warming because humanity has been burning more coal, oil and natural gas over the last 200 years. Coal, oil and gas all contain a lot of carbon. When they burn, the carbon joins with oxygen in the air to make carbon dioxide (CO_2). The more CO_2 in the air, the more it traps heat and stops it escaping into space. There are also two other greenhouse gases – methane and nitrous oxide. We will pay some attention to them in this report. But CO_2 has the most effect, and has been increasing most rapidly.

As part of a long term natural process, the amount of CO_2 and heat goes up and down. This process takes place over long cycles, of 21,000 years, 41,000 years, and 100,000 years. What is new is that we are forcing the pace.

Every year, some of the CO_2 we put in the air is absorbed by the oceans, and by plants and animals on shore. But not all. Some of it remains for at least 100 years.

Over the last several hundred thousand years the temperature of the earth has gone back and forth between two roughly steady states: ice ages and warm periods. For instance, we were in a warm period in the middle of the twentieth century.

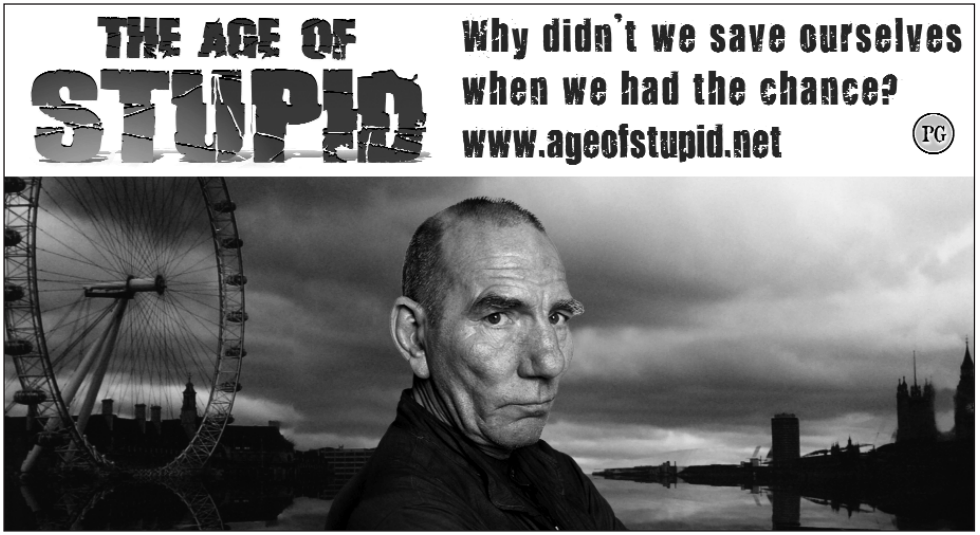
During the ice ages there were about 180 parts per million (ppm) of CO_2 in the air. During the warm periods the level of carbon was about 280 – 100 more. It is now 385 – another 105. Of that increase, 70 has happened in the last 50 years. We are pushing the envelope. No one knows exactly what will happen if we do this.

One concern is the possibility of very fast – 'abrupt' – climate change. Scientists are concerned about this because of what happened in the past. They learned a lot about this by drilling into the Greenland ice which contains an effective record going back 140,000 years.[23]

The scientists discovered that when the earth cooled, the process was gradual, over thousands of years, with temperatures and CO_2 levels declining in step. When the earth warmed, it also started out gradually. But then there was a rapid increase in both temperature and CO_2 levels often in twenty years or less.

Scientists have since looked for evidence of climate change in ice packs, glaciers, ocean floor deposits and caves around the world. What they have found confirms the Greenland research.

Scientists know this means that in the past there was some kind of feedback effect, or several feedback effects. An example can explain how climate feedbacks work. Rising CO_2 levels are now warming the Arctic. This begins to melt the permanent snow and ice.



Age of Stupid is a powerful film that tackles the likely effects of climate change www.ageofstupid.net

Snow and ice are white and reflect heat back into the atmosphere. When they melt, they reveal dark sea, dark tundra and dark trees. These absorb heat, and the Arctic warms up more, so the snow and ice melt more quickly. That reveals more dark tundra, trees and sea, which cause more melting, and so on. This feedback process has begun, and it is speeding up.

Scientists have discovered several more climate feedbacks as well, some of them very worrying.[24] They are sure that feedbacks and abrupt change will happen. But they are not yet agreed which feedbacks will be crucial, or how long we have. The best guess is twenty years, but it could be much more or much less.

The second worry is that we seem to be seeing serious effects of climate change now. The most important is a change in rainfall patterns, producing drought and famine, but also torrential rainfall and floods. In addition, rising sea levels will combine with a rising intensity in hurricanes and cyclones to produce catastrophic flooding.

There has been a drought in Sahel – the part of Africa just below the Sahara – for forty years. There is also serious drought in Central Asia and Australia. Forest fires in Australia and Greece, serious tropical storm damage in Bangladesh, Haiti, Costa Rica, and the USA, and the recent floods in Pakistan are all part of this pattern.

None of them are produced only by climate change. But rising temperatures are part of the reason for all of them. None of them are simply 'natural disasters'. In each case the effects of the natural problem are greatly increased by official neglect and corruption. But that is what it will be like in the future as well.

Fast, runaway climate change will produce large numbers of extreme weather events all over the world within a very short space of time. For a worrying example of how the governments of the world are likely to cope, look at how the richest country on earth coped with one hurricane in New Orleans.[25]

Famine, storms, drought and rising seas will produce hundreds of millions of refugees. This is likely to cause resentment, conflicts, hatred and mounting xenophobia and racism. The quickly changing climate will also change the balance of power between and within countries. That will mean war in many different places at the same time.

There can be no accurate estimates of human fatalities from all these causes, but they will be in the hundreds of millions. Rough estimates are that between 30% and 70% of the species on earth will perish. But it is in the nature of a runaway event that, while the consequences will be horrific, the precise scale remains unknown . Moreover, because we are forcing the pace at an entirely new rate, we cannot be sure what will happen.

All this means we have to move quickly to stabilise levels of CO_2. Yet most of the world's governments are still talking about putting more CO_2 into the air. They plan to eventually stabilise CO_2 levels in the atmosphere at much higher concentrations than we have now. And they don't plan to do so until 2050. Ten or five years ago, that's how many scientists were talking too. The scientists are talking differently now. This is partly because of considerable evidence that climate change has been speeding up, and that feedback effects are already happening. This means that the gap between what the scientists are saying, and what the politicians are doing, is huge and dangerous.

Many scientists, led by NASA's James Hansen, now argue that levels of CO_2 in the air are already too high, and that we will actually have to take CO_2 out of the atmosphere. Hansen estimates that we need to reduce from the current level of 387 ppm of CO_2 to 350 ppm at most.[26]

Other scientists feel that we can live with the present, or perhaps slightly higher, levels of CO_2. But whichever view you take, the immediate priority is to stabilise levels of CO_2 in the air, and that is what this report will focus on. The quicker we can do this the better the chance we have of avoiding catastrophe.

To stabilise greenhouse gas levels we do not have to eliminate all emissions. About half of the CO_2 is absorbed by the oceans and by plants and trees on land. On a global scale, a cut of 50% to 60% in emissions should stabilise CO_2 in the atmosphere. However, the richer countries currently emit more – Britain emits ten times as much as India per person. The poorer countries will insist that richer countries make deeper cuts. That is only fair, and we cannot do it without them.

Ideally, we can get close to cutting all UK emissions by 2030. In this report, though, we concentrate on how a million jobs could cut emissions by 80% in 20 years – the lion's share of what we need to do.

Of course cuts in the UK on their own will make little difference to global climate change. But if we campaign for a million new jobs, and win them, people all over the world will see what we have done. They will know it is possible. And then they can do the same. And that will save the planet.

Chapter 4

Jobs in electricity and energy

We will now describe climate jobs in detail. In the next three chapters we concentrate on the big three: electricity, transport, and heating. A million people working for 20 years can cut these CO_2 emissions by about 80%.

We will explain how we have arrived at these numbers of jobs and try to provide a reasonably detailed plan. But with production on this scale the technology will improve, and change, massively. Our plan is designed to show that climate jobs could work, based on what we know now.

This plan depends on a lot of electricity. The first step is to produce a lot of wind, wave, tidal and solar power to supply electricity. That way we can double the amount of electricity produced, and none of it burns gas or coal. CO_2 emissions from electricity go down to almost zero.

Then we cut the amount of electricity we now use by half, mainly by new regulations for appliances, lights and machines. That gives us even more spare electricity.

We insulate and renovate all homes and public buildings to cut the amount of emissions by about 40%. Then we replace half of the remaining emissions with electricity from renewable sources.

UK greenhouse gas emissions (tonnes per person) by sector

Carbon dioxide	**9.5 tonnes per person**
Electricity & energy production	3.5 tonnes
Transport	3 tonnes
Heating buildings and water	2 tonnes
Industry	1 tonne
Other greenhouse gas emissions	**1.5 tonnes of CO_2 equivalent per person**
Agriculture	1 tonne
Landfill	0.5 tonne

Distribution of climate jobs in an average year

Making renewable electricity	425,000 jobs
Renovating buildings	175,000 jobs
Changing transport	300,000 jobs
Industry and landfill	50,000 jobs
Education	50,000 jobs
Total	**1,000,000 jobs**

Finally, we cut the amount of oil used in transport by half through improved public transport, new regulations and design. Then we replace 60% of the remaining oil used in transport with electricity from renewable sources. That should cut emissions in electricity generation, heating and transport by over 80% within 20 years, as shown in the table on the right.

Emissions cuts and jobs created by our plan[27]

	Emissions before	Emissions after	Jobs created
Electricity	3.5 tonnes	0.2 tonnes	425,000
Heating buildings	2.0 tonnes	0.5 tonnes	175,000
Transport	3.0 tonnes	0.6 tonnes	300,000
TOTAL	**7.5 tonnes**	**1.3 tonnes**	**900,000**

We still have 100,000 of our 1,000,000 climate jobs available for other uses.

Renewable energy

That's the broad outline. We will start with how to double the amount of electricity we use, and produce it all from renewable energy. It is called renewable because it uses uses endlessly renewed sources of power – the wind, the sun, waves, river and tides.

To produce a steady supply of renewable energy you need a mix of several kinds. This is because sometimes, in some places, the wind blows stronger, and sometimes it stops. The sun does not shine at night, and so on.

We need many kinds of renewable energy, because it's hard to store electricity. It's not stuff, it's a pulse moving down wires. It has to be used when it's made.

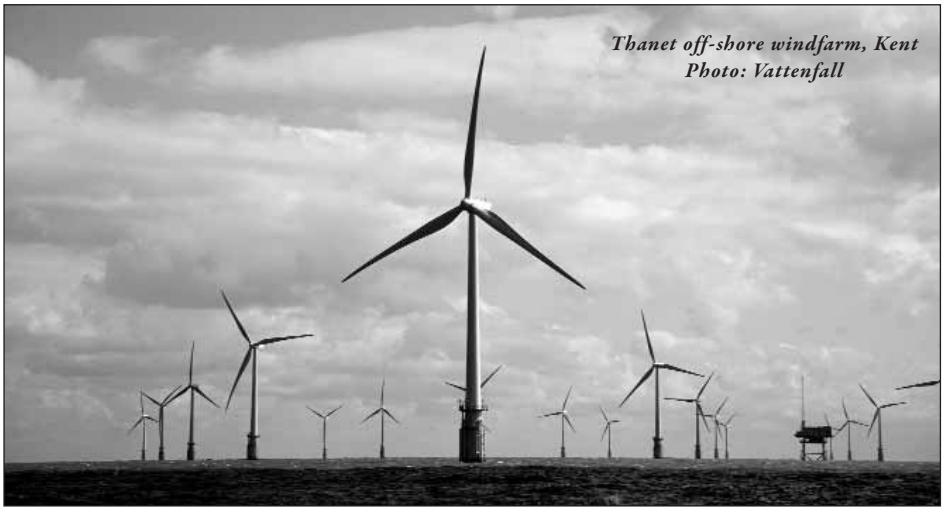
We also need a mix of energy from different places. Wind and sunshine vary from place to place. So we need to extend the national grid with cables to take electricity from wind, sun, tide and waves right across the country. The supply will balance even better across long distances. Modern long distance High Voltage Direct Current cables now make it possible to transmit electricity right across Europe and North Africa.

In any case, we will need massive changes to the current electricity grid. There will be many more places and facilities supplying the grid, and the coordination of all that energy will be more complex too. None of this is likely to work with our present privatised and divided grid. There seems little alternative to renationalisation.

Currently, the UK makes and uses 400 terawatt hours (twh) of electricity a year. We can almost double it in 20 years (see table below).

How we can almost double electricity production in 20 years[28]

	twh/yr	Jobs
Onshore wind	90	20,000
Offshore wind	520	260,000
Wave power	40	24,000
Tidal stream	60	27,000
Tidal range	36	16,000
Backup energy	14	28,000
New national grid	--	50,000
TOTAL	**760**	**425,000**



Thanet off-shore windfarm, Kent
Photo: Vattenfall

Wind power

The new electricity will come mainly from wind power because we are blessed with wind in the UK. It is our compensation for all those centuries of complaining about the weather.

To explain how this works, let's start with onshore wind farms. Almost everyone has now seen a wind turbine with three narrow blades that turn in the wind, like a windmill. The blades are attached to a cylinder (the 'nacelle') that sits on top of a high tower. A dynamo inside the cylinder transforms the energy of the turning blades into electricity. Cables carry that electricity back to the grid.

Wind turbines need a steady supply of strong wind. So they are built in rural areas, often on ridges, in the hills, or along the shore. The turbines are usually built in groups, or 'wind farms'. There are some objections to how they look, but some of these will be reduced as people begin to take climate change more seriously. There would also be more support if both farmers and small rural communities were allowed to manage and profit from wind farms.

In the first few years, most of the jobs in wind farms will be making the tower, the central cylinder and the blades in separate factories. They are then transported and assembled together on site. These are skilled factory jobs. But as wind farms grow, after 20 years about half the jobs will be in manufacture and half in maintenance.

With 20,000 workers a year, we can produce about a quarter of our current electricity from onshore wind (90 out of 380 twh/yr).[29] The big bonanza for the UK, though, is offshore wind. There are four great resources of renewable energy in Europe and North Africa. One of them is North Sea wind.[30]

About half the jobs in offshore wind will be the same as onshore wind – at first mainly factory jobs. The other half, though, are in assembling the turbines, taking them out to sea, and putting them in place. Much of this work will use the same skills built up over years in shipbuilding and on North Sea oil and gas rigs. It will also require a lot of seafarers.

We estimate it will take 260,000 workers 20 years to build and maintain enough offshore wind for 520 twh/yr of electricity. That's more than our total electricity use now (400 twh/yr).

Some of this will depend on a new technology called 'floating wind'. At present offshore wind turbines are anchored to the ocean floor, usually with a single steel or concrete plug. Floating wind is basically a boat or pontoon with a wind turbine mounted on it. Several prototypes have been built. The technology could possibly run into serious problems, but we expect it to work. If it does, floating wind could provide far more electricity than we have planned for.

Wave and tidal power

Onshore and offshore wind will provide the most jobs. But there will be another 60,000 jobs a year in wave and tidal power.

Wave power is really stored wind power – wind creates waves. The energy can be tapped using floating buoys, or via hinged flap systems or by turbines. They usually face the incoming waves, and turn the energy of the waves into electricity.

Tidal stream power turbines do the same with incoming and outgoing tides. 'Tidal range' power relies on barrages and lagoons in areas with particularly high tides.

These marine power technologies are still in the early stages. The UK is a world leader in research and development, and in test facilities, with the European Marine Energy Centre in the Orkneys and the New and Renewable Energy Centre in Northumbria. The majority of jobs here are in research and development, in manufacture, and in maintenance at sea.

Combining technologies

Wind power will be the core technology for renewable energy in the UK. But it needs balancing with other forms of energy - for several reasons.

For one thing, the demand for electricity varies throughout the day, and is at its highest during early evenings in winter. It is difficult to store electricity. This is less of a problem with gas or coal – you simply turn the power station supply up and down at different times of day, and burn less fuel when you need little electricity. But wind turbines turn through the night. If that electricity is not used at night, it is wasted.

There are several ways of solving these problems. One is a national grid that links up wind from off the shore of Cornwall, off Newcastle, out in different parts of the North Sea, and on shore in Wales, Kent, Yorkshire and so on. If the wind is not blowing somewhere, it is likely to be blowing 1,000 miles away.

This is also where wave and tidal energy are important. There are always waves around Britain, though strength varies. Tides move in and out at different times as you go round the coast, and are of reliable strength.

Moreover, the modern grid connections don't just go far out to sea. The technology now exists for cables to deliver electricity across all of Europe and North Africa. The other great resources are wind in Siberia, wind in Kazakhstan, and wind and sun in North Africa. It is perfectly possible to export electricity from Britain across Europe and to import it back at other times, to balance supply.[31]

Electric bus at a charging station in Beijing, China Photo: Maciej Janiec

Spreading demand

Another way of balancing wind is to spread demand. We will be making twice as much electricity as we do now. That electricity can be used at night in transport and buildings.

There are several ways of doing this. One is to charge the batteries on electric vehicles at night. In some cases electric cars and bicycles can be charged at home. But mostly this is likely to be a matter of buses in garages and 'filling stations' that lift out batteries and put in newly charged ones.[32]

Home and building owners, too, can be encouraged to use electricity at night. This would start with the installation of 'smart meters' in every building that could be programmed to control electricity use at different times. With well insulated boilers, water can be heated mostly at night and used mostly during the day. Buildings can also be heated to a certain background temperature, and topped up during the day.

Free, or very cheap, electricity late at night will encourage people to spread the load. This makes no sense commercially, but every sense environmentally if the government is running the grid.

This can be combined with 'load shedding'. One form of this is for businesses and other users to get cheap electricity in return for agreeing to shut down at rare moments of low supply. Another form is for households and businesses to agree to shut down parts of their use briefly at times of high demand, using smart meters.

Finally, we can also use 'headroom' – have more electricity available than we need, rather than always running at the edge. This would cut into the profits of a private company, but it makes sense for a public company trying to save the planet.

Other renewable energy jobs

We will also need some other forms of backup energy for electricity. The current gas power stations will not be closed immediately. Some of them will stay open for much of the next twenty years as new renewable power is built.

There is also solar power. One form of this, solar water heating, is discussed in the next chapter. Photovoltaic (PV) cells are the second kind of solar power. These cells come in thin boxes, and are attached to south facing roofs. They turn sunlight into electricity, even on cloudy days. In Britain these are more expensive than wind power, and make more sense in sunny countries like Spain. So for the moment we see a limited number of jobs. However, mass production in other countries may soon bring the cost down dramatically.

Then there is concentrated solar power (CSP). This works like a steam engine. Mirrors concentrate the rays of the sun on mercury or liquid salt. The pressure turns a dynamo that creates electricity. CSP already works impressively in many countries, including Spain. North Africa would be even better in the long run. The obvious thing to do is build more wind power in Britain and exchange it for CSP electricity from other countries.[33]

There have also been suggestions for use of 'biofuels' in power stations. This is controversial, and we will return to this in the chapter on agriculture (see pages 37-38).

Carbon Capture and Storage (CCS) is also called 'clean coal'. In coal fired power plants, a 'scrubber' takes the CO_2 out of the air after the coal burns. That's the 'capture'. This CO_2 is then turned into a liquid under pressure and shipped to a cavern underground or undersea. That's the 'storage'.

The scrubbers work. They are expensive, which means more jobs, but it's also the reason why power companies have only installed them in small 'demonstration' plants. The storage is more problematic technically, and there is still no working coal power station in the world capturing and storing all its carbon.

Different contributors to this report have different views on this. Some of us are deeply sceptical of clean coal, and some are strong supporters. So what we propose is this: we want some of the one million jobs to be for the research, design and building of the first working coal plant in the world to capture and store all its carbon.

If this works safely, it will be an enormous achievement. If it doesn't, then we will know.

We have not included any jobs in nuclear power. Most of us think this is too expensive, toxic and dangerous. However, we are aware that there are many people in the union movement who support nuclear power and we wish to continue discussions with them.

We can't know now what the likely balance of these various technologies will be. But we estimate, quite roughly, that we will need about 425,000 jobs a year for all of them.

Reducing demand

Finally, we are going to need large amounts of renewable electricity to transform the way we heat buildings and run transport. To free up supply for that, we also need to reduce the amount of electricity we use.

Currently about a third of electricity is used for lights and appliances as well as cooking and heating in homes, about a third for the same things in public buildings and businesses, and a third for industry. Reducing this is mainly a matter of strict new regulations.

This is not, in the main, a matter of developing new technologies. We already have lights and appliances that use much less electricity. We just need regulations saying that in three years time everything sold has to meet the standards of the best available now.

Within five years after that, electricity use has to cut by half again. This has been done before by regulation with many technologies. However, we have to be sure not to regulate on the basis of 'energy efficiency'. That means the manufacturer can make a fridge that is twice as efficient, but twice as big, and so uses the same amount of electricity. Instead, we need rules for the maximum electricity a machine or appliance can use.

With these sorts of controls, it should be possible to cut current electricity use by at least half. So we can double electricity production, and halve the amount of electricity we use now. That gives us a lot of spare electricity to transform transport and how we heat buildings. And we will eliminate almost all CO_2 emissions from making electricity.

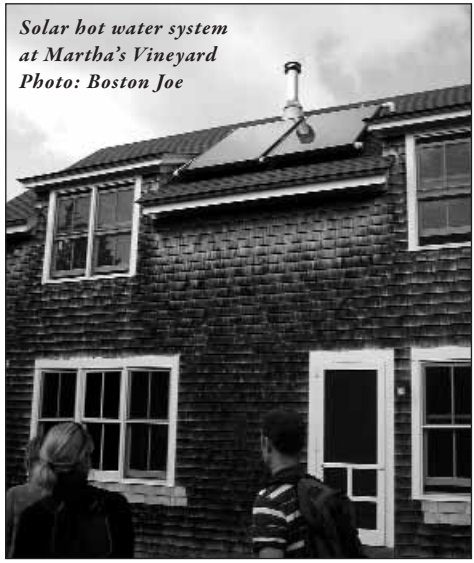
Main jobs in renewable power

- The majority of jobs will be in factories that make wind, wave and tidal turbines, and solar thermal heating
- Transport and assembly of turbines on site
- Maintenance of wind farms and marine turbines
- Transport and assembly of offshore wind and marine turbines, using the skills learned by construction workers, divers and seafarers in the North Sea oil and gas fields
- Building barges and boats for assembling and maintaining offshore wind and marine turbines
- Manufacture of long distance cables and pylons
- Building a new grid
- Other factories and mills that supply parts and materials
- Research and development in wave and tidal turbines
- Research and development in clean coal
- Manufacture of a new generation of low energy lights, appliances and machines
- Training and education in the necessary skills

Chapter 5

Jobs in homes and buildings

Heating buildings and water accounts for about two tonnes per person of CO_2 emissions. This is about 20% of each person's CO_2 emissions.



Solar hot water system at Martha's Vineyard Photo: Boston Joe

This chapter is about jobs in refitting homes, public buildings and businesses. We will need about 200,000 workers for the first fifteen years of the project, and 100,000 for the next five years. Most of them will be construction workers of all kinds.

These workers will insulate and draught proof homes and buildings so they use less energy. They will also install local renewable energy in and on top of the buildings. And they will install electric heating powered by renewable energy from the grid. In most cases, they will put up scaffolding, street by street, and do all the required work at the same time.

Here is how it will work in detail. We will start with homes. The last chapter dealt with the electricity used in homes for powering lights and appliances. As we showed there, we can cut this electricity use by half, and eventually supply the remaining half with renewable electricity.

Three quarters of emissions from houses and flats, however, are caused by heating the air and water. To reduce this we need to insulate, draught-proof, and replace boilers. This can cut the amount of energy needed to heat the home and water by about a third.

The most direct way to save energy in a house is to use insulation to reduce the amount of heat lost. This can usually be added easily to the loft space, which is particularly vulnerable. About one in four houses already have some loft insulation, but in many cases much less than is needed.

Another major source of heat loss is through the walls. If they are cavity walls, as in most houses built since 1945, then it is easy to pump in foam as insulation. In older buildings with no cavity, the insulation has to be applied inside or outside. Applying it inside is easier, though it reduces the size of the rooms a bit, and can also increase the risk of overheating in summer. Applying insulation to the outside as a render works better, but may be unpopular with conservationists in some areas.

A lot of heat is lost through windows. In the UK these are often single glazed, and many older buildings have draughty window frames. The solution here is double, multiple or 'secondary' glazing, and draught proofing windows, doors and plugging any other areas of heat loss.

Finally, more than half of homes can have an old boiler replaced with a new 'A-rated' boiler that uses much less energy to heat water.

Using all these techniques, we can cut the amount of emissions from gas and coal for heating by about a third. It makes more sense to do all these jobs together. A team of building workers can put up scaffolding all down one street. Then they go in as a team, work quickly, and do all the necessary jobs in one go. This cuts labour time by about a third, and it reduces the inconvenience.

The next strategy is to install renewable energy on site, where we can. This can be either solar hot water thermal energy or ground source heat pumps. Solar hot water is also called solar thermal heating. The water goes through thin black painted pipes on the roof, and the sun warms the water. For this to work you need a suitable roof.

Ground source heat pumps work by digging water pipes into the ground. They rely on the fact that in winter the temperature below the surface is higher than the temperature at ground level (in summer it is cooler and we can make use of that as well). They can only be installed where people have suitable gardens.[34]

Installing the renewable energy from solar water heating and ground source heat pumps can be done at the same time as the insulation and refitting work. This again is more efficient, and causes less trouble for the residents, than doing things bit by bit.

Our estimate is that it will take **200,000 workers** ten years to transform all existing homes. Each house will need a different combination of insulation, glazing, draught-proofing, boiler replacement and onsite renewable energy. Households will save a lot of money on bills over the years, but we propose that the work be done for free.

Once this work is done, emissions from heating homes and water will have been cut by about 40%. (See endnote 37 for calculations in full). On top of that, we can replace much of the heating now done with gas, coal and oil with electricity – once the majority of electrical energy is from renewable sources.

Some heating of water (in kettles or immersion heaters) or air (for instance by blower heaters) is already done by electricity. However at present electricity produces a lot of emissions because it is inefficient to generate. So there is no point in replacing gas with electric heating immediately. We need to wait until almost all of our electricity comes from renewable sources. This means workers will probably have to come back a second time after fifteen years to install electric heating.

At the moment, not including electricity, there are 80 million tonnes of CO_2 emissions from heating homes. Our estimate is that insulating, refitting, new boilers and solar thermal can cut that by 40%, to 48 million tonnes. A switch to electricity can then cut that to 24 million tonnes, a total cut of 70%.

Non-domestic buildings

We turn now to non-domestic buildings – all the buildings that are not homes or factories. These include office buildings, hospitals, shops, restaurants, warehouses, schools, and many more.

Many of us have worked in commercial offices built in the 1960s or 1970s with single glazing in ill-fitting metal windows. Sometimes these buildings are air conditioned in an attempt to make up for the inability of the building to soak up the enormous amount of energy put out by the IT equipment.

Total energy use in non-domestic buildings is about half that in homes. But much more of it comes from electricity, and much less of it goes on heating air and water. So non-domestic buildings produce 22 million tonnes of CO_2 emissions a year from gas, coal and oil used to heat rooms and water. This is just over a quarter of similar emissions in homes. These buildings will need similar treatment to homes.[35]

Public buildings differ a great deal from one to another, however, in the ways they use energy. A school, an office building full of computers, a restaurant and a supermarket are very different. The basic jobs to be done are the same – insulation, fixing windows and doors, replacing boilers, regulating lighting and appliances, and adding thermal solar power and heat pumps.[36] We estimate that over 5 years 200,000 workers can cut energy use and emissions in non-domestic buildings by about 40%.

Then, as with homes, once there is enough renewable electricity, much of the remaining heating in non-domestic buildings can be switched over.

Mixed housing and office built to the R2000 super-efficient building system on a brownfield site in Victoria, Canada
Photo: Mike Nelson Pedde

New build

But there is one way non-domestic emissions can be cut faster than domestic emissions – new buildings. The average house is replaced after 100 years. The average public building stays up for 40 years. This means that after 20 years, only 20% of houses and flats will be replaced. But 50% of public and business buildings can be replaced.

It is much easier to save energy and cut emissions in new buildings. Here the answer to emissions is a matter of regulations, rather than new jobs. The government already has detailed building regulations. There are already plans to tighten the ones about energy use. Two things are necessary now.

One is to tighten the regulations still further. There are now many examples, particularly in Germany, of housing developments that use very little energy. Scandinavian countries already have far more stringent building regulations than the UK. The second is to make the new regulations take effect immediately.

The new buildings will be a bit more expensive than at present – about 10% to 20% more. There will not be more climate jobs here, however. These will be the same building workers as before. There will, however, be jobs for energy inspectors. At the moment enforcement of building regulations on energy use is left to private inspectors paid by the builder, and abuse is widespread. The solution is perhaps 10,000 public inspectors with stringent powers.

With insulation, refitting, new boilers, solar thermal heating, some heat pumps, and tightly regulated and inspected new build we should be able to cut domestic emissions by 75% in 20 years.[37] That will require an average of 175,000 workers every year for 20 years. When we have enough electricity, it will be possible to cut this even further.

Main jobs in homes and buildings

- Most jobs will be in building trades of all kinds
- Manufacture of building materials, insulation materials, new boilers, solar thermal, and heat pumps
- Manufacture of low energy appliances
- Suppliers of materials and parts for those manufacturers
- Architects, engineers, and research and development
- Housing inspectors
- Training and education for all these skills

Chapter 6

Jobs in transport

This chapter is about jobs in transport. To see how to change, we'll start with emissions now. Transport currently accounts for about three tonnes of emissions per person, or 174 million tonnes for all of us.

Cars, planes, lorries and vans account for almost 90% of our emissions now. So that's where we need to cut.

We need to do four things, wherever possible. The first, and most important, is switch people to public transport. The second is switch freight from lorries and planes to trains. The third is to replace petrol and diesel engines with renewable electricity. None of these solutions will be easy, but they are possible.

Public transport

We will begin with the big one - cars. The figures for passenger miles in 2007 were:

Cars, vans and taxis	**425 billion passenger miles**
Buses and trains	**68 billion passenger miles** [39]

CO_2 emissions from transport [38]

	Million tonnes	% of transport emissions
Cars	77	44
Air	37	21
HGVs	26	15
Vans	15	9
Sea/waterways	12	7
Rail	4	2.2
Buses	3	1.7
TOTAL	**174**	**100**

Cars, vans and taxis carry six times as many passenger miles, and have thirteen times the emissions. So for each passenger mile, they emit about twice as much CO_2.

One reason is that the average car on the average journey carries 1.6 people.[40] Another is that long vehicles save energy. Think of the way that riders in the Tour de France bunch behind a leader, because he saves them energy by breaking through the resistance of the air. The same principle works for buses – and really well for trains, which are long in proportion to their fronts.

The third reason is that trains and trams move more easily because the wheels and the tracks are made of the same material – steel. There is less friction, so less energy is needed.

These are the three reasons why, right now, every switch to public transport cuts emissions in half. There are two more reasons why public transport could do much better than that.

The TGV (high-speed electric trains) at Pasteur-Montparnasse, France Photo: Matthew Black

One is that occupancy rates on buses and trains now are quite low – there are exceptions, but most seats are empty outside of rush hour. With a better, and more comprehensive public transport system, it should be possible to fill a lot more seats. We will return to this point.

The other reason is that it is much easier to run electric trains and buses than it is to run electric cars. Right now, with most electricity coming from gas and coal, there is no saving in heating homes by electricity. But the trade off is better for buses, trains and cars. Even now, we can cut emissions by electrifying transport. Once most of our electricity is renewable, the savings will be very large.

We also need to think of cycling and walking as part of a public transport strategy – they are good for your health, and the only CO_2 they produce is in the air you breathe out. We will return to this point too.

Making public transport popular

That's the case for public transport. But making the case is not the same thing as getting people to use public transport. The transport system has to be designed so people want to get out of their cars.

For that, several strategies have to go together. The first would be reserved bus lanes. That way buses could be faster than cars. Some streets would have to be bus only at certain times of day. Not having tickets would also speed up buses.

Another strategy is a more frequent, and more comprehensive, service. That makes travel more reliable, warmer, drier, and more appealing, and means you can get to many more places. With a more frequent service, it will also be possible to run smaller buses and shorter trains at slow times. And, crucially, there will be space for shared taxis.

A key step, though, is to work towards making buses and trains free. Many transport union activists feel there are dangers in doing this immediately. They fear, understandably, that without money coming in from tickets, the government will not invest properly in public transport. As an interim step, we can make travel free for all children, seniors, and people with disabilities. We can use current government subsidies to keep ticket prices low. We can also simplify tickets, with only one or two fares for any destination, and bring prices into line with the lower average prices in Europe. Then, once a comprehensive service is established and secure, we can make it free. This will make for many more users, and fewer cars, and faster travel, and more frequent trains and buses.

The service will never be really free, of course. Someone still has to pay for it. The fair solution is the one we use for schools and hospitals. Everyone pays for the service out of their taxes. People who use private hospitals still pay for the NHS, and old Etonians pay for state schools. In the same way, all of us, car and bus users alike, would pay taxes for public transport. Taxes would be a bit higher, but most of us would save more on tickets and petrol.

At the moment approximately 160,000 people in the UK drive taxis and cabs.[41] We don't want to put them out of work. But for most trips they are only carrying one or two people, plus the driver. Many countries in the world have shared taxis and minibuses. They say on the front where they are going, they let you off when you ask, and you flag them down when you need them. At the start of the journey, the taxis line up, and each one goes off as it fills up, which usually takes three or four minutes. The system works well.[42]

An 'Eco-Cab in Stockholm, Sweden, pedal-powerewd with a small electric battery to help with hills Photo: phototouring

The key is full taxis, so they use less energy. Once they become popular on certain routes, the drivers can upgrade to minibuses. And all the taxis can be electrified. They will be able to make a particularly useful contribution in rural areas and with transport for people with disabilities and the elderly, taking them right to their door. At the moment about half of vehicle miles in the UK are on rural roads.[43]

It should go without saying, but it doesn't, that all of the new comprehensive transport system will have to be accessible to people with disabilities. This would cut costs for the health and social services as people become more independent. More importantly, it will transform people's lives.

Any one of these strategies won't make public transport popular on its own. Taken together, and over time, they can make a decisive difference.

Finally, we can try banning cars from inner cities, or from whole cities, altogether. This would allow fast, efficient transport, and mean that most streets could be returned to trees, children, neighbours, grass, parks and gardens. This won't work by passing a law. But it could work if people in one city voted to try it. We think the results would be such that everyone else would want to do it too.

Trains

So far we have been looking mainly at buses and taxis. We also need trains. We can switch to buses quickly, because the roads are already there. Every time you fill a bus you clear space on the roads.

The train network is already nearly full. The seats are not – many are empty. But the number of trains is close to what the tracks and systems can carry. And there have to be regular times at night to maintain the track.

So the first step is to build a new, second network.

With rail most of the jobs in the first few years will be in construction, not in driving and running the system. And a new rail system can be entirely electric from the beginning.

The real gain here is in carrying freight. Remember, HGV lorries produce one fifth of all transport emissions. It is very difficult to electrify a lorry – they travel too far and consume too much energy changing speed. Rail freight already uses about one sixth of the diesel of a lorry carrying the same freight. Electric rail could eventually eliminate emissions altogether.

We would need to expand the existing depots, and build a network of new ones. But the freight could be broken down and distributed in electric vans, recharged at the depot at night.

The existing rail network is already well fitted to moving freight – it just needs full electrification. A new passenger network could run faster trains.[44] It could also run double decker trains, as in other European countries, because we could have higher bridges and longer platforms.

With trains, as with buses, more frequent services and free tickets would combine to attract even more passengers, and provide a denser and more reliable service.

How many jobs - and what jobs?

We can get a pretty clear idea of the jobs that would be needed from the ones we have now. Currently we have about 180,000 bus workers, mostly drivers, and 120,000 rail workers, doing a variety of jobs. That's about 300,000 in all. There are another 170,000 more indirect jobs supplying the bus and rail industry.[45]

We propose a 250% increase in bus and train travel. At first sight that would mean an increase from 300,000 to 1,050,00 direct workers. That is a very large number of workers to find – we also need workers for renewable energy and refitting buildings. But in practice we could do it with fewer workers. With all the strategies we proposed above, it should be possible to double passenger loads per vehicle. That would nearly, but not quite, halve the number of workers needed. And making buses and trains free will also save jobs.

Ordinarily, unions and workers would worry about losing all those jobs. But we are proposing a massive increase in public transport jobs, and a wide variety.

It should also be possible for 600,000 workers – 300,000 more than we have now – to carry the new passenger miles. Those workers could also carry a massive increase in rail freight.

About a third of those jobs would be bus drivers. At first about half would be building new rail lines. In time those would become permanent jobs on the railways.

There would also be about 150,000 jobs with shared taxis. At least some of these would be part of the National Climate Service.

On top of that we can encourage cycling. Ordinary bicycles are good for your health and burn nothing but food. Electric bicycles, now widely used in China and in Europe, also have very low emissions.

The key thing here is building a network of wide, safe, separate cycle lines that are not simply white lines on a road. This can be done quickly. It would rapidly generate jobs in building proper lanes, building and maintaining bikes, and in factories making electric bikes. We figure cycles could probably replace a tenth of car passenger miles.[46]

Lower speed limits would also make cycling and walking safer. And they are a fast way of cutting emissions – the amount of petrol needed to move a car increases rapidly after 50 mph.

In all, with cycling, and with buses, trains and taxis working at double capacity, we could cut car and van passenger journeys by at least two thirds, and total passenger emissions by at least half.[47]

Electrification

But public transport is only part of the answer. The other part is electricity. On the face of it, we simply make all the electricity renewable and electrify all the cars.

There are two problems. One we have mentioned before. We can double the amount of electricity we generate, but we would need much more than that to electrify all heating and transport. So we also have to reduce the total amount of energy used in transport.

The other problem is that right now electric cars don't work that well. There is only one car available that goes more than 100 miles without recharging. The Tesla sports car runs for 200 miles, costs £90,000 and takes 16 hours to recharge. There are also questions about materials for batteries.

However, there is a big advantage to recharging batteries at night. A system of service stations where you haul out batteries and replace them, much as you would fill up a tank now, could make a big difference. The key would be a law that said all new cars had to be electric.

Luckily, public transport already fits more easily with electricity. The whole rail system can be electrified. On motorways we can build reserved lanes for buses with overhead electric lines. These can be connected to cities by bus stations at each interchange. With a mixture of local buses stopping at each exit, and express buses running long distances, intercity bus travel could be far quicker than now, and run every few minutes.

Vans, buses and shared taxis fit electricity well. They don't have to go fast. They can use hybrid technology on all-electric motors to turn constant braking into saved energy. And they can change batteries regularly at depots.[48]

Some, but not all, the authors of this report think there are other reasons for avoiding electric cars. One is congestion. A second is the large number of people killed and maimed by cars. The third is that if we have millions of cars in rich countries, then people in China and India will want them too. That will put an enormous strain on the world's resources, and lead to massively increased emissions.

On the other hand, some of our authors think that electric cars could make an enormous difference.

Air and sea transport

This still leaves air and sea transport.

Planes account for more than a fifth of UK emissions from transport. Almost all of this comes from international flights.[49] Plane emissions are deposited in the upper levels of the atmosphere, where they do more harm, and some of them are greenhouse gases that do swift harm. There is debate about how much difference this makes, but a reasonable guess is that it at least doubles the impact of plane emissions.

That would make air emissions from planes roughly as important as cars - but they are harder to cut. Planes are aerodynamic, they are already public transport, and there is no way to electrify them.

There are ways of coping. Over twenty years we can replace most European and domestic flights with rail travel. There are obvious exceptions like the Orkneys. And there is a strong argument for building a decent high speed rail system first and then discouraging or banning flights. A speedy reliable train service across Europe could take passengers 1,000 miles in seven hours to holiday in Spain.

Over half our air miles, however, come from flights beyond Europe. Design can have an effect here. Regulations can insist that planes fly full, as charter flights do now. Businesses travellers can be discouraged, and teleconferencing encouraged. All that can probably reduce air emissions from 34 million tonnes to 15 million tonnes.

Beyond that, there are three other possibilities. Biofuels are a controversial idea, for reasons we talk about in Chapter 8. But if there is a case for them anywhere, it's in planes.

Blimps are slower and more stately, but still soaring. A third possibility is sea travel. Ships are already the low emission way of moving freight. Air freight has 46 times the emissions per tonne, and even rail freight has six times the emissions of shipping.[50] Ferries with half the crowding of sleeper carriages on railways would cut emissions drastically, and be as cheap as planes.

It is difficult to see how to cut total emissions from water transport. It has low emissions and in a low carbon economy, there would be an increase in water travel and freight.[51]

The new jobs here are on blimps, at sea, and on high speed rail.

The results

If we do all the things we have suggested in this chapter, we will still have some emissions from HGV lorries, planes and water travel. If electric cars work in time, emissions can be cut by 80% (see table to the right).

It is possible of course, that electric cars will not work out. In that case, a larger shift to public transport combined with some electric cars would allow us to cut car emissions to 7 million tonnes, and the total to 42 million tonnes. That would be still be a cut of 76%.

At first, most climate jobs will be in refitting buildings and in renewable energy. But over time, transport will take up the majority of jobs. Here most people will be able to transfer their old skills, and pleasure in the job, to similar work. Cabin staff can work on international rail and ships, HGV drivers can drive buses and trains, taxi drivers will have friendlier and more talkative cabs, and car workers can make electric cars, taxis, buses and bikes.

How we can cut emissions from travel [52]

	Million of tonnes	
	Before	**After**
Cars	77	0
Air	37	12
HGVs	26	8
Vans	15	0
Sea/waterways	12	15
Rail	4	0
Buses	3	0
TOTAL	**174**	**35**
Cut in emissions 80%		

Main jobs in transport

- Bus drivers
- Shared taxi drivers
- Driving, stations, signals and track work in rail
- Building and electrifying rail lines
- Manufacture of track, engines, rolling stock, electric cars and buses, and cycles and electric bikes
- Building cycle lanes
- Supply of parts and materials
- Maintenance, servicing and repair of all vehicles
- Training and education in all the necessary skills

Chapter 7

Jobs in industry, agriculture and education

In the last three chapters, we have covered jobs in renewable energy, construction and transport. These account for eight tonnes of CO_2 emissions per person. That's out of a total of 9.5 tonnes of CO_2 per person, or 11 tonnes of all greenhouse gases. So we have covered the most important areas. As it happens, they are also the areas where it is easiest to agree how to make cuts in emissions.

Agriculture and industry are different. Cuts in emissions here require complicated political choices. These sectors are also much more immersed in the global economy, in ways we will explain.

Moreover, for the last three chapters we could to some extent rely on research that has already been done. There has been much less work on agriculture and industry, and that means we can be less certain about how many jobs will be needed.

First, an easy one. The half a tonne of emissions from making 'other energy' lumps together four main things:

- energy used in refineries
- natural gas leaks of methane
- flaring and leaks in oil and gas fields
- making solid fuel.

Greenhousse gas emissions by sector (per person)

Industry	1 tonne
Agriculture	1 tonne
'Other energy'	0.5 tonne
Landfill	0.5 tonne
Education	needed for all other jobs

If we make the changes already discussed in the last three chapters, almost all of these emissions will disappear. If we stop using oil in transport, there will be no energy used in refineries. If we stop using natural gas in power stations and to heat houses, there will be no leaks. If we stop using coal and other solid fuel, we will have no emissions making it.

And another easy one. Emissions from landfill account for another 22 million tonnes of CO_2 equivalent - almost half a tonne per person. Here again cuts in emissions are pretty straightforward. The main problem is methane (natural gas) emissions from the decay of organic matter (left over food) in rubbish. In Britain, and worldwide, we have already eliminated much of these emissions by feeding the methane into pipes as it seeps out of landfill. That methane is then burned, and can be used for heat and energy.

So one strategy is more jobs in energy from landfill. The other possible strategy is simply sorting and recycling left over food. This can then be collected separately, and sent to be processed into different combinations of energy, fertiliser, and food for pigs. Again, there are jobs in food recycling plants.

These two strategies can cut almost all emissions from landfill.

Industry

Now for a harder one. Industry produces slightly less than one tonne of emissions per person. This may seem a low figure. Many people somehow assume that most climate change emissions come from industry.

They don't. For instance, industry uses only about one quarter of our total electricity. More importantly, though, most electricity use comes from electricity generation or transport. We have already covered these in previous chapters. Almost all the electricity will be from renewable sources. Most of the transport of freight for business will be on railways and vans run by electricity.

That covers all the use of electricity, petrol and diesel in industry. When we say one tonne of emissions from industry, we mean what's left. That mainly comes from three sources.

The first is burning fuel to keep factories, other industrial buildings and workers warm. Here the emissions can be cut in the same ways as in other buildings.[53]

The second source of emissions is burning fuel to make the large amounts of heat needed in certain industrial processes. Processing iron and steel is the biggest one, but aluminium and pulp and paper processing are big consumers too. Here some emissions can be reduced by using renewable electricity instead of coal or natural gas. More cuts can be made with improved design. But this is not as simple as the changes in keeping a factory warm.

The third source of emissions is those that don't come from burning, but from some other effect of the industrial process. Cement, for instance, is manufactured in a process that takes the carbon out of limestone and releases it as CO_2. Here there are some cuts to be made by using different materials, and some by changing design.

Again, though, the changes are not simple. For one thing, each factory and each process is different. What is needed is a team of skilled designers and craftspeople who can come into a factory or plant, work out the changes needed, and do them.

These teams can do something else as well. We have already said that factories will be using renewable electricity. But we have also been emphasising that we will have more electricity than we do now, but not enough to waste it. So the teams that go into the factories can also redesign the layout of machines, the pumps, and the electricity lines to reduce the amount of renewable electricity used.[54]

Which still leaves the question of who pays. That's pretty straightforward if the changes mean the company saves money quickly, as happens with most insulation. But what about industrial processes that require large investments, and would leave the company weaker in the face of competitors overseas?

After all, industries export a lot of their product. Electricity, housing and transport are all mostly tied to one country. Government regulation can simply change what happens in that country. But industry makes things that go around the world.

So changes to industry can't simply come from regulations by a government in London. That regulation can make a difference. But the real changes will come from concerted government action around the world. Even without that, though, we can probably reduce emissions from industry by half.[55]

Agriculture

Agriculture, too, is not straightforward. There are political problems. British agriculture is part of a global market, and much of our food comes from abroad. Also, the actual production processes are complex, and vary a lot.

The first thing to say, though, is that agriculture accounts for just less than one tonne of emissions per person. As with industry, people find this surprising. Partly it's because agriculture is not the same thing as food. About half our food is imported, so is not counted in UK emissions. The transport of food, and the electricity use in canneries, slaughterhouses, warehouses, and stores has been covered by previous chapters. Here we are talking only about agriculture – growing food and animals on farms.[56]

Very small amounts of emissions – about four million tonnes in all – come from burning oil in agricultural vehicles. Most emissions come from methane and nitrous oxide. The split is about equal.

The methane comes from cattle, sheep and goats. They chew the cud, have two stomachs, and take their time digesting food. In the process they produce methane that comes out in burps and farts. Pigs, chickens, ducks, and even ostriches and llamas don't do that.

Nitrous oxide comes from using nitrogen fertiliser in the soil, or from manure, which also contains nitrogen.

Cattle produce methane - a powerful greenhouse gas Photo: Compassion in World Farming

The majority of this fertiliser is used to grow grains to feed sheep and cattle.

There are partial technical solutions – different grasses, different land use practices, and different animal feeds, or more pigs and fewer cattle. Some people argue for giving up meat altogether, but this divides both the environmental and the union movements.

A strong case has also been made for switching a lot of agriculture to 'second generation' biofeuls.[57] Biofeuls are basically alcohol made from plants. Petrol engines, with some modifications, can burn the alcohol. The attraction is obvious, above all for planes.

There are several problems in practice.[58] There is only so much land on the planet. In many cases, forests are cut down to grow biofuels. In other cases, they are grown on land that was used for crops, and other forests are cut down for more crop land. The release of CO_2 and methane when forests are cut down is enormous.

Moreover, when biofuels and food crops compete for land in the global market, cars will beat poor families every time.[59] That will raise food prices, stoke hunger, and destroy more forests.[60] In addition, many biofuels consume a great deal of fossil fuel energy in the production process.

Many people argue that we can avoid these problems by using 'second generation biofuels'. These are crops that grow on land not used for trees or food now. Or they grow on land now used for pasture, but could be surplus if we eat less meat. Or they are made from recycled leftovers.[61]

The problem, however, is that there is a global political dispute going on right now over 'first generation' biofuels. Arguments for limited and controlled use of biofuels are in practice likely to be used to legitimate all biofuels. Here again the authors of this report are in two minds, and we do not recommend jobs in biofuels at the moment.

More organic agriculture would also create more jobs, and does not use nitrogen fertiliser. But yields are lower, which means more land has to be found somewhere on the planet.

For the moment, then, we are not sure, or agreed, on what to recommend for jobs in agriculture. This is why our proposals, for now, concentrate on other areas. We will assume that agricultural emissions can be cut by 30% through changes in processes and regulations. Obviously, we will need more than that in the long run, and there will probably be many jobs involved.

Education

Our last category is jobs in education, training and research. These are not jobs in reducing emissions from the education sector – those have already been covered in other chapters. Here we mean the training and research necessary to back up other climate jobs.

Training will be done in different ways for different jobs. At the moment, for instance, blade technicians in wind turbine factories are trained on the job, often in another country. Bus drivers are trained by the employer, and then on the road with an experienced mentor. Train drivers take years to become fully qualified. So do master mariners, who have a good deal of their education in college. As do engineers, of all kinds.

So there will be workplace, college and university education, in different combinations – and many apprenticeships. The number of apprenticeships has shrunk drastically in this country, partly because of subcontracting, and an economy that discourages private employers from providing training for more than the part of the craft they need. The climate service should encourage three and five year apprenticeships, with day release, that teach an entire craft. This is less boring, and it produces more flexible, thoughtful and innovative workers. One particular apprenticeship we will need large numbers of, across all sectors, is combined electricians and electrical machine fitters.

These apprenticeships can provide a future to a large number of school leavers who currently lack opportunities. They can also open craft skills to more women, and to older people wanting to restart their working lives.

'I'm ready for a green economy' placard at a Green Jobs educational event in Vancouver Photo: Green-for-all

We will also need a good deal of research and development. In any industry, much of this takes place as part of the process of production on a large scale. In particular, that's where big productivity savings are made.

In new industries, solving new problems, we will need more such research. But we will also need university based research. The current model of scientific and engineering research tied to the immediate needs of British industry does not serve either science or industry well. There is a need for projects that look at basic scientific problems, that might not work, or do not serve an obvious need. In the past, British industry and science were among the world leaders precisely because they did both 'practical' and 'theoretical' work. We need that again.

Finally, this research needs to be 'open source' – with the results available to the world, not concealed by commercial secrecy. If we can pioneer this, and other countries follow, it will enormously accelerate our ability to cut emissions globally.

An overview

We have not yet done the work - nor have we found anyone else who has - to be able to estimate accurately how many jobs we will need in industry and education. For the moment, we will assume that each of those sectors takes 50,000 jobs (see table below).

Distribution of climate jobs (first 20 years)

Electricity	425,000
Buildings	175,000
Transport	300,000
Industry	50,000
Education	50,000
Total	**1,000,000**

The building jobs include 200,000 working on homes for the first ten years, the same number working on public and business buildings for the next five years, and 100,000 fitting electric heating in homes for the last five years. See panel below for how the jobs will look after 20 years.

Distribution of climate jobs (after 20 years)

Electricity	300,000
Transport	600,000
Education	50,000
Other	50,000
Total	**1,000,000**

These are guesses. Twenty years is a long way off. We are assuming that with technical progress, and a grid in place, it will take less jobs to replace wind farms than it did to build them in the first place. We also assume that industry and buildings will have been reconfigured.

These are not all the jobs in a new low carbon economy. These are the new, government climate service jobs. They do not include the 300.000 already working on buses and trains, for instance. Nor did they include the building workers, many of them trained by the National Climate Service, who would go on to build low carbon homes and buildings.

We could make even deeper cuts, and get closer to Zero Carbon Britain, if electric cars work. We could also do it with more jobs in public transport, or more electric heating. And we can do it if we find ways to make deeper cuts in agriculture and industry, or to use biofuels in planes.

It does not have to take 20 years. A million and a half workers could do it in 13 years. Two million could do it ten years.

Climate jobs: cuts in emissions

	Tonnes per person	
	Before	**After**
Electricity	3.0	0.2
Transport	3.0	0.7
Buildings	2.0	0.4
Industry	1.0	0.5
Agriculture	1.0	0.7
Other energy	0.5	0.1
Landfill	0.5	0
TOTAL	**11**	**2.6**

Total cut in emissions: 76%

Chapter 8
What you can do

In an era of government cuts and austerity measures, climate jobs and investment will only become real if we campaign, organise and fight for them. It is a truism, but social change has only ever come from people struggling together.

With austerity programmes being pursued by governments across Europe, the ideas contained in this report can help counter the argument that there is no alternative. It shows how creating one million climate jobs is both technically feasible and affordable and how the necessary public investment can build a green industrial base – the "commanding heights of the future." [62]

But we have to learn the lesson that if climate change is the result of massive market failure we cannot rely on the market to take the decisive action needed.[63]

A fairer system of taxation and stronger government regulation must be part of the solution. So is the need to debate and explore alternative, democratic forms of public ownership if the planet's productive resources are to meet social need and halt a slide towards ecological disaster.

Thousands of people have read this or an earlier edition of this report. At first we met with some scepticism, as the concepts were new to many in the union movement. But in many British trade unions the argument for climate jobs has been won.

The idea of climate jobs has become national policy for many trade unions and is spreading internationally. Now we need to expand the campaign. The argument for climate jobs has been made, and often won. We need to start the campaign to get those jobs.

The authors of this report have spoken at numerous meetings and seminars. Often we've found that workers and environmentalists agree with everything we say, but don't know what they should do next. So in this chapter we will look at different ways that we can organise.

Those of you who have read this far will come from a number of different points of view. Some of you will be active trade unionists, involved as a workplace representative. Perhaps you regularly attend your union branch meeting and take part in the debates and votes that take place there. Other readers will be in a union but wouldn't consider yourself active – maybe you got hold of this pamphlet through your union branch, but don't go to meetings.

Some readers might not be trade unionists, or even in work. But you see the need for jobs, or you are desperate for action over climate change. Perhaps the cuts have put you on the dole, or you have come out of the education system and haven't yet found work.

Finally many of you will be environmental activists. Maybe you saw this report and read it because you wanted to know more, or were unconvinced of the need to create climate jobs.

Perhaps you've been to Climate Camp, or are a member of the RSPB, the Campaign against Climate Change or Friends of the Earth. Perhaps you've signed petitions and joined demonstrations, but want to do more. Whichever group you are from, you can help.

So what can I do?

Here are some ideas how you can help spread the campaign for one million climate jobs.

Popularise the idea of climate jobs even further

This is particularly important as working people face enormous cuts in their jobs and services. Climate jobs allow campaigners to offer a positive way forward. Instead of simply saying "we are against this cut" or "stop this service being closed," we can argue for positive solutions. Climate jobs won't just create work and save the planet - the investment has the potential to pull the economy out of crisis.

Ask people to sign up to the campaign and add their name to our website

We want to show the breadth of support for a million climate jobs so as to create the ground swell campaign that can force action from national government. This includes MPs, local government councillors, authors and leading trade unionists. We also want ordinary campaigners, activists and unionists to do the same in their thousands.

We should get organisations – cycling clubs, union branches, churches, mosques and synagogues, professional associations, local branches of political parties and NGOs to add their group to the list of supporters at www.climate-change-jobs.org.

Link with existing campaigns

Campaigns against austerity measures are starting up everywhere. They will be holding meetings, demonstrations and protests. We need to get the message of climate jobs to every one of those events. The demand for a green economy needs to be at the heart of those struggles.

We need to build a network of campaigners prepared to get organised to visit picket lines, speak at meetings, petition in town centres and leaflet workplaces. There are activists in every town and city in Britain willing to get involved in this.

The Campaign against Climate Change (CaCC) which produced this report have groups around the country. Our trade union group has an extensive network of union members who want to campaign for climate jobs. Groups like Climate Camp, Friends of the Earth and Greenpeace have members in every town. National supporting trade unions such as PCS, CWU, UCU and TSSA have local branches in many towns and workplaces.

Getting in touch with all of these can seem daunting. But if you start from the existing groups such as those on the CaCC website, you can quickly find a network of others who want to get involved.

We have found public meetings that discuss the idea of climate jobs have been very popular. These meetings don't have to be big, just bringing together trade unionists and environmentalists can start a dialogue about how to work together.

Part of The Wave, a march against climate change, London, 2009 Photo: Peter J Dean

Getting together, booking a room and inviting activists to an initial organising meeting is the easiest first step. Contact the CaCC office or the CaCC trade union group (see inside back cover for details) – we can help you get a speaker or put you in touch with local activists.

To many environmentalists, unions can seem very confusing. There are many different bodies, they seem to organise in strange ways – sometimes geographically, sometimes on a workplace level and sometimes across an industrial sector.

At the same time, environmentalists often seem strange to trade unionists. Environmental meetings can seem long and sprawling, with no fixed agenda, unlike more rigid trade union meetings. Sometimes people don't like to take votes, or elect officers.

These differences shouldn't worry us. They are just different methods of working. Those of us who have put this report together come from all sorts of different traditions. Over the years we have learned to work together, and learned from each other.

An important aim of this report is to develop the debate both within and between trade unions and environmentalists.

Raising climate issues in your trade union

Not everyone in a union knows the ropes either. We have lots of support already, but we still want climate jobs discussed at every level of the union movement – and in every branch and workplace.

Unions organise in a democratic way. While they have a layer of officers and leaders, nationally and locally many of these are elected by the membership. Policy is decided by annual conferences, through motions submitted by branches and groups.

The unions that support the campaign for climate jobs do so because at their union conferences activists have debated and discussed motions from branches that have called on them to do so. We want to expand this, so when you discuss the issue in your union branch, you might want to see whether it can be passed up to the next union body – perhaps the 'region' or the 'sector'.

What you can achieve will depend on your union branch, but getting involved is the first step to finding out what can be done. If you are a union member and have never been involved in your branch, you might feel uncomfortable raising these issues. But when you do, you are likely to get a welcoming reception.

Here's what you, and your union branch, can do:

- Find out where your union branch meets. In a unionised workplace, the best person to ask is your workplace representative or shop steward. Explain that you want to raise the issue of climate jobs and show them this report. If your union already supports the idea, explain this.
- Ask your shop steward how you can best raise the issue. This might be through a motion - a short statement that the union body agrees to action. Or by simply speaking on the issue. Depending on how your branch is organised, you might want to speak about the idea of climate jobs yourself or see if you can get the union to invite a speaker from the campaign.
- There are other tried and tested actions that union branches are familiar with. For example, the branch can agree to purchase copies of this report to circulate among members. They could sponsor a joint meeting with another campaign group, or invite a speaker from the climate jobs campaign.
- In recent years many unions have started to elect environmental or green representatives. These reps are like shop stewards or health and safety reps, but for the environment. They campaign for changes at work that improve the environment and reduce energy use. Unfortunately these reps have no statutory rights, but if combined with health and safety legislation they can make a difference. Many of the changes they argue for would improve working conditions – or save money.
- Green reps or learning reps can also help to educate fellow workers about climate change - by, for example, organising film showings or workplace meetings. At one electronics firm in the North West, representatives showed the Al Gore film *An Inconvenient Truth* after work for their colleagues, provoking a debate about what could be done there to reduce energy use and involve trade unionists in environmental campaigning. There may also be activists who have been involved in TUC GreenWorkplaces or Climate Solidarity projects in your workplace you could contact.

Reaching out to other workers

We live in a new and challenging time for the environmental movement. The failure of a genuine international agreement at Copenhagen in 2009 has demoralised some. The economic crisis has already led to governments saying they cannot afford even the minimal changes they had agreed to help fight climate change.

This can paralyse us as environmentalists. Or we can use this new situation to our advantage. We can reach out to those people who are having their livelihoods attacked, their services cut and jobs destroyed. We can get involved in their campaigns to spread a different message – of climate jobs and green investment.

If there is a strike, protest or campaign in your area it is important that you show solidarity. Go down and join the picket lines and demonstrations. Take copies of this report to show the campaigners about the alternative.

A number of high profile campaigns in recent years have had environmental ideas at their heart (see box below).

Disputes at Visteon and Vestas

When the workers at the Visteon car component plants occupied their factories in the face of closure early in 2009 they issued a statement that said:

> ***"Our skills - we can make anything in plastic - should be used to make increasingly needed parts for green products: bike and trailer parts, solar panels, turbines, recycling bins, etc."***

These workers wanted to save their jobs. But they had also started to think about what they did. If cars were no longer in demand, what else did society need that they could turn a hand too?

Visteon workers met a wave of solidarity. Other workers, trade unionists, socialists and campaigners took food, bedding and solidarity down to the occupied plants. This support enabled them to carry on their struggle and although they didn't save their jobs, they won a huge financial settlement.

A few months later another occupation had a profound impact on the union and environmental movements in Britain. Vestas, Britain's only wind turbine manufacturer, decided to move production to the USA from the Isle of Wight. Six hundred men and women lost their jobs and the island's economy was devastated.

The insanity of closing a turbine plant when the world desperately needs more renewable energy was there for everyone to see. Again, the occupation of the plant received huge solidarity from trade unionists, environmentalists and islanders. A climate camp set up outside the occupation involved hundreds of people.

While the Vestas occupation did not end in victory, thousands of trade unionists and environmentalists learned that there was no iron wall between their struggles. Groups worked together around the country to provide solidarity.

There will be more struggles like this. Many will start in communities or workplaces where the environmental link is not obvious. Sometimes workers will be on strike in carbon intensive industries like car plants or airports. Workers in industries like these aren't selfish. They care about the future of the planet, but are worried about their livelihoods.

This is why we need to support them and show that environmental issues play a part in these disputes too. Car workers for instance could be producing the buses, coaches and trains that our expanded public transport system needs. If those campaigns can defeat their bosses or the government, then all of us will be stronger.

The way forward

The umbrella for the British Trade Union movement is the Trades Union Congress. The TUC strategy for a 'Just Transition' argues that working people should not lose out in the transition to a low carbon economy. They demand that:

> ***"jobs loss as a result of environmental transition is minimised and that change within sectors does not occur at the expense of decent work and decent terms and conditions. A Just Transition is also required to ensure that environmental initiatives... do not impact on lower income groups."*** [64]

Workers in high carbon industries are not our enemy. We want them to have better, safer jobs in a future economy.

The future of aviation, coal or nuclear power are things that not all of us will agree on. However it is important that there is a dialogue between different sections of the trade union movement and environmentalists about how we take things forward. In this report however, we have shown that part of the drive towards creating millions of climate jobs is to retrain, redeploy and reuse the skills that people already have.

Take the North Sea oil industry. Thousands of people are employed who have skills in building structures at sea, deep sea diving, flying helicopters and navigating boats. If we are to construct off-shore wind-turbines in their thousands, these workers will be urgently needed. People who work in the car industry will be able to turn their skills to making buses, coaches and trains for our expanded public transport networks.

When the Tories destroyed the coal mining industry in the 1980s, hundreds of thousands of people were thrown on the unemployment scrapheap. We don't want that repeated. Anyone who loses their job in a low carbon economy will have a new one, or the opportunity to retrain and redeploy.

Winning a million climate jobs will not be easy. None of our recent governments have looked like they would simply introduce the measures we need. We will have to force them. But the climate jobs we want to create offer much more than jobs that can help save the planet. They will be jobs with decent pay and proper health and safety. Many will be skilled jobs that will help halt the decline in manufacturing industry. They will give hope to young people facing a bleak future. And campaigning for them will help unite trade unionists, environmentalists, students, pensioners and the unemployed. Such a coalition will be a powerful force.

The more we build on the this, the more links we create, the more networks we build, the more we support each other's struggles, the greater the chance of us winning the changes we need.

In May 2010, the Bolivian government called a World People's Conference on Climate Change and the Rights of Mother Earth in Cochabamba, Bolivia. A grassroots alternative to the failed United Nations 2009 Copenhagen talks, the conference concluded with a Universal Declaration of the Right of Mother Earth.[65] In the words of Domingo Lechon, Climate Justice Co-ordinator from Friends of the Earth Mexico:

> ***"Cochabamba represents a unique opportunity for popular demands to be adopted by governments. We will use the new people's agenda as a rallying call to mobilise movements of affected peoples, indigenous peoples, peasant farmers, trade unions and women to dismantle corporate power and force our governments into action".***

Today, millions of people face a stark future. The campaign for climate jobs is about offering an alternative to the austerity measures and cuts offered by the current government. It is a positive alternative – putting people and planet first.

Mass movements of ordinary people are what force governments to introduce change. Whether the campaign for the right to vote, the right to be in a trade union, or even the right to protest. All of these have brought huge pressure – demonstrations, protests, and strikes – to bear on governments and politicians.

Our campaign is no different. In the short term we need to spread the idea of climate jobs and make it central to existing campaigns and strikes. Every strike that protects a service or saves jobs, could also create new climate jobs. The case for one million climate jobs can help build mass support for an alternative to austerity measures that are trying to make us pay the price for the economic crisis. It can help challenge the fatalism that has afflicted trade unions and popular protest for too long. We can show in practice that another world really is possible.

Endnotes

1 We are following the excellent example of David MacKay, *Sustainable Energy – without the hot air,* UIT, Cambridge, 2009, downloadable at www.withouthotair.com

2 Emissions are measured in million tonnes of CO_2. For methane and nitrous oxide they are measured in million tonnes of CO_2e, which means CO_2 equivalent – enough methane to have the same effect as a tonne of CO_2. These are estimates partly because emissions fell 10% from 2008 to 2009, because of the recession. It is not clear how high emissions will be in 2010 and 2011. We have chosen the higher numbers for 2008 because 2009 may, or may not, prove to be an exceptional year. Sources: Department of Energy and Climate Change statistics for greenhouse gas emissions, 2008 and 2009, at www.decc.gov.uk. To make these estimates, we have included emissions from refineries under transport, where almost all oil is used. We have included emissions from manufacturing solid fuel and other energy under buildings, where much of it is used. We have added the emissions from aircraft fuel and ship fuel sold in Britain for international travel to the government's more conventional measure of British emissions. We have included emissions from leaking gas pipes as part of buildings. For more details on the calculations, see the Technical Note on UK Emissions on our website www.climate-change-jobs.org

3 Our detailed calculations are in the Technical Note on Jobs Created and Lost, available on our website: www.climate-change-jobs.org

4 See note 3 above.

5 Source: 'Government spending details' at usgovernmentspending.com

6 See Jonathan Neale, *Stop Global Warming,* Bookmarks, 2008, pp. 50-55; and Paul Koistinen, *Arsenal of World War II: The political economy of American Warfare,* University Press of Kansas, Lawrence, 2004.

7 International Monetary Fund, *Global Financial Stability Report,* April 2009, p. 36. The figures are given in dollars: $110 of write-offs up to the end of 2008, and a further $200 million expected in 2009.

8 For ease of calculation, we have used an average wage of £27,000. In 2009 the median earnings for full-time men was £28,270. That means half of men earned more than that and half less. The mean earnings for men was £35,661. That means the average, but it is distorted by very high earnings by a small number. For full time women the median was £22,851 and the mean was £26,000. These figures are from the 2009 annual Survey of Hours and Earnings (AHSE) published on the website www.statistics.gov.uk. We are assuming here that climate workers will be both men and women, they will be paid a bit more than the man in the middle makes, but that they would not necessarily be paid overtime. So the wages in the National Climate Service would be a bit higher than £25,000. However, the calculations work out much the same if we use higher numbers.

9 We are not counting in the costs of employers' national insurance contributions paid in by the government, because these are in effect the government paying the themselves.

10 Mattias Dolls, Clement Fuest and Andreas Peichl, *Automatic Stablizers and Economic Crisis: US vs. Europe,* Institute for the Study of Labor, July 2009. The key table is on p. 14, and suggests a rate of 44%, or 11,880 out of £27,000. However, the authors are using data from Euromod, which does not include spending on VAT and other indirect taxes. To allow for this, we have used the estimates for indirect taxes in Richard Murphy, 'Cut Government Debt by Increasing Spending', www.compassonline.org.uk, 10 July 2009, for a person on £25,000 a year, and allowed about 4% of total expenditure for indirect taxes. This gives us a total rate of 48%. 48% of £27,000 is £12,960, which we have rounded to £13,000. We have not taken account of employers' national insurance contributions, on the grounds that when someone is a public employee, the government is in effect paying themselves the employer's contributions.

11 This is more than for many public sector workers, because building work, transport and wind power create a lot of jobs in the supply chain. See the note on Jobs Created and Lost on our website: www.climate-change-jobs.org

12 This is a low estimate, and assumes that electricity is cheap, public transport is free, and house refitting is free. The real figure will certainly be no lower than this, and might be much higher.

13 Calculations based on the figures in Mike Brewer, Luke Sibieta, and Liam Wren-Lewis, *Racing Away: Income Inequality and the Evolution of High Incomes,* Institute of Fiscal Studies Briefing Note 76, 2008, p. 9. This paper uses data from 2005-2006, and the numbers would be slightly higher now.

14 See http://robinhoodtax.org.uk/

15 See the note Subsidies by Barbara Harriss-White on our website: www.climate-change-jobs.org.

16 This chapter owes a good deal to the Green New Deal Group, *The Cuts Won't Work,* New Economics Foundation, London, 2009.

17 Will Hutton, Guardian website Comment is Free, 13 September 2009.

18 Samuel Brittan, 'Why UK should not fret about national debt', *Financial Times,* 27 March 2009.

19 CIA World Factbook 2010 for national incomes, at purchasing power parity. In May 2010 unemployment in Japan was 5.2% and in the UK 7.9%, but the counting is less rigorous in the UK.

20 See note 10 above.

21 Paul Mosley, T. Subasat and John Weeks, 1995, 'Assessing Adjustment in Africa', *World Development,* 23 (9): 1459-1473.

22 John Weeks, 2000, 'Latin America and the "High Performing Asian Economies": Growth and Debt', J*ournal of International Development,* 12:625-654.

23 Two readable accounts are Richard Alley, *The Two-Mile Time Machine,* Princeton University Press, Princeton, 2000; and John Cox, *Abrupt Climate Change and What It Means for our Future,* Joseph Henry Press, Washington DC, 2004.

24 For a readable summary of many of the possible feedbacks, see Fred Pearce, *With Speed and Violence,* Beacon, Boston, 2007. The recent and worrying climate science is summarised in Katherine Richardson et al, *Synthesis Report on Climate Change: Global Risks, Challenges and Decisions,* University of Copenhagen, available at www.climatecongress.ku.dk; Richard Hawkins, Christian Hunt, Tim Holmes and Tim Helweg-Larsen, *Climate Safety,* Public Interest Research Centre, 2008, available at www.climatesafery.org; and *Zero Carbon Britain 2030,* pp. 37-57.

25 See Neale, *Stop Global Warming,* pp 223-233; Spike Lee's film *When the Levees Broke,* 2006; Douglas Brinkley, *The Great Deluge,* William Morrow, New York, 2006; Jed Horne, *Breach of Faith,* Random House, New York, 2006; and John McQuaid and Mark Shleifstein, *Path of Destruction,* Little Brown, New York, 2006.

26 See most recently, Hansen, J., Mki. Sato, P. Kharecha, D. Beerling, R. Berner, V. Masson-Delmotte, M. Pagani, M. Raymo, D.L. Royer, and J.C. Zachos,'Target atmospheric CO_2: Where should humanity aim?', *Open Atmos. Sci. J.,* 2008, 2, 217-231; and for much more, go to Hansen's website at Columbia, www.columbia.edu/~jeh1/

27 See note 2 above.

28 For the details of our calculations of possible renewable energy resources and jobs needed, see footnote 1, the Technical Note on Jobs and the Technical Note on Jobs and Capacity in Renewable Energy on our website www.climate-change-jobs.org

29 For all the calculations in this chapter on jobs, capacity installed and electricity produced, see the Technical Note on Jobs and Capacity in Renewable Energy, on our website. To work out the estimates for capacity installed and electricity production, we have relied on Martin Kemp and Josie Wexler, eds., *Zero Carbon Britain 2030,* Centre for Alternative Technology, Machynlleth, Wales, 2010 (ZCB); The Offshore Valuation Group, *The Offshore Valuation,* Public Interest Research Centre, Machynlleth, Wales, 2010 (PIRC); and David JC Mackay, *Sustainable Energy – without the hot air,* UIT, Cambridge, 2009; and a series of background papers by Dave Elliott of the Open University, posted on our website.

30 See Technical Note on our website by Dave Elliott on Estimates of Renewable Resources across Europe and Beyond.

31 See the Technical Note by Dave Elliott on our website.

32 There have been arguments for using electric car batteries as a resource to draw on at periods of peak demand. *Zero Carbon Britain 2030*, however, says that the energy losses are so great that it is an inefficient way of storing energy; p.111.

33 At the moment there are considerable political problems with plans to develop CSP in North Africa for export. See the Technical Note on CSP by Dave Elliott on our website. In the longer run, if we get a mass climate jobs programme and other countries follow suit, these problems could be easily solved.

34 Both *Zero Carbon Britain 2030* and MacKay, *Sustainable Energy,* propose that wall mounted heat pumps could also make a major difference in Britain. Unfortunately, recent research suggests that for the moment this is not the case. See Energy Saving Trust, *Getting Warmer: a field trial of heat pumps,* 2010. Ground source heat pumps do not seem to be a magic bullet, but do work reasonably well in new buildings.

35 Gupta, R. and Chandiwala S (2009), *A critical and comparative evaluation of approaches and policies to measure, benchmark, reduce and manage CO_2 emissions from energy use in the existing building stock in cities of developed and rapidly-developing countries – case studies of UK, USA and India.* The World Bank, USA

36 For the detail see Briefing Paper: *Building industry* by Fergus Nicol and Rajat Gupta on our website, www.climate-change-jobs.org; David Jenkins, Phil Banfill and Giuseppe Pelligrini-Massini, *Non-domestic conclusions of the Tarbase project – Reducing CO_2 emissions of existing buildings*, Urban Energy Research Group, School of Built Environment, Heriot Watt University, 2010; and *The UK's approach to the thermal refurbishment of non-domestic buildings: A missed opportunity for bigger carbon emission reductions?* has been written by Caleb Management Services Limited, and commissioned by Kingspan Insulated Panels downloadable from www.kingspanpanels.com/research.

37 The calculations are as follows:

Emissions from homes now **80 million tonnes**

After refitting, solar thermal and heat pumps - 54 million tonnes; including switch to renewable electricity - 27 million tonnes; and including effects of new build (20%) - **22 million tonnes**

Emissions from non-domestic buildings now **22 million tonnes**

After refitting, solar thermal and heat pumps - 13 million tonnes; including switch to renewable electricity - 6.5 million tonnes; and including effects of new build (50% of stock) - **3 million tons**

Total emissions now - 102 million tonnes

Total emissions after all changes - 25 million tonnes.

38 Transport statistics Great Britain 2009 Table 3.7 We have adjusted the statistics to take account of the emissions from electric rail. Without this adjustment, public transport has about a third of the emissions of cars and vans, not half.

39 Transport statistics Great Britain 2009 Table 1.1.

40 Statistics for passenger occupancy rates are from Table 1.7 of the Defra paper at http://www.defra.gov.uk/environment/business/reporting/pdf/passenger transport/pdf, a paper titled *2008 Guidelines to Defra's GHG Conversion Factors: Methodology Paper for Transport Emission Factors.* This paper includes emissions in respect of different types of transport of all kinds, including 'real life' estimates taking account of actual rather than theoretical fuel consumption. Emissions per passenger kilometre (or tonnes for freight) are given for different forms of transport, except cars where the figure is for vehicle km. The car figures can be converted to passenger km using Table NTS 0905 from the Department for Transport's National Travel Services statistics which give car occupancy rates at https://www.dft.gov.uk/pgr/statistics/datatablespublications/nts/.../nts0905.xls

41 Transport Statistics Great Britain 2009 has figures in Table 1.16 for people employed as 'Taxi, cab drivers and chauffers'. This gives 164,000 for people employed in the transport industry and 32,000 for other industries, presumably chauffeurs.

42 It may also prove useful to run at least some women only taxis at night.

43 215 billion road kilometres on rural roads, 184 billion on urban roads, and 100 billion on motorways. Source: Department for Transport, *Transport Statistics Great Britain 2009*.

44 There is controversy over whether a really high speed network is needed, because the trains would use more energy – the drag increases with the square of the speed. But trains going 125 or 150 miles an hour would be enough in Britain.

45 Ecosgen, *Employment in Sustainable Transport,* a report by the Campaign for Better Transport and Sustrans, 2010.

46 This is a rough estimate, and in practice the figure may be a good deal more or less.

47 See the Technical Note on Transport Jobs and Emissions on our website.

48 There is also a case for using hybrid buses and taxis now as a transitional measure to full electrification.

49 We count the plane fuel sold in the UK, so in effect only outgoing flights. This is a good reflection of UK use however, as we should be responsible for about half the emissions from flights into and out of the UK, and the other countries for the other half.

50 *Zero Carbon Britain 2030,* p. 130.

51 With rising oil prices there have already been successful experiments using huge kites to catch the wind and reduce oil consumption by 20 per cent on cargo ships – expected to double to 40 per cent with the next generation. See, for instance, http://www.treehugger.com/files/2008/03/beluga-skysails-cargo-ship-kites.php . Other articles cite a range between 15 and 50 per cent of fuel saved.

52 *Transport statistics Great Britain 2009* Table 3.7. We have adjusted the statistics to take account of the emissions from electric rail. Without this adjustment, public transport has about a third of the emissions of cars and vans, not half. Table 3.7, gives the figure of 2.5 million tonnes of CO_2. For a reference to a higher figure, 3.85 million tonnes, see: 'Act on CO_2' on the Directgov website:
http://actonco2.direct.gov.uk/home/what-you-can-do/On-the-move/Compare-CO_2-emissions.html .
There is also DfT Factsheet 3 *Railways: Greenhouse Gas emissions.* It's of interest that 40 per cent of the network is electrified but these routes account for around 60 per cent of passenger miles. Freight traffic, though, is 95 per cent diesel. Total emissions are estimated to be 43 per cent from electric trains and 57 per cent diesel. http://www.dft.gov.uk/pgr/statistics/datatablespublications/energyenvironment/climatechangefactsheets.pdf . The source is: http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2008_final/2008_final.aspx
Figures vary slightly but those given above are probably as good as any. There may be ramifications in translating rail emissions to those per passenger mile because passenger trains disproportionately use more efficient electric trains. But for now these rough and ready figures are accurate enough for our purposes.

53 The way the government collects the statistics makes it difficult to impossible to tell how much of industrial and business emissions are from heating industrial buildings. We suspect it is a substantial proportion.

54 For an idea of some of the possibilities here, see the often over-optimistic, but always stimulating, work of Amory Lovins, L. Hunter Lovins and their colleagues. Examples are Paul Hawken, Amory Lovins and L. Hunter Lovins, *Natural Capitalism: Creating the Next Industrial Revolution,* Back Bay Books, New York, 2000; and Ernst von Weizacker, Amory Lovins and L. Hunter Lovins, *Factor Four: Doubling Wealth, Halving Resource Use,* Earthscan, London, 2001.

55 This is a rough estimate. But for some of the possibilities, see the books by Lovins and associates cited above, and more recently Ernst von Weizacker, Karlson Hargroves , Michael Smith and Cheryl Desha, *Factor Five,* Earthscan, London, 2010.

56 UK agricultural emissions in 2008 were 48 tons of CO_2 equivalent for 2008, about 0.8 tonnes per person. See Department of Energy and Climate Change, *2008 UK Final Greenhouse Gas Emissions: Data Tables,* downloadable from www.decc.gov.uk.

57 The case for limited and controlled use of biofuels is well put in Martin Kemp and Josie Wexler, *Zero Carbon Britain 2030,* Centre for Alternative Technology, 2010, pp. 189-231 and 247-249.

58 www.biofuelwatch.org.uk is the place to start in the literature on the problems of biofuels.

59 George Monbiot has argued this eloquently, and influentially, over several years.

60 There is controversy over the effect of biofuels on the last big surge in agricultural commodity prices in 2008-09. This was at least partially driven by biofuels, particularly American production, but the fact that prices eventually fell quite quickly suggests that speculation also played a considerable part.

61 Many people would also include 'sustainable' forests of fast growing trees that can be burned and then replaced by new growth. We have not included this, because with this kind of forestry most of the CO_2 remains in the air for most of the carbon cycle.

62 See Seamus Milne, 'Even the Isle of Wight wants Miliband to buck the market', *The Guardian* 22 July 2009 http://www.guardian.co.uk/commentisfree/2009/jul/22/green-jobs-market-vestas-strike

63 See the Stern Review, *The Economics of Climate Change* (2006) http://www.hm-treasury.gov.uk/stern_review_report.htm

64 *A Green and Fair Future: For a Just Transition to a Low Carbon Economy,* Touchstone Pamphlet 3, TUC, 2008, p. 3.

65 See http://www.guardian.co.uk/environment/2010/apr/21/evo-morales-grassroots-climate-talks

The Campaign against Climate Change trade union group aims to get trade unionists involved in action on climate change.

We have support from several major trade unions and have hosted three national conferences that have brought together hundreds of delegates to debate the issues raised by global warming.

For more information see the **Campaign against Climate Change** trade union group website http://cacctu.wordpress.com. To join our mailing list or to get involved contact **Martin Empson** on 079 585 35231 or email **climatetradeunion@googlemail.com**

One million climate jobs

In 2009, the Campaign against Climate Change trade union group – working with academics, climate activists and several UK trade unions – decided to fight to make the government create one million green 'climate' jobs. We produced a report *'One Million Climate Jobs NOW!'*

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