One million climate jobs NOW!

campaign against climate change

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The photo was taken in July 2009 on the Isle of Wight and shows workers at the Vestas wind turbine blade factory protesting against the closure of the factory. The occupation lasted 18 days.

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A report by the
Campaign against Climate Change
trade union group to the Communication Workers Union, Public and Commercial Services union, the Transport Salaried Staff Association and the University and College Union

Introduction

Several trade unions and many climate activists in Britain have decided to fight to make the government create one million green climate jobs immediately. This short report from the Campaign against Climate Change explains how we can do that and why we must.

At some point gradual climate change is going to turn into runaway catastrophe. We may well hit that point in the next twenty years. To avoid doing so, we need drastic cuts in the amount of carbon dioxide, methane and other greenhouse gases we put into the air.

This will mean government regulation and international agreements. It will also take a lot of work – jobs. We have to produce 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 two and a half million unemployed people in Britain. By next year there are likely to be three million or more. It is possible that the economy will have started to 'recover' by 2010. But recovery only means that profits and sales begin to rise. Unemployment will grow for a time after 'recovery' begins, and may stay high for a very long time.

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.

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

Contents

Who are we?

In the spring of 2009 the trade union group of the Campaign against Climate Change organised a conference of 200 union activists. That conference decided to start a serious fight for green climate jobs.

We set up a working commission to draw up detailed plans. That commission has people from the campaign, from several UK unions, from non-governmental organisations and many academic experts. It is preparing a longer report with more detailed calculations of how many jobs will be needed in each sector and how much they will cut emissions.

But we are bringing out this booklet now, because we want unions to start fighting for a million jobs right away.

The main kinds of new jobs we need

Section 1 – What are climate jobs?

Climate jobs are jobs that reduce the amount of greenhouse gases we put into the air. Greenhouse gases cause global warming. This preliminary report will concentrate on the most important gas, carbon dioxide (CO_2).

We are emitting CO_2 into the atmosphere by burning coal, oil and gas – these are called CO_2 'emissions'. We need to cut CO_2 emissions as fast and as deeply as possible, especially in developed countries like the UK. Here we should be looking at cuts of around 75% to 80%. That means burning only 20% of the coal, oil and gas we do now. (For the reasons why, see section 3.)

We can do that. But it will take a lot of work. If we can cut our energy use in half and supply half of that from alternative energy, we can cut CO_2 emissions by 75%. We will need at least a million new climate jobs to do that. When we say a million climate jobs, we mean something rather different from what the politicians 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, flood control and many more things. All these jobs are necessary. But they do not affect global warming.

We want a million new jobs, not ones people are already doing. We don't want to add up existing and new jobs and say that we now have a million climate jobs. We don't mean jobs with a climate connection, or a climate

aspect. We don't want old jobs with new names, or ones with 'sustainable' in the job title. And we don't mean 'carbon finance' jobs.

We want the government to employ a million workers. That means we want the government to start employing 83,300 workers a month and to have employed one million within twelve months.

This is a new idea. Up to now, government policy has been to use subsidies and tax breaks to encourage private industry to invest in renewable energy. They also plan to give people grants or loans for part of the cost of renovating their homes. Their idea is to encourage the market.

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 and the new NCS employs staff to do the work that needs to be done. That way we can be sure it is done. Given what the scientists are telling us, we need to be sure.

Most of us in the trade union group would like to see almost all of these workers employed by central or local government. We are aware this may not be politically possible, and part of the work will probably be done by contractors. But we want the government to control the project - so that we all know they are making sure it happens - and not simply rely on the market. And we want jobs with proper wages, pensions and trade union rights.

A million new climate jobs will also create hundreds of thousands of other new jobs. This always happens with new investment. New jobs are created with suppliers. For example, the new National Climate Service may run the wind turbine factory. But that factory will buy steel, wood, aluminium, electricity,

brooms and tea, and the people who make and transport those things will also have jobs.

New jobs are also created because a million new workers with wages spend more money than they did on the dole. Somebody has to make the goods and services they buy. Those people have new jobs too. And so do the people who make the things they buy, and the new materials their companies buy.

But some people will lose their jobs. If there is a massive expansion in renewable energy, some of the jobs in the old energy economy will go. By no means all, and it won't happen quickly, but it will happen.

In the same way, a massive shift to public transport would create jobs driving buses, making buses, and making electric cars. But there would be fewer jobs making petrol and diesel cars.

Many more jobs will be created than lost. It takes many more workers to run buses and trains than it does to build cars for the same number of passengers.[1] For a given amount of energy, it takes more workers to build and operate alternative energy than it does to build and operate gas or coal fired power stations.[2] And jobs renovating homes and buildings do not put anyone out of work.

We will have to protect people who lose their jobs because of the new climate economy. This is easy if the government employs the new climate workers. The government simply guarantees new jobs to these workers and provides training if needed.

Communities dependent on fossil fuel industries must also be supported economically and financially to help transform the local economy and improve community well-being. Moreover, enough of the new jobs in the climate economy must go to the communities most

affected. This is not only a matter of social justice. If we don't guarantee jobs in this way, different groups of workers will be in conflict. There are powerful forces in society, like the oil companies, who do not want a new climate economy. They will use those divisions between workers to make sure nothing is done.

So the new Climate Service will employ a million direct workers, but create about one and a half million jobs in all. This is a rough estimate. The government will be employing 1,000,000 workers directly. Examples from other industries suggest that these million workers will create approximately another 850,000 jobs in related industries and increased spending in local economies.[3]

On the other hand, some jobs will also be lost. We cannot yet be precise about these numbers, but something like 350,000 is probably not that far out. This gives us a net gain of 1,500,000 workers.

Section 2 – How will we pay for these jobs?

How can the government pay for a million new climate jobs?

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 gives the scale of this. In 1942, their first year in the war, the American government spent as much on the military as the entire Gross Domestic Product of the US the year before. 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.[4]

The Soviet Union, Germany and Britain 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.

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 International Monetary Fund (IMF) estimate is that the British government has lost at least £200 billion.[5] That's £8,000 for each worker in Britain.

We estimate that we can employ a million workers over a ten year period 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:

- £25 billion in wages for one million jobs over one year
- £5 billion in employers' national insurance and pension contributions
- £20 billion in other costs like materials, fuel, supplies, rent, and interest.

Total cost £50 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 benefits.

Individual cases vary. But on average, every time the government employs someone on £25,000, they save £12,000 on that person's taxes and benefits.[6] *That's* ***£12 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 approximately another half a million new 'indirect' workers.

The government will save on the taxes and benefits of those half a million workers too. Again, they will save £12,000 a job. That's ***£6 billion saved*** on half a million jobs. Add that to the £12 billion already saved and we get ***a total of £18 billion.***

Case study: A worker's taxes and benefits

Take the example of a single parent with one child and rent of £500 a month who earns £25,000 a year.

	In Work	**Out of work**
	£	£
Income tax paid	3,705	0
National insurance	2,120	0
Council tax	700	0
VAT, petrol duty, car tax, TV license, alcohol duty, etc	2,300	1,100
TOTAL TAX PAID	8,825	1,100
Child tax credit	1,110	2,785
Jobseekers' allowance	0	3,353
Housing benefit	0	6,082
TOTAL BENEFITS	1,110	12,210
GOVERNMENT MAKES	**7,715**	
GOVERNMENT LOSES		**11,100**

So when this worker has no job, the government loses a total of **£18,815** in taxes and benefits.

This is only an example. The figures would be different for someone with a working partner, or no children, or a higher income, or no rent.[7]

The government will get money back. Bus and train passengers buy tickets. Electric cars and low energy appliances are sold for money. People pay bills for electricity from renewable energy.

If a private company were spending £50 billion, they would expect to get more than that back each year. That's how they make a profit.

The government won't necessarily be able to do that with climate spending. The government might decide not to charge for house insulation or installing solar heating, or to make public transport free. Renewable energy is currently slightly more expensive and won't pay back everything put into it.

So let's assume the government only gets back 25% of what they spend. That means they will get back £12.5 billion. Let's round that down to **£12 billion.** Add that to the £18 billion saved ***and the government has saved £30 billion a year*** on the cost of a million new climate jobs.

We started with the government spending £50 billion. But they have saved £30 billion. In other words, they spend £50 billion up front every year, but they get back £30 billion each year. ***So the real cost is only £20 billion*** a year. There are several ways the government can find £20 billion a year:

If the richest 1% each paid 5% more income* tax, *this would raise £5 billion a year. The richest 1% of taxpayers all earn 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 income tax.[8]

Maybe we could cancel the new Trident nuclear submarine, or bring the troops back from Afghanistan? The authors of this report think that we should do both anyway. If we had full employment, it would be simple. We could stop spending money on projects thought to be useless or even destructive, and spend the money on employing people to save the climate instead. But we don't.

Right now we also want to create jobs. Cutting Trident won't help here. Let's say there are 3 million unemployed. Just suppose you cut Trident and other government projects by one million jobs, and use the money to hire a million climate workers. Unemployment would still be 3 million.

We want to bring it down to 2 million. We can't do that just by cutting other jobs. What we want to do instead is to create extra jobs.

We could make extra jobs by borrowing money. During the depression in 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 make jobs and pays the money back when things get better. We can raise part of the £20 billion this way.

The government could print 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 it's now called 'quantitative easing'.

People always say that if you print money, then inflation explodes like in Germany in the 1920s or Zimbabwe today. That's what happens if you print far too much money. In the last year the Bank of England has just spent £175 billion on 'quantitative easing'. The world has not come to an end. We are only looking for £20 billion a year in total.

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.[9]

But what if they already spent it? Many politicians and economists are now saying they are sorry, but they have given all the money to the banks and there isn't any more. So they say they have to cut jobs, services and wages in the public sector to get the money back. That also means the government can't spend money on new climate jobs.

There are two things to say to these politicians and economists.

First, if you gave all the money to the banks, take some of the money back from the banks.

Second, and crucially, cutting government jobs when you have already have mass unemployment is madness. You lose their taxes, and you have to pay benefits. Because the sacked workers are not spending money, other workers will lose their jobs, and the government will lose their taxes and have to pay them benefits too.

The suffering is great and the savings to the government are very small.

This damaging approach has been tried before. In the early 1930s Herbert Hoover, the US president did it and failed; Ramsay McDonald, the British prime minister, did it and failed; and the people who ran Germany before Hitler came to power did it and failed.

It does not work.

Section 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.

For the last 200 years humanity has been burning more and more coal, oil and natural gas, and putting more and more carbon dioxide ($C0_2$) into the air. This CO_2 traps heat and warms the earth.

Successive scientific studies have tended to present a progressively more alarming picture of the speed at which the earth is likely to warm up. A particular concern is the potential for 'runaway climate change'. This concern arises in part from recent discoveries about the past.

Scientists have learned a lot about this by drilling into the Greenland ice which contains an effective record going back 140,000 years.[10]

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 sudden explosion in both temperature and CO_2 levels. This rapid increase often happened in twenty years or less.

The last big change was from the last Ice Age to the present warm period. In Greenland, half of that change happened in 3 years.

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.

The effective conclusion is that ***when the earth warms, it starts gradually and then reaches a 'tipping point' when it 'explodes'.***

Scientists know this means that in the past there was some kind of feedback effect - or several feedback effects. Here's an example to explain how climate feedbacks work. Rising CO_2 levels are now warming the Arctic. This begins to melt the permanent snow and ice. 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 is speeding up.

Many scientists were shocked by the unprecedented shrinkage of the Arctic sea ice in 2007. Estimates of when the summer sea ice might disappear completely tumbled from 80 years to 30 or less.

This also threatens a rapid increase in Arctic warming which will increase the rate at which the permafrost in the surrounding land mass melts. This threatens to release the methane held in the permafrost, and methane is a very powerful greenhouse gas indeed.

Scientists have discovered several more climate feedbacks as well, some of them very scary.[11] They are reasonably sure that feedbacks and abrupt change will happen. But they are not yet agreed which feedbacks will be crucial, or how long we have.

There is one worrying sign. CO_2 levels in the atmosphere are measured in parts per million (ppm). The difference between an ice age and a warm period is 100 ppm. In the last 250 years we have added another 105 ppm. Two thirds of that has been added in the last 50 years.

The scientists' best guess is that we may have ten to twenty years to act. It is possible that we may even have fifty years. And it is possible that we may have less than ten years.

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.[12]

Climate change has already extended the mid-latitude tropic belt, leading to drought that has lasted many years and led to recurrent famines in the Sahel regions of Africa. With abrupt climate change, it is likely that water and food shortages will become critical well before rising sea levels. We can expect crop failure and widespread famine.

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

There can be no accurate estimates of the dead from all these causes, but they will be in the hundreds of millions. Humanity as a whole will survive, though many species will not. One guess is that 30% of the species of life 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 unknowable.

The threat of runaway climate change means we have to move quickly to stabilise levels of CO_2 in the air.

However, 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 in the air to 350 ppm at most.[13]

Other scientists feel that we can live with the present, or perhaps slightly higher, levels of CO_2 in the air. But whichever view you takes, 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 chance we have of avoiding catastrophe.

To stabilise greenhouse gas levels we do not have to eliminate all emissions. Part of the CO_2 that goes into the atmosphere each year 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 air.

However, the richer countries of the world currently emit far more than their share. 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.

This means the UK will have to cut its emissions as fast as possible by about 75% to 80%. We can do this, and we can do it quickly.

Section 4 – The jobs

This section looks at the jobs that need doing. We will soon produce a longer report that will give more details about how many jobs need doing, in which sectors, and how much carbon they will save. This booklet only gives rough estimates.

One way to cut carbon emissions is to stop burning coal, oil and gas and make energy another way – 'alternative energy'. The second is to use energy more efficiently. Still heat the house, for instance, but insulate the walls and roof so it requires less fuel to stay warm.

We have to do both fast.

Energy

Alternative energy is also called renewable energy. This is because it uses endlessly renewed sources of power – the wind, the sun, waves, rivers and the tide. Unlike oil and gas, the supply will never run out.

To produce a steady supply of renewable energy, you need a mix of several kinds. This is because most forms of renewable energy work best at different times and in different places. Sometimes, and in some places, the wind blows stronger, and sometimes it stops. Solar power does not work at night.

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 longer distances. You have more sunlight, and are certain

to have steady wind, if you link up across Europe. There are also proposals to generate electricity from concentrated solar power machines in the Middle East and North Africa and send it across Europe.

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.

Wind power

All that said, onshore and offshore wind power makes the most sense in Britain. We have a lot of wind.

Wind turbines (modern windmills) are big. Solar power works well locally and domestically. Wind power works best in big wind farms in windy places. This is because the amount of electricity generated is much greater if the wind speed is higher. That means the towers need to be tall so the blades are high up where the winds blow. Turbines also work well offshore, where the wind blows more steadily. Most of these jobs will be in manufacturing.

The UK currently produces 401TWh (Terawatt hours, or trillion watt hours) of electricity a year. If 250,000 wind workers are employed for ten years, by 2020 wind could produce 300 TWh, three quarters of the present supply.[14]

Wave and tidal power

Marine power technologies, like offshore wave and tidal current turbines, 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 resource potential is huge, and so is the export potential. There are currently dozens of

projects in development around the UK. If this technology can be developed here, it will be a service to the world.

Solar power

The most economic form of solar power in Britain at the moment is solar water heating. Household water passes through thin pipes on the roof and is heated by the sun. Once installed it's virtually free. This is already widely used in other parts of the world, particularly rural China.

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 the sunlight into electricity, even on cloudy days. PV cells are expensive, but they are the main backup to wind. Once mass produced, they should come down in price.

For much of the time solar PV cells installed on roofs will be producing more electricity than the house needs, but this will not be wasted. The cables that carry electricity into the house from the supplier can also carry the spare solar electricity back to the grid.

Other alternative energies

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'. That CO_2 is then turned into gas 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 is also the reason why power companies have not installed them anywhere in the world.

The main renewable power jobs

The majority of jobs will be in factories that make wind turbines, marine turbines, PV cells and solar heating

Transport and assembly of turbines and solar power on site

Maintenance of wind farms, marine turbines and solar power

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

Construction of a new grid

Other factories and mills that supply parts and materials

Research and development in marine turbines

Research and development in clean coal

Training and education in the necessary skills for all the above jobs

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 of us 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 of its CO_2.

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 that it 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.

Energy use

Alternative energy is half the solution. The other half is reducing energy use.

In Britain almost 80% of our CO_2 emissions are due to energy used in homes, public buildings and transport. The jobs that need doing are concentrated in those areas.

The other 20% is mostly from manufacturing, agriculture and land use. We will say something about these later.

Homes

Homes are responsible for about a quarter of UK CO_2 emissions.[15] Three-quarters of home emissions come from fuel burned to heat air and water. This is usually gas or coal, though a few water heaters still use electricity.

New houses can be made very low carbon simply by tightening the building regulations. This is about

regulation, not mainly about new jobs. But we will need plenty of rigorous building inspectors.

However, new houses only add one home in a hundred each year. So most of the work has to go into improving existing homes, many of which have been around for 100 years or more.[16]

Each home is different, so different techniques will apply. But the first priority is to stop them leaking heat. For many homes the easiest first step is to insulate lofts and cavity walls. Many older houses don't have cavity walls so will need solid wall insulation, which is more difficult.

Older houses often also need draught proofing. A lot of heat is lost through single glazed windows, so double glazing or secondary glazing will be helpful here.

The second priority is to replace all old boilers with the current generation of highly efficient boilers – this is already required for any replacement boilers.

These measures should cut emissions from heating air and water by between 40% and 50%. It will take approximately 200,000 workers ten years to do this.[17]

This is not enough, however. Something more is necessary. One way is to integrate renewable energy sources into buildings. Solar water heaters on roofs are possible. At present costs, it would take another 100,000 workers ten years to do 19 million homes. The cut in heating emissions would be another 6%.

It would also be possible to cut a further 8% by putting solar PV cells on 10 million roofs. But at present costs it would take 200,000 more workers ten years. There is an argument, though, for using solar power to back up wind when it fluctuates.[18]

In many cases the work could be done more efficiently by teams of building workers who move through a neighbourhood block by block, doing several

jobs at once in each house. This will require careful planning and central funding.

Ground source heat pumps are also a possibility. They could cut emissions by large amounts in houses with gardens. But they run on electricity and will not greatly reduce emissions until more than half of electricity on the grid comes from renewable energy. So it will often make sense to install wind, wave and tidal energy first, and to fix leaky houses, before installing these more sophisticated technologies.

Home appliances

About a quarter of energy use in homes comes from lighting and appliances. Here the main solutions are not new jobs, but new regulations. For instance, old style incandescent light bulbs will be banned in the next few years.

What is needed, however, is complete regulation of all appliances and lighting for energy use. The government would set regulations for next year that fit with the best appliances currently on the market. Those regulations could be regularly tightened as the technology develops.[19]

The usual practice is to regulate the energy efficiency of the appliance – for instance how much electricity a fridge uses for how much cooling. However, this is a trap. Many manufacturers will simply make bigger, more efficient fridges to replace small inefficient fridges, giving little or no actual energy savings. What is needed instead is limits on the total amount of electricity any fridge, or TV, or whatever, can use.

It is often said that standby settings should also be eliminated. In fact this isn't necessary, because regulations can simply require that they use 0.1 watts or less.

The main jobs in homes and buildings

Most jobs will be in building trades of all kinds

Manufacture of building materials, boilers, 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

Here the saving is mostly by regulation, not jobs. But the workers at any factory threatened with closure should be able to retool and reopen making new, efficient appliances. These could then be sold very cheaply, at much less than cost, to anyone prepared to turn in inefficient old appliances. Even allowing for the emissions created by making the new appliances, this would still cut emissions considerably.

Public buildings

About one-sixth of CO_2 emissions come from buildings that are not homes, but not factories either. The main energy users here are shops, offices, warehouses, schools, hotels and restaurants.

The balance of emissions depends very much on what the building is used for, but overall these profiles are different from those in the home. Almost half of

emissions still come from heating (and in many cases cooling) systems and water heating. But the emissions from lighting are much higher – about a quarter of the total.

Lighting use can be reduced by regulations, though commercial buildings often already use more efficient strip-lights. There is still a lot of room for improvement by careful use.

Most emissions from heating and cooling can be reduced by the same measures used in homes, though sometimes the need to cool a building is caused by bad design or large heat inputs from information technology. We estimate that it would take about 100,000 workers over ten years to insulate, renovate, or in some cases replace, these public buildings.[20]

Regulations for new non-domestic buildings already call for a minimum of 10% of energy use to be covered by renewable sources which are integrated into the building. There is no reason why this could not be extended to refurbished buildings.

Transport

Transport accounts for a third of UK emissions.[21] The main thing we have to do here is switch from cars, planes and lorries to buses, trains and bicycles.

Passenger journeys in cars and light vans produce about one eighth of the total UK emissions from all sources, not just transport. Buses and trains produce a third of the emissions of cars, and cycling almost none.[22] So we need a massive expansion of integrated public transport that runs often, late into the night, goes everywhere, has space for bags, is clean, comfortable, safe, and neither empty nor crowded.

Modal shift will not be easy. The rail network carries more passengers than at any time since World War II and is in urgent need of upgrade and renewal. However, a domestic high speed rail network will not

only provide a sustainable alternative to a third runway at Heathrow; it will free up valuable capacity for passengers and freight on existing routes.

A planned programme of rail re-openings will also help people get out of their cars. Suppressed demand for rail is high; where routes have been re-opened in Wales and Scotland, passenger numbers have far exceeded official projections.

We will need more buses, and more small buses and minibuses with good storage to avoid wasteful empty buses outside rush hour, and to get people close to their destinations.

Additionally, trams have proved particularly successful in encouraging people to get out of their cars and onto sustainable public transport.

Bicycles can make a large difference. This includes the familiar kind, that keep you fit. But in China electric bikes are also widely used, and produce very low emissions. To get people using bikes in large numbers, however, requires a large network of safe, secure, separate bike lanes. These have been built in many countries. Again, many Chinese cities also have comprehensive networks of free or very low rental bike depots. You simply leave your house, or get off a train, pull a bike out of hundreds stored in a rack, and park it in another rack when you reach your destination.

Cars, vans and taxis now account for six out of seven passenger miles in the UK. There are several ways of encouraging people to switch from cars. We can make public transport more attractive. We can ban cars from inner cities, or ban cars during rush hour, or reserve some streets for buses and cyclists. We can limit the speed of cars to 55 mph, which will also cut emissions. We can make public transport very cheap or free. Or we can use a mixture of all these.

Let's assume that such measures, and a lot of jobs, allow us to change three journeys in six to buses,

trams and trains, and one in six to bicycles. If that happens, it would cut CO_2 emissions from cars by half.[23]

Trains

Trains are especially useful for replacing plane travel and road freight. Aviation accounts for about 6% of UK CO_2 emissions, according to official figures. However, the CO_2 from planes does at least twice the damage, because it is emitted much higher in the atmosphere. Taking that into account, planes are responsible for about 12%, or one-eighth, of our emissions. This is also the fastest rising source of emissions.

High speed trains can replace domestic and European flights. From Heathrow, for instance, this represents half of all flights, although a smaller proportion of passenger miles. And planes produce eight to eleven times the CO_2 of high speed rail.[24] This is an enormous saving, but requires building more electrified high speed rail lines in Britain, and across Europe. It would also help to ban all domestic flights as a first step.

HGV lorries in the UK currently account for about 3% of total UK emissions. Lorries emit about six times more CO_2 than trains for every ton carried one mile.[25] Lorries also carry most of the freight – seven times as much as rail.

Transferring freight from road to rail will play a key role in building a sustainable transport future. To help encourage the shift, important improvements to the railway infrastructure, including gauge clearance will be required.

New rolling stock, trams and energy efficient buses will be needed to deliver the low carbon transport future. Thousands of skilled jobs in the manufacture of the respective vehicle fleets could be created, a welcome reversal to the recent spate of job losses in the train manufacturing and maintenance sector.

The main jobs in transport

Jobs in bus travel

Jobs in rail travel

Construction work in building and electrifying high speed rail and other new rail lines

Manufacture of track, engines and rolling stock

Manufacture of electric cars and buses

Manufacture of bicycles and electric bikes

Building cycle lanes

Supply of parts and materials for that manufacture

Maintenance, servicing and repair

Training and educating in all the necessary skills

Electric cars

Buses and trains are the main solutions. However, there will still be some cars on the roads.[26] Electric cars are responsible for less emissions, although the difference is not that great, depending on where the electricity comes from.[27] However, batteries reduce local air pollution. And once we have extensive wind farms, wind turbines will produce a great deal of electricity in the late night hours that has to be used then or wasted.

This electricity can be used to recharge electric car batteries at night. Moreover, those car batteries can be linked to the grid and provide a store that can be drawn upon if there are sudden falls in the renewable energy supply, or sudden surges in demand. [28]

There are equivalent savings to be made from electric buses and trams.

How much difference would this make?

Let's assume that half of the passenger miles by car each year switch to buses, trains and trams, and a sixth switch to bikes. Let's also assume that the remaining cars, buses and the trains are all electric. Then the 12% of CO_2 emissions that come from cars would shrink by a good deal more than half. Replacing all domestic and most European air travel with high speed rail would cut another 12% of emissions by about a third.[29] Add in replacing half of HGV traffic with rail freight, and we have cut total UK transport emissions by almost half.

That will require a very large number of rail and bus workers. This is because they would carry three times the passengers and three times the freight they do now.[30] There are about 300,000 rail and bus workers now, so three times the work should mean about 900,000 more.[31]

At first sight, this is an enormous number – almost all of the one million jobs we are campaigning for. However, there are three things to say here. One is that it may be possible to run a more extensive, efficient service with fewer workers.

The second is that the whole project for one million climate jobs can happen in two stages. In the first stage, transport jobs would be a quarter or a third of the total. Most of the jobs would be in building renewable energy and renovating buildings.

At the end of that first stage (after about ten years), almost all of the houses would be renovated and

most of the renewable energy capacity would be built. There would still be jobs in maintenance, and some in construction, but many fewer. At this point, the second stage, transport would take up most of the jobs.

The third thing to say is that we may find that we need more than a million jobs. If we do, we will have to fight for them. If we have already won a million jobs, that will not be so hard. But it may be that technical progress will make them unnecessary.

Other greenhouse gases

Until now we have been talking about jobs that will reduce carbon dioxide emissions. Two other greenhouse gases are also important: methane and nitrous oxide.

These are very powerful greenhouse gases, but we only put small amounts into the air. If you measure the total warming effect of all the greenhouse gases from the UK, methane is responsible for 7% and nitrous oxide for 5%.[32]

Both these gases, however, remain in the atmosphere for much less time than CO_2. So cutting CO_2 makes a long term difference. Cutting methane and nitrous oxide give you fast cuts. And fast cuts are what we want first.

The good news is that emissions of both methane and nitrous oxide in the UK have fallen by half since 1990. It should be possible to cut both more, and quite quickly.[33]

Half of methane emissions come from the slow decay of food waste in landfills. There are two solutions here. One is collecting and burning more of the methane that seeps out of landfills. The other is sorting out the food waste at home and burning it to produce electricity or using it to produce biogas.

However, a third of methane emissions come from agriculture. So do two thirds of nitrous oxide emissions. There are difficulties in reducing emissions here. But the

matter is important, and we will return to it in our longer report.[34]

Manufacturing

A large proportion of the new climate jobs will be in manufacturing.

We have already mentioned most of these – manufacturing wind turbines, marine turbines, solar power, power lines, building materials, boilers, heat pumps, low carbon appliances, electric buses, electric cars, rolling stock, and the parts and materials for all these industries.

There will also be work, however, in redesigning and renovating factories so they are more efficient, and in building new, more efficient machines and factories.[35]

Education

Finally, there are jobs in educating and training many new skilled trades people like electricians. And there will be training in new skills for already experienced crafts people. Over the years the nature of the new jobs will also change, and people who have been trained will need training again.

Some of the jobs in training will be on the job, and some in colleges and universities. There will be paid work for teachers and lecturers here. But workers being trained will have to be paid too, and there will be more of them than the teachers.

One million jobs

We have now mentioned a wide variety of jobs. Our longer report will go into more detail about the distribution of these jobs in different sectors. For the moment, the total clearly adds up to more than a million jobs a year for ten years.

There are two possible ways of approaching this. One is to take longer – perhaps twenty years – to cut our

CO_2 emissions deeply. The other is that once we have a million jobs, people will be persuaded that the programme is a good thing. They will also become far more conscious of climate change, and there will be millions of 'climate ambassadors' among the new workers and their families. So if we need more jobs, we are likely to get them.

Section 5 – Making it happen

OK. We're serious. It sounds good. Now we have to make it happen.

Because we mean it. We are not doing this to just to influence union policy, or party policy, or to make ourselves feel good. We want to make the government do it. To do that, we have to bring intense pressure to bear on the government of the day, whoever they may be. We will do this whether it is a Labour or a Tory government. That means building a campaign in many different ways.

The scale of the problem of climate change - and of the real solutions - requires union activists to think in daring and unusual ways. The precedent in this country was when the unions founded the Labour Party, and then used it to fight for a health service and a welfare state.

This challenge means that unions will have to join and lead all kinds of other groups. We cannot solve this problem without jobs and massive government programmes. Unions understand that.

At the same time, though, union activists and environmentalists will have to learn to work together. We will not win this one unless union activists fight not just for themselves, but for the planet too.

This means leadership from the top, and engagement at the national level, with an extraordinary unwillingness to compromise. Nature, after all, is not going to compromise with humanity.

But it also requires union members and local representatives who are willing and determined to lead the campaign at a local level and to involve other groups. We want climate scientists talking to meetings of postal workers, and union branch secretaries going to talk in mosques.

In the end, we also need union members prepared to make their national leaders act.

This adds up to a very tall order. But once people and organisations have been persuaded to back the idea, projects start more easily.

In some unions the national leadership already does. There we need to go the branches and workplaces. In other unions some national leaders will be hesitant, and some sections of workers will understandably be worried about their jobs. Here we need to argue carefully and listen patiently. We will need to persuade workplace groups and branches, and then take resolutions to national conferences. In doing this, we will need to work closely with union projects like Climate Solidarity.[36]

Unions have a long tradition of passing motions on policy. The proposers of the motion then feel good and nothing happens. We don't want that.

So every step of the way we need to be saying that we mean this. If you say that often enough, people start believing that you mean it. Even you believe it. Then you can make it happen.

We need to move out beyond unions to the whole of society. We can ask local councillors to support a million climate jobs, and then mayors and whole councils.[37] The key here will be polite but consistent lobbying. We can do the same with local branches of political parties, with members of parliament, and with the assemblies of Wales, Scotland and Northern Ireland.

We can approach the churches, mosques, synagogues and temples. National environmental organisations, and their local branches, can be another stronghold. So will the many local clubs with obvious links to the issue – cyclists, bird watchers, train enthusiasts, transition towns and all the rest.

In addition, there are all the groups with no obvious connections to the issue. Choirs, the patrons of a particular hairdresser, parent teacher associations, book

groups, amateur dramatic societies, pub patrons, youth groups, and many thousands of other possibilities.

The point of all this will be to establish, in front of everyone, that most people in the country support a million new climate jobs.

Action

Persuasion and support on their own will not be enough. We will need action.

Action will put pressure on the government of the day. But there is an equally important fact about human psychology. If people just listen to arguments, they feel passive and don't care that much. If they organise and act, they feel more deeply committed. Even seeing others taking action makes people stronger. It makes them feel that something can be done, and people like them can do it.

So campaigning for support can lead to action, but action also leads to support.

Action can be of many kinds. In unions, one form of day-to-day action is the work of union environmental or green representatives. These reps are like shop stewards or health and safety reps, but for the environment.

Management currently often refuse to recognise environmental reps. But we can elect them, and make management talk to them. The government is also refusing to give environmental reps statutory rights. We can push them too.

Union environmental reps can fight to cut energy use. Management will generally go along with that. But union reps, backed by union members, can also fight for management to actually spend money on the climate.

For instance, union members can force employers to insulate and ventilate buildings properly. They can insist that new buildings are built to the highest standards, with solar panels on the roof. And union reps

also have an important role in raising awareness: their fellow workers are more likely to trust them.

In addition, disputes over the closure of local offices, depots, and hospitals affect the climate; every time a local office closes, both staff and service users have to travel further every day, with more emissions. Strikes to prevent local office closures are battles to defend the climate, and deserve wide support.

Campaigns and actions over climate in the wider society will bring unions and other activists together. We can build local campaigns to fight for planning permission for wind farms. We can campaign for local councils to insist on solar roofs and low carbon buildings as a condition of all permission for new buildings. Students and staff can fight for the same thing in universities, and tenants associations in council housing.

It is also essential for unions to be part of national climate campaigning. Climate jobs are only part of what we have to do to halt climate change. On 5 December 2009 there is a large national demonstration in London over climate change. It is part of global attempts to bring pressure on the United Nations talks on a new climate treaty. We need union banners and union members all over that demonstration.

We also need national limits on total emissions, and government regulation of flights, appliances, housing and so on. Then there are the campaigns and direct actions against plans for new roads, airports and power stations that will hurt the climate.

The most important kind of action, though, will be the fight to defend jobs at workplaces threatened with mass redundancies or closure.

For example, the Vestas wind turbine blade factory on the Isle of Wight faced closure in the summer of 2009. The workers occupied the factory and held it for 18 days. They were then evicted, and are fighting on.

It is now difficult to find anyone on the island who did not support the occupation. The Tory council has swung to support for the workers. The occupation was on national television, and in the newspapers in Britain, the United States, Denmark and all over the world.

That's the resonance when 17 workers fight for their jobs and for the planet. Imagine a million.

We need more fights like Vestas. They were lucky, it was a wind power factory. But the great advantage of a widely known national plan for a million jobs is that workers can fight to be a part of it. Car factories are shrinking or closing all over the world. Those car workers can demand that the government rescues their jobs and they retool to build electric buses or cars. Building workers facing the sack can demand insulation work. Factory workers can demand they be funded to retool and make low energy washing machines.

This means we can fight for a million climate jobs as national government policy from the top down. But we can also fight for climate jobs from the bottom up, workplace by workplace. That will make national campaigning stronger. And if we have workers in different parts of the country occupying the same time and fighting for their jobs and our planet, the resonances will be global and the pressures on the government immense.

It may take even more than that to move the government of the day to employ a million workers. It may take a national strike by one union, or by several unions. We should be prepared to do that if we have to.

Of course we cannot solve the climate crisis just by cutting emissions in the UK. The country is small, and the planet large. But we can make a decisive difference. If we do win a million new climate jobs, our example will be seen on television in every country. All over the globe, workers will know what to do. And they will do it. That will change the future of the planet.

References

[1] See the discussion of public transport jobs in section 4 of this report.

[2] Renewable energy is currently more expensive than coal and gas. The reason it is more expensive is that it takes more labour – more jobs – to produce the same amount of power.

[3] We have used the Scottish Input/Output tables to estimate both the job gains from the climate change strategy and the job losses from the decline of fossil fuel industries. See www.scotland.gov.uk/Topics/Statistics/Browse/Economy/ Input-Output and www.scotland.gov.uk/publications/2009/03/IOTables1998-2004.

[4] See Jonathan Neale, *Stop Global Warming*, Bookmarks, London, 2008, pp. 50-55; and Paul Koistinen, *Arsenal of World War II: the political economy of American warfare*, University Press of Kansas, Lawrence, 2004.

[5] International Monetary Fund, *Global Financial Stability Report*, April 2009, p. 36. The figures there are given in dollars: $110 of writeoffs up to the end of 2008, and a further $200 million expected in 2009.

[6] Mattias Dolls, Clemens Fuest and Andreas Peichl, *Automatic Stabilizers 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 £11,000 out of £25,000. However, the authors are using the data from Euromod, which does not include spending on VAT and other indirect taxes. To allow for this, we have slightly rounded down the figures for indirect taxes suggested by Richard Murphy, 'Cut Government Debt by Increasing Spending', www.compassonline.org.uk, 10 July 2009, and estimate that a person employed on £25,000 a year will pay about £1,000 more in indirect taxes than the same person on the dole.

[7] This example is taken from Richard Murphy, 'Cut Government Debt by Increasing Spending'. We have left child benefit out of the calculations because it is the same whether or not you are in work. We have also left out employers national insurance contributions, because if the worker is in public employment these are equally a cost and an income for the government.

[8] 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.

[9] See background paper for this report on 'Subsidies' by Barbara Harriss-White.

[10] 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.

[11] 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 Richard Hawkins, Christian Hunt, Tim Holmes and Tim Helweg-Larsen, *Climate Safety*, Public Interest Research Centre, 2008.

[12] 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.

[13] 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 CO2: 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/

[14] Here are the calculations:

In 2008 the total UK supply of electricity was 401 TWh. 7 TWh of that came from wind. In 2008 the UK had 3.4 GW of installed wind power. So approximately 2 TWh of electricity were produced that year for each MW of installed capacity. 150 GW of installed capacity should produce 300 TWh, three quarters of current electricity production.

In 2008 the US wind energy industry employed 85,000 workers directly. The US had 25 GW of installed capacity, including 8 GW installed that year alone, but many turbines were imported. Germany had 38,000 directly employed wind workers and 24 MW of installed capacity, including less than 2 GW installed that year. But Germany was a major exporter of turbines. If we add the German and US figures together, we get 123,000 workers employed directly, 10 GW of capacity installed each year, and 49 GW of total installed capacity.

If the comparison holds, we can install 15 MW a year for ten years, produce three-quarters of current electricity from wind within ten years, and employ 189,000 wind workers directly. But we will need more wind workers in the UK, because part of our wind will be offshore, which is more expensive. A rough guess would be 250,000 workers if half the power comes from offshore wind.

That would give us three quarters of our current level of electricity from wind. However, ten years from now energy efficiency savings should also have reduced the amount of electricity needed. But more electricity will be needed in transport and housing to replace fossil fuels. These figures also do not allow for rising productivity on the one hand, or the need for increased capacity because of intermittency on the other.

Sources: World Wind Energy Association, *World Wind Energy Report 2008*, p. 12; Global Wind Energy Council, *Global Wind 2008 Report*, p. 57; European Wind Energy Association, *Wind at Work – wind energy and job creation in the EU*, January 2009.

[15] 27% if you don't count emissions from international aviation and shipping, 25% if you do.

[16] The following section is based on a background paper for this report by Fergus Nicol and Rajat Gupta on 'The Building

Industry'. There is also a very useful summary of the numbers in Department for Communities and Local Government, *Review of the Sustainability of Existing Buildings: the Energy Efficiency of Dwellings – Initial Analysis*, 2006. The numbers below are based on Box 1 on p. 7. We have not included combined heat and power, because of questions about the use of biomass.

[17] Nicol and Gupta, 'The Building Industry', estimates this from *Energy Efficiency of Dwellings,* Box 1 on p. 7, on the assumption of one job for each £50,000 expenditure. It is likely that both technology and skills would increase greatly with mass production, in which case we would need fewer jobs. The calculation that it would reduce energy use by more than half comes from potential carbon saving in Box 1.

[18] Figures for solar water heating and PV cells come from *Energy Efficiency of Dwellings*, on the same assumption of £50,000 per job. We are assuming that some of the jobs would be in installation, but many would be in manufacture.

[19] David J. C. MacKay, *Sustainable Energy – without the hot air*, UIT, Cambridge, 2009, has a useful table of which appliances use how much energy on p. 70.

[20] See Nicol and Gupta, 'The Building Industry'; and R. Gupta and S. Chandiwalla, *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*, Research paper for the World Bank, 2009. A recent report estimates that all non-domestic buildings could be improved to energy category C at a cost of £2bn per year over the next 20 years: *The UK's Approach to the Thermal Refurbishment of Non-Domestic Buildings - A Missed Opportunity for Bigger Carbon Emission Reductions?* Caleb Management Services Limited, downloadable from www.kingspanpanels.com/research.

[21] Transport is sometimes counted as 24% of 'domestic' emissions, but this does not include international aviation. Include that, and the percentage rises to 28%.

A conservative estimate of the impact of CO_2 released by planes into the atmosphere is that it doubles the warming effect. Allowing for that, transport emissions would be 34% of the UK total. Calculations based on the figures in Department for Transport, *Transport Statistics Great Britain 2008*, p. 56. The data there are for 2006.

[22] In the UK, buses and trains produce only about half the amount of CO_2 cars produce for each passenger kilometre. In some other countries, the comparison favours buses and trains much more. This is partly because of better designed trains and buses, but mainly because the buses and trains are fuller outside rush hour. In these cases, buses and trains can run on a third of the CO_2 of cars, or even less. This is perfectly achievable in the UK. See Neale, *Stop Global Warming*, pp. 267-8; MacKay, *Sustainable Energy,* p. 122; David Sperling and Deborah Salon, *Transportation in Developing Countries: an overview of greenhouse gas reduction strategies*, Pew Centre on Global Climate Change, 2002, p. 15; Alice Bows and others, *Living Within a Carbon Budget*, Tyndale Centre, Manchester, 2006; Department for Transport, *Carbon Pathways Analysis: informing development of a carbon reduction strategy for the transport sector*, July 2008; and *Transport Statistics Great Britain 2008*.

[23] The source for the statistics here is *Transport Statistics Great Britain 2008*. The key tables are table 1.1 on page 14 and table 3.7 on page 56. We have arbitrarily assumed that one half of light van mileage is similar to car travel, and one half similar to HGV usage. This is assuming that bicycles have no CO_2 emissions. Bikes do have embodied emissions, and electric bikes have trivial emissions. But in the comparison we are looking only at fuel use.

We also assume that buses and trains are responsible for a third of the emissions per passenger kilometre, which assumes somewhat better passenger loads in public transport outside peak time than we currently have. In fact, the saving is likely to be more because commuters to work would be proportionately more likely to switch their journeys to public transport. This matters because passenger loads for commuters are close to one person per car, while for leisure use and school runs they are about two persons per car. For all uses, there are about 1.5

people in a car on average. (See *Transport Statistics Great Britain 2008*, table 1.5 on p. 17.) All comparisons here with buses and trains have taken this into account – we are comparing passenger miles, not vehicles.

[24] John Stewart, *Who Says There Is No Alternative: An Assessment of the Potential of Rail to Cut Air Travel*, report for the RMT union, June 2008.

[25] All the lorries together currently emit 43 times as much CO_2 as all the freight trains together. But the lorries are only carrying seven times as much freight as the trains. That means that lorries are emitting six times as much per ton as freight trains. See *Transport Statistics Great Britain 2008*, pp. 56 and 66; and Department for Transport, *Carbon Pathways Analysis: Informing Development of a Carbon Reduction Strategy for the Transport Sector*, July 2008, p. 18. These calculations are only for the fuel used – diesel in both cases. They do not take account of the CO_2 emissions from building lorries and roads, or from building trains and railways. Studies comparing the costs of rail and road construction produce conflicting results, but tend to favour roads. We have been unable to find any studies that compare the emissions in construction. But even if the net difference between road and rail freight is less than six-fold, it is certainly very large indeed.

[26] We have not suggested cars run on agrofuels. These are not a solution because they make climate change worse, lead to the destruction of forests, and cut into the world food supply.

[27] It is easy to exaggerate the savings from electric cars. There are two common ways of doing this. One is to compare the energy used for the electric car in KW with the energy used in a petrol car. But an electric car can use less energy to run, while still having almost the same emissions if you count the emissions way back at the power plant.

Another way to exaggerate the saving in emissions is to say: 'Even when the electricity supply comes from power stations that use gas and coal, electric cars still create less emissions than petrol cars. But if half the electricity supply

came from renewable energy, then electric cars would have much lower emissions.'

This sounds reasonable. However, imagine that we have replaced three quarters of current UK electricity with renewables. So we now have 400 TW hours of electricity a year, and 300 of that comes from wind and other renewable energy. Then imagine that we add another 100 TW hours of electricity demand from electric cars. We have not yet produced any more renewable energy. Until we do, all the extra demand for electricity for cars will be met by the existing fossil fuel power stations.

[28] See John Cowsill, *In What Ways can Electric Vehicles Assist the UK Renewable Energy Strategy?*, University of East London thesis, 2008.

[29] This would cut almost half of flights, but a smaller proportion of passenger miles. However, this is based on John Stewart's study of flights from Heathrow, and it may be that if you include all traffic from UK airports, then European and domestic flights may account for more than half of passenger miles.

[30] According to *Transport Statistics Great Britain 2008*, 84% of passenger kilometres are by car, van and taxi, and 13% are by rail and bus. If car, van and taxi miles fall by half, that will be 42% by car, van and taxi and 55% by rail, a four-fold increase in public transport passenger kilometres. And then we have to add the effect of moving half of aviation miles to rail.

[31] Accurate statistics for public transport employment in the UK are surprisingly difficult to find. But if you add up members of the RMT, the TSSA, ASLEF, and the passenger transport section in the Unite union, there are about 220,000 union members working on buses and trains. These membership totals include some workers in Ireland and in other sectors, which slightly inflates the numbers. Assuming that the real number is 200,000, and that union density is about two thirds, this gives a total of 300,000 workers. But it could be as much as 350,000.

[32] This is working from the figures for 2007 in Joanna Jackson et al (AEA), *Greenhouse Gas Inventories for England, Scotland,*

Wales and Northern Ireland, 1990-2007, September 2009. We have adjusted these figures to take account of the CO_2 emissions from international aviation and shipping, which they do not include.

[33] The next few paragraphs lean on the statistics in Joanna Jackson et al, *Greenhouse Gas Inventories*; National Farmers Union, *Agriculture and Climate Change*, November 2005, especially pp. 41-44; and Barbara Harriss-White, background paper on 'Agriculture' for this report.

[34] See the background paper on 'Agriculture' by Barbara Harriss-White.

[35] 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.

[36] Climate Solidarity is a new trade union project on climate change. It will be organising 'action groups' of trade unionists to cut carbon emissions collectively. The idea is to act on climate change in groups based at work. We aim to cut our own emissions on commuting, housing and food and therefore to be in a good position to negotiate with management on workplace reductions. It has been set up by four unions - CWU, NUT, PCS and UCU - working with the Climate Outreach and Information Network (COIN) but there are plans to it spread across the whole trade union movement. See www.climatesolidarity.org.uk

[37] This could well be done in cooperation with the Friends of the Earth 'Get Serious about CO2' campaign. For more details go to www.foe.org.uk

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 two national conferences that have brought together hundreds of delegates to debate the issues raised by global warming.

**For more information,
to join our mailing list
or to get involved, please
contact Martin 079 585 35231
or Roy 0780 1263 265 or email
climatetradeunion@googlemail.com**

One million climate jobs NOW!

Several trade unions and many climate activists in Britain have decided to fight to make the government create one million green 'climate' jobs immediately.

This report from the Campaign against Climate Change explains how we can do that and why we must.

We face the threat of runaway climate change. To avoid that, we need a massive programme to produce renewable energy, renovate all our buildings, and provide first class public transport.

There are over two and a half million people in the UK without jobs. We can put those people to work to help to save the planet. Our example will inspire the world.

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