THE ROUGH GUIDE to

Saving energy

& REDUCING YOUR CARBON FOOTPRINT

This book is carbon neutral
See carbonneutral.com for details

In association with

sky

A typical carbon footprint

The average Briton produces 11 tonnes of CO_2 – the main greenhouse gas – each year. Here's how that breaks down.

Recreation 1.95 tons
Everything from driving to a sports club to watching television.

Heating 1.49 tons
Central heating and stand-alone heaters.

Food 1.39 tons
Agriculture, food transport, cooking and restaurants.

Household 1.37 tons
Lighting, fridges, home building and DIY.

Hygiene 1.34 tons
Bathing, showering and washing, and health services.

Clothing 1.00 tons
Production, transportation, retail, washing and drying of clothes and shoes.

Commuting 0.81 tons
Travelling to and from work by car or public transport.

Aviation 0.68 tons
Flying for holidays or work.

Education 0.49 tons
School buildings, equipment and travel

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Contents

This Sky special edition is excerpted from the Rough Guides to Ethical Living (by Duncan Clark) and Climate Change (by Robert Henson)

Focus on the solutions

James Murdoch

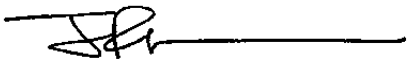
The serious risks of climate change are beyond dispute. But too often the focus is on the problem not the solutions. The more I've learnt about the challenge of climate change, the clearer it has become that there are things you can do – things that are surprisingly straightforward and which improve your lifestyle rather than detract from it. That's why I'm delighted to be sponsoring this Rough Guide, which I hope you'll use to find out the "how" of saving energy and addressing your carbon footprint.

The starting point is that we need to see that small actions taken by each of us – multiplied many times – can add up to a much bigger picture. If everyone reading this booklet saved one tonne of carbon dioxide (about 10% of the average person's usage in a year) we'd save the equivalent to the energy used by residents in a town the size of Woking. And with the solutions in this book you'll see that isn't hard to achieve. Changing all of the standard lightbulbs in the average home to low-energy bulbs, for example, would save nearly half a tonne of carbon. And that's before you look at heating, your energy supplier, travel and the other energy-using products in your home.

Companies, like households, need to play their part. At Sky we've made a number of changes this year, including changing our energy supplier to buy all green electricity for our sites, increasing our use of hybrid vehicles, introducing automatic lighting controls in our offices and continuing to reduce the power consumption of our set-top boxes. Overall we've nearly halved our site emissions – and in May we took the company carbon neutral.

Listening and talking to our customers it is clear that our biggest opportunity is our reach into our customers' living rooms. There is also a real opportunity to help people calculate their energy consumption and to show them what they can do. We've been offering selected customers a free gift of low-energy lightbulbs as one small step. You can join in at www.jointhebiggerpicture.com.

In this book, you'll find practical solutions about what you can do to make a real difference. We can all play our part and achieve victories in our homes to save energy (and money) and, when they're all added up, to help address climate change.



James Murdoch
Chief Executive, BSkyB

Green Britain: The Big Picture week on Sky News and five news

It seems that everyone from Westminster to Hollywood is looking for a tree to hug. The barrage of reports from scientists suggesting a link between our dirty fuel habits and climate change has built a solid political consensus. Even big business is starting to realise the economic potential of reducing its carbon footprint. But environmentalists believe there is still an "action gap".

While most people accept the conclusions of the scientific majority, not all believe individuals can make a difference. At Sky News we are attempting to bridge that gap. Our mission is to explain the science and lead our viewers, readers and listeners to some of the solutions they can take to reduce their energy use. We are also trying to test the sincerity of the green evangelists, investigate the effectiveness of our recycling policies, while keeping a close eye on the rapidly expanding carbon offset business.

All those strands will be pulled together in **Green Britain: The Big Picture** week which runs on Sky News and five news January 8–12, 2007. We hope the mixture of live broadcasts and taped interviews, and the unique contribution of Sky News users will help build a snapshot of the environmental challenges facing the country.

Our aim is to give clear, practical advice to people who want to adopt a lower-carbon lifestyle. Make it your resolution to embark on a New Year "carbon diet" with Sky News.

Robert Nisbet
Sky News Environment Correspondent

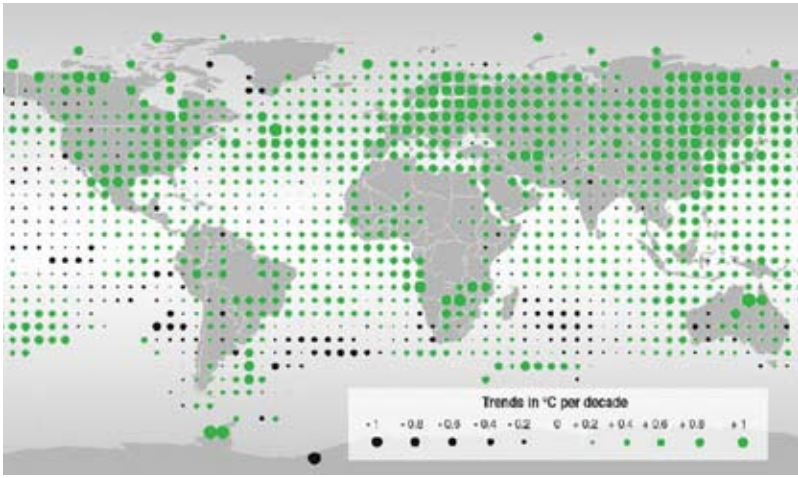
Climate change

Key questions & answers

Is the planet really warming up?

In a word, yes. Independent teams of scientists have laboriously combed through more than a century's worth of temperature records (in the case of England, closer to 300 years' worth). These analyses all point to **a rise of close to 0.8°C** (**1.4°F**) in the average surface air temperature of Earth over the last century.

The first five years of the twenty-first century, along with 1998, were the hottest on record – and quite possibly warmer than any others in the past millennium. Apart from what temperatures tell us, there's also a wealth of circumstantial evidence to bolster the case that



View of a warming world: a depiction of temperature change by region, 1976–2000 (IPCC)

Earth is warming up. Arctic sea ice is thinning; glaciers are melting; the growing season is lengthening; species are being pushed into new territories… the list goes on.

But don't many experts claim that the science is uncertain?

Not really. There's near-unanimous agreement that global climate is changing and that fossil fuels are at least partly to blame. Today, most of the scientific debate is about the details: exactly how much the planet will warm, the locations where rainfall will increase or decrease, and so on. Some of this uncertainty is due to the complexity of the processes involved, and some of it is simply because we don't know how individuals, corporations and governments will change their greenhouse emissions over time.

Is a small temperature rise such a big deal?

A degree or so of warming may not sound like much, but the rise has been steeper in certain locations, including the Arctic, where small changes can be amplified into bigger ones. The warming also serves as a base from which heat waves become that much worse – especially in big cities, where the **heat-island effect** comes into play. The concrete oceans of pavement in an urban area heat up more readily than a field or forest, and they keep cities warmer at night. During the most intense hot spells, cities can be deadly, as evidenced by the thousands who died in Paris in 2003.

How could humans change the whole world's climate?

By adding enormous quantities of carbon dioxide and other **greenhouse gases** to the atmosphere over the last 150 years. These gases absorb heat radiated by Earth and release only part of this heat to space, resulting in a warmer atmosphere.

The amount of greenhouse gas we emit is staggering. Just in terms of carbon dioxide, also known as CO_2, the figure is around 26 billion metric tonnes per year. That's

Earth's atmosphere seems huge, but it's actually extremely thin – like a piece of paper wrapped around a football
NASA

more than four tonnes per person. And all this gas goes into an atmosphere that's remarkably shallow. If you picture Earth as a football, the bulk of the atmosphere would be no thicker than a sheet of paper wrapped around that ball.

Couldn't the changes have natural causes?

As sceptics are fond of pointing out, Earth's atmosphere has gone through countless temperature swings in its 4.5 billion years. These are the results of everything from cataclysmic volcanic eruptions to changes in solar output and cyclic variations in Earth's orbit. So how can we be sure that the current warming isn't "natural" – ie caused by something other than burning fossil fuels?

That query has been tackled directly over the last decade by the **Intergovernmental Panel on Climate Change** (**IPCC**), a unique team that draws on the work of more than 1000 scientists. Back in 1995, the IPCC announced that:

> "The balance of evidence suggests a discernible human influence on global climate."

By 2001, the picture had sharpened further:

> "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

One way scientists support claims like these is to look at the changes taking place and compare them to what you'd expect from non-greenhouse causes. For example,

over the past several decades, Earth's surface air temperature has warmed most strongly near the poles and at night. That pattern is consistent with the projections of computer models that incorporate rises in greenhouse gases; it's less consistent with the warming that might be produced by other causes.

Couldn't some undiscovered phenomenon be to blame?

Although many people would love to find a previously unknown "natural" phenomenon to blame for our warming planet, it's extremely unlikely that scientists will find a candidate. Even if they did, it would beg a difficult question: if some newly discovered factor can account for the climate change we've observed, then why aren't CO_2 and the other greenhouse gases producing the warming that basic physics tells us they should be?

How do the rainforests fit into the picture?

The well-publicized destruction of rainforests across the tropics isn't the main cause of global warming, but it plays a highly significant role. Tropical forests hold nearly half of the carbon dioxide present in vegetation around the world. When the forests and their undergrowth are burned, they release huge amounts of carbon dioxide into the atmosphere.

And the ozone hole?

There are a few links between ozone depletion and global warming, but for the most part they're two separate issues. The world community has already taken steps to address the Antarctic ozone hole, which is expected to disappear by the end of the twenty-first century.

Was Hurricane Katrina related to global warming?

It's impossible to tie any single weather event, including Katrina, to global warming. Several hurricanes of comparable strength have been observed across the Atlantic over the last century. That said, the waters of the Gulf of Mexico that fuelled Katrina were at near-record warmth. It appears that the tropics are part of a global trend towards ocean warming that goes hand in hand with atmospheric warming, and several studies have found an increase in hurricane intensity since the 1970s.

Will anyone be killed or displaced by climate change?

Quantifying the human cost of climate change is difficult. Weather-related disasters kill thousands of people each year, regardless of long-term changes in the climate. And many of the projected impacts of global warming are inseparable from other issues such as poverty and population growth. But there's no doubt that millions of people could be seriously affected by climate change.

In the decades to come, the warming of the planet and the resulting rise in sea level will likely begin to force people away from some coastlines. Low-lying islands are already vulnerable, and entire cities could eventually be at risk. The implications are especially sobering for countries such as **Bangladesh**, where millions of people live on land that may be inundated before the century is out.

Another concern is moisture – both too much and too little. Rainfall appears to be increasing slightly on a global average, and in many areas rain appears to be falling in shorter but heavier deluges conducive to **flooding**. Paradoxically, **drought** also seems to be becoming more prevalent. Changes in the timing of rainfall and runoff could complicate efforts to ensure clean water for growing populations, especially in the developing world.

Warming temperatures may also facilitate the spread of vector-borne diseases such as **malaria** and dengue fever. Many of these dangers are already with us. The World Health Organization estimates that in the year 2000 alone, more than 150,000 people died as a result of direct and indirect climate-change impacts.

Will New York and London really end up under water?

Not soon, but it may be only a matter of time. Sea levels are expected to rise between 90 and 880mm (3.5–35.0")

by 2100, depending primarily on how much greenhouse gas we emit. The top-end estimate could inundate the lowest-lying parts of some cities. Even if the sea-level rise were more modest, hurricanes and coastal storms on top of that rise could cause major problems.

Longer term, if emissions continue to rise, the Greenland ice sheet could be thrown into an unstoppable melting cycle that would raise sea level by more than 7m (23ft). This might take a few centuries, but should it come to pass, many of the world's most beloved and historic cities would be hard-pressed to survive.

Will agriculture suffer?

That depends on where you live. Global agricultural productivity may rise over the next century, thanks to the extra CO_2 in the atmosphere and to barren regions becoming warm enough to bear crops. However, yields in the tropics, home to hundreds of millions of subsistence farmers, are likely to drop.

And wildlife?

Because climate is expected to change quite rapidly from an evolutionary point of view, we can expect major shocks to some ecosystems and possibly a wholesale loss of species. According to a 2004 study from the University of Leeds, climate change between now and 2050 may commit as many as 37% of all species to eventual extinction.

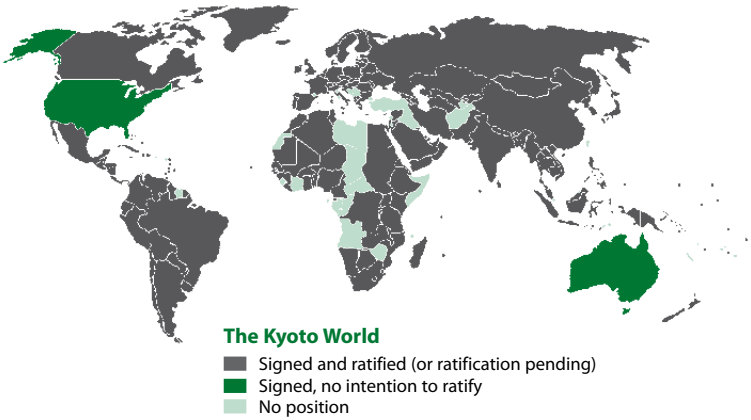
What's all this about the gulf stream?

The Gulf Stream and North Atlantic Drift bring warm water (and with it warm air) from the tropical Atlantic to Northern Europe. This helps keep the UK several degrees warmer than it would otherwise be. There is a distinct possibility that this system could be diminished by climate change, because increasing rainfall and snowmelt in the cold north could send more freshwater into the North Atlantic, pinching off part of the warm current. The best estimate is that the flow might weaken by 10–50% over the next century – not enough to stop the UK from warming, but enough to reduce the effects of climate change somewhat.

What's the Kyoto Protocol?

It's a United Nations-sponsored agreement among nations to reduce their greenhouse-gas emissions. The treaty was finalized in Kyoto, Japan, in 1997, but it didn't become international law until late 2004. As of 2006, 163 states have ratified the treaty (see map), including most of the industrialized world. Two significant exceptions are the US and Australia.

Under Kyoto, industrialized nations have pledged to cut their yearly emissions of carbon by varying amounts, averaging 5.2% by 2012, as compared to 1990. That equates to a 29% cut in the values that would have otherwise occurred. However, the protocol didn't become international law until more than halfway through the 1990–2012 period. By that point, emissions had risen substantially in many countries.



Will Kyoto make a difference?

Only if it leads to a more ambitious next step. Even if all the Kyoto targets were met by 2012, it would only make a tiny dent in the world's ever-increasing output of greenhouse gases. And few of the world's big economies are on track to meet these targets anyway. Moreover, the century-long lifespan of atmospheric CO_2 means that even if we turned off every fuel-burning machine on Earth tomorrow, the world would continue to warm for decades as the oceans slowly release the heat they've collected in recent years.

The bottom line is that we won't come close to keeping greenhouse heating in check until changes in lifestyle and technology enable us to massively reduce our emissions – or until we find a safe method to remove enormous amounts of carbon from the atmosphere.

Which countries are emitting the most greenhouse gases?

The US is in first place, with 30% of all of the human-produced greenhouse emissions to date and about 20% of the current yearly totals – despite having only a 5% share of global population. Close behind is China, which threatens to become the biggest emitter by 2025. It's worth noting, however, that China's emissions per person are still comparatively low. Moreover, some of its emissions are accounted for by the manufacture of goods exported to the West.

Does the growth of China and India make a solution impossible?

Not necessarily. China is already making progress on vehicle fuel efficiency and other key standards. And because so much of the development in China and India is yet to come, there's a window of opportunity for those nations to adopt the most efficient technologies possible. At the same time, the sheer numbers in population and economic growth for these two countries are daunting indeed – all the more reason for prompt international collaboration on technology sharing and post-Kyoto diplomacy.

Will we reach a "tipping point"?

The effects of climate change aren't linear. A 4°C warming could be more than twice as risky as a 2°C warming because of **positive-feedback processes** that tend to amplify change and make it worse. The worry is that at some stage – a so-called "tipping point" – these processes could make global warming uncontrollable.

Since each feedback has its own triggers, there is no single temperature agreed upon as a tipping point for Earth as a whole. However, one goal adopted by the European Union, as well as many environmental groups, is to limit global temperature rise to 2°C (3.6°F) over pre-industrial levels. Worryingly, we're already about 40% of the way there.

If oil runs out, does that solve the problem?

No. It's true that if oil resources do "peak" in the next few years, as some experts believe, we're likely to see economic downswings, and those could reduce oil-related emissions. But the longer-term question is, what fuel sources will the world use to fill any energy shortfall: coal, nuclear, renewables or some combination of the three? If the big winner is coal – or some other, less-proven fossil source such as shale or methane hydrates – it raises the potential for global warming far beyond anything in current projections.

Won't nature take care of global warming in the long run?

Only in the *very* long run. The human influence on the greenhouse effect could last the better part of this millennium. Assuming that it takes a century or more for humanity to burn through whatever fossil fuels we're destined to emit, it will take hundreds more years for those greenhouse gases to be absorbed by Earth's oceans.

There are few analogies in the geological past for such a drastic change in global climate over such a short period, so it's impossible to know what will happen after the human-induced greenhouse effect wanes. All else being equal, cyclical changes in Earth's orbit around the Sun can be expected to trigger an ice age sometime within the next 50,000 years, and other warmings and coolings are sure to follow. In the meantime, we'll have our hands full dealing with the next century and the serious climate changes that our way of life may help bring about.

What can I do?

As individuals, we can each attempt to reduce the greenhouse-gas emissions that we're personally responsible for. The rest of this book explains how to get started.

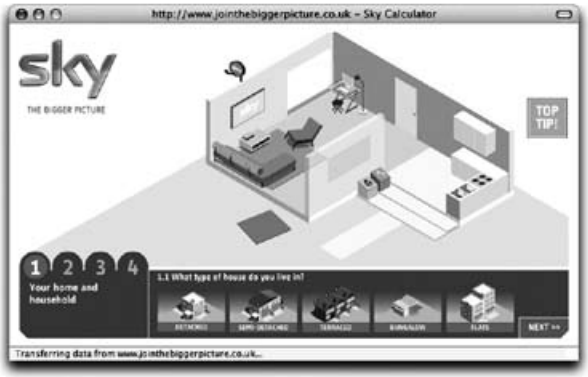
Your carbon footprint

... and how to reduce it

When trying to reduce your impact on the climate, a good first step is to take stock of your personal "carbon footprint" – the total amount of CO_2 emissions that you are directly or indirectly responsible for. To do this, turn to a carbon calculator. These simple online tools allow you to work out how much carbon each activity in your life generates and how your total compares to those of others.

One of the best carbon calculators can be found at Sky's Bigger Picture website. Simply click the Carbon Calculator link, enter a few simple details about your home, car, energy bills and so on, and the website will do all the rest.

The Bigger Picture www.jointhebiggerpicture.com



While you're there, explore the other sections of the Bigger Picture website to discover lots of helpful tips on leading a more climate-friendly lifestyle.

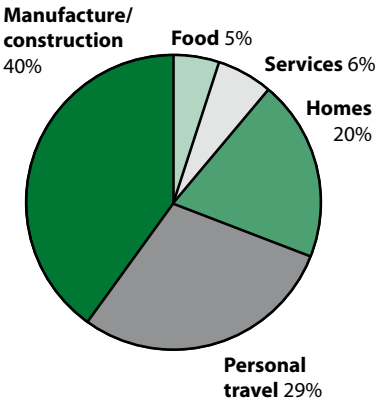
To see how the average UK carbon footprint breaks down, turn to the inside cover of this book.

The UK's carbon emissions

The chart below provides a breakdown of the carbon emissions of the UK. As it shows, around half of the total is accounted for by things beyond the direct control of individuals – such as factories, farms and services, and the building of offices, homes and roads. There may be things we can do to help reduce these emissions (supporting companies that are seeking to be more climate friendly, for example), but the easiest areas to make improvements are the other half of the emissions: homes and personal travel.

Based on figures from Best Foot Forward

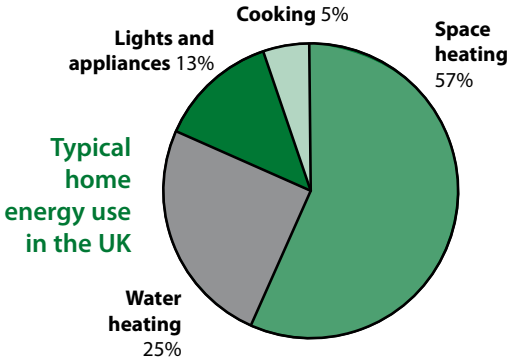
What's included?
Food: farming
Homes: electricity, heating
Personal travel: road, air, rail, water
Services: shops, health clubs, etc
Manufacture/ construction: factory goods, road building, etc



Homes

According to the Energy Saving Trust, the average British household could reduce its CO_2 emissions by a third – and save up to £250 per year – simply by becoming a bit more energy efficient. The best way to get started is to take stock of energy use in your home. The chart overleaf provides a breakdown for a typical UK household. As it shows, space and water heating are the most energy-hungry areas.

To help you reduce your home's impact on the climate we've devoted the next three chapters to heating, insulation and electricity. For more comprehensive advice, consider a **home energy audit**. These can usually be



Typical home energy use in the UK

arranged for free via your local Energy Efficiency Advice Centre. Call 0800 512 012 for more details. An expert will advise you on how to make your home greener and let you know about any grants you may qualify for.

Personal travel

On average, we travel more today than ever before – both within the country and on trips abroad. This is having a major impact on the climate, since nearly all our vehicles are powered by fossil fuels. To find out how to reduce the emissions of your car, turn to p.38. For more on air travel and how the various modes of transport compare, see p.49.

Heating & insulation

Warm your home, not the climate

Heating accounts for around a fifth of the greenhouse emissions of the average UK citizen, so even a small improvement in the way we warm our homes and water can make a big difference. The first step is to minimize waste; the second is to improve insulation; the third is to consider upgrading to a more efficient boiler or even a renewable-energy heating system.

Step 1: Tweaking your heating

Most households can achieve significant cuts in their CO_2 emissions just by making a few adjustments to the way they use their existing heating set-up. Here are some good ways to get started.

▶ **Turn it down** Reducing your heating and hot-water temperatures by just a small amount can make a disproportionate difference to your energy consumption. You may find you sleep better, too. For rooms, try 16–18°C and throw on a sweater. Each degree you lose will save 114–228kg of CO_2 emissions (and £15–30 on your bills) each year. As for hot water, aim for 50–60°C.

▶ **Keep your tank warm** If you have an uninsulated hot water tank, be sure to equip it with an insulating jacket. For just a few pounds, this could reduce the energy required to heat your water by 25–45%.

▶ **Heat rooms not walls** Put foil reflectors behind radiators to reflect heat back into the room. You can

make your own, but you'll get better results buying them off the shelf.

▶ **Close the curtains** Draw the curtains at dusk, before the warmth starts to escape.

▶ **Don't heat empty spaces** Efficient heating controls – especially those that let you specify the temperature of individual rooms, or programme different temperatures for different times of day – can take a significant chunk out of your energy demands. Also look into **thermostatic radiator valves**, which allow you to control each room's temperature automatically.

Step 2: Insulating

It may not be as glamorous as installing a solar panel on your roof, but improving the insulation of our homes can have just as big an effect for far less money.

Loft insulation

Decent loft insulation can reduce the annual CO_2 footprint of a typical UK home by 1.5 tonnes and reduce heating bills by a fifth.

Current building regulations state that loft insulation in new buildings should be 20cm (8"). If your current insulation is 10cm (4") or less, you should seriously consider topping it up to the 20cm level, and possibly adding even more. If you want a grant to install a renewable-energy technology (see p.29), you'll need at least 27cm (11").

Any type of loft insulation is better than nothing but certain types are greener than others. As a rule, those that use minerals as their raw material use more energy in their production – and are less likely to be locally sourced – than those that use natural materials such as wool or flax. The latter, though often more expensive, allow for better circulation of air and help to avoid the retention of toxins in a building.

Wall insulation

Most houses built after the 1930s have **cavity walls** – an inner and outer wall with a gap in between. (A typical cavity wall measures 30cm, whilst a solid wall will usually be only around 23cm.) Filling the cavity with insulation can lead to huge energy savings and usually takes only around three hours. The process involves drilling holes in the building's exterior wall and injecting the insulation material, which can be foam, mineral wool or some other option, depending on your budget.

Unfortunately, nearly a third of the UK's 24 million dwellings have solid walls, while a further 1.75 million have cavity walls that are unsuitable for filling. It is possible to insulate solid walls but it's more costly and labour intensive. The main decision is whether to go for **internal or external** insulation. The former will reduce your room sizes by around 1cm on each side and will

Paybacks for insulation products

The exact cost and payback period for each type of insulation and draught-proofing depends on your specific home and heating system, but the following figures show how the various options typically compare.

	Typical cost	Annual savings	Payback period
Cavity wall insulation	£260	£130–160	1–2 years
Internal wall insulation (for a gas-heated 3-bed semi)	£800–1400 (£40/m^2)	£100–200	5–15 years
Loft insulation (from 0 to 270mm)	£230-75	£180–220	1–2 years
Loft insulation (from 50 to 270mm)	£200–40	£50–60	3–5 years
Draught proofing	£50–75	£20	3–5 years
Floor insulation	£100	£40–50	2–3 years
Filling gaps between floor and skirting	£20	£10–20	1 year
Hot water tank jacket	£10	£20	6 months

mean complete redecoration; the latter is more expensive and will change the look of your building.

One good option for internal wall insulation is **sempatap**. It can be decorated with any finish (emulsion, wallpaper and even tiles) and enables the wall surface to remain warm, eliminating condensation and black mould growth. By installing sempatap in all rooms, a typical three-bedroom semi-detached house could save around 3800kWh per annum, equating to £95 or 18% of heating costs. However, the up-front cost would be about £1300 plus redecoration, so it would take at least fourteen years to pay for itself.

Windows

Old single-glazed windows are a major source of heat loss, so it's worth considering **double-glazing**. However, new windows are expensive, and the payback period can be as much as twenty years, so if you have a limited budget it's better to start off with adding loft insulation and replacing inefficient appliances.

If money is no object, probably the greenest choice is wooden frames – but be sure to get wood from certified sustainable sources. Second best is metal, followed by PVC, which doesn't last as long and can't be recycled. If you're on a more modest budget, you might explore DIY secondary glazing, which involves adding extra (openable) windows either inside or outside your existing ones.

The very cheapest method of secondary glazing is a special clingfilm-like material designed to be applied to standard window frames. You can do a whole house for less than £20, but it's a fiddly, time-consuming job that has to be repeated each year to get the best results.

Step 3: Consider upgrading your heating system

The most common fuel in the UK for space and water heating is natural **gas**, formed underground by decomposing matter over millions of years. Gas heating systems are better for the environment (and cheaper to run) than those powered by coal, oil or electricity. So

Electric heating: a climate crime

Compared to gas systems, electric heating is profoundly inefficient, producing on average around twice as much CO_2 per unit of heat than gas does. At present, there are 1.6 million UK residences heated by electricity. Many of these are rural houses that aren't connected to the gas network, but even in cities a significant number of homes use electric radiators and storage heaters. Because of this, many well-insulated residences built in the 1990s produce as much CO_2 via heating as poorly insulated houses from the 1890s.

If you own a home with electric heating, consider switching to gas or even wood. If you're renting, probably the best you can do is use your heaters as efficiently as possible. Set thermostats at sensible levels and switch heaters off a while before you go out.

if you're on the gas network but don't have gas heating, seriously consider making the switch. If you live in one of the quarter of UK homes that's not on the gas network, there are various renewable options to consider (see overleaf).

Better gas boilers

If you're on the gas network but don't have an efficient **condensing combination boiler**, then it's worth considering an upgrade. Combination (aka combi) boilers heat water on demand rather than filling a tank with hot water that may or may not be used. Modern condensing models are also highly efficient, producing more than 10% extra heat per unit of energy than a model made ten years ago.

Combi boilers aren't cheap, but you could easily save around £1000 (and plenty of CO_2 emissions) over the space of ten years, depending on your gas demands and future prices. A combi will also let you reclaim the cupboard space occupied by your hot water tank, though on the flip side it won't work in the event of a power cut.

When shopping for a boiler, be sure to look for one bearing the Energy Efficiency Recommended label. You can find a list here:

Energy Saving Trust www.est.org.uk/myhome/efficientproducts/boilers

Though combi boilers are far greener than using a hot water tank, they're not perfect. Depending on where your boiler is situated in relation to your tap, it can take up to a minute to actually get any warm water out. In this time you will probably waste around ten litres of water plus the gas used in heating the water that ends up in the pipe. There are ways around this problem, however. One low-cost measure worth taking when a boiler is being installed is to insulate your hot water pipes. This will keep the water in the pipes warm for much longer.

A more elaborate solution is a **Zenex Gas Saver**. This "top box" bolts onto your combi, extracting otherwise wasted energy from gases exiting the system via the flue and using it to pre-heat the incoming cold water feed. The box costs £575 (plus installation costs) but can pay for itself in three years, since it cuts gas demand by around 11% and saves around 5000 litres of water (around £25 per year on a metered water bill). It will reduce a typical home's CO_2 emissions by almost a tonne per year. The Gas Saver can be used with all Alpha and Veissmann boilers and many others besides. For more information, see:

Zenex Gas Saver www.zenexenergy.com ▷ 0800 328 7533

Solar water heating

Though most people associate solar power with generating electricity, it's also possible to convert sunlight directly into heat. The typical set-up is a roof-mounted **solar collector** panel, which channels the Sun's energy into your hot-water tank. Such systems have been around since the 1970s and there are currently about 80,000 installations in the UK. Generally, the collector is combined with a traditional hot tank system, but some combi boilers are also compatible.

Solar hot water is well worth considering if you have electric water heaters and/or high levels of hot-water demand in summer – but you'll need a south-facing roof. A typical system will provide all your hot water in the summer and about 50% of your total annual demand. Expect to pay around £2500–4000, depending on the type and size of collector. The Low Carbon Buildings Programme (see p.29) offers a £400 grant towards the cost. The payback period is around 15–25 years when compared to electric water heating.

Beware of ads and salesmen promising savings that are too good to be true, and always get several quotes before committing to an installer. Manufacturers include:

Solar Twin www.solartwin.com ▷ 0845 1300 137
Powertech www.solar.org.uk ▷ 01202 890 234

Ground-source heat pumps

Heat pumps extract warmth stored in the ground. A length of plastic pipe is buried in the ground and filled with a mixture of water and antifreeze. This liquid absorbs heat from the ground and an electric compressor raises the temperature to a useful level. The heat is distributed around the home by underfloor heating or radiators. Such systems require some electricity to drive the pump and compressor, but can be made completely renewable when combined with a small wind turbine.

You could produce all your heating with a ground-source pump, but it's generally more cost-effective to opt for a smaller system with a fossil-fuel-driven immersion system to kick in during times of peak need. The ground loop needs a trench 75–100m long and 1–2m deep for a typical house. Vertical systems are possible but more expensive. The pump itself is a fridge-sized box.

A typical 8kW system costs £6000–10,000, but unless you're building a house from scratch, you need to factor in a few thousand more for the distribution system (underfloor heating is ideal, but it is possible to use radiators). That's a big outlay, but the system could reduce your bills by up to two-thirds, thereby paying for itself within twenty years. The Low Carbon Buildings Programme (see p.29) offers grants of up to £1200 or 30% of total costs.

Note that you'll need a high level of insulation in the home, since poorly insulated properties will require the

pump to work harder, consuming valuable electricity. For more information, see:

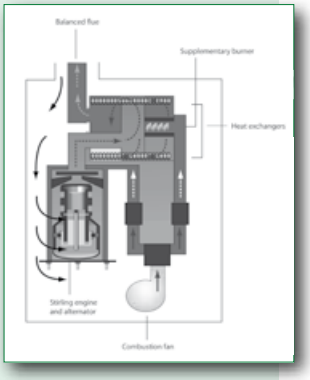
Ground Source Heat Pump Club www.nef.org.uk/gshp

Wood-powered heating

When wood is burnt, it does produce CO_2 but this is absorbed by new trees planted to replace the mature ones felled. Some additional CO_2 emissions come from harvesting and transporting the wood, but the overall carbon footprint is far smaller than with a fossil-fuel heating system. Automatic wood heating systems are far more efficient (by 80–90%) than traditional open fires or wood-burning stoves. They also provide a manageable heat source that is controlled by thermostats, and require far less maintenance. They are yet to catch on in a huge way in the UK, but Austria alone already has more than 100,000 installations.

Micro CHP: the way forward?

Micro **combined heat and power** (CHP) units, which are due to hit the UK market in the next couple of years, are a bit like super-efficient domestic-scale power stations. They replace your standard boiler, burning fuel (usually gas) to generate electricity and channelling the heat produced during this process into water and radiators. This dual approach reduces energy consumption and carbon emissions by as much as 25%. Furthermore, since the electricity is consumed where it's produced, there are fewer transmission losses, reducing CO_2 emissions even further.

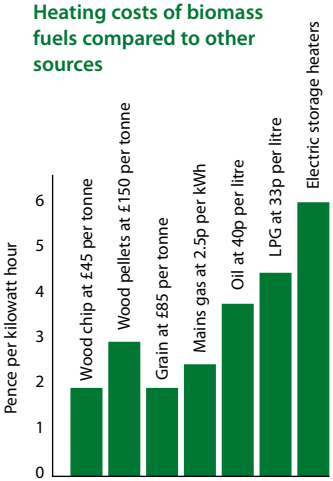


Two main brands are currently being tested in the UK: **WhisperGen** by Powergen and **Microgen** by British Gas. Both are expected to be available to residential customers before 2008 and will retail for around £500–1000 more than a normal boiler, with a payback time of just 3–4 years. For more information, see:

WhisperGen whispergen@powergen.co.uk ▷ 0800 068 6515
Microgen www.microgen.com ▷ 01733 393 100

A wood-powered **room heater** provides heating for a single room, though some models can be fitted with a back boiler to provide hot water. **Log and pellet boilers** are larger and can easily produce enough heat and hot water for a standard home. You'll only need to take the ash out every week or so, but you will need plenty of space to store the fuel, since wood has a lower energy content than coal or oil.

Heating costs of biomass fuels compared to other sources



Costs are £2000–3000 for a room heater and £5000–10,000 for a log or pellet burner, but the fuel is cheap (see chart) and the Low Carbon Buildings Programme offers a grant of up to £1500. You can find your nearest woodfuel supplier at:

Log Pile www.logpile.co.uk

Air conditioning

Once relatively rare in the UK, air conditioning (AC) is becoming increasingly popular with British householders. This trend has been driven by the searing heat waves made more common by human-induced climate change. That's somewhat ironic, since AC units themselves are quickly becoming a significant contributor to global warming. One recent report estimated that by 2020 domestic air conditioners in the UK could account for almost five million tonnes of CO_2 per year.

A typical home AC unit running at full power uses around 1–2 kilowatts of energy, which makes its carbon footprint roughly equivalent to that of a fan heater. Greener ways to keep interior temperatures down include fans (which are far less energy hungry) and adding pale, reflective blinds to south-facing windows. A more serious option is a ground-source heat pump. If you must use electric air conditioning, try to avoid pushing the temperature dial below 25°C.

Electricity supply

From green tariffs to home generation

Currently, around three-quarters of the UK's electricity is generated by coal and gas plants, which pump vast quantities of CO_2 into the atmosphere. The government aims to make the national supply more climate-friendly over the coming decades by expanding renewable and nuclear capacity and developing next-generation fossil-fuel plants which are more efficient and able to sequester (bury) the carbon dioxide they produce. But even if these target are met, it still makes sense to reduce your electricity consumption as much as possible. In the short term, every unit you use leads directly to CO_2 emissions.

The dirty power behind our plug sockets: a bellowing smokestack at a fossil-fuel power station

Of course, renewable sources already provide some of our electricity – nearly 5% at present, with targets of 10% by 2010 and 20% by 2020. Ironically, though, much of our current "renewable" capacity comes from burning the gas formed as our rubbish decomposes in landfill sites. Over the next two decades, wind will become the dominant renewable source, though it remains to be seen how much this development will be held up by opposition to wind-farm planning applications. If you'd like to voice your support for wind power in your area, drop into:

Yes2Wind www.yes2wind.com

But what can we do directly to become greener users of electricity? One option is to buy your power from renewable sources – or even buy the equipment to generate your own. People argue about whether the UK could be entirely reliant on green sources, such as wind and solar, but few doubt that the more we generate, the better. Another option is to simply consume less power – something we can do surprisingly easily, as the following chapter shows.

Green electricity tariffs

There are a wide range of **green electricity tariffs** on offer – both from major power suppliers and from specialist companies that only deal in renewable energy. The basic premise is that you pay a little bit more and the company supplies you with energy generated from green sources. The actual flow of electrons arriving in your plug sockets won't be any different from before, but the supplier will agree to put green-generated electricity into the national grid to match all of the power you buy.

Unfortunately, however, due to current laws, signing up for a green tariff doesn't necessarily increase in the

Switching power companies

Various websites make it quick and easy to compare your current electricity and gas tariffs with those of other suppliers, including the various green options. Such sites are all much the same, but use Switch and Give and a donation will be made to a charity of your choice if you do decide to change supplier.

Switch and Give www.switchandgive.com

amount of renewable energy being generated. That's because you may simply be helping the supplier meet its legal obligation to purchase a certain proportion of its power from renewable sources. Even if your supplier deals *only* in green energy, they'll probably be selling "credits" to companies who aren't meeting their legal minimums. All of this doesn't mean you shouldn't bother signing up, but it does mean you should continue to do your best to reduce your power use – don't think a green tariff makes your electricity carbon neutral.

The most popular green electricity providers include:

Ecotricity www.ecotricity.co.uk ▷ 0800 032 6100
Good Energy www.good-energy.co.uk ▷ 0845 4561 640
Green Energy UK www.greenenergy.uk.com ▷ 0845 456 9550
Juice (from NPower) www.npower.com

Generating your own electricity

If you want to put renewable power in your home on a more tangible level, there are a number of options. Most of the renewable energy sources – from wind and solar to hydro and geothermal – can be exploited on a household scale. And since Conservative Party leader David Cameron famously determined to install a wind turbine on his Notting Hill roof, home-generation has been more popular than ever.

In some cases, micro-generation systems make sense not only from an environmental perspective but also from a financial one: you may save money in the long run, and there are grants available to contribute to the price of installation (see p.29). You may even be able to feed any extra power back into the national grid and get paid for it. For example, NPower and Good Energy will pay about 5p for each kilowatt hour of electricity generated. First, however, you'll need an export meter, which will cost around £400.

That said, a system that will make you anywhere close to self-sufficient in electricity will require massive up-front investment, and in most cases it's far more efficient to start off by improving your heating and insulation.

Renewable energy grants

The UK government offers grants for household renewable energy projects via the **Low Carbon Buildings Programme**, launched in April 2006 and managed by the Energy Saving Trust. Of the £80 million initial fund, £6.5 million is ring-fenced for householders. However, a successful application depends on your home already having basic levels of energy efficiency in place, including 270mm of loft insulation, cavity wall insulation if possible, low-energy light bulbs, thermostatic radiator valves (TRVs) and a room thermostat and programmer. The application process is fairly simple and you'll normally get a decision within thirty days.

Low Carbon Buildings www.lowcarbonbuildings.org.uk ▷ 0800 915 0990

Wind turbines

Wind turbines create electricity from the kinetic energy of moving air, most commonly with a three-blade rotor. There are two categories of micro turbines: small ones designed to be mounted on buildings, and bigger ones designed to be raised on stand-alone masts. The power output of either type depends on the length of the blades, the wind speed (which rises with height) and whether there's any air-flow obstruction from buildings or trees.

As a guide, a small 1kW roof-mounted turbine with a 1.75m blade might realistically produce about 650kWh per year at an average wind speed of 4.5 metres per

Two Swift Turbines on a domestic building in Berwickshire

Planning issues

The government recently proposed making changes to the planning system so that installing micro renewables on existing houses will be classed as a permitted development. In the meantime, it would be advisable to contact your local authority planning department before you start work. Typical issues that need addressing include visual impact, noise and changes to the character of listed buildings or conservation areas. Planning applications cost around £120–200.

second. That's about 20% of a typical household's needs. But an appropriately sited 6kW stand-alone turbine with a blade diameter of 5.5m, raised 15m above the ground, should be capable of producing 7500kWh from an average wind speed of 5mps. This is about double the needs of a typical home so you would be able to export the surplus to the grid.

As for costs, expect to pay £3000 per kW installed, a third of which may come from a grant. You might break even in 15–20 years with a decent-sized stand-alone turbine. Most smaller units struggle to pay for themselves during their lifetimes, though a steep rise in energy prices could change this. You can find windspeed estimates for your postcode here:

UK Wind Speed Database www.bwea.com/noabl

For more information on micro wind turbines, see:

British Wind Energy Association www.bwea.com/small

Solar photovoltaics

Photovoltaics (or **PV**) panels generate electricity from sunlight. It's a beautiful concept, though there are a few catches. First, the panels are energy-intensive to make and can take up to five years of solid use just to repay their carbon debt (the amount of CO_2 emitted during manufacture). If the system is used in conjunction with batteries, the carbon debt may even be ten years.

Cost is another issue. Expect to pay around £5000–£10,000 for a 1kW system, which would be capable of providing about 25% of your total electricity demand, depending on your location. Factor in the panels life-

Corbis

expectancy – around 25 years – and it's unlikely the system will ever pay for itself, unless electricity prices go up by around 70%.

That said, the government will pay for as much as half of the total costs via the Low Carbon Buildings Programme. So PV is worth considering – especially if you have an unobstructed south-facing roof in a sunny part of the country, and if you tend to consume electricity in the day, when the panels are active.

For more information on solar photovoltaic systems, see:

British PV Association www.greenenergy.org.uk/pvuk2

Selling an energy-efficient home

When deciding whether to invest in energy-efficiency and renewable-energy measures for your home, bear in mind the benefits they might bring if you ever sell the property. A poll carried out by the Energy Saving Trust suggests that 70% of homebuyers see energy efficiency as an important feature.

From summer 2007, everyone selling a house will have to produce a **Home Information Pack**. As part of this process an inspector will produce a Home Condition Report and an Energy Performance Certificate, which will assess the energy efficiency of the home through a simple A–G energy rating, complete with recommendations for improvements.

The big switch off

Slimming down your electricity use

Unless you've spent your life savings going energy self-sufficient, it pays – environmentally and financially – to reduce your household electricity consumption. This doesn't have to mean drastic lifestyle changes, as at present a large proportion of our household power is simply wasted, frittered away by the likes of energy-inefficient fridges, overfilled kettles and TVs on standby.

White goods

Though high-tech devices are starting to catch up, white goods are still our biggest power eaters. Let's take a look at each appliance in turn.

Fridges and freezers

Household fridges and freezers run non-stop and collectively consume more energy than the total used in running all the offices in the country. If you have an old, inefficient model, consider upgrading. It will pay for itself in a few years and make CO_2 savings from the moment you plug it in.

If you don't want to invest in a new fridge you could still make savings with a **SavaPlug**, available from various websites and shops. It replaces the fridge's normal plug and has a sensor that reduces the amount of electricity used to pump the refrigerant around the fridge. Savings of more than 20% can be achieved, but before buying be sure to check that your model isn't on the incompatible list at:

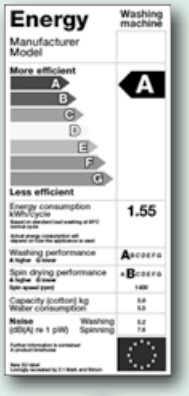
Savawatt www.savawatt.com

Whatever type of fridge you have, its energy consumption is influenced by the amount of time the door is left open and, strangely, how clean and ice-free it is. So defrost regularly and once in a while check the grille at the back for dust and dirt. This will add to the efficiency and lengthen the fridge's working life.

Shopping for energy efficiency

When buying any electric device, it makes sense to choose the most energy-efficient model available; some appliances use double the energy to get the same job done. Efficient products reduce CO_2 emissions *and* save you money. And they're easier to find than ever thanks to the following labelling schemes.

EU Energy Label By law, all retailers must show the EU Energy Label on or alongside all new fridges, freezers, washers, tumble dryers, dishwashers, lamps, ovens, light bulbs and air conditioners. Each item is ranked from A (efficient) to G (inefficient) in terms of its power consumption under standard running conditions. These days all washing machines available in the UK tend to be graded above D and fridges/freezers above C, so a "middle" rating is actually relatively low, and really efficient models are labelled A+ or even A++.



Energy Efficiency Recommended Administered by the UK's Energy Saving Trust, the Energy Efficiency Recommended Logo (EER) was developed to point customers to the most energy-efficient products on the market. It can be found on light bulbs and appliances as well as boilers, heating controls, insulation and more. The criteria are strict. For example, to bear the logo at the time of writing, fridges must be A+ or A++ . You can find endorsed products online or by phone: www.est.org.uk/myhome/efficientproducts ▷ 0800 915 7722

Washing machines

When you use a washing machine, around 90% of the energy consumption goes towards heating the water. This means the easiest way to cut the carbon footprint of your laundry is to select the lowest temperature (and the shortest cycle) that will get the job done to a satisfactory standard. A 30 or 40 degree wash is sufficient for most non-heavily soiled clothing. If there's an economy setting, use it. For even greater CO_2 savings, always let clothes dry on a line or rack rather than using an energy-hungry dryer. And if you're replacing your machine, be sure to choose a model rated "A" for energy efficiency.

Dishwashers

As with washing machines, most of the energy consumed by a dishwasher is used to generate heat – both to warm the water and, for drying cycles, to warm the air inside the machine. So always opt for the coolest setting that will get the job done.

As for how dishwashers compare with washing up by hand, this depends on the individual machine, the efficiency of your hot-water heater and, most importantly, how economical you are when washing up by hand. A study from the University of Bonn reported that dishwashers use less energy overall than the typical person at a sink, but this doesn't include the energy costs of producing, delivering and eventually disposing of the machine. Moreover, the study gives figures for hand-washing that can be slashed with just a bit of care, and assumes you run your machine with full loads, skipping extra features such as "pre-rinse".

Lighting

Light bulbs account for around 10–20% of domestic electricity usage – that's more than £1 billion each year in bills between us – yet around 95% of the energy that typical incandescent bulbs use is lost in heat. Energy-efficient **compact fluorescent** bulbs

Sunpipes

If you live in a house that needs the lights on during the day, even in the middle of summer, consider installing a **Sunpipe**. These super-reflective tubes carry natural daylight from your rooftop into dimly lit areas, diffusing the light around the room via a translucent ceiling fixture. Sunpipes can provide 100W of light in the winter and up to 500W on a sunny summer day. For more information, see:

reduce energy waste by more than 75% and they also last around ten times as long.

Decent efficient bulbs cost around £5 each (the cheapest ones tend to produce slightly "artificial" light) but will pay for themselves within a year if used for four hours a day. Each bulb will save you around £100 in power and replacement incandescent bulbs during its lifetime. If you want to spread the cost, replace old bulbs when they stop working, putting the efficient bulbs in the rooms where you use lights the most (not forgetting outdoor security lights).

What about **halogen** lights? These tend to be mid-range performers in the efficiency stakes. Better-quality halogen bulbs are around twice as efficient as typical incandescents and half as efficient as compact fluorescents. However, halogen light fittings often take multiple bulbs, raising their overall energy consumption.

Regardless of which type of bulbs you use, you can reduce their carbon footprint by turning the lights off when you leave a room. This alone can knock £15–30 off your annual electricity bill.

Don't standby, turn off

Around 8% of our domestic electricity is consumed by appliances such as TVs, DVD players, stereos and computers left on standby. Many devices – especially TVs – use almost as much energy in standby mode as when they're in use. Amazingly, the average microwave oven uses more energy powering its digital clock than it does

cooking food (costing the owner around £7 per year). So, get into the habit of turning devices off properly. This can take a decent chunk out of your emissions and bills, as the following table shows.

Appliance	*Time on standby/ plugged in*	*kWh used*	*Cash savings of switching off*	*CO_2 savings of switching off*
Typical TV	21 hours per day	203	£13.80	50kg
Video	21 hours per day	125	£11.04	40kg
Battery charger	159 hours per week	18	£2.16	7.5kg
Microwave	23–24 hours per day	70	£8.40	29kg

TVs, computers and gadgets

Electrical goods are proliferating, and this could result in a 20% increase in household electricity consumption by 2020. Some of the worst offenders are flat-screen **plasma TVs**, which typically use four times as much energy as traditional models. A cheap plasma TV is typically rated at about 550 watts. Used for four hours each day, the result will be 344kg of CO_2 and nearly £100 in electricity bills.

Many **set-top boxes** need to be on or in stand-by mode to ensure the programme schedule is up-to-date. Switching the box to stand-by when it's not in use can save 30–50% of the energy used by the box.

Computers vary widely in terms of energy consumption – both in use and in standby. You can reduce the period of inactivity that causes the machine to sleep or hibernate via the Control Panel (on a PC) or System Preferences (on a Mac). Better still, turn off computers when they're not in use for extended periods or, if you must keep them on, dedicate their stand-by time to the fight against climate change (see www.climateprediction.net to find out more).

Portable devices such as **mobile phones** and **MP3 players** tend to consume relatively little electricity in themselves. However, around 95% of their total energy consumption is accounted for by chargers that are plugged in and working even after the device is fully recharged. So try to get into the habit of unplugging devices when charged and switching their chargers off at the wall.

Get to know your meter

Most people know roughly how much they spend on shopping but have no idea how much energy they use. Monitoring your meter will help you understand how much electricity you consume and where savings can be made. Even better, get a plug-in power meter that allows you to monitor individual appliances over a number of days to see how much energy they use. Start with your fridge or freezer as this is on every hour of every day, so it's easy to extrapolate its yearly consumption from a few days' use. If any of your appliances give figures that equal or exceed the levels in the table below, you might be better served changing to a more energy-efficient model.

Appliance	*Typical annual running cost*	*Efficiency savings of a model rated A+*	*Annual cost savings*	*Annual CO_2 savings*
Lighting	£86	75%	£64	230kg
Fridge-freezer	£78	60%	£35	189kg
Dishwasher	£49	40%	£13	70kg
Washing machine	£32	30%	£5	27kg

If you really want to be in touch with your energy usage, consider an **Electrisave** unit. These £80 devices connect to your meter and transmit real-time usage info (in terms of units, CO_2 and cost) to a wireless display. For more information, or to buy online, visit:

Electrisave www.electrisave.co.uk

On the road

Greener driving & greener cars

According to the Department for Transport, the average British person travels 7000 miles each within the country, and the vast majority of that distance is travelled by car. The result is a huge amount of carbon dioxide. Indeed, our cars account for around a fifth of the UK's greenhouse gases, with a typical vehicle producing its own weight in CO_2 for every 6000 miles driven. However, as this chapter explains, we can significantly reduce the impact of our cars on the climate by making changes to how we drive, what we drive and what fuel we use.

Lower-carbon driving

Even if your vehicle's a gas-guzzler, you could cut its fuel usage by as much as 30% by tweaking your driving practices. Here's how.

▶ **Drive at the right speed** Most cars achieve maximum fuel efficiency when travelling at speeds of around 30–50mph. As speeds edge above 55mph, fuel consumption goes up as much as 15% for every additional 10mph. So simply driving on the motorway at 60mph rather than 80mph can cut emissions and fuel costs by almost a third.

▶ **Lighten the load** Keep heavy items out of the car unless you need them – you'll typically lose a percent or two in efficiency for every 50kg you haul. Also keep an eye on tyre pressure: rolling resistance goes up and efficiency goes down by as much as 1% for every PSI (pound per square inch) below the recommended pressure range. However, there's no benefit, and some risk, to driving with over-inflated tyres.

▶ **Avoid idling** Except when it's required (such as in stop-and-go traffic), idling is wasteful – and it doesn't benefit your car, except perhaps in extremely cold conditions. Even five minutes of idling can throw half a kilo of greenhouse gas into the air, and anything more than about ten seconds of idling generates more global-warming pollution than stopping and restarting.

▶ **Starting and stopping** Jack-rabbit starts and stops not only put wear and tear on your car, but they also drain fuel economy. Accelerate gradually, and anticipate stops by starting to brake well in advance. If you have a manual transmission, the best time to change gears is between 1500 and 2500 rpm.

▶ **Cut back on air-con** Running air conditioning typically cuts down a vehicle's efficiency by a few percent. That said, if it's a choice between driving with the windows down and running the A/C, there may be little difference in fuel usage, according to some studies. That's because wide-open windows can increase the car's aerodynamic drag, especially at high speeds. If outside temperatures are comfortable, try using the vents and fan but leaving the A/C off.

How to buy a greener car

On the whole, cars are gradually getting greener. This applies both to their fuel efficiency (and therefore their contribution to climate change) and to their emissions of poisonous gases and particulates. However, some cars are *far* greener than others, so if you're in the market for a new vehicle, it makes sense to seek out the lowest-emissions model that fits your needs and budget. Even if it means spending a bit more up front, you may save money in the long run thanks to lower fuel costs.

Unfortunately, the UK government's PowerShift scheme – which offered grants to help individuals buy greener cars – has come to an end. But it's worth keeping your eyes open for other grants via the following website, which is also a useful source of information about greener vehicles.

Energy Saving Trust www.est.org.uk/fleet

"Standard" petrol and diesel cars

Unless you opt for an electric or electric-hybrid vehicle (discussed later on), the first question is diesel versus petrol. Both have their pros and cons. Standard diesel fuel is worse than petrol in terms of poisonous emissions and yet diesel engines are significantly more efficient and hence better in terms of global warming. In terms of alternative fuels, diesel engines leave you the option of using biodiesel (see p.44), while petrol engines are cheaper and easier to convert to LPG (see p.46). Overall, a diesel car is generally the greenest choice for people who live in the countryside, but city dwellers concerned about urban air quality might prefer to plump for petrol.

Whether you go for petrol or diesel, it's not hard to find information about the relative greenness of the various models. The ETA's online Car Buyer's Guide provides emissions and efficiency data – plus an overall environmental star rating – for most of the cars on the UK market. The VCA CarFuelData site is equally comprehensive.

ETA Car Buyer's Guide www.eta.co.uk
VCA CarFuelData www.vcacarfueldata.org.uk

Good cars, bad cars

Following are the greenest and least green cars (excluding electric models) available in the UK at the time of writing, as determined by the ETA. As the lists show, the most eco-friendly cars are light and have comparatively small engines. The most climate-frying and air-polluting cars tend be heavy, unaerodynamic and/or super-powerful – either boy-racer vehicles or hulking 4WDs.

The ten best

1. Honda Civic 1.4 IMA Executive
2. Toyota Prius 1.5 VVT-i Hybrid
3. Citroen C1 1.0i
4. Toyota Yaris 1.0 VVT-i
5. Daihatsu New Sirion M300 1.0L EFi
6. Suzuki Swift 1.3 GLZ 3 door DDiS
7. Vauxhall Corsa 1.3CDTi 16v SXI 5 door
8. Peugeot 107 1.0 (65bhp)
9. Toyota Aygo 1.0 VVT-i 3 & 5 door
10. Ford Fiesta 1.4 Duratorq TDCi

The ten worst

1. Lamborghini Diablo 132
2. Bentley Arnage RL
3. Aston Martin Lagonda V12 Vanquish S
4. Aston Martin Lagonda DB9
5. Bentley Continental Flying Spur
6. Rolls-Royce Phantom
7. Chrysler Jeep New Grand Cherokee 5.71
8. Porsche Cayenne S 6 Speed
9. Corvette C6 7.0 V8
10. Volkswagen Phaeton 6.0 4Motion

Electric hybrid cars

Electric "hybrid" cars, such as the **Toyota Prius** and **Honda Insight**, look and drive just like normal cars, yet their semi-electric engines are as much as twice as efficient as their straight petrol equivalents. Unlike "proper" electric cars (discussed overleaf), hybrids never need to be plugged in and charged up. Instead, the car charges its own battery when the brakes are applied (converting the car's kinetic energy into electrical energy) and also when the petrol-powered part of the engine is powering the car along at high speeds. The battery's energy is then automatically used when lower speeds are required. The result is that hybrid cars can achieve over 60 miles per gallon – and with exceptionally low levels of harmful emissions.

The main problem with hybrids is that they're currently quite expensive. If buying new, you can expect to pay around 10–20% more than you would for an equivalent non-hybrid model. And the fuel consumption won't necessarily be lower than that of a small, super-efficient, non-hybrid diesel such as the Toyota Yaris. That said, hybrids only cost £40 per year in road tax and are exempt from London congestion charging.

The Honda Insight's hybrid petrol–electric engine makes it one of the greenest "normal" cars on the market

Electric cars

Recharged via a standard **mains socket**, electric cars are the greenest vehicles on four wheels. If charged up with electricity from renewable sources, their use creates practically no carbon dioxide. Even if charged up with electricity generated from fossil fuels, they're much more eco-friendly than petrol and diesel cars, due to their high levels of energy efficiency.

Unfortunately, there are a few catches. Most electric cars don't go very fast and they need to be recharged after a certain number of miles (usually between 30 and 120, depending on the model). Moreover, you need a parking space near a plug socket.

At the time of writing, the only electric car widely available in the UK is the **G-Wiz**. Designed for two adults plus either two children *or* shopping, and capable of 40mph, the G-Wiz will do roughly 40 miles before requiring a recharge (which takes a few hours). At the time of writing, they cost around £7000, but by the manufacturer's calculations you could potentially save more than that every year in fuel (a G-Wiz achieves the equivalent of 600mpg), tax (eco-friendly cars are exempt) and, in central London, parking and the Congestion Charge (both free). You'll also save money on maintenance, since electric cars have very few moving parts. For more information, see:

G-Wiz www.goingreen.co.uk

A carbon-neutral vehicle? G-Wiz!

Electric cars with more room, a longer range and a faster top speed do exist. These range from serious sports cars (see www.acpropulsion.com) to vans (such as the Renault Kangoo Electric, which can manage around 70mph). However, none of these are available in Britain at the time of writing. Hopefully this will change over the next few years.

Motorbikes and mopeds

Small motorbikes are relatively green when it comes to CO_2 emissions. Indeed, a modern moped can be even more climate friendly than a train (see p.50). Obviously, motorcycles with bigger engines release more CO_2, but only very powerful performance bikes emit as much as a typical family car. (On the flip side, motorbikes have comparatively bad emissions of poisonous gases and particulates, so don't do any good for urban air quality.)

Even more climate-friendly than a typical moped is an **electric** model. Unlike electric cars, these are widely available, with decent models starting at around £1500. In terms of climate change (and cost), driving a decent e-scooter for thirty miles is equivalent to leaving a 100W light bulb on for just a few hours. Moreover, such vehicles produce zero poisonous emissions. Some models – such as the EVT168 (pictured) – even look flashy, too. The downside is that most current e-scooters can only manage about 30mph and need to be recharged every thirty miles or so. For more information, visit:

Scoot Electric www.scootelectric.co.uk

By 2007, the UK's first **fuel-cell** motorbike should also be available – the space-age-looking ENV by Intelligent Energy. These will retail for around £5000 but offer considerably greater range and power than an e-scooter. Find out more at:

ENV Bike www.envbike.com

Alternative fuels

Even if you don't upgrade to a greener vehicle, you may want to consider what you put in your existing one. There are lower-carbon alternatives for both petrol and diesel engines.

Biofuels: biodiesel and ethanol

Biofuels are fuels made from plants – anything from corn to sunflowers. Their primary attraction is simple: the carbon they release when burned is no more than the carbon they soaked up from the atmosphere when growing. This neat cycle isn't entirely "climate neutral", since fossil-fuel energy goes into fertilizing, harvesting, processing and distributing the crops. But the overall carbon footprint of a biofuel can be substantially smaller than the petroleum equivalent.

The biggest environmental problem for biofuels is demand for land. It would take huge areas of crop land to turn biofuels into a major part of the global energy picture. This could squeeze food production or require the conversion of virgin land into farms, something which has implications not just for wildlife habitat but for the greenhouse effect itself – especially if it involves deforestation. All told, then, the benefits of biofuels depend entirely on how and where the crops they're made from are grown. There are two main categories of biofuel:

▶ **Ethanol** (ethyl alcohol) is a substitute for petrol. It's usually sold in a mixture of 10% ethanol and 90% gasoline (E10). Higher-proportion blends are also available (such as E85, with 85% ethanol), but these can only be used in a special "flexible fuel" vehicle. Ethanol is widely used as a fuel in Brazil and the US, but not yet in the UK.

Currently, most ethanol produced in non-tropical climates is made from corn. Unfortunately, it takes a great deal of fossil-fuel energy to create the fuel, meaning that the overall CO_2 emissions are only about 30% lower than a vehicle running on petrol. Bigger carbon savings could be made in the future if chemists succeed in developing efficient ways of creating ethanol from cellulose.

▶ **Biodiesel** is a substitute for standard diesel. The idea of running a diesel engine on plant-based fuels isn't new: when Rudolph Diesel invented his super-efficient combustion engine at the end of the nineteenth century, he famously ran his prototypes on peanut oil.

Biodiesel can be almost 50% more climate-friendly than standard diesel, but there is a catch. Though the fuel can be made from sustainably grown crops (or even used cooking oil), it can also be made very cheap-

Vegetable oil as a car fuel

Biodiesel is one thing, but what about all those stories in the press about people filling up with plain old vegetable oil in supermarket car parks – such as Welshman Daniel Blackburn, who made the headlines in 2003 by using veg oil to motor all the way from John O'Groats to Land's End? It's true that, after a conversion costing around £500–1000, many diesel engines will run perfectly well on standard cooking oil. And the result may be even greener than biodiesel, since veg oil requires less energy-intensive processing. As long as you declare what you're doing and pay the relevant tax, it's perfectly legal, too.

Daniel Blackburn

Daniel Blackburn on his way from John O'Groats to Land's End

At the time of writing, you can expect to pay around 70p per litre – including 25p in tax – for vegetable oil, making it cheaper than normal petrol and diesel. Still, be aware that many car manufacturers claim it can be bad for the engine. For more information about using cooking oil to stop the planet frying, including conversion quotes and a list of which cars are suitable, see Daniel Blackburn's site:

Veg Oil Motoring www.vegoilmotoring.com

ly from palm oil, the cultivation of which is a major cause of catastrophic deforestation in Indonesia and elsewhere. Palm-based biodiesel has the potential to do much more harm than good, but consumers typically have no way of knowing whether palm oil was used to create the biodiesel they're buying.

Biodiesel can be used in many recently produced diesel cars without modification. The fuel is available in pure form but blends with petroleum diesel are more popular. The latter aren't as good from a carbon perspective, but still reduce certain harmful emissions and increase engine efficiently. Before filling up, check with the manufacturer of your car whether they approve the use of neat or mixed biodiesel, otherwise you could invalidate your engine warranty. For a list of filling stations, see:

EST www.est.org.uk/fleet ▷ 0845 602 1425

LPG

LPG (**Liquid Petroleum Gas**) is basically **propane**, as used in camping stoves and stand-alone gas heaters. A byproduct of oil refining and natural gas extraction, it's a fossil fuel but it has lower greenhouse-gas emissions than petrol and also results in fewer poisonous fumes. Most petrol-powered cars can be converted to run either solely on LPG or on both LPG and petrol, the result being a car that emits about the same amount of CO_2 per mile as an equivalent diesel car.

Conversion to LPG usually costs a few thousand pounds, but once it's done you can get cheap fuel and, in London, exemption from the congestion charge.

What about hydrogen?

Instead of being charged up, fuel-cell vehicles generate electrical energy on-board by combining oxygen (from the air) with hydrogen. The hydrogen can be made on the fly from petrol or methanol, or, more commonly, generated elsewhere using electricity and then stored on board in replaceable canisters. Like other electric cars, fuel-cell vehicles help reduce air-borne pollution in towns and cities and they're extremely efficient in terms of CO_2 per mile. Trials using taxis and buses have already successfully demonstrated that the fuel cell can work well, and commercial models may be available to consumers within the decade.

It's questionable, however, whether hydrogen vehicles will be the environmental panacea that their advocates describe. The main problem is that it takes a lot of energy (most of which currently comes from fossil fuels) to make the hydrogen in the first place. So the creation of a hydrogen infrastructure – production plants, distribution channels and re-filling stations – would only bring benefits in terms of global warming if there was a massive growth in renewable energy.

Cutting back on cars

Efficient vehicles and low-carbon fuels are all well and good, but perhaps the best way to reduce the environmental impact of our driving is simply to drive less. There are various ways to do this…

Car clubs and lift shares

If you want to get shot of your car but don't want to rely solely on public transport, consider looking into car sharing and car clubs. This is not only environmentally sound, but may also make sense financially (it is said that if you factor in the time it takes to earn the money to buy, run, insure, tax and maintain your own vehicle, the typical driver achieves an average speed roughly equivalent to walking).

Either for a regular commute or a one-off drive, **car sharing** is based on the simple rationale that one car carrying, say, three people is three times less polluting, congesting and expensive than three cars carrying one person each. Although the UK has been much slower to grasp this fact than much of continental Europe, the car-sharing movement is taking off. The Internet has also helped, providing the ideal way for people to find and organize sharing. Whether you're looking for passengers or a ride, visit:

Freewheelers www.freewheelers.co.uk
Liftshare www.liftshare.com
National Car Share www.nationalcarshare.co.uk

Car clubs or **car pools** are something else entirely. You don't actually own a car but have access to a communal

one situated within a few minutes' walk of your house. Beside a possible joining fee and/or small monthly charge, you only pay for the hours or mileage you use. City Car Club, for example, which operates in London and various other cities, costs around £4 per hour. See:

City Car Club www.citycarclub.co.uk ▷ 01484 483 061

To find your nearest car clubs, see:

Car Plus www.carclubs.org.uk ▷ 0113 234 9299

Getting the train

Travelling by train is typically around two to five times more climate-friendly than driving, depending on the type of car and the number of passengers. So favour rail over road whenever possible. For more on how cars compare with trains, see p.50.

Cycling and walking

A larger proportion of short trips are made by car today than ever before. Cycling and walking are the most climate-friendly of all forms of travel, and they keep you fit, too. So, when possible, dust off the bike and/or walking shoes and leave the car at home.

Holidays

The air-travel issue

A climate-friendly flight is something of a castle in the air. Combine their high greenhouse-gas emissions – per passenger, per mile – with the fact that planes allow us to travel such vast distances and you have a recipe for environmental disaster.

Despite the relatively tiny number of people who regularly fly, aviation accounts for 3–4% of the total human impact on the climate, according to the Intergovernmental Panel on Climate Change (IPCC). That's around the same as the whole of Africa. And that figure is on the up thanks to the ever-growing number of flights. The number of air passengers flying into and out of the UK is expected to nearly treble by 2030 – to around 500 million. This rapid growth threatens to offset the cuts in greenhouse emissions being made in other sectors.

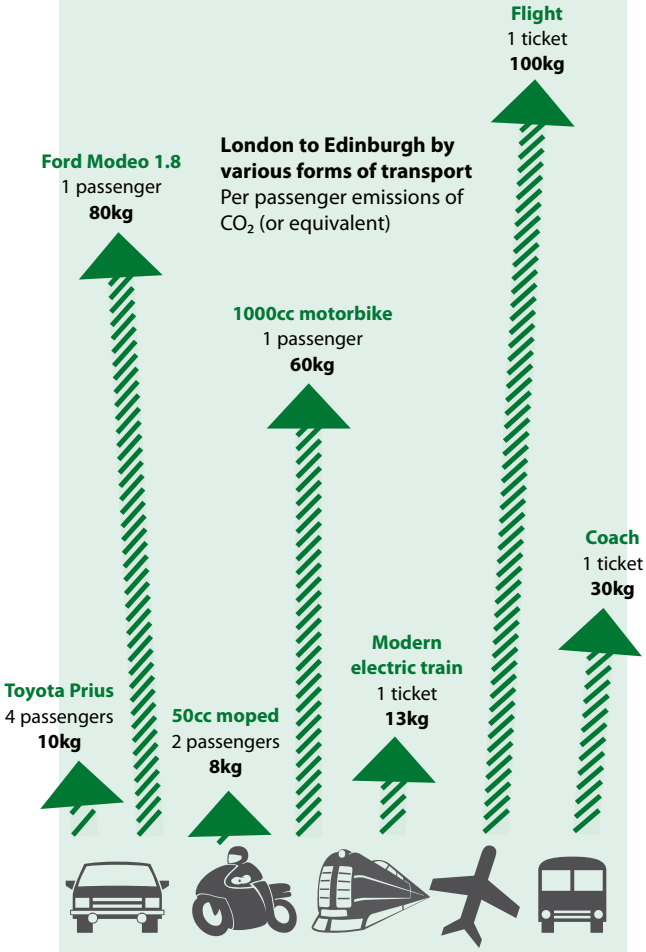
The reason air travel is so bad for the climate is not just that aeroplanes release a great deal of greenhouse gases into the atmosphere – it's the fact that they do so in the upper troposphere and lower stratosphere, where their effect is compounded. The contrails (vapour trails) that planes create are another factor. The science surrounding this topic is not yet rock solid, but researchers believe that contrails add to the greenhouse effect – especially at night, when their tendency to stop heat escaping from Earth isn't offset by their tendency to reflect incoming sunlight.

All told, the impact of a flight is thought to be around three times greater than the CO_2 emissions would suggest. So two seats on a return trip from London to San Francisco create the equivalent impact of at least five tonnes of CO_2 – almost as much as the average UK household's yearly output, or 20,000 miles in an averagely efficient car.

Less harmful planes may eventually emerge, but even if they do – and there are no climate-friendly designs

Planes, trains & automobiles...

Comparing the impact on climate change of different forms of transport is not simple, as it's necessary to factor in, among other things, occupancy levels (a car with four people in it is almost four times less polluting, per passenger, than the same car with one person in it), speed (driving at 80mph can burn 30% more fuel than driving at 50mph) and the specific vehicle (a diesel train is far more polluting than an electric train). There's also the fact that planes, though not necessarily *much* worse than cars in terms of emissions per passenger mile, allow us to travel incomparably further. Despite all this confusion, the following diagram should give you a rough sense of how the various forms of transport compare. Climate aside, riding from London to Edinburgh with two people on a Vespa is not recommended…



It's not just how far they fly – it's how high they fly and the vapour trails they create. A plane's overall effect on climate change is around three times worse than its CO_2 output would suggest.
Photo: Corbis

currently in the pipeline – they won't replace current fleets any time soon, since passenger planes stay in use for decades. In the meantime, the only way governments could reduce air travel's impact is by cutting down on the number of flights. The obvious way to do this would be to make the price of a ticket reflect the environmental costs through some kind of tax system on take-off and landing. (Another option would be to tax aviation fuel, which is currently duty free, but this would be difficult due to various international treaties.)

So far, governments have been loath to take such steps. For one thing, they have few incentives, since aviation, being by its nature international, isn't included in the national targets for emissions cuts specified in the Kyoto Protocol. This is significant: officially, the UK's greenhouse emissions fell by 4% between 1990 and 2004. But factor in shipping and aviation and the net result is a *rise* of 1%.

What you can do

For anyone concerned about global warming, cutting back on air travel is an obvious goal. This might mean giving up flying altogether, or it might mean taking fewer flights and making up for it by staying longer each time. It might also mean favouring destinations that are closer to home. Short flights tend to be around 25% worse, per passenger per mile, than long-haul flights (because they have more empty seats and because taking off and land-

ing burns more fuel than cruising) but overall it's still far worse to travel longer distances.

Another approach is to consider alternative ways of travelling. With more than two people on the same itinerary, it can even be more climate-friendly to drive than to fly – especially for short distances such as trips from the UK to northern Europe. Better still are **trains and boats**, which are typically responsible for many times fewer emissions per person per mile than either cars or planes. To find out how to travel from London to almost anywhere in the world by rail and sea, visit:

The Man in Seat 61 www.seat61.com

If you do choose to fly, consider offsetting the emissions (see p.62) and try to favour daytime flights due to the issue of contrails already discussed.

Finally, you might want to consider buying flights via North South Travel, who donate their profits to charitable projects in Africa, Asia and Latin America.

North South Travel www.northsouthtravel.co.uk

FlightPledge

FlightPledge Union is a website at which you can register your intent not to fly for environmental reasons. The objective is "to sign up as many people as possible, firstly to reduce the number of aircraft movements, and secondly to show the government that there is a large number of people who are willing to voluntarily limit their flying and make an individual gesture to reduce their personal impact on the environment". You can choose the gold pledge (no non-emergency flight in the next year) or the silver pledge (no more than two short-haul or one long-haul).

Flight Pledge www.flightpledge.org.uk

Food

Lower-carbon eating

Add together the fossil fuels and fertilizers used in farming and transporting our food to and from the shops, and the carbon footprint of our meals can be substantial. The best way to reduce this footprint is to favour local produce.

Europe has been importing food and drink from far and wide for millennia – tea from China, spices from India, coffee from Ethiopia. But the globalization of modern food markets is on a completely different scale. These days we fly in fruit from the global South when it's out of season in the North, and we ship in goods that we could grow in the UK, but which can be sourced more cheaply from elsewhere. Indeed, the distance travelled by the food we put on our plates is thought to have roughly doubled in the last two decades. Today, the contents of an average shopping basket of goods can be the result of tens of thousands of miles' journeying, by road, sea and, in some cases, air.

For food grown in the UK, too, the distance from "farm to fork" is bigger than ever, not least because supermarkets tend to deliver everything to their stores via distribution centres. Since these are few and far between, long truck journeys are inevitable. One much-cited study traced vegetables on sale in a supermarket

Is organic food climate-friendly?

According to most neutral commentators, organic farms tend to use less energy and create less CO_2 per kilo of produce than the non-organic equivalent. This is in part because man-made fertilizers, which organic rules prohibit, are highly energy-intensive to manufacture. That said, much organic food is imported from distant countries, and this transport can add significantly to its carbon footprint – especially if it's air-freighted. For this reason, the best rule of thumb is to favour local food over organic food. Even better, look for produce that's local *and* organic.

in Evesham: they were grown just up the road, but had arrived via a huge round trip taking in Hereford, Dyfed and Manchester.

All these extra "food miles" have a global-warming impact. According to a 2006 government report, UK food transport now accounts for 18 million tonnes of CO_2 – and also costs the country £9 billion in congestion, accidents and other externalities. Petrol used to transport food in vans or lorries at least has a tax payable on it, but aviation fuel – used, for example, to fly in out-of-season strawberries from South Africa to the UK– isn't taxed at all.

So, look out for UK produce wherever possible, and avoid high-value, out-of-season perishables (such as berries and beans), since these are the products most likely to have been imported by air.

Where to buy local food

It's increasingly possible to find local food in your local supermarket, but you may also want to explore specialist outlets such as:

Farmers' markets and farm shops

The idea behind farmers' markets is simple: "farmers, growers or producers from a defined local area are present in person to sell their own produce, direct to the public. All products sold should have been grown, reared, caught, brewed, pickled, baked, smoked or processed by the stallholder."

This way, food transport is kept to a minimum, the farmers get a better deal than they would get via a retailer and consumers get fresher produce. To get offi-

Long-distance dining

In a study called *Eating Oil*, the campaign group Sustain (www.sustainweb.org) measured the miles travelled by our foods and the energy that the transportation consumes. One of their case studies looked at a basket of imported foods you might pick up in any UK supermarket:

From abroad to the UK

- **5kg of chicken from Thailand** 10,691 miles by ship
- **1kg of runner beans from Zambia** 4912 miles by plane
- **2kg of carrots from Spain** 1000 miles by lorry
- **0.5kg of mangetout from Zimbabwe** 5130 miles by plane
- **5kg of potatoes from Italy** 1521 miles by lorry

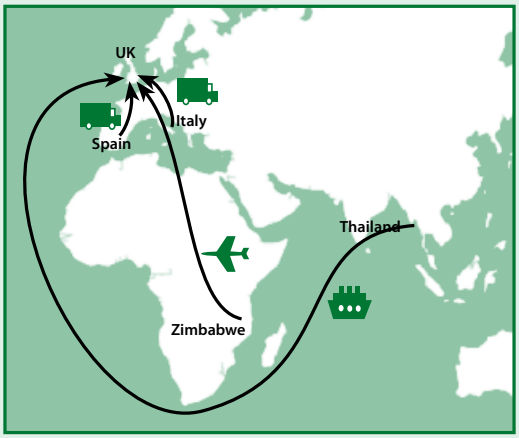
From the UK to the distribution centre

- **1kg of sprouts produced in Britain** 125 miles by lorry
- **All the imports to the distribution centre** 625 miles by lorry

From the distribution centre to the store

- **British sprouts, plus all the imports (total weight 13.5kg)** 360 miles by lorry

Add it all up and, collectively, these goods would have travelled almost **25,000 miles**, using up 52 megajoules of energy in doing so – equivalent to boiling the kettle for around 700 cups of tea. By contrast, an equivalent basket of seasonal produce



from a farmers' market went only 376 miles, using up just one megajoule (around 13 cups of tea).

Organic foods aren't likely to be any more local. The UK imports the overwhelming majority of its organic produce, partly because we don't produce enough and partly because imports are cheaper. Sustain worked out that a basket of 26 imported organic products could have travelled nearly 150,000 miles, releasing as much CO_2 as "an average four bedroom household does through cooking meals over eight months".

FARMA

cial FARMA certification, a farmers' market must ensure that produce is grown, reared or caught within a 30 mile radius around the market (50 miles for some larger cities and coastal or remote towns and villages).

Farm shops apply the same philosophy on a smaller scale, typically offering the produce of just one farm. To find farmers' markets and farm shops near you, visit:

Farmers' Markets www.farmersmarkets.net ▷ 01225 787 914
London Farmers' Markets www.lfm.org.uk
FARMA www.farma.org.uk

Organic delivery

Organic delivery services, aka **box schemes**, bring local, seasonal fruit and veg (perhaps bolstered by foreign goods imported by ship) direct to your door. Most box-scheme companies also offer all sorts of other foods and goods, from bread to washing-up liquid, so it's perfectly possible to save yourself from ever going to the supermarket. Even when you factor in the delivery van, the overall pollution and energy use tends to be smaller than driving to and buying from the supermarket.

Grow your own

Perhaps the greenest produce of all (and doubtless the most satisfying to eat) are fruit and vegetables that you've grown yourself. You don't need a huge garden or to give up the day job. The following website is a great place to get started.

Grow Your Own Organics www.organicgardening.org.uk

You can find local box schemes via the directory at this Soil Association website:

Why Organic?
www.whyorganic.org

If you can't find any local schemes, or if those you've tried aren't very good, you could try one of the bigger box scheme companies, some of which will deliver to nearly anywhere in the UK. For example:

A typical mixed box from Abel & Cole. Like most organic delivery services, they offer a wide range of fruit and veg options – from the Farmer's Choice Combi Bag (£8) to the Family Organic Box (£22) – as well as bread, fish, meat and store-cupboard goods.

Fresh Food www.freshfood.co.uk ▷ 020 8749 8778
Simply Organic www.simplyorganic.net ▷ 0870 760 6001

London and the South East are also well served by Abel & Cole and Organic Delivery.

Abel & Cole www.abel-cole.co.uk ▷ 020 7737 3648
Organic Delivery www.organicdelivery.co.uk ▷ 020 7739 8181

Another useful website is Big Barn, which allows you to search for your nearest local-food suppliers – both organic and non-organic.

Big Barn www.bigbarn.co.uk

Low-carbon cooking

- **Picking pans** Choosing the right size pan for cooking and keeping a lid on for most of the cooking process can reduce the energy needed to cook food by 90%.
- **Only boil what you'll use** Nothing's more wasteful than filling a kettle to the brim to make one or two cups of tea. So get into the habit of using the water gauge.
- **Gas vs electric** As with heating, gas cookers are more environmentally friendly than electric ones. However, try to avoid too much unburnt gas leaking from the hobs before you light them. The gas is mainly methane, which is 24 times more potent in terms of global warming than CO_2.

Waste & water

Reduce, reuse, recycle

Though less significant in terms of climate change than heating, electricity or travel, the rubbish we throw out and the water we use do add to our carbon footprints. The old green mantra – reduce, reuse, recycle – can help us minimise this contribution to climate change.

Rubbish & recycling

British homes produce around 25 million tonnes of rubbish each year – and that figure is increasing by 2% annually. Of this, less than a quarter is currently recycled. New laws and targets will force our recycling figures up over the coming years, but in the meantime there's much we can do on an individual level to reduce the amount we send to landfill. In doing so, we can help reduce the greenhouse emissions that result from the production of packaging and bin bags, the decomposition of food waste and the collection and processing of our refuse.

Food and paper: biodegradable waste

Over 50% of our domestic refuse is organic in nature, such as kitchen and garden matter, paper and cardboard. In a landfill site, each tonne of this waste produces 300–500 cubic metres of landfill gas, which includes **methane**, a greenhouse gas more than twenty times as potent as CO_2. Many big landfill sites extract the methane and use it for power generation but where this is uneconomical, the gas seeps into the atmosphere. All told, decomposing waste accounts for around a fifth of UK methane emissions.

The best way to limit the greenhouse emissions of your biodegradable rubbish is to **compost** it – as long as the heap can "breathe" it won't produce methane, and with a bit of patience you'll end up with a lovely crumbly compost that will help your garden thrive. Any

How to make compost

The best way to get good results without creating bad smells or attracting vermin is to buy a sealable compost bin. These are mostly made from thick plastic and will take virtually any organic matter. If you build your own compost bin on bare soil and leave it open at the top, avoid all foodstuffs except fruit, vegetables and things like tea leaves and coffee grounds (meat, dairy and grain-based products are a magnet for rodents).

Whichever option you go for, ensure you have a good mix of carbon-rich **browns** – such as dried flowers, woody stems and cardboard – and nitrogen-rich **greens,** such as fresh grass cuttings and kitchen waste. Best results are achieved by cutting large items into smaller pieces to accelerate the process. Build the heap in layers and introduce air on a regular basis by occasional turning or by adding a layer of cardboard and paper every now and then. You want a moist heap rather than a wet or dry one, so if it's too wet add more dry material and if too dry add water (or even urine, which is a great nitrogen-rich accelerator). Your heap will take between six months and two years to turn into sweet-smelling dark crumbly compost.

A **wormery** is another option. These can be good for small spaces, but they demand rather more attention than a normal compost heap. For more information, or to buy online, visit: www.wigglywigglers.co.uk

A can-o-worms wormery from Wiggly Wigglers

excess paper and card should be recycled, since making new paper from old paper, compared to making it from virgin fibres, uses 64% less energy and 58% less water.

Of course, it's also sensible to generate less degradable waste in the first place. For instance, an astonishing 20% of the food we buy is fed to the bin, at a cost of £424 a year to the average household. The solutions are simple: plan carefully when shopping; use the freezer to preserve goods that are likely to go off; and make use of leftovers rather than letting them sit in the fridge decaying.

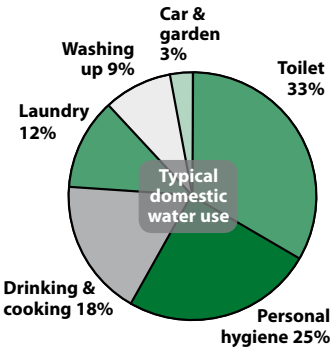
Plastic, glass and metal

When it comes to non-biodegradable waste, the first step is to generate less – for example, by bringing your own bags to the supermarket and favouring goods with minimal packaging. You could even follow the advice of the German government and make a point of leaving excess packaging in the shop after you've been through the checkout.

But however much plastic, glass and metal you end up with, recycle whatever you can. Recycling just two glass bottles saves enough energy to make five cups of tea; recycling a tonne saves 315kg of CO_2 emissions. As for plastics, recycling can save 66% of the energy consumed in manufacture, reduce water use by 90% and cut emissions of sulphur dioxide, nitrogen oxides and CO_2 by more than 50% each. Unfortunately, only certain types of plastic are widely recycled in the UK.

Water

Every drop of water we use has been treated; and every drop we put down the plughole or toilet is later treated again. All of this treatment requires energy, resulting in greenhouse-gas emissions. A family of four uses approximately 200,000 litres of water per year, which takes 94kWh to supply and 83kWh to treat, resulting in 78kg of CO_2 – equivalent to a car travelling 1100 miles. So, it's worth limiting your water use where possible; if your water is metered, you'll save money, too. Here's how:



Toilet flushing The easiest way to make savings here is to put a displacement device in the cistern. A water-filled plastic bottle will do the trick, as will a built-for-the-job "hippo". If you are fitting a new toilet choose an eco-flush that allows you to choose a full or half setting.

Taps You can reduce the flow of taps with Tapmagic inserts, which provide a spray when the tap is turned slightly but full flow when turned more fully. They're less than £5 each and are easy to fit. See www.tapmagic.co.uk


Tapmagic inserts can cut water use for a particular sink by as much as 50%

Baths and showers A five-minute shower typically uses around 25 litres of water, compared to 80 litres for a bath and 120 litres for a power shower.

Watering the garden A hose can get through more than 1000 litres per hour, so get a water butt fitted to the down pipe from your roof and use that instead. Rainwater is better for plants, too. Add a solar-powered irrigation system (www.solarflow-garden.co.uk) and the garden will even water itself. You can also minimize evaporation by watering in the evening and aiming at the base of plants rather than the leaves.

Getting serious If you really want to cut your water use, consider a rainwater harvesting system. You'll still need a mains supply for drinking water but will save around 50% on consumption. Such systems cost around £2000–3000 for a typical home and pay for themselves in around 10–15 years (this will fall if water bills rise as expected by 10% a year for the next five years). See www.ukrha.org and www.rainharvesting.co.uk.

Carbon offsetting

Employing a climate cleaner

Anyone who wants to neutralize their effect on climate change will be interested in the various schemes that allow you to "offset" your carbon footprint. Whether you want to cancel the CO_2 of a single long-haul flight, a year of car journeys or your entire existence, the process is the same.

First, you visit the website of an offsetting organization and use their carbon calculators to work out the emissions related to whatever activity you want to offset. This will be translated into a fee which the offsetting organization will use to soak up a matching amount of CO_2 from the air. To do this, they fund projects such as the replanting of damaged rainforest or the distribution of long-life, low-energy light bulbs in developing countries. As a guide, it usually costs around £7/$12 to offset a tonne of CO_2. At this price, a seat on a round trip from London to New York costs around £12/$20 to neutralize, while a typical year of driving in an averagely efficient car clocks in at around £20/$35.

Arguments for and against

Offset schemes have proved popular not just with individuals, but everyone from corporations (BSkyB, for example, has gone carbon neutral) to celebrities (Pink Floyd, Pulp and the Pet Shop Boys all offset their tours).

However, some people argue that offsetting is simply a plaster on the wound, hiding the inherent unsustainability of carbon-intensive Western lifestyles. There's some truth in this point – offsetting isn't as good as not emitting the carbon in the first place. But it's certainly better than doing nothing, and there's no reason why we can't buy offsets *and* make efforts to reduce our emissions directly.

Another criticism sometimes made is that offset projects may not make the swift, long-term carbon savings that are claimed of them. It's true that some of the projects – most notably tree planting – may take decades to soak up the carbon you've paid to offset, which is one reason why many offsetting groups are moving towards sustainable energy projects instead of trees. As for whether the carbon savings are real, the major offsetting services are externally audited to address just this question. They include:

CarbonNeutral Company www.carbonneutral.com
Climate Care www.climatecare.org

And finally...

Spreading the word

In addition to reducing your own carbon footprint, you can help move society as a whole towards a more climate-friendly future by voicing your concerns.

▶ **Work or school** Find out what policies exist on energy efficiency. If there aren't any, or they seem half-hearted or inadequate, work for something better by relaying your suggestions to the powers that be.

▶ **Your community** Cities, towns and councils vary hugely in how committed they are to solving the greenhouse problem. Contact your local government and ask what climate-change measures they've adopted. Then see what you can do to raise awareness and make change happen – by attending local-government open meetings, for example.

▶ **Your finances** If you've got a significant amount of money in investments, consider moving them towards a fund that supports action on climate change. Generally that will be one that engages in "socially responsible investing".

▶ **Write to your MP** Climate change won't be solved without political will, so it can't hurt to write to your MP and ask what they're doing to help. This is easier than ever thanks to websites such as:

They Work for You www.theyworkforyou.com
Write to Them www.writetothem.com

You could also consider joining an environmental campaign group that's pushing the government to do more. The big ones include:

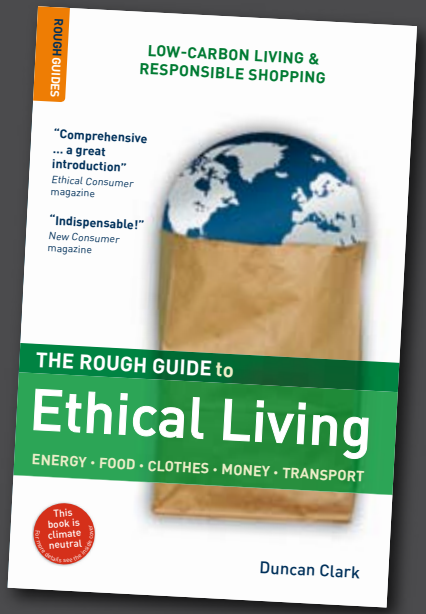
Friends of the Earth International www.foe.co.uk
Greenpeace www.greenpeace.org
WWF www.wwf.org

Find out more

For more information on the subjects covered in this book, check out the following Rough Guides, available from all good bookstores.

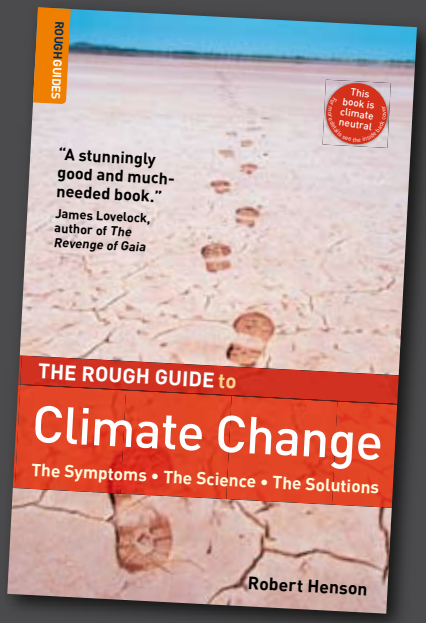
The Rough Guide to Ethical Living

Low-carbon living and responsible shopping



The Rough Guide to Climate Change

Global warming: the symptoms, the science and the solutions



Green Britain – get the big picture!

Starting on Monday 8 January, **Sky News** and **five news** are broadcasting a week of special green reports.

Entitled **Green Britain – The Big Picture**, the week will give a comprehensive snapshot of climate change in the UK and provide viewers with practical advice on how they can make a difference to the environment.

The Big Picture on screen and online will cover everything from alternative energy to Britain's most eco-friendly school.

You can be part of **The Big Picture** by adding your local, personal story to our climate change map at **sky.com/greenbritain** (from Jan 8). And why not take a few minutes to calculate your own carbon footprint at:

jointhebiggerpicture.com

GB Green Britain
The Big Picture

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