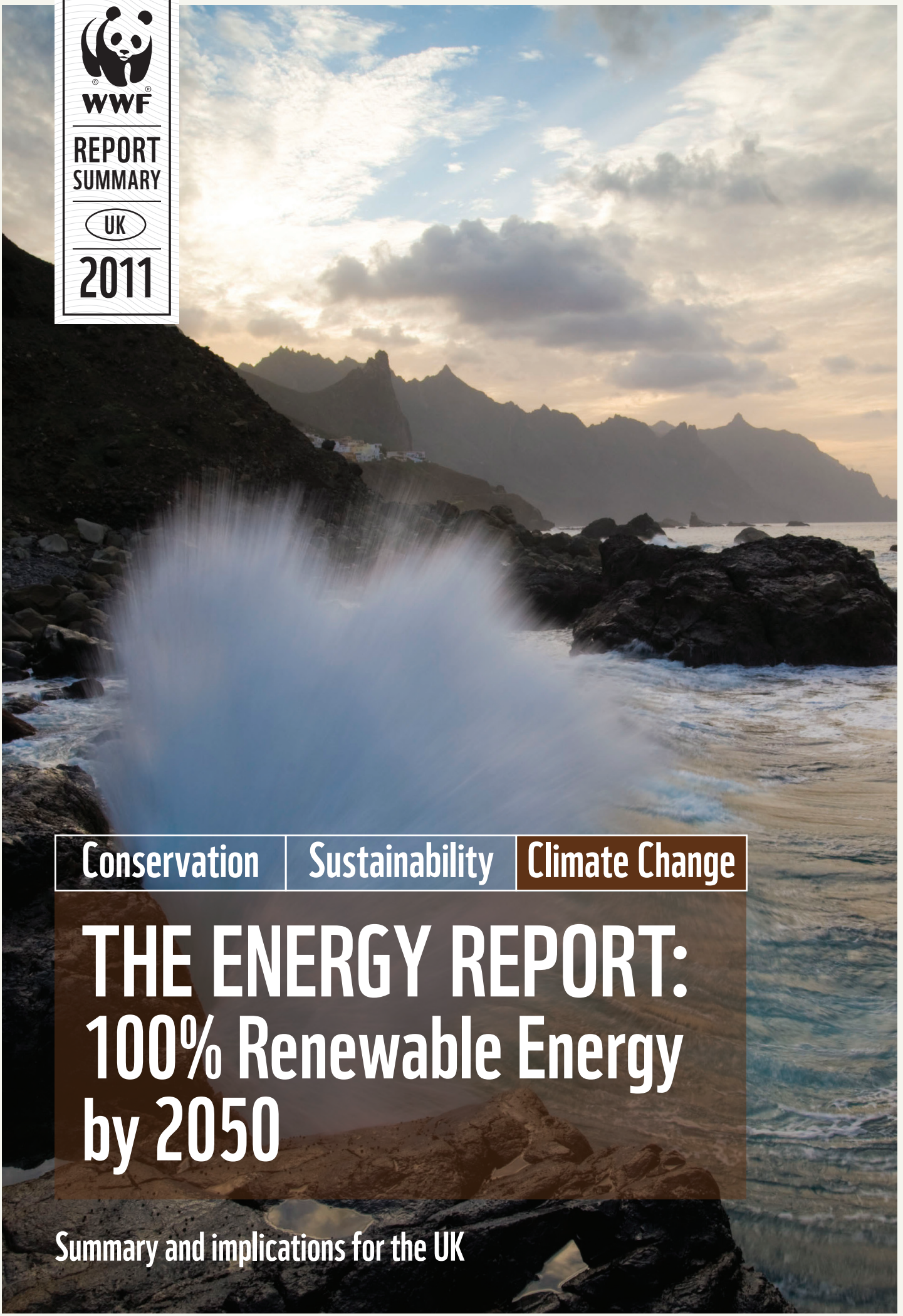
WWF

REPORT SUMMARY

UK

2011



Conservation | Sustainability | Climate Change

THE ENERGY REPORT: 100% Renewable Energy by 2050

Summary and implications for the UK

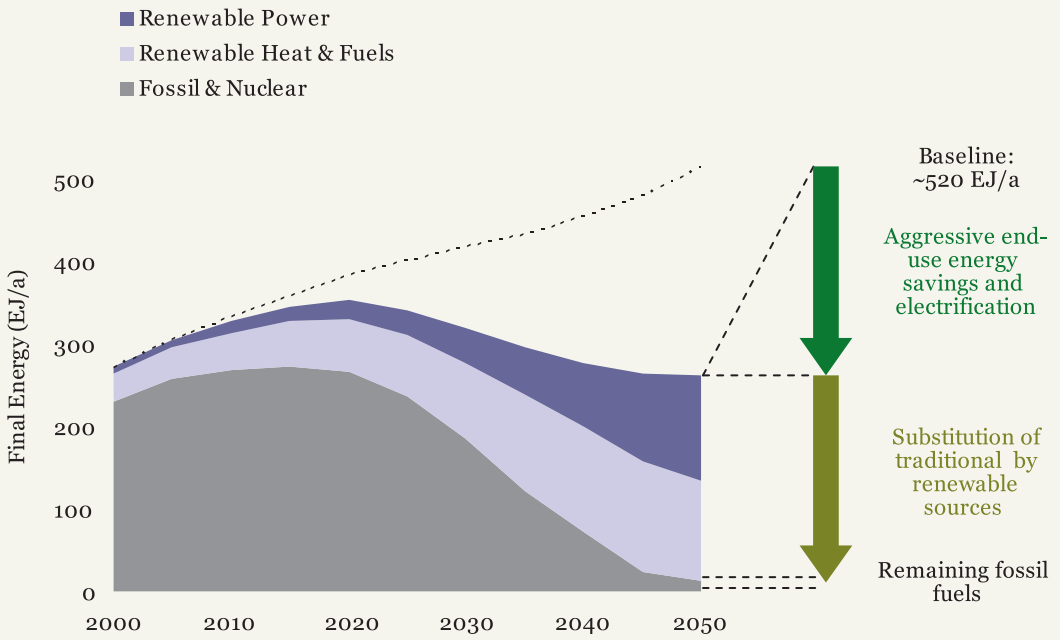
INTRODUCTION

A world powered by 100% renewable energy. That's WWF's vision by the middle of this century. Achieving it will mean avoiding catastrophic climate change, less pollution, increased energy security and improved health for people worldwide.

But is it possible? We called upon respected energy consultancy Ecofys to investigate. The result is the most ambitious science-based examination ever of a renewable and clean energy future on a global scale. The study shows that it is technically possible to achieve almost 100% renewable energy sources within the next four decades.

The Ecofys scenario raises many issues and challenges, outlined in this briefing and discussed in more detail in *The Energy Report*. Meeting the energy needs of current and future generations is one of the most important, difficult and urgent political tasks for every government. This paper sets out our recommendations for the UK government in light of these challenges.

Download *The Energy Report: 100% renewable energy by 2050*
wwf.org.uk/energyreport



Evolution of energy supply in the Energy Scenario, showing the key developments.
Source: The Ecofys Energy Scenario, December 2010.

TOP PRIORITIES FOR THE UK GOVERNMENT

Ensure energy savings from existing housing stock, delivered through the Green Deal, are high enough to enable the UK to meet its carbon reduction targets.

Commit to the near-decarbonisation of the power sector by 2030, through massive increase in the UK's use of renewables and investment in new grid infrastructure.

Establish a Green Investment Bank to raise finance for renewable energy and energy efficiency.

Work for the rapid roll-out of electric vehicles, alongside measures to reduce the need for private car travel. Put climate change at the heart of new UK aviation policy.

Champion innovative sources of finance to support climate change action in developing countries.

Put in place a strong, mandatory certification system for environmentally and socially sustainable bioenergy.

Produce a detailed action plan to reduce greenhouse gas emissions and other environmental impacts of food consumption.

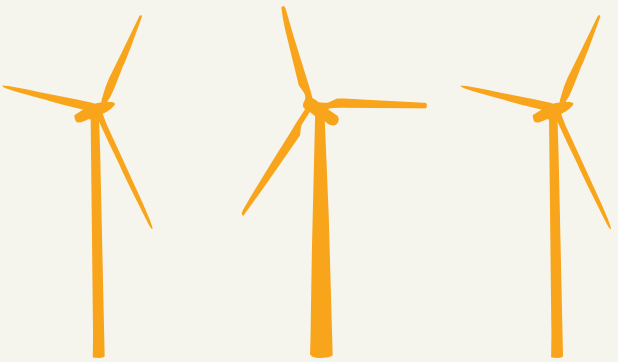
Set ambitious emission reduction goals: The EU should cut emissions through domestic action by at least 30% below 1990 levels by 2020 and the UK should cut emissions by at least 60% by 2030.

WHY THE WORLD NEEDS A 100% RENEWABLE ENERGY FUTURE

Switching to renewable energy isn't just the best choice. It's our only option. The way the world produces and uses energy today is not sustainable.

- A fifth of the world's population has no access to reliable electricity.[1] More than 2.7 billion people are dependent on traditional bioenergy (such as wood and charcoal) for cooking and heating [2] – with serious economic, environmental and health impacts.
- Production from known oil and gas reserves will fall by around 40-60% by 2030, according to the International Energy Agency. [3] Continuing to depend on fossil fuels will mean substantially higher and more volatile energy costs, driven by the increasing scarcity of oil and gas and a move to unconventional – and increasingly environmentally damaging – sources. Supply disruptions, accidents and disputes over energy resources will continue to challenge energy security.
- The global energy sector is responsible for around two-thirds of global greenhouse gas emissions. And its emissions are increasing at a faster rate than any other sector. 'Business-as-usual' scenarios show an increase in emissions that would lead to very dangerous levels of warming, far above the threshold agreed by governments of 2°C above pre-industrial levels.
- Nuclear is a risky and expensive option, producing dangerous waste that remains highly toxic for thousands of years. It could also potentially contribute to political instability and insecurity.

A FULLY SUSTAINABLE RENEWABLE ENERGY SYSTEM IS THE ONLY WAY TO SECURE ENERGY FOR EVERYONE AND AVOID ENVIRONMENTAL CATASTROPHE



1 IEA, *World Energy Outlook (WEO)* 2010, Paris
2 IEA, *World Energy Outlook (WEO)* 2010, Paris
3 IEA, *World Energy Outlook (WEO)* 2009, Paris

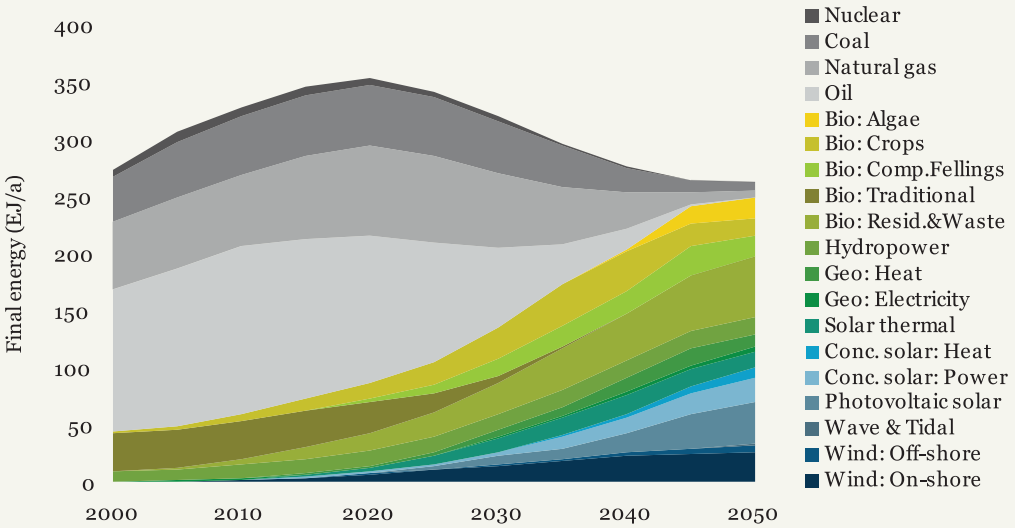
THE ECOFYS SCENARIO IN A NUTSHELL

Ecofys envisages a world in 2050 where energy demand is 15% lower than in 2005. Although population, industrial output, economic activity, passenger travel and freight transport continue to rise as predicted, ambitious energy-saving measures allow people to do more with less. Industry uses more recycled and energy-efficient materials, buildings are constructed or upgraded to need minimal energy for heating and cooling, and there is a shift to more efficient forms of transport.

As far as possible, the world uses electrical energy rather than solid and liquid fuels. Wind, solar, biomass and hydropower are the main sources of electricity, with solar and geothermal sources, as well as heat pumps, providing a large share of heat for buildings and industry. Because supplies of wind and solar power vary, 'smart' electricity grids have been developed to store and deliver energy more efficiently. All of this is delivered using already proven technology and processes.

Bioenergy (liquid biofuels and solid biomass) is used as a last resort where other renewable energy sources are not viable – mainly to provide fuels for aeroplanes, ships and trucks, and in industrial processes that require very high temperatures.

By 2050, the world is saving nearly €4 trillion per year through energy efficiency and reduced fuel costs compared to a 'business-as-usual' scenario where everyone carries on using energy in the same way as at present. But big increases in capital expenditure are needed first – to install renewable energy-generating capacity on a massive scale, modernise electricity grids, transform goods and public transport, and improve the energy efficiency of our existing buildings. Investments begin to pay off around 2040, when the savings start to outweigh the costs. If oil prices rise faster than predicted (the scenario uses a conservative estimate of $87 per barrel in 2030 and $142 in 2050), and factoring in the costs of climate change and the impact of fossil fuels on public health, the pay-off happens much earlier.



World Energy Supply by Source
Source: The Ecofys Energy Scenario, December 2010.

CRITICAL ISSUES AND RECOMMENDATIONS FOR THE UK

The Ecofys analysis shows that the world can technically meet its energy needs from renewable sources by 2050. But, to make this happen, the UK and the rest of the world must address key technical, social, environmental, economic and political issues. Governments, businesses, communities and individuals across the world all have a role to play.

Below are our key recommendations for immediate action in the UK.

ENERGY CONSERVATION

HOW TO DO MORE WITH LESS ENERGY

Under the Ecofys scenario, global energy demand in 2050 is 15% lower than in 2005. This is in striking contrast to 'business-as-usual' projections, which predict energy demand will at least double. This difference is not based on any reduction in activity – industrial output, domestic energy use, passenger travel and freight transport continue to grow, particularly in developing countries. Instead, reductions come from using energy as efficiently as possible:

- In manufacturing, using recycled materials greatly reduces energy consumption, and innovative product design improves efficiency.
- By 2030 all new buildings require almost no conventional energy for heating or cooling – using existing architectural and construction expertise. The energy efficiency of existing buildings is radically improved through ambitious retrofit programmes.
- In transport, improvements in fuel efficiency and operations reduce energy use. People also move to more efficient, lower carbon modes of transport.

The more energy saved, the easier moving to a renewable energy future will become. The UK Energy Research Centre recently demonstrated that the UK could reduce energy demand in the residential and transport sectors by 50% compared to 'business-as-usual', reducing the cost of the UK transferring towards a low-carbon energy system by up to £70bn by 2050.[4]

4 UK Energy Research Centre, *Making the transition to a secure and low-carbon energy system*, UKERC Energy 2050 Project, 2009 http://www.ukerc.ac.uk/Downloads/PDF/U/UKERCEnergy2050/0906UKERC2050.pdf, p. 103

IN THE UK

Strong energy efficiency policies are needed in every sector of the economy. However, the UK's housing stock is notoriously inefficient and must be a priority for action. The proposed 'Green Deal' to help householders retrofit their homes with energy efficiency measures is an opportunity to massively decrease energy wasted through inefficient housing.

We are calling on the government to:

- *Make sure the Green Deal delivers ambitious energy savings, guaranteeing the UK meets its carbon budgets and providing certainty to businesses and investors.*
- *Produce and publish a plan setting out how it is going to deliver the Green Deal. This should include financial incentives for householders to take part in the scheme at the scale required.*
- *Set minimum energy efficiency standards for the private rented sector, making sure the most inefficient and unhealthy homes cannot be rented, and reducing the number of households living in fuel poverty.*

ELECTRIFICATION

The Ecofys scenario depends on using electrical power wherever possible. Currently, electricity meets less than one-fifth of the world's energy needs. By 2050, under the Ecofys scenario, it accounts for almost half. This is because electricity and heat are the forms of energy most easily generated by renewables.

- Massively increasing generation from the renewable resources with the least environmental impact will be vital – both in large-scale renewable power plants and at a local level.

- Extended and modernised electricity grids are needed to cope with increased loads and different energy sources. A combination of large ('super') and 'smart' grids holds the key. Efficient international networks will help balance variable renewable sources from different regions, while smart meters will enable consumers to manage demand to match variable supply.

IN THE UK

A priority for the UK must be to work towards a near-decarbonised power sector by 2030, as recommended by the Committee on Climate Change.[5] The UK has huge potential renewable energy resources, particularly in the marine environment. Tapping into these offers tremendous potential for new green industries. For example, the *Offshore Valuation Report*,[6] recently prepared by the UK government and key industry players, showed that by using 29% of the UK's offshore resources, the UK could become a net exporter of electricity by 2050, creating around 145,000 jobs and £62bn of annual revenues for the economy.

We want to see:

- *The introduction of stable, long-term financial incentives for renewable power in the current electricity market reform and an ambitious renewable energy target for 2030. These will improve investment certainty for renewables and help boost the UK's renewable energy industry.*

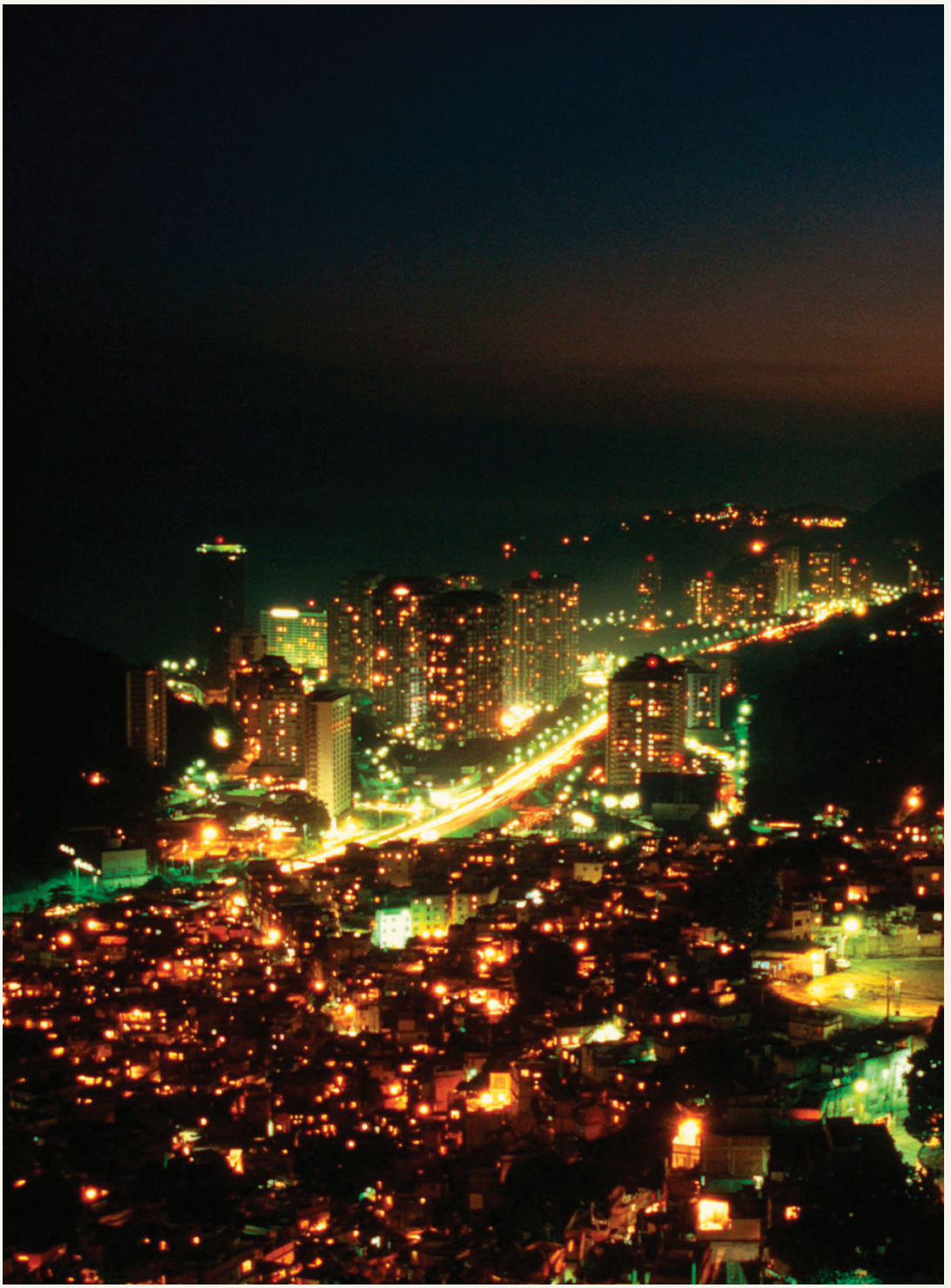
- *A strong emissions performance standard for the UK placing limits on new electricity generation plants' carbon emissions. This would avoid locking the country into a new generation of high-carbon infrastructure.*

- *No support or subsidy for new nuclear power stations. These are environmentally hazardous (producing a high level of radioactive waste for which no long-term storage solution exists) and could also crowd out the potential for renewable energy. Current government proposals amount to a substantial hidden subsidy for nuclear.*

- *A co-ordinated offshore grid, with neighbouring offshore renewable energy projects connected together to the onshore grid rather than being connected separately. Developing this grid should be one of the central objectives of the government's offshore transmission regime, given its possible environmental and cost benefits. The UK should also continue to play a leading role in the North Sea Grid Initiative, and work with the EU to develop strategic interconnection links between the EU's major national grids.*

5 Committee on Climate Change, *The Fourth Carbon Budget: Reducing emissions through the 2020s*, 2010. http://downloads.theccc.org.uk.s3.amazonaws.com/4th%20Budget/CCC_4th-Budget_interactive.pdf p239

6 The Offshore Valuation Group, *The Offshore Valuation: valuation of the UK's offshore renewable energy resource*, 2010, http://www.offshorevaluation.org/downloads/offshore_valuation_exec.pdf



The electricity networks that power our world are one of the great engineering feats of the 20th century. The work we need to do to modernise them over the coming decades will be one of the great feats of the 21st century.

EQUITY

A sustainable energy future must be a fair one. The equal right of every person to benefit from the world's energy resources has to be recognised and realised. Historically, the world's energy consumption has not been fairly balanced. Rich countries have built their economies on cheap, plentiful fossil fuels, and continue to consume the vast majority of global energy supplies. Around 1.4 billion people – a fifth of the world's population – have no access to reliable electricity.[7] 2.7 billion people use biomass (mainly wood, crop residues and animal dung) for cooking and heating.[8] This has serious impacts on local biodiversity and health. The pollution from traditional cooking fires prematurely kills about two million women and children each year.[9]

Better alternatives are needed so unsustainable biomass use can end. Efficient cooking stoves are one simple and cost-effective solution. They don't need so much biomass to power them, meaning less deforestation and fewer harmful emissions. Sustainable management of fast-growing tree species for energy production also reduces the need to cut down primary forests.

From solar power across Africa, to geothermal power in Indonesia, developing countries have great potential to fuel economic growth with renewable energy. Large-scale wind, solar and geothermal plants are beginning to appear. Micro-scale renewables used at community or household level also give options to those not connected to an energy grid. Renewables offer hope to the hundreds of millions of people trapped in energy poverty.

IN THE UK

Ending energy poverty and providing clean electricity for all in developing countries should be a key priority for the Department for International Development. The UK should use its role as a major donor to the World Bank to press for fundamental reform of the bank's energy lending policies. These should overwhelmingly focus on providing sustainable energy to the poor. The World Bank should move away from its historic support for large-scale, often fossil fuel-based, energy projects.

In global forums including the UN and G20, the UK should champion innovative sources of finance, such as levies on international aviation and shipping and financial transaction taxes, to support climate change action in developing countries.

7 IEA, *World Energy Outlook (WEO)* 2010, Paris
8 IEA, *World Energy Outlook (WEO)* 2010, Paris
9 http://www.iaea.org/Publications/Magazines/Bulletin/Bull442/44204002429.pdf

LAND USE

The thorniest issue highlighted by *The Energy Report* is the role of bioenergy. The Ecofys scenario foresees very significant improvements in energy efficiency, and a substantial shift to less polluting forms of transport. Even so, it relies on a substantial increase in bioenergy use, with fuel coming from organic waste, existing forests and biofuel crops on agricultural land. This increase is mainly in sectors which depend on liquid fuels and can't use electricity – notably aviation, shipping, heavy goods vehicles and some high temperature industrial processes.

The key issue is how to make sure that any increase in bioenergy use is sustainable. *The Energy Report* uses rigorous analysis to assess how much land could be available globally to grow biofuels to meet the demand for liquid fuels. As this is a global assessment, the report also highlights the need for further work to identify where exactly this bioenergy could be grown, and how the land is being used at the moment. At a local level, it's important to consider the rights of communities, including indigenous people, the movements of migratory species, the effect on food security and water supplies, the type of infrastructure and governance systems in place, and a host of other constraints.

The Energy Report suggests two key ways to minimise the impact of using more bioenergy: reducing meat consumption and constraining the growth in aviation. The Ecofys scenario includes a significant reduction in meat consumption in the developed world (explained further under lifestyle issues) to free up land for biofuels.

Limiting growth in aviation and shipping could also help by reducing the demand for liquid fuels. 'Business-as-usual' assumptions project a sharp increase in aviation transport by 2050. Cutting this growth by a third would reduce the land needed for growing crops for transport by 19 million hectares.

We recognise the challenge presented by this issue and favour careful land use planning and measures to address unrestrained growth in demand for liquid biofuels.

IN THE UK

Strict criteria are needed to make sure that any bioenergy used comes from sustainable sources and is directed to the sectors of the economy that need it most.

We want to see:

- *Clear proposals for a strong European mandatory certification system for sustainable bioenergy under the electricity market reform and the government's work on the Pathway Analysis.*
- *A strategic approach to bioenergy to ensure that the sectors of the economy that need it most get priority. For example, for the aviation and long-haul freight sectors, there are few alternatives to bioenergy. However, other forms of renewable energy are available for the power sector.*

LIFESTYLE

The Ecofys scenario shows that the world can get almost all its energy from renewable sources by 2050 while maintaining rates of economic growth and with people continuing to lead prosperous, healthy lives. Indeed, quality of life for many will improve immeasurably with access to electricity and clean energy. Everyone will, however, need to make wiser choices about the way they use energy.

- To grow enough food for a growing global population, while also having enough land to meet potential demand for biofuels, many people will need to change their diets. The Ecofys scenario envisages people in OECD countries eating half as much meat by 2050, while meat consumption increases by a quarter elsewhere. Wasting less food, particularly in rich countries, will also save energy and free up more land. More than one billion people are undernourished worldwide. Any food and farming strategy needs to focus on securing the basic human rights to adequate food and good health, and on reducing the global environmental impacts of producing and consuming food.

- Reducing the distance food and other goods are transported will also reduce the need for biofuels. The Ecofys scenario projects steep rises in freight transport by 2050 if no action is taken. If this growth is cut by a third, it would reduce the land needed for growing crops for transport by around 8%.

- Personal mobility is also predicted to rise by 2050. Ecofys suggests the world can manage these increases by moving towards more efficient forms of transport. To achieve this massive investment in efficient public transport systems is needed, along with fundamental changes in attitudes and behaviour.

- As already mentioned, Ecofys found there would be a steep global increase in aviation if present trends continue. Constraining this expected growth would ease demand for biofuels, land and water resources.

IN THE UK

Changing the way people eat and travel will need action from individuals and businesses, supported by strong policies and regulatory frameworks from government. We are actively engaged in these sectors in the UK, as our work on the Livewell Plate, electric vehicles and the One In Five Challenge shows (see below).

We're calling on the government to:

- *Develop a detailed action plan to reduce greenhouse gas emissions and other environmental impacts of food consumption. This should include a commitment to significantly reduce food waste, leading on defining the key principles of a sustainable diet, and aiming to reduce meat consumption by 15-20% by 2020.*
- *Support tougher EU legislation for conventional vehicle emissions. Government should also work towards the rapid roll-out of electric vehicles. This will require a widespread network of charging points. To reduce car use and emissions, the government also needs to introduce measures such as an increase in fuel duty, more toll roads, congestion charging, greater support for walking, cycling and car sharing schemes and better public transport. Higher rates of Vehicle Excise Duty (VED) for more polluting cars will also encourage a move to lower-carbon vehicles.*
- *Make sure that emissions from aviation fall to, or below, 2005 levels by 2050. The new sustainable aviation framework should acknowledge that capacity constraints for aviation will be needed to achieve this target. Restrictions should include a moratorium on new planning applications for airport expansion. The new framework should also encourage shifting to greener forms of transport – from plane to high-speed rail, for example – and alternatives to travel such as videoconferencing.*

ONE IN FIVE CHALLENGE

Curbing the growth in air travel would mean less land is needed for growing biofuels. Businesses and organisations that take part in our One in Five Challenge commit to cut 20% of their business flights within five years. A dozen large employers have signed up to the programme, proving that by using audio, video and web conferencing, reducing business travel can not only cut emissions but also make good business sense.

wwf.org.uk/oneinfive

ELECTRIC VEHICLES

According to a new WWF report, *Electric Avenues: Driving home the case for electric vehicles in the UK*, the UK needs at least 1.7 million electric vehicles by 2020 and 6.4 million by 2030 to meet its climate change targets. Capital grant funding and investment in charging infrastructure, such as expansion of the Plugged-in Places scheme, will be important to stimulate the market and ensure the rapid ramp up of electric vehicles.

LIVEWELL PLATE

Alongside the Rowett Institute of Nutrition & Health (University of Aberdeen), we've been researching our diets and promoting the benefits of a healthy diet for a healthier planet. The Livewell 2020 diet is based on healthy eating guidelines from the UK government – and it will also help meet the UK's carbon targets. If people adapt their diets slightly – eating less meat and fewer processed foods, replacing them with more fruit, vegetables and grains – it will make a positive difference to ourselves and the planet.

wwf.org.uk/livewell2020

FINANCE

Renewable energy makes long-term economic sense, saving nearly €4 trillion a year by 2050 according to the Ecofys scenario. And that projection doesn't even take into account the costs saved from slowing catastrophic climate change, nor the added value of the millions of jobs created, or health and social benefits like better air quality and well-being.

But significant capital investment is needed first. The world needs to install renewable energy on a massive scale, modernise electricity grids, transform public transport infrastructure, and improve the energy efficiency of existing buildings. Global capital expenditure of €1 trillion a year is needed, growing to around €3.5 trillion a year over the next 25 years.

To achieve this level of investment, politicians need to clearly support renewable energy and energy efficiency, and create supportive legislation to build investor confidence. New financing models, legislation and stable political frameworks to encourage long-term investment in renewables and energy efficiency are needed.

Such investment could help stimulate economic growth, creating 'green collar' jobs. China recently announced plans to invest 5 trillion yuan (€580 billion) in a new 10-year alternative energy programme that will create 15 million jobs. Energy efficiency savings, especially in industry, can also help spur economic competitiveness and innovation.

IN THE UK

The UK urgently needs to establish a Green Investment Bank (GIB) to raise finance for renewable energy and energy efficiency. The GIB should be able to leverage its capital and reduce risk on investment to help generate the huge levels of private finance needed to decarbonise the UK's energy system. This will remove barriers for large institutional investors, lower the cost of loans for millions of Green Deal home energy efficiency improvements and limit the cost of energy bills.

The country needs £450 billion of investment in energy supply and demand measures by 2025. The money is there in the £4 trillion of funds under management in the UK. But traditional investors alone are only likely to raise up to £80 billion.

To fill this funding gap, the UK needs a GIB that is established by statute, with £4-6 billion of capital by 2015, with the ability to issue bonds. This is an urgent priority because any delay makes it much harder to generate enough investment in the timescale required.

We're also calling on the UK government to introduce mandatory greenhouse gas reporting, making it compulsory for large companies to publicly disclose how much carbon they emit. This will provide reliable, comparable information so investors can assess risks and make better-informed investment decisions. We believe this will help investors to support low-carbon businesses, finance rapid growth in vital sectors like renewable energy and energy efficiency and play a key role in driving the shift to a much-needed greener global economy.

INNOVATION

The Ecofys energy scenario is ambitious and radical. But it is grounded firmly in today's reality. Only technologies and processes that are already proven have been included. This means there's an opportunity to further advance on the Ecofys scenario – to increase the proportion of renewable energy from 95 to 100%, and to reduce the need for biofuels and the pressure this puts on food and water supplies and the natural world.

To achieve this, research and development into renewable energy production and energy efficiency must increase substantially. Current global spending on this is around €65 billion a year. That needs to double over the next decade. Economies that invest in clean innovation will be well placed to prosper in the renewable energy future.

Key areas for research and development include reducing energy demand through more efficient materials, processes and technologies; smart grids and appliances; electricity storage; improving the efficiency of biofuels and producing fuels from algae; hydrogen storage and transportation; and alternative energy sources for industrial processes that still rely on coal under the Ecofys scenario.

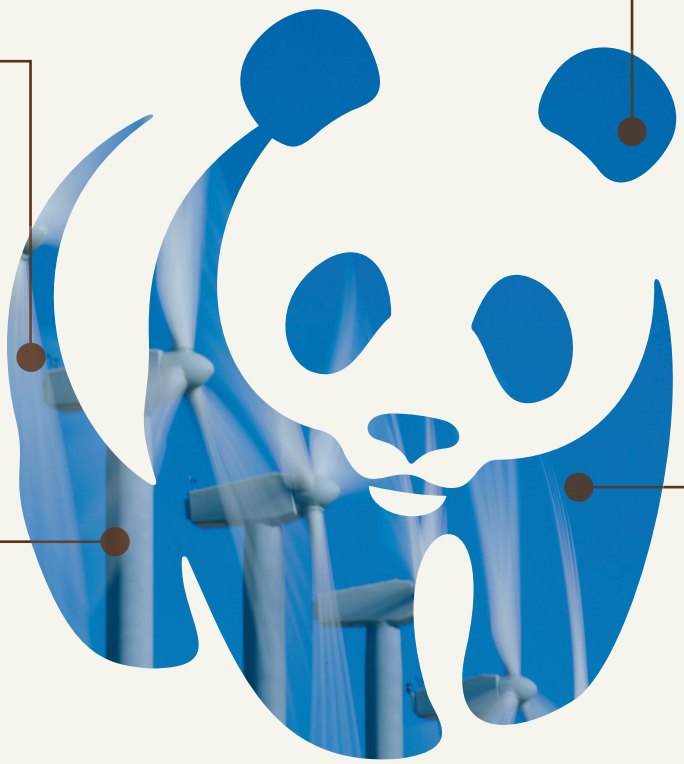
THE ENERGY REPORT in numbers

80%

We need to cut global greenhouse gas emissions by at least 80% by 2050 (from 1990 levels)

2050

WWF has a vision of a world powered by 100% renewable energy sources by 2050



15%

In 2050, energy demand could be 15% lower than in 2005, although activity levels rise as predicted.

€4 TRILLION

By 2050 we could save nearly €4 trillion a year through energy efficiency and reduced fuel costs.

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

wwf.org.uk