



WWF®

REPORT

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# DECARBONIZING THE FUTURE: SEIZING POWER FOR GLOBAL CHANGE

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## **Front cover**

The PS20 solar thermal tower in Sanlúcar La Mayor, Andalucía, Spain.

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WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

The Global Climate & Energy Initiative (GCEI) is WWF's global programme addressing climate change and a move to 100% renewable energy through engagement with business, promoting renewable and sustainable energy, scaling green finance and working nationally and internationally on low carbon frameworks. The team is based over three hubs – Mexico, South Africa and Belgium.

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Dawn over Whitlee wind farm on Eaglesham Moor just south of Glasgow in Scotland, UK, is Europe's largest onshore wind farm with 140 turbines and an installed capacity of 322 MW, enough energy to power 180,000 homes.

# FOREWORD

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**Samantha Smith**

Lead of WWF Global  
Climate and Energy Initiative

Energy and climate change are now inextricably intertwined. On the one hand, energy is key to development and to powering the lives people aspire to live. On the other, at least two-thirds of all global greenhouse gas emissions now come from the use of fossil fuels – coal, oil and gas. Fossil fuels are our dominant source of energy, but also the main cause of climate change. The extraction and use of fossil fuels is increasingly becoming a driver for rising air pollution, deteriorating public health, depletion of forests and freshwater sources, loss of biodiversity and nightmare scenarios for climate change.

This grim present, however, doesn't have to be our future. The world can embark on a pathway toward a fully renewable-fuelled economy by 2050. We can meet global energy needs and fight climate change if we make renewable energy, coupled with strong energy efficiency, the focus of energy investments and decision-making. This is our only hope and solution, and that is why WWF is working to make renewable energy and energy efficiency the key elements of citizen, government and corporate responses to climate change.

In 2011, WWF published *The Energy Report* showing that it is possible and cost effective to build a transition to get all the energy we need from renewable sources by 2050. This ground-breaking report presented 10 recommendations for a 100 per cent renewable energy future. It argued that switching to renewables isn't just the best choice, it's our only option. Since then, WWF has been increasingly advocating the transition to renewable energy at international, regional and national levels to make this vision a reality – to make renewable energy the new normal.

Currently, WWF is running a global energy campaign called "Seize Your Power", calling on financial institutions and governments to make a significant shift in funding from fossil fuels to renewable energy. Cutting fossil fuel investments is crucial but this decision, which has been embraced by some multilateral institutions and governments, needs to be accompanied by significant investment in renewable energy as well.

To share WWF's global experience in the journey of scaling up renewable energy solutions, we are publishing this booklet presenting a collection of essays written by WWF offices, highlighting the work that has been done to make sustainable, renewable energy a fundamental solution to tackle climate change.

The Intergovernmental Panel on Climate Change has told the world yet again that climate change is a huge risk we must tackle. What is new is the clarity and urgency of the message, and the inescapable link between transforming the energy sector and fighting climate change. We know more than ever before about what to do, how much time we have left, and what will happen if we don't act. The truth is, we must quit fossil fuels and switch to clean renewable energy, while using energy as efficiently as possible. This is achievable, cost effective and can be done equitably and in a way that still meets energy needs for development and wellbeing. We have the knowledge and the power to stop climate change – we just need to seize it.

# SEIZING GLOBAL POWER IN CLIMATE MITIGATION

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Tabaré A Currás

WWF Global Climate and  
Energy Initiative,  
Renewable Energy at Scale

## An introduction to the booklet

Greenhouse gas (GHG) emissions from human activities, mainly carbon dioxide (CO<sub>2</sub>) from burning fossil fuels, have warmed the planet in the last century much faster than at any other time in human history. Consequently, the climate system is undergoing changes at a pace never experienced in the last couple of hundred thousand – if not millions – of years. Snow and ice cover in the northern hemisphere is shrinking drastically; global sea levels are rising, threatening many coastal areas and even entire nations; ocean acidification is increasing, probably at a rate not experienced for 300 million years; and some climate extremes are becoming more and more frequent.<sup>1</sup>

GHGs such as CO<sub>2</sub>, methane (CH<sub>4</sub>) and nitrous oxides (NO<sub>x</sub>) have reached their highest levels in the atmosphere in at least 800,000 years. CO<sub>2</sub> has been the major anthropogenic GHG since pre-industrial times. Compared to around 150 years ago, CO<sub>2</sub> concentrations in the atmosphere have increased by 40 per cent and ocean acidification by 30 per cent, mainly due to fossil fuels.

Fossil fuel combustion for energy use is responsible for over 32 billion tonnes of CO<sub>2</sub>, which represents about two-thirds of global GHG emissions.<sup>2</sup> Continued release of CO<sub>2</sub> and other GHGs into the atmosphere will cause further warming and subsequent changes in the global climate system.<sup>3</sup> Climate change will have many impacts on ecosystems and species composition, as well as posing great hazards to global prosperity, security and social stability – particularly for the poor. In fact, climate change is already causing the deaths of nearly 400,000 people a year and costing the world more than US\$1,200 billion (almost 2 per cent of global GDP).<sup>4</sup> If current trends continue, global mean temperature will increase by much more than 2°C by the end of the 21st century, compared to pre-industrial times. Moreover, as up to 40 per cent of CO<sub>2</sub> will stay in the atmosphere for more than 1,000 years, present emissions pathways will largely determine future warming beyond this century.

Keeping global warming well below the 2°C threshold, not exceeding 1.5°C, requires the world to fundamentally change the way it produces and uses energy. Curtailing

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1 IPCC. 2013. Summary for Policymakers. In: Stocker, T.F. et al (eds), *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK and New York, NY, USA.

2 IEA. 2013. *CO<sub>2</sub> Emissions from Fuel Combustion*. IEA, Paris. <http://www.iea.org/publications/freepublications/publication/name,43840,en.html>

3 That is, the dynamics and interactions in the atmosphere, hydrosphere, cryosphere (for example, sea ice, lake ice, river ice, snow cover, glaciers, ice caps and ice sheets, and frozen ground), land surface and biosphere (for example, living organisms).

4 DARA. 2012. *Climate Vulnerability Monitor: A Guide to the Cold Calculus of A Hot Planet*. Madrid, 2012. <http://daraint.org/climate-vulnerability-monitor/climate-vulnerability-monitor-2012/report/>

climate change will demand large-scale changes in the global energy system as well as strong abatement of all GHG emissions in all sectors of society.

It is possible to limit global warming to safer levels – if we act today and make choices to follow emissions pathways compatible with keeping warming well below 2°C. Current global efforts will not achieve this target, and as ambitious mitigation actions become delayed further, options to close the gap become more expensive. We need to act now on climate mitigation.

We have the means to build a sustainable future and avoid the worst impacts of climate change. Reducing our energy consumption through energy efficiency and energy conservation, and growing renewable energy as the global economy's prime supply source are essential mitigation choices worldwide.

Renewable energy and energy efficiency have strong social, economic and environmental advantages. Limiting dangerous climate change through ambitious renewable energy up-scaling and energy demand down-scaling maximizes benefits for everyone (for example, through improved air quality, higher employment and better and cleaner industrial development).

Climate change is a global problem, which we need to address through international cooperation, as well as regional, national and local efforts. This WWF booklet explains a variety of national WWF experiences and interventions to reduce global GHG emissions in line with staying well below 2°C. We reveal views on climate mitigation and illustrate the various national and regional options for strong emissions abatement. We include essays that capture the key economic, social, environmental and ethical arguments for ambitious climate mitigation.

The solutions in this booklet are just a small sample of the many ways the global WWF network is working on clean energy solutions to fight climate change.

# RENEWABLES AS THE NEW NORMAL

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Dr TS Panwar

WWF-India

Climate Change and Energy

## Visions from India

“Renewable energy”. What is the first thought that comes to mind when you hear these words? A clean, upcoming form of energy? A solution to meet the needs of communities not connected to the grid? An additional contributor to the main fossil-based energy forms such as coal and oil? A possible solution to environmental problems like climate change? Or just a buzz word?

It is probably a mix of the above, plus many more. Our task is to change perceptions and make people believe that renewable energy can become the anchor of energy, instead of just being supplementary or additional. Renewables must become the new normal. WWF believes that it is technically feasible and economically viable to have 100 per cent global renewable energy by 2050.

In an increasingly interdependent world, countries like India have joined the renewable energy bandwagon – not just for the fun of it, but due to sheer necessity! India cannot afford to lag behind in the renewables race – the statistics are too compelling.

Despite having large power generation capacity based on coal, 289 million Indian people do not have access to electricity, and 840 million are still dependent on traditional, and inefficient, biomass energy sources. India has the second largest population in the world, but is still very lowly ranked on the Human Development Index, meaning development and poverty eradication are a key priority. While India is the third largest GHG emitter in the world, its per capita emissions are less than a quarter of the world average.

All this clearly points to India needing more energy to meet its development objectives. It is vital that this energy is generated in a clean and sustainable way. This is where renewables offer a lifeline.

India has tremendous scope for establishing renewables as its primary energy source. The country has many forms of renewable energy easily available, including solar, wind, hydro and biomass. India was the first country to set up a government Ministry of Non-conventional Energy way back in the 1980s. It still has a strong institutional set up, with a dedicated Ministry of New and Renewable Energy (MNRE) to its credit today, whose duty it is to harness the potential of renewable energy.

India had envisioned an average economic growth rate of 8 per cent in the last five years. Although this is now down to below 5 per cent, demand for energy has still put serious pressure on supply sources. India faces difficult challenges in meeting its energy needs sustainably and at competitive prices.

**THE STATISTICS FOR INDIA  
ARE TOO COMPELLING  
AND IT CANNOT AFFORD  
TO LAG BEHIND IN THE  
RENEWABLES RACE**

More than 30 per cent of India's 1.21 billion population now live in cities, and the country is expected to top the world chart in urban growth for the next 40 years. This will bring new challenges in providing energy and urban infrastructure for all. Fossil fuels have dominated the country's energy scene for many years. Currently, coal-based power plants generate 70 per cent of India's electricity, and supply falls 10 per cent short during peak hours. It is expected that pressure will continue on supply sources as well as the fiscal situation in coming years.

There is now a dire need to re-strategize India's energy roadmap in view of these challenges, plus the country's reliance on high imports of fossil fuels (not only oil, but also coal in recent years) and the energy security, environmental and financial issues that come with this.

Some renewable energy technologies are becoming more cost effective and are now readily available. Renewables are also increasingly being viewed as critical for providing access to energy, particularly in rural areas through decentralized generation. Grid-connected, renewable energy-based power generation capacity has grown in recent years (from 2 per cent of India's total capacity in 2002 to 12.5 per cent as at 31 January 2014). India makes the top 10 in Ernst & Young's latest Renewable Energy Country Attractiveness Index, which ranks 40 countries on the attractiveness of their renewable energy investment and deployment opportunities.<sup>1</sup>

The Indian government, MNRE and bodies under them have been aggressively promoting renewable energy. Under the National Action Plan on Climate Change, Jawaharlal Nehru National Solar Mission plans to install up to 20 billion watts of grid-based solar power by the end of the final phase of the mission in 2022. This works out at 8.5 per cent of India's current total installed power generation capacity.

MNRE has set targets for adding renewable energy capacity not only from solar, but also from wind, small hydro and biomass under the twelfth five-year development plan period (2012-17). India also has schemes aimed at increasing energy efficiency in key industrial sectors, such as the Solar Cities Programme, Renewable Purchase Obligations, Renewable Energy Certificates, and the Perform Achieve and Trade scheme.

In fact, India reduced its energy intensity (energy use/GDP) by more than 2 per cent in 2013, ahead of the global average. Overall, India's energy intensity is substantially better than that of many other nations, including several industrialized countries.

The above initiatives show the Indian government's positive approach to promoting energy efficiency and increasing renewable energy in the national energy mix. However, is the strength and pace of efforts enough to move India toward a sustainable, climate-resistant future? Let us not forget that India is one of the most vulnerable countries to the impacts of climate change, with its agriculture-dependent economy, high poverty levels and vast coastline, for example. Mitigating these impacts clearly requires ambitious, dedicated, coordinated and timely efforts from multiple stakeholders, including the government, industry, NGOs and citizens.

Thus, WWF-India advocates scaling up renewables in the country and is striving to establish "renewables as the new normal". We believe renewable energy is the answer to meet India's future energy demands and can solve one of the country's and the world's biggest problems: climate change.

**INDIA NEEDS MORE ENERGY TO MEET ITS DEVELOPMENT OBJECTIVES. IT IS VITAL THAT THIS ENERGY IS GENERATED IN A CLEAN AND SUSTAINABLE WAY. THIS IS WHERE RENEWABLES OFFER A LIFELINE**

<sup>1</sup> Ernst & Young, 2014. *Renewable Energy Country Attractiveness Index* [http://www.ey.com/Publication/vwLUAssets/RECAI\\_40\\_-\\_February\\_2014/\\$FILE/EY\\_RECAI%2040\\_Feb%202014.pdf](http://www.ey.com/Publication/vwLUAssets/RECAI_40_-_February_2014/$FILE/EY_RECAI%2040_Feb%202014.pdf)

A series of national, state- and district-level WWF-India studies emphasize that a renewable energy-based pathway is the route forward. WWF-India is pushing for near 100 per cent renewable energy for the country by the middle of this century, against a reference scenario in which the economy is likely to be dependent primarily on fossil fuels – coal, oil and gas. This renewable energy vision is supported by a strong technical analysis carried out in partnership with the Energy and Resources Institute (TERI), a leading research institute in India.

**WWF-INDIA ADVOCATES THE NEED FOR SCALING UP RENEWABLES IN THE COUNTRY AND IS STRIVING TO ESTABLISH 'RENEWABLES AS THE NEW NORMAL'**

Achieving this vision will be tough, but it is certainly not impossible. However, it will require a coordinated and cohesive approach from all stakeholders.

The first and most important step will be to make energy efficiency improvements to aggressively cut India's overall energy demand by as much as half. Renewable energy sources will then be able to meet this reduced demand. The country needs multiple renewable sources to make this shift possible. The mix of sources will depend on the resource availability in particular regions, but solar, wind and hydro are considered to be the main fuels for electricity generation. Biofuels will increasingly play a major role in meeting growing energy demand, especially in the transport sector.

What are the key requirements for this vision? Aggressive research and development, higher investments and enhanced awareness, to name but a few. Research and development in high potential renewable energy target areas like biofuels and storage technologies needs to speed up. Appropriate measures for grid enhancement, stability augmentation and modern load and grid management are also needed. Another key requirement is of course more investment, both from public and private sources. We also need massive awareness raising efforts to promote efficient renewable energy options among different stakeholders.

Expanding renewable energy would bring significant benefits in terms of energy security, energy access, health impacts, and environment and biodiversity conservation. But achieving this poses considerable challenges, and requires several changes. These include not only the timely availability of alternative, commercially-viable technological solutions across sectors, but also a rapid scaling-up of these options, together with accelerated building-up of supporting infrastructure, appropriate skill-sets, regulatory and institutional frameworks and adequate renewable manufacturing capacities.

**A HIGHER SHARE OF RENEWABLE ENERGY WOULD BRING SIGNIFICANT BENEFITS IN TERMS OF ENERGY SECURITY, ENERGY ACCESS, HEALTH IMPACTS, AND ENVIRONMENT AND BIODIVERSITY CONSERVATION**

Apart from technology, political will and a shared vision are the most critical prerequisites for the development of 100 per cent renewable energy. Higher levels of global and regional cooperation can play a key role in accelerating the pace and spread of renewable energy development. Transformational technological and policy shifts are urgently needed if India wants to achieve 100 per cent renewable energy by 2050. And most importantly, transformation will have to happen at the individual level, with changes in people's mindsets and thought processes.

Thus, the task for organizations like WWF is challenging – but far from impossible.

# THINKING OUT LOUD

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Masako Konishi  
WWF-Japan  
Climate Change Programme

## Japan's rising voice in favour of renewable energy

The East Japan Great Earthquake followed by the Fukushima nuclear power plant accident devastated Japan. A hundred thousand people are still living as refugees, being deprived of their daily lives in their hometowns, with no end in sight.

This tragic accident completely changed Japanese people's way of thinking on energy issues. They believed the nuclear facilities in Japan were safe, because nuclear experts and the government had said so. They tended to be indifferent to technical issues like energy, and politically were very inactive.

But the destruction caused by the nuclear accident changed this. Japanese citizens felt so threatened by nuclear power that the majority rose up and protested publicly to stop its further use. Since then, there has been huge discussion on Japan's future energy use, including how to use nuclear power and what the energy mix should look like. Japanese citizens have participated in the discussion proactively and expressed their opinions.

The Democratic Party of Japan, the party in power at the time of the disaster, hosted a year-long national debate on the country's future energy mix, and decided to aim to phase out nuclear power in the 2030s. For the first time in Japanese energy history, renewable energy saw the light.

The feed-in-tariff law, which sets a generous price for generating wind, solar and biomass energy and supports the building of new renewable energy facilities, passed in summer 2012, one year after the accident. Japanese people have remained so untrusting of existing nuclear power plants (even those that pass regular checks) that they are not willing to give approval for the reactivation of existing nuclear reactors. None of Japan's 54 nuclear reactors is working currently.

Renewables in Japan (excluding large hydro) only accounted for 1 per cent of total electricity generation before the accident. To a large extent, this was down to a lack of supportive policies. By 2013 the figure had risen to 2 per cent. At this share, renewables in Japan cannot be considered as the main alternative source of energy yet. To cover the loss of nuclear power, which used to generate 30 per cent of Japan's electricity, more fossil fuel-based power plants are operating. Today, we pay US\$200 billion more to import gas, coal and oil, which emits more CO<sub>2</sub> into the atmosphere.

When the Liberal Democratic Party (who are politically conservative) took power at the end of 2012, they promptly reversed the decision to phase out nuclear power

THE FUKUSHIMA NUCLEAR  
POWER PLANT ACCIDENT  
COMPLETELY CHANGED  
JAPANESE PEOPLE'S WAY  
OF THINKING TOWARD  
ENERGY ISSUES

in the 2030s, made by the former government. They declared that Japan could not reduce GHG emissions by 2020, which the country had already committed to. Now power companies, as well as the government, are telling the Japanese people that if they cannot use nuclear, electricity prices will go up. They also say manufacturers will take their business out of the country, meaning less employment and the economy declining.

Is this true? An industrialized country like Japan, with no domestic fossil reserve, cannot prosper without nuclear power? Is it really impossible to reduce CO<sub>2</sub> without using nuclear? Is it naïve to believe that renewable energy can be Japan's main energy source?

WWF-Japan does not think so. We believe we have to depart from the old way of thinking, which led us to the tragic accident, and adopt completely new, innovative ideas for future energy plans. WWF-Japan's recent report *Energy Scenario Proposal for Decarbonizing Japan*<sup>1</sup>, shows that it is possible for the country to be a 100 per cent renewable energy society by 2050, while phasing out nuclear power plants gradually.

At first sight, 100 per cent renewable energy seems impossible; especially since energy demand in an industrialized country like Japan is huge. However, it is precisely in energy demand where the key to renewables lies: the less energy we demand in the future, the more we will be able to cover with renewables. So, it is about how we reduce energy consumption, how we make things more efficient and how we save energy.

JAPAN HAS TO DEPART  
FROM THE OLD WAY OF  
THINKING AND ADOPT  
COMPLETELY NEW,  
INNOVATIVE IDEAS FOR  
FUTURE ENERGY PLANS

But another question emerges: how can Japan, already known as one of the most energy efficient countries in the world, raise its efficiency levels and reduce its energy consumption even further? In this respect, Japan might be seen as a "dry towel" – an already energy efficient country, which cannot be squeezed any more for energy efficiency. It is true that Japan improved its energy efficiency dramatically after two oil crises in the 1970s and 1980s. However, looking more closely, since the 1990s Japan has not improved its energy efficiency at the pace it did before. During some periods, energy efficiency has even gone backwards.

At WWF-Japan we believe there is still a lot of room to raise efficiency levels in all sectors. For example, improving lighting efficiency by changing incandescent bulb lights to LED could reduce electricity use by a quarter. In the commercial sector, improving older heat distribution and production systems could cut electricity use by a third. In the transport sector, transitioning to renewable-powered electric vehicles and fuel cell vehicles could phase out fossil fuel-based energy.

Adding all these efficiency measures together, Japan could reduce its energy consumption by 52 per cent compared to 2008 levels. An industrialized country like Japan can reduce its energy consumption significantly without people having to live a life of austerity!

IT IS POSSIBLE FOR JAPAN  
TO GO FOR 100 PER CENT  
RENEWABLE ENERGY BY  
2050, WHILE PHASING OUT  
NUCLEAR POWER

The next key challenge will be to figure out how to make renewable energy Japan's main energy source, far beyond the current 2 per cent. As Japan is a small island country surrounded by ocean located in mid-latitude, it has huge potential for renewables. WWF's *Energy Scenario* found that it is technically feasible to achieve 100 per cent renewables in Japan, by using only a small portion of the country's total renewable potential and avoiding negative environmental impacts of renewable installations.

<sup>1</sup> WWF-Japan. *Energy Scenario Proposal for Decarbonizing Japan. Part 1: Energy Efficiency, Part 2: 100% Renewable Energy, Part 3: Cost-Analysis, Part 4: Electricity Grid Scenario*. <http://www.wwf.or.jp/re100>

**BARRIERS TOWARD 100 PER CENT RENEWABLE ENERGY IN JAPAN ARE SOCIAL AND POLITICAL, NOT TECHNICAL**

There are some crucial conditions, though. The largest barrier is the power grid system. To integrate massive renewable energy successfully, there should be no bottlenecks in the system. However, this is not the case today. The Japanese power grid is divided into 10 regions, each with a dominant, vertically integrated power company. Power companies have said that Japan cannot integrate weather-dependent renewable energy because inter-regional power grids are limited. However, WWF-Japan's grid scenario found that even the current power grid system is able to incorporate 50 per cent of total generation in 2030. And if investment into the grid and systemic reform start today, 100 per cent renewables by 2050 becomes possible. So, it is a social and political problem, rather than a technical problem.

Perhaps the strongest barrier of all is the negative and popularly prevailing belief that Japan cannot reach full renewable energy supply because renewables are not always there when you need them. People believe that for 100 per cent renewable energy we would need the sun to shine and the wind to blow all the time.

But that is just not true. Variability of renewables can be managed adequately, and in many different ways. For example, using better weather forecasting systems can make wind and solar resources' performance more predictable. Renewable energy can be used when it is available, and other sources can be used when it is not. These facts are already common knowledge in Europe and America, where renewable energy is more advanced. Furthermore, as WWF-Japan's *Energy Scenario* illustrates, when renewables generate excess power (when resource availability is high) there are innovative ways to exploit extra generation (for example, by storing it for later use) and no need to depend on back-up power stations. In fact, the *Energy Scenario*'s cost-benefit analysis found that a 100 per cent renewable economy actually pays off!

Perhaps what Japanese people and policymakers need the most is confidence in renewable energy. They need to believe that renewables can be Japan's main source of energy. The first step to gaining this confidence will be to have renewables making up at least 20 to 30 per cent of Japan's energy in a few years' time. When the Japanese people realize renewables are viable and there is no need to depend on dangerous nuclear and expensive imported fossil fuels, we are sure they will be happy to go for more renewable energy. After all, Japanese people know how crucial energy safety and security is.

# DECARBONIZING THE FUTURE NOW

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Liangchun Deng  
WWF China  
Climate and Energy  
Programme

## China's revolutionary energy transition

For China, with the world's largest population and the second largest, and still fast-growing, economy, roadmapping energy development and its resource and carbon implications is most definitely a global concern. A deeper look into China's energy system, which burns almost half the world's coal each year, makes it even more apparent why an energy development roadmap is critical if the world wants to meet the United Nations Framework Convention on Climate Change (UNFCCC)'s 2°C target, as enshrined in its Copenhagen Accord.

Yet we have stubborn conventional wisdom in China that “coal is indispensable”. Mainstream energy experts tend to use “rich in coal, short in oil and gas” to describe the resource landscape of China's energy system. They argue that China can only rely on coal for its energy, because it is stable in supply and demand, and economically efficient.

**YET WE HAVE STUBBORN  
CONVENTIONAL WISDOM  
IN CHINA THAT 'COAL IS  
INDISPENSABLE'...WRONG,  
WRONG, WRONG**

Wrong, wrong, wrong. The narrative of “rich in coal, short in oil and gas” was developed half a century ago, when renewable energy choices were limited and fossil fuels were the primary option to support large-scale industrialization and urbanization. Mainstream energy experts did not expect China's energy consumption to rise so fast, or that ecosystems and human health would suffer so much from pollution caused by burning fossil fuels.

If we consider that China has abundant resources of clean renewable energy, is coal still “indispensable”?

WWF's recent report *China's Future Generation* looks at this question for the country's electric power sector, and our answer is a sweeping “no” to dirty coal and its dominance in China's power generation. Current proven renewable energy technologies could support over 80 per cent of China's growing power demand toward 2050, while cutting emissions from the power sector by 90 per cent. This would be accompanied by increased economic efficiency. To achieve this, China must adopt enhanced economy-wide energy saving and efficiency measures and summon the political courage to stop new coal-fired power plants from 2020 – and then ban coal power from 2040.

In short, a renewable future would be feasible, not risky, cleaner and cheaper for China.

Such visionary scenarios will most definitely anger coal supporters and their vested interests. They have tried to make Chinese people sceptical toward climate change. Fortunately, they have not succeeded so far.

China's mainstream coal narrative is particularly wrong, considering that the country is the world leader in manufacturing renewable energy solutions – wind and solar in particular. China is also already home to the largest installed renewable power capacity in the world. For four years running, the country has invested more in renewable energy than any other nation in the world. For example, in its twelfth five-year plan a few years back, China aimed to produce 5 billion watts (GW) of energy from photovoltaics (PV). However, the country has ended up increasing this target seven-fold. In 2013 alone, China added 12-14 GW of PV, about a third of total new solar power globally.

Domestic manufacturing advantage will also increase, supported by growing technology capacity and expertise. China should be ready to kick off the “renewable energy revolution”.

**WITH POLITICAL COURAGE TO STOP NEW COAL-FIRED POWER PLANTS FROM 2020 AND THEN TO BAN COAL POWER FROM 2040, CHINA CAN REDUCE EMISSIONS FROM THE POWER SECTOR BY 90 PER CENT**

The central government is playing a crucial role in directing China's energy roadmap toward renewables. China's Renewable Energy Law and its supporting regulatory measures, including concession biddings, feed-in tariffs and mandatory purchase of renewable power, effectively leveraged key stakeholders to support the country's energy transition. Toxic clouds, a side-effect of China's heavy reliance on coal, have made the transition to renewables even more necessary and urgent. Chinese leaders endorse the concept of “Ecological Civilization” to achieve harmony between people and nature. This is fundamental for the “Chinese Dream” or more concretely “economic prosperity and national renewal” toward mid-century.

Governments at sub-national level are also ramping up plans and actions. China's comparatively developed economic capitals, which have suffered most from air pollution in recent years, have established ground-breaking targets for coal reduction. Phasing out coal is not an idealistic vision any more, but a real political practice in some places. Phasing out should expand to more regions in China, so the country can cap its coal consumption as soon as possible to prepare for a steady decline in coal use thereafter. These efforts should be accompanied by enhanced renewable energy development ambitions, so intrinsically risky options such as nuclear power or shale gas do not replace fossil fuels.

Wind power is already generating more electricity than nuclear in China. In 2013, the country added about 16 GW of new wind power, around a third of all global deployment.

It is high time now for China to become more determined and ambitious, rejecting the conventional coal narrative and adjusting its role in its own energy structure. Currently, coal makes up around two-thirds of China's total energy mix. Such high penetration needs to drop gradually to a level appropriate to China's national context and international responsibility. To get there, coal's share in China's energy mix should drop by an average of up to 2 per cent per year.

**CHINA SHOULD BE READY TO KICK OFF THE ‘RENEWABLE ENERGY REVOLUTION’**

With a 1 per cent annual drop, coal will still support around one-third of China's energy consumption by 2050. Some optimistic energy officials and their leading advisors are sharing this scenario. It needs to be mainstreamed as China's minimum acceptable sustainable energy standard. Decreasing coal's share by 2 per cent a year will make China more likely to reach a no-coal future by 2050. Such a scenario is fundamental to WWF's global vision of 100 per cent renewable energy and is also necessary to realize UNFCCC's goal of stabilizing GHG levels and preventing dangerous anthropogenic interference with the climate system.

To achieve this, China needs appropriate resource and environmental pricing mechanisms to level the playing field for all energy options from a social perspective,

instead of only from the private and market perspective. Carbon pricing has many practical tools to do this, implicitly by emission standards, or explicitly by a tax or its equivalent from an emission trading scheme. These concrete policy choices vary in their environmental effectiveness, economic efficiency, social equity and political acceptance. However, at political level, the decision to adopt resource and environmental pricing needs to be made.

The consequences of lack of appropriate pricing mechanisms addressing externalities are already showing. For example, hundreds of thousands of people in China die prematurely each year as a result of outdoor air pollution, mainly caused by burning coal.

In economic terms, WWF's report *The True Cost of Coal* indicates that the external cost of coal was already US\$100.8 (630 RMB) per ton as early as 2007, when environmental problems were not as severe as today and climate-related carbon costs were not even calculated. Most recently, *China's Future Generation*, WWF's joint report with the Energy Transition Research Institute (Entri), calculated that a tax of US\$40 (250 RMB) per ton of carbon (equivalent to a tax of US\$20.3 or 127 RMB on one ton of coal) is the minimum level required to make coal more expensive than other power generating sources by 2025. The suggested tax rate on coal is far less than the external cost it causes.

**IT IS HIGH TIME NOW  
FOR CHINA TO BECOME  
MORE DETERMINED AND  
AMBITIOUS, REJECTING  
THE CONVENTIONAL COAL  
NARRATIVE**

Inappropriate fossil fuel subsidies need to be phased out and the money directed to developing clean and renewable energy. For example, the International Monetary Fund recently estimated Chinese post-tax fossil fuel subsidies at US\$280 billion annually, which is more than 5 per cent of the country's GDP based on market exchange rates. This money could boost development of renewable and energy efficient solutions, while, most importantly, laying the foundation for truly fair competition between all energy options. Once externalities are appropriately addressed, subsidies to renewable energy will be neither legitimate nor necessary, and will not cause a burden on public finances.

With favourable politics and appropriate policies in place, China's "Renewable Energy Revolution" could move faster and more steadily. The country could not only confidently deliver or even surpass its 15 per cent non-fossil fuel target by 2020, but also increasingly use clean renewable energy such as wind and solar to fulfil this target, while also leaving a solid foundation for further technology breakthroughs and innovations, such as a mature smart grid and energy storage systems. China recently set a target of having 5 million electric cars on the road by 2020, which tops the targets of the US and Germany, the other two "champions" of this technology so far. All these efforts will enable China to maintain quality growth, compete economically, and above all, protect its environment so the country can reach the "Chinese Dream" by 2050.

# DENMARK: A GLOBAL LEADER ON CLIMATE AND ENERGY

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Hanne Jersild  
WWF-Denmark  
Climate and Energy Policy

**“Be the change you want to see in the world”**

Mahatma Gandhi

Today, climate change is one of the world’s most serious problems. As the Earth warms, the impacts escalate and can cause runaway, irreversible changes. We urgently need to change our energy supply from fossil fuels to renewable energy.

To do this, we need global frontrunners – countries showing that green energy transition and growth are not conflicting interests, but that it’s possible to work on solving the climate challenge at the same time as securing economic growth.

Denmark is a frontrunner. The country is showing how to make this transition so we can prevent dangerous climate change, and save precious places and species, such as the Arctic and the polar bears in the north, and in the India, the Sundarbans swamp forests, which are home to Bengal tigers.

Denmark has traditionally been very dependent on coal for energy production. However, the country has decided to shift away from fossil fuels and aim for 100 per cent renewable energy by 2050.

Danish interest in sustainable energy technologies dates back several decades. In the 1970s, the oil crisis and public resistance to nuclear power contributed to the development of renewable energy, and in 1985 the Danish parliament formally declared that no nuclear power stations should be built in the country.

Since then Denmark has especially focused on promoting wind energy and energy efficient solutions. The Danish experience is that it is indeed possible to develop a greener economy and at the same time secure growth and welfare. This has been made possible thanks to broad political agreements across the Danish parliament, which has ensured continuity of policies and stability for companies and other stakeholders.

Being surrounded by the sea and good wind conditions, it was natural for innovative minds to look toward wind as a future energy solution. This has made Denmark the world champion on this key renewable energy technology. Today, wind power supplies more than 30 per cent of Danish electricity. This compares to 3 per cent globally, 7 per cent in the European Union as a whole, and 8 per cent in Germany. Wind power capacity was 750 watts per capita by the end of 2012, compared to 400 watts in Germany, 190 watts in the United States, and 60 Watts in China. Despite the so often mentioned “dangers” and “unreliability” of this weather-dependent clean energy source, including “probable blackouts”, Denmark has not seen any power cuts. Good grid and load management by the Danish authorities ensured a smooth transition.

Another crucial focus area during the past decades has been energy efficiency. Since 1980, Denmark has managed to ensure growth in the Danish economy while maintaining nearly stable energy consumption, proving that smart energy use and economic growth go hand in hand.

**TO MAKE THIS CHANGE  
WE NEED GLOBAL  
FRONTRUNNERS –  
COUNTRIES SHOWING THAT  
GREEN ENERGY TRANSITION  
AND GROWTH ARE NOT  
CONFLICTING INTERESTS**

**WIND POWER SUPPLIES  
MORE THAN 30 PER CENT  
OF DANISH ELECTRICITY.  
THIS COMPARES WITH  
3 PER CENT GLOBALLY,  
7 PER CENT IN THE EU  
AS A WHOLE, AND 8 PER  
CENT IN GERMANY**

**THE DANISH AMBITION IS  
TO REACH 100 PER CENT  
RENEWABLE ENERGY BY  
2050. SO IT IS IMPORTANT  
THAT DANISH EFFORTS  
STAY ON THE RIGHT  
PATH. 2020 IS AN  
IMPORTANT MILESTONE**

To give a clear example, from 1990 to 2011, gross energy consumption fell by 1 per cent, adjusted for fluctuations in climate and electricity trade. Over the same period, GDP grew by more than 39 per cent. Energy intensity in the Danish economy is falling – in 2011 each unit of GDP accounted for 29 per cent less energy than in 1990. In the building sector, Denmark is a world leader in energy efficiency standards and requirements. Today the heat demand of new buildings is only about 17 per cent of what it was before 1961.

Denmark also has one of the highest shares of district heating in the world. This has given the country the opportunity to increase the efficiency of electricity and heat production by using combined heat and power plants (CHP).

The Danish ambition is to reach 100 per cent renewable energy by 2050. So it is important that Danish efforts stay on the right path. 2020 is an important milestone. The Danish parliament has agreed that by then, Denmark will reduce GHG emissions by 40 per cent at home; wind power will cover 50 per cent of electricity consumption; and the country will cut gross energy consumption by 7.6 per cent compared to 2010. WWF-Denmark actively supports these goals.

WWF-Denmark will continue to push for ambitious political goals on the path toward 2050. It is extremely important that Denmark stays on target and continues to demonstrate the benefits of green transition and ambitious climate and energy policies.

This is also why WWF-Denmark has been a strong advocate for another new initiative – a Danish Climate Change Act to create a stable long-term framework for climate policies leading toward 2050. The government is about to table the Act in parliament and it should enter into force by 1 January 2015.

The new Act will create an independent climate change committee, which will advise the government on climate-related policies. We at WWF-Denmark believe this will contribute to ensuring continuity of policies as well as providing a steady focus on climate change and the green transition of the Danish energy system. We believe the committee will help keep decarbonization at the right pace and prevent short-term political and economic considerations from overshadowing long-term challenges and commitments.

Denmark's engagement in creating a green energy system has put the country in an advantageous position, not only as a frontrunner in climate and energy policies, but also as a green energy technology leader. Denmark is home to large cleantech companies including Danfoss, Vestas, Grundfos, Novozymes, Rockwool, Siemens Wind Power and Velux, as well as to a large range of suppliers and consulting firms involved in green energy technology.

As a result of its early efforts to develop renewable energy and energy efficiency, the production and export of clean energy technology solutions has had a very positive and substantial impact on the Danish economy. Denmark is the global cleantech champion in terms of sales as a proportion of the country's total economy. Clean energy technology sales amount to the equivalent of 3 per cent of GDP – the highest in the world. And energy technologies represent about 10 per cent of total Danish exports, with green energy technologies making up the largest share.

Though a relatively small country, with only 5 million people, it is important that Denmark continues to aim high through its policies and actions. Denmark's unique position as global leader in green energy policies and technologies gives a more powerful voice than its modest size might suggest.

This is also why Denmark, in October 2013, received WWF's highest honour, a Gift to the Earth – a public celebration of the conservation action by a government,

**GREEN ENERGY HAS  
PUT DENMARK IN AN  
ADVANTAGEOUS POSITION:  
AS A FRONTRUNNER IN  
CLIMATE AND ENERGY  
POLICIES AND AS A  
GREEN ENERGY  
TECHNOLOGY LEADER**

company, organization or individual who has demonstrated environmental leadership and made a globally significant contribution to the protection of the living world. The Danish Prime Minister, Helle Thorning-Schmidt, received the accolade.

It is important that Denmark continues to lead and Danish politicians live up to this responsibility. Our focus should constantly be on the green transition of our energy system and the development of innovative technologies, so Denmark's small-scale experiences can hopefully serve as inspiration for large-scale solutions around the globe. This will allow us to be the change we want to see in this world.

# ON GHG EMISSIONS REDUCTION: OPPORTUNITIES ARE EVERYWHERE!

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Ricardo Troncoso &  
Vanessa Pérez-Cirera

WWF-Mexico  
Climate Change and  
Energy Programme

**TO PREVENT THE PLANET  
WARMING MORE THAN 2°C,  
AN ECONOMY-WIDE,  
CROSS-SECTOR  
PERSPECTIVE IS NEEDED**

## Cross-sectorial experiences from Mexico

When we consider climate change mitigation and reducing CO<sub>2</sub> emissions, our thoughts usually turn to energy and all the emissions coming from fossil fuel power plants. Burning coal, natural gas and oil for electricity and heating is the largest single source of GHG emissions. This is why switching from fossil fuels to renewable energy sources is a key focus for WWF. It is one of the most cost-effective avenues to provide clean energy for all.

However, to prevent the planet warming more than 2°C, this is not enough. Fossil fuels are used in many other activities across all economic sectors, from industry to transport. And CO<sub>2</sub> emissions come from other sources apart from fossil fuels, such as waste and forestry. We need to take an economy-wide, cross-sector perspective, as recommended by the Intergovernmental Panel on Climate Change (IPCC).

In Mexico, the energy sector is the largest GHG emitter across the entire economy, producing more than 200 million tons (Mt) of CO<sub>2</sub>, according to the *National Climate Change Strategy*, published in 2013 and based on the *1990-2010 National Greenhouse Gases Inventory*. The energy sector is followed closely by the transport and agroforestry sectors. The Strategy's top priorities are energy transition and energy efficiency improvements.

Mexico is identifying mitigation actions across the economy. Back in 2010,<sup>1</sup> the National Institute of Ecology and Climate Change (INECC) found that Mexico could potentially cut its CO<sub>2</sub> emissions by 261 Mt a year by 2020. Around 30 per cent of cuts would come from the energy sector and the rest from other sectors like transport, forestry, agriculture, waste and industry.

In 2013, the public policy component of Mexico's Low Emissions Development (MLED) programme,<sup>2</sup> led by WWF, worked closely with the INECC to update and improve information on how current development will affect Mexico's GHG emissions. They also looked at the least costly and most profitable opportunities for reducing GHG emissions at present.<sup>3</sup>

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1 Secretaría de Medio Ambiente y Recursos Naturales and Instituto Nacional de Ecología. 2010. *Potencial de Mitigación de Gases de Efecto Invernadero en México al 2020 en el Contexto de la Cooperación Internacional*. [http://awsassets.panda.org/downloads/potencial\\_mitigacion\\_gei\\_mexico\\_2020\\_cop.pdf](http://awsassets.panda.org/downloads/potencial_mitigacion_gei_mexico_2020_cop.pdf)

2 The MLED program is financed by the US Agency for International Development (USAID) to help Mexico achieve a low emissions development path.

3 To access these documents go to: <http://www.mledprogram.org/documentos>. The links to the specific documents are: [http://www.mledprogram.org/docs/MLED-DOC\\_Update\\_of\\_Mexicos\\_Emissions\\_Baselines\\_and\\_Mitigation\\_Portfolio.pdf](http://www.mledprogram.org/docs/MLED-DOC_Update_of_Mexicos_Emissions_Baselines_and_Mitigation_Portfolio.pdf) and <http://www.mledprogram.org/docs/MLED-DOCU-Updated-analysis-Mexicos-GHG.pdf>

**MEXICO COULD ACHIEVE ITS EMISSIONS REDUCTION TARGET, 30 PER CENT BY 2020, AND ACTUALLY GO BEYOND IT, WITH APPROPRIATE SUPPORT**

One of the main results of this effort was the realization that Mexico could achieve its emissions reduction objective – 30 per cent below baseline by 2020 – and actually go beyond this target by reducing 320 Mt of CO<sub>2</sub> emissions (which represents a 33 per cent cut compared to baseline), if, with appropriate support, it fully implemented a total of 129 abatement levers. From these, 60 per cent would be profitable, from a single economic standpoint. Some examples of profitable actions include a massive change in light-bulbs, integrated public transport systems in cities, and tapping into the huge potential of geothermal renewable energy.

But the story doesn't end there. On the contrary, it gets better. As the efforts to improve and extend this information continue from a cost-competitive<sup>4</sup> and development perspective, new findings have come to light.

We now know that many of these GHG reduction opportunities are also a great chance to deliver economic growth and sustainable development across many different sectors, not just energy. Examples of these indirect benefits include improvement in air quality and public health thanks to massive integrated transport systems in cities; or the income redistribution to poor local communities from forest conservation activities. While there is still a lot to explore and understand about co-benefits<sup>5</sup> and indirect economic and social impacts of GHG reduction, some initial conclusions can already be identified.

One of the most important is that sectors are closely interconnected. That is, whatever we do within one sector may have positive or negative impacts on others.

In 2012, an INECC study<sup>6</sup> revealed, among many other findings, that implementing actions to reduce emissions (like taxes or soft loans on low carbon infrastructure) not only has impacts across different sectors, but also may have effects at macro-economic level, for example, on jobs, consumption, income, investment, health and social welfare. This reinforces the need for and usefulness of an economy-wide low carbon development view and planning.

There are other considerations we need to take into account when undertaking economy-wide low carbon development planning. For example, how cross-sectorial interventions may contribute to building stronger and more efficient markets. An interesting example is the innovation in clean technologies and business models (cleantech), to connect renewable energy to the grid at scale. Another is the impact of working on cleaner, greener and more comfortable cities from an integrated urban planning perspective, thinking about efficiencies across sectors in a space where they are physically interconnected.

An example of how Mexico has started to implement this cross-sectorial vision is the Special Program on Climate Change, which aims to specify concrete sector and cross-sector activities (for four years) for each ministry in the public administration, in line with Mexico's 2020 mitigation goal. Examples of these activities include fulfilling clean energy infrastructure needs, plus the realization of forest conservation goals, to achieve optimal infrastructure while minimizing environmental impacts.

**GHG REDUCTION OPPORTUNITIES CAN ALSO BE A GREAT CHANCE TO DELIVER ECONOMIC GROWTH AND SUSTAINABLE DEVELOPMENT**

4 Cost-competitive refers to products, services or technologies that provide the same quality as other products, but with lower costs. For example, wind power turbines have become cost-competitive when compared to other fossil fuel technologies like oil and gas. This does not necessarily include a quantification of co-benefits or positive externalities from clean technologies.

5 We talk about co-benefits when we refer to benefits from mitigating actions other than GHG emissions reductions, such as jobs created, energy security and poverty alleviation, among others.

6 Programa de las Naciones Unidas para el Desarrollo and Instituto Nacional de Ecología. 2012. *Evaluación Macroeconómica para el Análisis de los Impactos Económicos, Sociales y Ambientales de Programas, Estrategias, Acciones y Políticas Públicas para la Reducción de Emisiones de Gases de Efecto Invernadero en México*. [http://www.inecc.gob.mx/descargas/cclimatico/2012\\_estudio\\_cc\\_mitgef6.pdf](http://www.inecc.gob.mx/descargas/cclimatico/2012_estudio_cc_mitgef6.pdf)

**WHATEVER WE DO WITHIN  
ONE SECTOR MAY HAVE  
POSITIVE OR NEGATIVE  
IMPLICATIONS ON OTHERS**

Another interesting example is *8%+: Private Sector and Low Carbon Growth in Mexico*, a study recently published by WWF and the Mexican Business Council for Sustainable Development. It shows the role the private sector can play in catalyzing others, such as the forestry and waste industries. It also challenges the perceived incompatibility of emissions reduction with the private sector and industrial growth, and promotes the role of corporates in enhancing cleantech innovation and developing sustainable infrastructure – key enablers for reducing emissions from energy.

This paper has aimed to show the importance of thinking and working with a cross-sectorial perspective, as the IPCC recommends. Renewable energy can bring important indirect social and economic benefits, for example, income redistribution, jobs creation and public health, in sectors such as forestry, transport, industry and waste.

There are also important benefits of looking at the economy from a sector connectedness point of view. Using a cross-sectorial lens allows us to understand the catalyzing role of certain sectors, such as the private sector, as well as to identify the levers or enablers which may have a positive effect on all sectors (for example, the reduction of fossil fuel subsidies). It helps us to identify the actions we can take to maximize not only GHG emissions reductions, but the direct and indirect benefits of implementing them.

Climate action and climate policy have progressed immensely in the past few years. However, Mexico still has much to learn if we want to design a truly effective and efficient climate policy. A cross-sectorial lens may well ease this task.

# SCIENCE MEANS BUSINESS

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**Hector Cordero Irigoyen**  
WWF Global Climate and Energy Initiative, Climate Businesses Engagement

We know that global warming is mainly caused by humans. Human activities, particularly those of corporations, depend largely on fossil fuel combustion. Thus, fossil fuels' share of GHG emissions has increased dramatically since the beginning of the industrial era. Corporates, transport and households have all contributed on different levels to the climate crisis we find ourselves in. The positive news is that there is a window of opportunity for companies not only to reverse the current climate shock, but also to do it profitably.

Does science “mean business”? Yes. Ground-breaking evidence from the Intergovernmental Panel on Climate Change (IPCC) suggests that continuing release of current levels of GHGs into the atmosphere will cause devastating warming by 2050. As the International Energy Agency points out, a huge contributor to this is the 10 countries that produce 70 per cent of all energy-related CO<sub>2</sub> emissions. Topping the list are China and the United States, contributing 23.8 per cent and 17.3 per cent of global emissions respectively.

Corporations from all sectors have a huge opportunity. Investing in energy efficiency measures and shifting away from fossil fuels and replacing them with renewables can save millions in the short-term. In the US, it has been estimated that savings could top US\$190 billion annually by 2020. The Mexican corporate sector could save the equivalent of 8 per cent of the country's GDP by 2020 if investment in energy and renewables starts now. Scientists are serious when they talk about irreversible climate change. Taking this warning as an opportunity to grow business sustainably is the best way forward.

**THERE IS A WINDOW OF OPPORTUNITY FOR COMPANIES NOT ONLY TO REVERSE THE CURRENT CLIMATE SHOCK, BUT ALSO TO DO IT PROFITABLY**

To seize this opportunity, companies should take the first step, stopping excessive reliance on governments to pass effective climate mitigation legislation. With the creation of an international framework to tackle climate change threats uncertain, governments often lack incentives to increase their ambition from international fora. Progressive companies should take the lead confidently, showing that the economic value of adopting low carbon measures can also lead to net gains for the country overall.

As the majority of CO<sub>2</sub> emissions come from few sectors in which many corporations operate, such as power, transport and industry, the solution to mitigating global warming could come from a critical mass of responsible corporations. The key question is, who should act and who should bear the costs?

Will corporations respond adequately to the challenges posed by climate change? If there are financial incentives, the answer is yes. However, the ambition required is much higher compared to the average company's corporate social responsibility actions currently or under a business-as-usual scenario in the future. The IPCC has warned that to stop global temperatures increasing by more than 2°C by 2050, we need to reduce emissions by 50 per cent by 2030, and by 40 per cent to almost 80 per cent by 2050.

However, the gap between the ambition required to make the 2°C decarbonization pathway a reality and current GHG reduction efforts continues to broaden. Science tells us we need a comprehensive decarbonization of all sectors of the economy, including utilities. Approaches that focus only on subsectors will not meet the 2°C challenge. For corporations, the time to take action is now and the window of opportunity is short.

**TO SEIZE THIS OPPORTUNITY, COMPANIES SHOULD TAKE THE FIRST STEP**

How can companies get started with climate action? Firstly, corporations that want to craft a successful strategy to reduce GHG emissions should gradually shift away from fossil fuels as their primary source of energy. Also, companies need to move toward material use efficiency, carbon intensity improvements and energy demand reductions via energy efficiency investments. Doing this will make a real difference to companies' net profits.

A WWF-US report on private sector involvement in climate change mitigation reveals that to be on track to stay below 2°C, the US corporate sector must reduce its total annual GHG emissions by 1.2 billion tonnes of CO<sub>2</sub>eq by 2020 from 2010 levels.<sup>1</sup> This is equivalent to reductions of approximately 3 per cent per year across the US corporate sector. By adopting energy efficiency measures and investing in renewable sources of energy, this target is achievable and could generate big profits.

Conventional wisdom suggests that the transition from a fossil fuel-dependent to a low carbon economy would bring more costs than opportunities. However, this is far from the truth. The WWF-US study certainly helps demystify the financial opportunities available from investing in key low carbon energy options.

Another important part of the business case for investing in mitigation measures is the substantial savings corporations could make from investing in technology upgrades. For example, upgrading transport fleets can make them more fuel efficient and less costly to run. Similarly, upgrading buildings with energy efficient lighting and heating, ventilation and air conditioning systems can result in long-term savings, as can improvements to data centres, motors and vehicles, and recovery of waste heat. The WWF-US report estimates that American corporations could reap up to US\$85 billion (present value) by 2020 at a 325 per cent rate of investment from technology upgrades. What else do companies need to start taking action?

Climate science is giving businesses an unprecedented opportunity to act. But the IPCC has made it clear that this opportunity has a strict deadline. Emissions must peak by 2015 and the decline by up to 80 per cent by 2050. The transition from traditional fuels to renewables can no longer wait for lax legislation to become stringent. Companies must learn how to measure and manage their emissions, partly because it shows transparency on the company's specific contribution to climate change. However, most importantly, it will deliver substantial savings in the long term through a variety of actions.

**THERE IS AN UNPRECEDENTED OPPORTUNITY FOR BUSINESSES TO ACT, BUT THERE IS A STRICT DEADLINE**

The best way for companies to track their performance is by benchmarking their current targets against the effort to close the 2°C gap and challenging themselves to perform within this level of ambition. This way, companies can become sector leaders and eventually climate leaders.

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<sup>1</sup> CO<sub>2</sub>eq refers to the emissions or emissions concentration of GHGs controlled by the Kyoto Protocol and the United Nations Framework Convention on Climate Change (UNFCCC) – carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), fluorinated gases (F-gases) and sulphur hexafluoride (SF<sub>6</sub>) – based on the equivalent warming that would be caused by CO<sub>2</sub> only. By definition and over a 100-year time scale, one kilo of CO<sub>2</sub> has the warming impact of "1", while a kilo of other GHGs can have a much higher warming impact.

The call of science requires leadership, which companies can answer both as an opportunity to grow and as an opportunity to become agents of change. We are certain that the emissions gap will continue to broaden if current mitigation efforts do not become stronger. But we can rest assured that in light of the financial opportunity that closing this gap presents, there is potential for global warming to be limited to 2°C. Let's hope the corporate sector seizes this opportunity and sets an example to other sectors to join the battle against global warming.

# CAN DECARBONIZATION AND DEVELOPMENT GO HAND IN HAND?

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WWF-South Africa  
Living Planet Unit

## The view from South Africa

Let's not beat about the bush: producing 1 per cent of global emissions, South Africa makes the world's top 20 GHG emitting countries.<sup>1</sup> More disconcerting still is that our per capita emissions currently exceed the global average of 6.8 tons, at 10 tons per capita. To put this in context, South African per capita emissions almost equal the European Union's 10.9 tons and are higher than those of China and India.<sup>2</sup>

This poses a challenge for South Africa, where the availability of abundant, historically cheap, coal-based energy supplies have created an unusually high dependence on carbon fuels and powered energy and carbon intensive industrial development. As far back as we can remember, coal has powered South Africa's economic growth. It covers 77 per cent of our primary energy needs. 86 per cent of our electricity generation capacity is based on coal<sup>3</sup> and around 34 per cent of the country's petrol and diesel is manufactured from coal.<sup>4</sup>

Some South Africans even take pride in being a global leader in coal-to-liquid technology, which is highly emissions-intensive. Cheap coal-based energy has been an industrial development policy tool to harness the country's abundant minerals resources. This has subsequently developed links into downstream industries, creating a broad and loosely defined Minerals Energy Complex (MEC).

Little wonder then that decarbonization is met with opposition. The main pillars of decarbonization are reduced energy consumption; efficient decarbonized electricity generation through shifts to renewable energy; electrification of energy systems in transport, agriculture and industry; and improved resource productivity. With the country's industrial base, competitiveness and the scope for economic prosperity to be built around the carbon-intensive MEC, it is not surprising that decarbonization is seen as a potential limitation to economic growth.

Coal is not just a source of energy for the electricity sector. When we talk about shifting away from coal to other sources of energy, we have to take into account coal's entire value chain and inter-linkages with other parts of the economy outside the mining and electricity sectors. For example, coal is a source of export revenue; coal

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1 SouthAfrica.info. 2012. *South Africa's Energy Supply*. [http://www.southafrica.info/business/economy/infrastructure/energy.htm#U0VAm\\_mvXuN](http://www.southafrica.info/business/economy/infrastructure/energy.htm#U0VAm_mvXuN)

2 Pegels, A. and Stamm, A. 2010. *Decarbonizing South Africa? Prospects and Barriers to the Energy Transition*. [http://www.dime-eu.org/files/active/0/Pegels\\_DIME2010\\_Ettlingen.pdf](http://www.dime-eu.org/files/active/0/Pegels_DIME2010_Ettlingen.pdf)

3 Fakir, S. and Gulati, M. 2012. *Carbon Tax in South Africa. Presentation to Economic Development Department and National Treasury*, 18 May 2012.

4 GTZ (Gesellschaft für Technische Zusammenarbeit). 2009. *Energy-policy Framework Conditions for Electricity Markets and Renewable Energies – 16 Country Analyses*. Eschborn. <http://www.ecofys.com/files/files/gtz2009-en-terna-analysis-complete.pdf>

stocks play an important role in the financial sector; and coal is converted through various chemical processes into liquid fuels and other by-products, which will have to be replaced if coal is substituted. Hence, the lingering misperception that decarbonization does not fit with economic and social improvement in South Africa.

We have the distinction of being one of the most unequal societies on the planet. Our income inequality is among the highest in the world, with a Gini Coefficient rating of 0.68 and 39 per cent of the population living below the national income poverty line.<sup>5</sup> Economically, we have many challenges to overcome,<sup>6</sup> including tackling unemployment – which sits at 25-36 per cent<sup>7</sup>; expanding the tax base, which is stagnant due to high joblessness; the lack of formalization of jobs; increasing our appallingly low savings rate of less than 20 per cent; and attracting long-term foreign investment. A flourishing industry is the only hope for resolving these problems. If industry were to decline in the name of decarbonization, South Africa's problems would only worsen.

We at WWF-South Africa believe that the debate is not about the importance of affordable and reliable energy or about keeping industry afloat. In our minds, there is no doubt that we need to keep businesses in our country, and attract new industry and jobs to our nation. Enhanced economic growth and industrial development are undeniably laudable objectives and need to be part of the decarbonization debate. For us, the key issue is to find a development pathway that achieves decarbonization without constraining the productive sectors of the economy.

**WE CAN'T KEEP BUILDING SOUTH AFRICA'S FUTURE WELFARE ON MINERAL RESOURCES THAT WILL DEplete SOMEDAY. WE HAVE TO BUILD A NEW ECONOMY**

This can happen if we stop viewing decarbonization as a threat and pursue it as an opportunity. Our mineral resources will deplete someday, so we can't keep building the country's future welfare on them. We have to build a new economy, diversifying our economic base and the experience and capability of its human capital. Decarbonization provides us with precisely this opportunity.

We need to find an economic model that allows stronger linkages to be built between the old mining-dependent economy and a new type of economy that talks to the decarbonization concept. A decarbonized old economy can be built by treating tailings and recycling metals; minimizing material uses; stimulating multiple use of products by designing things with more than one function; and replacing fossil fuel-based electricity and liquid fuels and heat with renewable alternatives. The old economy would become more efficient and productive using green economy strategies while we build completely new sectors through low carbon technologies, infrastructure and systems. Many of these activities are already happening in one form or the other. A focused approach to decarbonization would only mean developing these activities at scale, by introducing policies that further instigate them and provide for investments, industrial activity and job creation.

**ENHANCED ECONOMIC GROWTH AND INDUSTRIAL DEVELOPMENT NEED TO BE PART OF THE DECARBONIZATION OF SOUTH AFRICA**

Decarbonization may become a major new source of competitive advantage, as companies adopt energy and carbon saving technologies and systems, and develop low or no-carbon technologies. South Africa is well endowed with low carbon natural resources, such as wind and sun. WWF-South Africa's work has shown that

5 Scholtz, L. and Gulati, M. 2013. *Experiences Around Responsible Business – The South African Experience*. Input paper prepared for Economic Policy Forum – Resources Policy: Energy and Environment. Organized by Observer Research Foundation on August 5-7, 2013 in New Delhi, India.

6 This para heavily draws upon Saliem Fakir. *Green Growth or Deep Green Economy – which one is it?* Engineering News. March 8, 2013. Available at <http://www.engineeringnews.co.za/article/green-growth-or-deep-green-economy-2013-03-08>

7 Louise Scholtz & Manisha Gulati. *Experiences around responsible business – The South African experience*. Input paper prepared for Economic Policy Forum - Resources Policy: Energy and Environment. Organized by Observer Research Foundation on 5-7 August 2013 in new Delhi, India.

**DECARBONIZATION  
WILL ENHANCE  
DEVELOPMENT BY  
REDUCING THE COUNTRY'S  
VULNERABILITY TO PRICE  
SHOCKS AND GLOBAL  
GEOPOLITICAL RISKS**

decarbonization can give us a platform to develop a cleantech industrial base. The country already has a well developed industrial base, which we can use to redefine the competitive advantage toward low carbon technologies and systems. This would enhance industrial growth by generating new sources of economic activity, helping to achieve broader social and economic development objectives.

Decarbonization will enhance development by reducing the country's vulnerability to price shocks and geopolitical risks. A diverse fuel mix and reduced dependence on oil imports will cut the danger of price shocks, which have become very common in the economy, and positively impact the balance of payments, which benefits the economy as a whole.

However, such decarbonized growth will require a different approach to technology and policy. Governing the decarbonization of industry is not just about regulating and providing incentives for pollution control and reducing air and water emissions. Purposeful decarbonization of industry will require a long-term vision – despite the inherent uncertainties in technology, markets and other developments that may improve production efficiency and promote innovation in the production system.

It will also require a repertoire of policies, specifically ones that align energy and industrial strategies, accelerate the deployment of low carbon technologies at scale, and create the right incentives for decarbonization at industrial and consumer levels. We believe that such measures will have dual effects: they will create conditions that allow for development of much needed new economic activities, and they will ensure that the overall costs related to decarbonization are offset by increased economic activity, as new industries, products and related economic activities prosper.

There are different ways of approaching decarbonization. We can either view it as bad for the economy or as a window of opportunity to make our fossil fuel-related sectors and activities more efficient, while growing these sectors and making them less dependent on fossil fuels. In any case, decarbonization is not going to happen overnight. It is a medium- to long-term process. So if we take a pro-active approach, as opposed to a passive or reactive one, we can ensure that decarbonization and development are in sync and concerns arising during the process are managed well.

# GROWING GREEN: DIVERSIFYING THE ENERGY MIX

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**Ugan Manandhar**  
WWF-Nepal  
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## An approach to Nepal's sustainable development

Nepal is only 147,800 km<sup>2</sup> in size (covering just 0.01 per cent of global landmass). However, it is home not only to the highest mountain peaks on Earth, but also to abundant biodiversity and natural resources, and to multiple cultures that have a love for nature. Paradoxically, despite its rich natural resources, Nepal is one of the world's poorest countries. With an economy based on agriculture, it ranks 157th out of 186 countries in the most recent Human Development Index. Nepal's slow progress in attaining sustainable development shows how undeveloped it is.

Lack of access to clean and reliable energy lies at the heart of Nepal's underdevelopment. Modern energy supply in the country, namely fossil fuels and electricity (mainly used in the transport, agriculture and industrial sectors), only accounts for 11 per cent of total use. Households consume the remaining 89 per cent, and are almost fully dependent on biomass from traditional sources like forests, agriculture residue and dried animal dung.

High dependence on traditional biomass, which is often used very inefficiently, has negative impacts on the environment and people and communities' quality of life. In the absence of access to clean energy, Nepalese people use biomass for cooking and heating. To produce the biomass, many trees are cut down unsustainably, leading to biodiversity loss, increasing carbon emissions, damage to soil quality and vulnerability to flooding.

On top of that, burning traditional biomass is a major source of health problems, especially for women and children who spend most of their time either around burning biomass, or collecting it in its different forms – time that otherwise could be devoted to education and improving their living conditions.

But modern energy access is not only about clean cooking and heating. It is also about clean and reliable access to electricity. In contrast to the huge need for basic electricity services for the poor, electricity consumption in Nepalese households only accounts for 2 per cent of total energy use at present. Nepalese people's electricity use is only 3 per cent compared to the global average electricity use per person – and CO<sub>2</sub> emissions are only about 0.03 per cent of the average global per capita emissions.

Electricity in Nepal mostly comes from hydropower, a source often constrained by dry seasonal conditions (for example, in winter) and vulnerable to periods of drought. With a growing population in urban and semi-urban areas, demand for electrification is increasing. During wet seasons, demand is nearly double what current capacity

**ACCESS TO CLEAN AND  
RELIABLE ENERGY LIES AT  
THE HEART OF NEPAL'S  
UNDERDEVELOPMENT**

can provide. And during dry seasons, Nepalese people often lack reliable supply of electricity, and have to suffer 12-18 hours of darkness per day. This can force them to switch to GHG emitting generators, fuelled by oil products such as diesel, to satisfy their power needs.

The way energy is consumed in Nepal has changed as expanding urbanization and haphazard development have altered people's lifestyles. Energy demand has gone up sharply compared to supply, showing that not only are more people in urban areas using fossil fuels for electricity generation and cooking, but more and more people in semi-urban areas are moving in this direction too.

Nepal is not a fossil fuel-endowed country, which forces it to import fuel to cover its energy needs. Since 2003, oil prices have been rising relentlessly. Growing imports due to increases in energy demand have forced the country to increase spending on energy. Between 2010 and 2011 alone, the nation spent approximately 116 per cent of its commodity export revenues on importing petroleum products, compared to just 27 per cent a decade before. Moreover, the Nepalese government subsidizes fossil-based cooking fuels such as LPG and kerosene. Consequently, and depending on how global oil market prices evolve, Nepal is increasingly exposed to an unsustainable burden on its national budget. This money could be used to improve the country's social development.

WWF-Nepal believes that the country's energy mix needs to be better balanced so everyone has access to sustainable energy. Access to clean and reliable energy has tremendous potential to transform the quality of life and the economic prospects of Nepal's almost 30 million people. Renewable energy can help the country end poverty and put it on the right path toward sustainable development.

**MODERN RENEWABLES  
GIVE NEPAL THE CHANCE  
TO PURSUE GREEN  
ECONOMIC GROWTH AND A  
BETTER ENVIRONMENT**

Modern renewables give Nepal the chance to pursue green economic growth and a better environment. Nepal should be looking to harness renewable resources, so it can steer its economy toward a green growth path. The country has huge endowments of renewable energy resources from sun, wind and water. Why don't we make use of them to fuel development and improve the status quo of Nepal's energy mix? For example, given Nepal's vast resources, hydropower capacity could be 70 times larger than it is today. Only 2 per cent of its huge potential is being exploited. Given the possibilities modern renewables present, Nepal could minimize its use of LPGs and kerosene for cooking and diesel for electrification.

Switching to renewables is a must if Nepal wants to make best use of its government expenditure. If Nepal could produce sufficient and reliable electricity domestically, the country would not have to spend NR 41 billion (about \$US418 million) each year on importing diesel. By saving this, Nepal could enlarge its current 600 MW hydropower capacity by an additional 150 MW a year or, alternatively, invest it in deploying other forms of renewables like solar and wind.

Another option for switching to renewables would be connecting renewable energy projects to carbon financing. Nepal's energy sector status quo leverages the use of fossil fuels, thus contributing to climate change. Nepal could doubly benefit from investing in renewables: firstly by reducing its use of imported fossil fuels while improving the energy mix, and, secondly, by earning revenue from carbon markets for reducing emissions compared to current trends. On top of that, an expanded renewable energy sector could offer substantial economic benefits for Nepal, both in terms of employment and diversified energy services.

**RENEWABLE ENERGY  
CAN HELP NEPAL END  
POVERTY AND PUT IT  
ON THE RIGHT PATH  
TOWARD SUSTAINABLE  
DEVELOPMENT**

The growing uncertainties around petroleum supply and the instability of oil prices in the global energy market make clear the importance of realizing the Nepalese people's aspirations for a stable, secure and sustainable energy supply. Whatever strategy the government decides on to address these concerns needs to take into account the diversification of Nepal's energy mix. Nepal's government has shown glimpses of being interested in this, by implementing renewable energy programmes for rural areas for example. However, no holistic strategy that aims to improve the country's energy conditions as a whole has emerged yet. And that is where an opportunity presents itself.

For renewables to lead Nepal's development there needs to be stronger political will to implement an appropriate and overarching energy vision. As such, an effective and comprehensive sustainable energy strategy that encourages an appropriate balance of renewable sources is urgently needed.

Current investment opportunities and the political, social, technological and economic environment hinder up-scaling of renewables in Nepal, thus creating limited space for a sustainable energy future. But transforming Nepal's energy system is possible, if the government acts immediately to provide policies to encourage the environment to change for good. The government needs to facilitate and strengthen the confidence of investors and the general public by providing more stable, transparent and inclusive marketplace opportunities and attracting the level of investment necessary to achieve a clean energy future.

**FOR RENEWABLES TO LEAD  
NEPAL'S DEVELOPMENT  
THERE NEEDS TO BE  
STRONGER POLITICAL WILL**

Nepal deserves to achieve sustainable development by diversifying its energy sources. When clean and reliable energy services become plentiful in its energy mix, Nepal's future will be brighter. Sustainable energy for all is about seizing the power to make sure the country not only remains in never ending peace and love, but also to keep building a nation where these are enhanced by a clean and promising energy future.

# THE *ENERGIEWENDE* MUST NOT REST ON ITS LAURELS

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Germany's *Energiewende* (energy transition) has ambitious targets. It is aiming for a full phase out of nuclear energy by 2022; an 80 to 95 per cent reduction in GHG emissions by 2050; the expansion of renewables in the power sector to 80 per cent; and a 50 per cent increase in energy efficiency by 2050. In fact, it proposes to reform the entire energy structure of the world's fourth largest economy. Essentially, it means a shift away from current heavy reliance on fossil fuels and nuclear power toward an electricity system dominated by renewable energy and embedded in an emission-free economy.

Contrary to popular belief, the German *Energiewende* is neither a chaotic nor an abrupt reaction to the horrendous events in Fukushima in March 2011. Instead, the nuclear incident opened the government's and people's eyes, and made the 2002 decision to phase out nuclear energy, a plan that remained in place until September 2010, necessary. The *Energiewende* is the product of a broad and extensive social discourse that has been rooted in the environmental anti-nuclear movement since the 1970s. It therefore has strong intellectual roots as well as being welcomed and supported by the vast majority of society.

The *Energiewende* is one of the biggest economic reform projects of the 21st century by any major nation, and is being watched globally. Germany can show the world that it is no longer living at the expense of its future generations, and that a highly industrialized country can prosper without nuclear power, and in the medium to long term, without fossil fuels.

THE *ENERGIEWENDE* OFFERS MAJOR OPPORTUNITIES SUCH AS THE TRANSITION TO CLIMATE-FRIENDLY AND NON-NUCLEAR ENERGY SUPPLIES, AND THE CHANCE TO SHOW THAT ALTERNATIVES TO CONVENTIONAL FORMS OF ENERGY GENERATION DO WORK AND ARE BOTH AVAILABLE AND AFFORDABLE

The *Energiewende* offers major opportunities such as the transition to climate-friendly and non-nuclear energy supplies, and the chance to show that alternatives to conventional forms of energy generation do work and are both available and affordable. As Germany is steadily increasing its share of renewables it is becoming less dependent on fossil fuel imports, with annual savings in energy imports of €10 billion. By implementing its national renewable targets and climate protection targets, Germany could halve its import bill for fossil fuels by 2020, increasing savings to €50 billion per year.

However, a number of economic, technological and socio-political challenges remain and will have to be overcome for Germany to continue its success. Current opinion polls suggest that almost 90 per cent of the German population back the energy transition resolutions. However, maintaining such a high level of support will be one of the key challenges when it comes to implementing changes.

As the *Energiewende* comes of age, this legislative session will be crucially important to its success. The biggest challenge posed by the energy transition is undoubtedly changing the current market design. As a marginal cost market, the energy-only market needs to be brought into line with an increasing feed-in of renewables into the system at a marginal cost close to zero.

THE ENERGI EWENDE IS ONE OF THE BIGGEST REFORM PROJECTS OF THE 21ST CENTURY AND IS BEING WATCHED GLOBALLY

Current reforms of the Renewable Energy Act are just the start of legislation that will eventually lead to comprehensive re-regulation of the German electricity market. The Act increased the share of renewables from 7 per cent in 1990 to almost 25 per cent by the end of 2013.<sup>1</sup> Since it is based on feed-in tariffs, it provides an incentivizing long-term investment horizon for smaller investors and has thus proven a success in significantly lowering the levelized cost of energy for renewables, especially onshore wind and PV solar.

Current reform plans will see renewable energy deployment rise to 40-45 per cent of electricity consumption by 2025 and 55-60 per cent by 2035. This will be accompanied by technology-specific extension corridors, thereby capping the current feed-in tariff design for new renewable power installations and adding quantity-based regulatory measures. Despite staying in line with the long-term targets for renewable energy deployment specified in the government's 2010 energy concept, current reform plans endanger the continuation of the dynamic renewables deployment of past years. To make things worse, the planned introduction of a tendering scheme for renewables from 2017 is coming far too early. It remains a largely unproved mechanism and thus threatens the existing secure environment for investment in renewables.

It is widely agreed, however, that the support scheme for renewables needs to be moved away from being merely a cost-plus approach to being integrated into a new electricity market design, so that rising electricity prices can be better held in check and system costs are more fairly distributed. Despite the fact that only a third of the price increases since 2000 stem from the deployment of renewables, current renewables reform is also largely about balancing costs and even more about introducing fair distribution of the economic burden. This will help maintain a high level of public support.

The European Commission's ongoing investigation into potential state aid proceedings under the Renewable Energy Act will stop entire industry sectors from showing a lack of solidarity by optimizing against the renewable energy levy. It is also a fine example of a two-level game, enabling the German government to push for tough reforms against strong vested national interests within the Commission's shadow of hierarchy.

Industry's exemptions from paying renewable energy levies amount to almost 30 per cent of consumed electricity in 2013, having increased by a third within the last 10 years. Meanwhile, the financial burden for the remaining 70 per cent of electricity customers (mainly small and medium enterprises and household customers) has increased from €3.6 billion in 2012 to €5.6 billion in 2013.<sup>2</sup> Of course, industry exemptions remain important to prevent carbon leakage and therefore need to be aligned with existing EU regulation.

As renewable electricity's share expands, additional areas of the energy transition will need to be addressed and various reforms will be necessary. Expansion of electricity grid infrastructure is absolutely necessary on both transmission and distribution level to cope with an increasingly decentralized energy infrastructure. In this respect, it is important to note that structural investment is needed in Germany's electricity sector. This would have been needed even without the transition. With all-time low investments both in grid and generation infrastructure since deregulation in 1998, recent years' low electricity prices are primarily due to the sector's maximization of profits while living off its existing capital stock. €1.2 billion out of

1 BDEW, 2013.

2 DIW. 2013. *Politikberatung Kompakt*. [http://www.diw.de/documents/publikationen/73/diw\\_01.c.431913.de/diwbkompakt\\_2013-075.pdf](http://www.diw.de/documents/publikationen/73/diw_01.c.431913.de/diwbkompakt_2013-075.pdf)

€2 billion of yearly investment into the network structure by 2020 would have been required even without the energy transition.<sup>3</sup>

Electricity storage systems will have to be developed and energy efficiency measures improved. The fact that the government has widely neglected the latter is particularly discreditable to Germany's ambitious energy saving targets. The 40 per cent domestic reduction target for GHG emissions by 2020 could certainly be achieved if Germany were to invest more in energy efficiency and if it were to adopt a clear stance in favour of restructuring Europe's emissions trading system, including a tightening up of European climate targets.

There is a narrow time frame to make sure climate change does not exceed 1.5°C, but it is possible. Germany's pressing challenge is to pursue a credible energy policy at EU level in the run up to the 2030 climate and energy package negotiations as well as to COP21 in Paris in 2015. Against this background, there is no alternative to *Energiewende*.

Energy transition cannot rest on its laurels. It must continue to lead the way forward, provide guidance for other nations to follow, and show that transition happen for the benefit of all. Already, more than 99 states and provinces have introduced support schemes for renewables, making renewables by far the largest growing technology for electricity generation worldwide in terms of installed capacity.

Besides helping nations to reduce their dependence on nuclear energy and fossil fuels, the deployment of renewables is also creating significant economic growth. In 2013 almost 380,000 jobs were based in the renewables sector in Germany, with estimates for 2020 reaching up to 600,000 jobs, including 250,000 related solely to energy efficiency.<sup>4</sup>

It is undeniable that the *Energiewende* will continue to be a powerful job creator in Germany and internationally. But it will be a driver for innovation in technology and engineering too. The *Energiewende* has already led to significant advances, including drastically lowering installation costs for PV solar, making this technology available for large-scale deployment and economic development in off-grid regions such as sub-Saharan Africa.

Already, pressure to implement change triggered by the energy transition has resulted in many solutions that were inconceivable a few years ago. These include development projects for direct current lines, the use of large generators of decommissioned power plants to stabilize the network, and the tapping of cost-cutting potential of renewables. Besides reducing the import dependency and costs of fossil fuels, the *Energiewende* has most significantly reduced the vast external costs of fossil fuel exploration, extraction, transport and combustion, which result in negative impacts on our ecosystems, human health and biodiversity – a sum that doesn't show on any energy bill.

It is these invaluable returns on investment in renewable energies that readjust the balance sheet. This would show even more clearly if the €544 billion of worldwide subsidies for fossil fuels in 2012 were to be scrapped off the books. In contrast, renewables received just €100 billion in subsidies. All of this proves that the *Energiewende* can be managed successfully and does not overextend an economy's capacities, but rather builds upon them making them both stronger and more competitive.

<sup>3</sup> BNetzA, 2010.

<sup>4</sup> Die Welt. 2013. *Jobmotor Energiewende*. [http://www.welt.de/print/welt\\_kompakt/print\\_wirtschaft/article121206690/Jobmotor-Energiewende.html](http://www.welt.de/print/welt_kompakt/print_wirtschaft/article121206690/Jobmotor-Energiewende.html) Numbers from DIW, [www.diw.de](http://www.diw.de)

AS THE SHARE OF RENEWABLE ELECTRICITY EXPANDS, ADDITIONAL AREAS OF THE ENERGY TRANSITION WILL NEED TO BE ADDRESSED AND VARIOUS REFORMS WILL BE NECESSARY

THE ENERGY TRANSITION MUST NOT REST ON ITS LAURELS, BUT CONTINUE TO LEAD THE WAY FORWARD AND PROVIDE GUIDANCE FOR OTHER NATIONS TO FOLLOW

# THE NORWEGIAN SOVEREIGN WEALTH FUND IN A CHANGING CLIMATE

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**Lars Erik Mangset and  
Inga Fritzen Buan**

WWF-Norway  
Climate and Energy

Norway. From the outside, often seen as a role model on sustainable development. Clean rivers. Spectacular landscapes. A high degree of electricity generation based on renewable energy. Often involved in peace negotiations. A population seen as one of the happiest on the planet. But how does this outside view of Norway match the reality when it comes to how the country invests its petroleum revenues on the global financial market?

As the saying goes, you don't want to see how your sausages are made. The way Norway stays among the wealthiest countries in the world is in stark contrast to its reputation for progressive sustainability policies. Through a financial lens, Norway looks rather two-faced.

Let's start with a premise that is well known to all Norwegians. Our long coast has provided for an industrial adventure, allowing Norway to become a significant producer and exporter of fossil fuels. All oil and gas companies operating on the Norwegian continental shelf are subject to a 78 per cent petroleum tax, bringing tremendous income to the Norwegian government and people.

In line with Norway's social democratic traditions, it was politically acknowledged at an early stage that this revenue should benefit current and future generations. This led to Norway's sovereign wealth fund, often referred to as the "oil fund", but more correctly termed the Government Pension Fund Global (GPF). All revenues from Norway's petroleum activities are funnelled into this, and invested into global financial markets outside the country. Theoretically, such investments should secure Norway's wealth in perpetuity.

In recent years, the fund has grown to become the largest sovereign wealth fund in the world, largely due to high oil prices over the last decade. It is now bigger than any oil-derived fund in the Middle East or the funds of Singapore and China. Today, Norway's small population of 5 million own 1.3 per cent of globally listed stock market values and a little less than 1 per cent of global debt. More recently, the fund has invested in expensive property, for example, in London and the US.

Dividing the fund's value (in local currency) between Norway's population implies that all Norwegians are theoretical millionaires. If we divide the value of our ownership in Apple alone, every Norwegian gets an iPad. Endless calculations can be made to illustrate this rather unprecedented wealth.

However, the inconvenient truth is that this economic bonanza is two-faced. In fact, the income comes from fuelling the biggest risk to global biodiversity and sustainability: climate change.

The Intergovernmental Panel on Climate Change (IPCC) has made it very clear that substantial reductions of GHG emissions are needed if we are to stand any chance of meeting the internationally agreed target of stopping global warming rising above

**WE CAN COMPARE NORWAY'S INVESTMENTS WITH A PERSON DRIVING A CAR FORWARD, BUT ONLY LOOKING IN THE REAR VIEW MIRROR. THE FUTURE CHALLENGES OF CLIMATE CHANGE ARE NOT CONSIDERED TO BE FINANCIALLY RELEVANT**

2°C compared to pre-industrial levels. To achieve this widely acknowledged and politically agreed goal, at least two-thirds of all known fossil fuel reserves must be kept in the ground unused, according to the International Energy Agency. There is thus a substantial need to shift financial investments from fossil fuel companies to renewable energy-related activities. There is also the parallel development challenge of ensuring energy access for all, in a sustainable and climate-friendly manner.

All this is a scientifically uncontested reality. But it is not considered directly in the construction of the GPFG's investment portfolio. Instead, the fund bases its investment decisions on the past four years' financial statistics. So we can compare Norway's investments with a person driving a car forward, but only looking in the rear view mirror. The future challenges of climate change are not considered to be financially relevant. Nor is how investments might endanger the achievement of the international climate target. A de-facto political consensus exists that there is no contradiction between Norway's climate policies and the fund's apparent breach of those policies.

In 2013, WWF did an analysis of the GPFG's exposure to fossil fuel investments. On the basis of the Carbon Tracker list, we found that the GPFG had ownership interest in 147 of the 200 companies in the world which own the highest reserves of coal, oil and gas, corresponding to 10 per cent of the fund's total stock investment. To put this in context, at this point the GPFG was invested in 7,000 companies, and chose to devote as much as 10 per cent of its total invested equities to the 147 worst companies in the world, from a carbon intensity point of view. These companies alone hold more fossil reserves than what can be burned for our planet to maintain a reasonable chance of limiting global warming to below 2°C. We found that Norwegian citizens own potential GHG emissions corresponding to 108 times Norway's annual emissions from ownership in these 147 companies alone.

Considering that the GPFG is solely based on income from petroleum activities and is heavily invested in fossil energy companies, many would make the logical assumption that the fund would financially hedge its investments in a manner which provides for a rather high exposure to renewable energy. But this is not the case. In fact, the GPFG is only marginally committed to investments in renewable energy. Its exposure to companies with renewable energy-related activities is defined through a weighted stock-index largely based on the FTSE All-World Index.

In practical terms, as pointed out by a report by the consultancy company Mercer, the GPFG is positioned for a future in which the challenge of climate change virtually does not exist. From a climatic viewpoint, this implies that the GPFG is part of the problem, not the solution. This can change if there is political will to do so, however.

In September 2013, WWF, together with the most prominent pension funds in Norway – KLP and Storebrand – submitted a recommendation letter to the new Norwegian government, proposing that the GPFG be given a mandate to invest directly in infrastructure, including renewable energy. As this would technically be a new asset class for the fund, it needs to be politically adopted in parliament.

In response, the Norwegian government recently adopted a marginal increase in its investments in so-called environmentally-related companies, which include renewable energy and energy efficiency. Sound good? Well, yes in theory. But in practice, no! Beware of investors who claim to be progressive in their pursuit of investing in renewable energy. Because the devil, as always, is in the detail.

First of all, the mandate to increase investment in renewable energy represents only a fraction of the fund's total value. Secondly, the mandate provides for increased

THE NORWEGIAN  
GOVERNMENT NEEDS A  
REALITY CHECK AND A  
LONG, HARD LOOK AT WHAT  
OTHER FUNDS AROUND  
THE WORLD ARE DOING.  
ON THIS BASIS IT SHOULD  
BENCHMARK ITS POLICIES  
FOR THE GPFG, AND BE A  
TRULY GLOBAL LEADER IN  
SUSTAINABLE FINANCE

investment in companies listed on the global stock markets. But, in reality there are relatively few pure renewable energy companies on the stock markets. For example, most utilities for electricity generation are diversified within coal, gas, nuclear and to a lesser extent renewables. Only a mandate to invest directly in infrastructure for renewable energy will ensure the fund is fulfilling its promise to increase its exposure to wind, solar, bioenergy and other forms of clean energy generation and related distribution.

WWF's position is that the GPFG must continue to choose the more environmentally progressive companies on the world stock markets. This will send effective market signals that investments in such companies are financially desirable. Parallel to this, the fund must create a concrete plan for divestment from fossil energy companies, and a plan for active engagement in companies that currently also have a minor fossil energy exposure, but which hold the potential to become clean energy companies in the future. For the fund to be exposed to renewable energy, it needs to expand its investment universe. Many other funds do this already. For example, PensionDanmark invests more than 5 per cent of its value in infrastructure for renewable energy.

The Norwegian government needs a reality check and a long, hard look at what other funds around the world are doing. On this basis it should benchmark its policies for the GPFG, and be a truly global leader in sustainable finance. Considering the GPFG's long-term orientation, and the country's financial capabilities, Norway is probably the best positioned investor to do this.

# SHIFTING MINDS FOR A NEW REALITY

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**Santiago Lorenzo**

WWF Global Climate and Energy Initiative, Green Finance

Throughout the 20th century, the economic paradigm of the Latin American and Caribbean (LAC) region was mostly based on one pillar: fossil fuels. During this time, based on their different resources, each country in the LAC region chose different ways and means to achieve economic independence and further development. Countries well endowed with fossil fuels were the envy of those with other commodities like fruit, cattle and cereals, because oil and gas were in increasing demand everywhere, under any circumstance.

Fossil fuels were at the core of development even for economies that had to import them, despite often creating an unsustainable burden on government budgets. Exploration to find more fossil fuels has been tireless. In the 20th century, the age of black gold came to the new world, capturing the imagination of every single person.

In economic terms, having fossil fuel resources had limited benefits for some economies and sectors of the population, but also created enclave-type economies based on oil and gas. Fossil fuel extraction has undoubtedly generated additional income for some governments, but wealth has not been widely spread. Dispute over these resources has also caused some international and local conflicts and rentier behaviour among local oligarchy. Furthermore, oil and gas production has had various negative impacts on the environment.<sup>1</sup>

The LAC region's short-term development perspective based on fossil fuels has negatively affected its potential entrepreneurship. Private and public sectors in the region are not early movers for economic opportunities. As followers, they are missing chances to take advantage of the new reality, where maintaining a fossil fuel-based economic paradigm only leads to economic, social and environmental peril.

LAC countries have vast renewable energy resources. These could supply 2050 electricity demand (expected to nearly triple to about 3,500 TWh<sup>2</sup>) more than 20 times over. Yet the region depends on fossil fuels to cover 40 per cent of its power generation.

Detaching from our 20th century energy fossil energy paradigm requires people to start thinking of renewables as the new – and only possible – global reality. Countries and regions that take the lead in developing available renewable energy sources will have first-mover advantage in one of the world's fastest growing sectors – reaping the economic growth that will flow from it.<sup>3</sup>

**FOSSIL FUEL EXTRACTION HAS UNDOUBTEDLY GENERATED ADDITIONAL INCOME FOR SOME GOVERNMENTS, BUT WEALTH HAS NOT BEEN WIDELY SPREAD**

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1 Pipelines, extraction sites and petrochemical plants – as well as frequent oil spills – have been conceived as natural costs for development in probably the most biodiversity rich continent in the world. Other externalities related to this energy paradigm have been particularly high in the region; high urban air pollution levels causing diseases are common in major cities.

2 Vergara, W., Alatorre C. and Alves L. June 2013. *Rethinking Our Energy Future: A White Paper on Renewable Energy for the 3GFLAC Regional Forum*. IDB, Washington DC, No. IDB-DP-292. [idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=3783672](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=3783672)

3 Ibid.

Renewables deliver more than just energy. Just some of the direct and indirect benefits of renewables include:

- They contribute to de-carbonization of regional economies by providing clean and reliable energy;
- They contribute to long-term energy security by diversifying the power supply and reducing the vulnerability of hydro-based power systems to unstable hydrological cycles;<sup>4</sup>
- The low operation and maintenance costs typically associated with renewables can allow redirection of budgetary resources to other development priorities;
- They create jobs;
- They reduce local health and environmental impacts of fossil fuel technologies;
- Non-hydro renewable electricity production can reduce power plant siting concerns;
- They represent a significant opportunity to attract new investment.<sup>5</sup>

**THE LAC REGION'S SHORT-TERM DEVELOPMENT PERSPECTIVE BASED ON FOSSIL FUELS HAS NEGATIVELY AFFECTED ITS POTENTIAL ENTREPRENEURSHIP**

By 2012, total renewable energy capacity in LAC countries had grown more than 230 per cent compared to 2006. In 2012 alone, more than 3 billion watts (GW) of new additional renewable capacity was brought online.<sup>6</sup> In that year, the region attracted over US\$16 billion in investments to the clean energy sector, representing some 6 per cent of total global investments in renewable energy.<sup>7</sup>

LAC economic output is projected to grow by about 3 per cent annually for the foreseeable future, supported by population growth and improvements in quality of life. This will require the region to nearly double its installed power capacity, to about 600 GW by 2030, at a cost close to US\$430 billion. This represents a challenge for the region's energy model, but also an opportunity to take a step forward toward real transformation. Today, the region has the opportunity to lead the transition to a new cleaner and more sustainable energy paradigm.

LAC countries have always looked for a sovereign path for development. Renewable energy gives the region a great chance to find it. Do LAC decision-makers realize this opportunity exists? They show glimpses of understanding, but the mirage of black gold is still attractive to them. In 2011, they allocated more than US\$20 billion to subsidize fossil energy in the region<sup>8</sup>, almost the same amount invested in renewables that year.

The reasons for the short-term thinking of our decision-makers include relatively short election periods, many powerful oil and gas sectors lobbyists and a historical cultural affinity to fossil fuels. None of these problems is unique to the region, and are seen in many countries around the world. But what can be done? It seems the answer lies with politicians.

**DETACHING FROM OUR 20TH CENTURY FOSSIL ENERGY PARADIGM REQUIRES PEOPLE TO START THINKING OF RENEWABLES AS THE NEW - AND ONLY POSSIBLE - GLOBAL REALITY**

4 LAC has high vulnerability to climate change that undoubtedly will change rain patterns and historical hydrological levels.

5 IDB (2013).

6 BNEF. 2013. *Multilateral Investment Fund: Climatescope 2013*. <https://www.bnef.com/InsightDownload/8692/pdf/>

7 Ibid.

8 IMF. 2013. *Energy Subsidy Reform: Lessons and Implications*. Washington DC. <https://www.imf.org/external/np/pp/eng/2013/012813.pdf>

**TODAY, LAC HAS THE  
OPPORTUNITY TO LEAD  
THE TRANSITION TO A  
NEW CLEAN AND MORE  
SUSTAINABLE ENERGY  
PARADIGM**

The technical arguments for acting decisively now are there. Every time scientists talk about climate change they provide more and more evidence of the dangers of letting the temperature rise beyond 2°C. Respected economists state that delaying action will increase the costs of addressing climate change.

The LAC region is highly vulnerable to climate change impacts.<sup>9</sup> Starting to act in line with wider global mitigation is crucial. Regional actions may not make a meaningful impact on abating GHG emissions in a volume that will keep temperature increases below 2°C. However, in economics, economies at scale help, and moving the region toward increasing use of renewable technologies will help other regions to demand renewable energy.

Our political class needs to agree climate policies as state policies beyond electoral cycles. Climate change is too serious to be used as a political hostage in parliamentary negotiations. Fossil fuels still have a role to play for many years to come, but the industry also needs to adapt for a future of clean energy. Politicians have to stop choosing to be (and letting their nations be) rewarded by this powerful industry and become statesmen and women not only for their countries but for the whole region. LAC countries have a promising future with renewable energy. Are its leaders prepared to make the right decisions?

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9 World Bank. 2012. *Climate Change: Is Latin America prepared for temperatures to rise 4 degrees?* <http://www.worldbank.org/en/news/feature/2012/11/19/climate-change-4-degrees-latin-america-preparation>. "Responsible for only a fraction (12.5 per cent) of the world's global emissions, Latin America could be one of the regions most affected if temperatures were to rise."

# TOUGH TIMES AHEAD

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**Dr. Stephan Singer**

WWF Global Climate and  
Energy Initiative, Renewable  
Energy at Scale

**RENEWABLES WILL TAKE  
- AND NEED TO TAKE - THE  
LION'S AND EVENTUALLY  
THE FULL SHARE OF  
GLOBAL ENERGY MARKET  
WITHIN THE NEXT  
FEW DECADES**

Let's assume we all want clean renewable energy. Great! Let's also assume the economic costs of renewables are decreasing further, and renewables are becoming cheaper every day. And not just cheaper over their lifecycle, which many renewables already are, but that the initial investment cost for wind, solar or any other clean renewable source is lower than that for coal, nuclear and other incumbent fuels. Then take into account the additional social benefits of low and zero emissions, waste and pollutants.

Will all this mean a massive breakthrough for renewables, and the mothballing of incumbent fossil fuel infrastructure, as mature technology development and economics might dictate? In an ideal world... yes.

But we are not living in an ideal world. If you step on other folks' turf, they might tolerate it if it's just a small, reversible step. But they will fight you if you claim their territory. We must be aware of and prepare for the big struggle we face from fossil fuel extraction companies if we go for 40 per cent, 60 per cent or even 100 per cent renewables. This is no niche market anymore. Renewables will take – and need to take – the lion's and eventually the full share of the global energy market within the next few decades. And we need to leave more than two-thirds of all existing fossil fuel reserves – plus reserves that become available in the future as uneconomic fossil fuel resources become economically viable – in their holes if we want to have a decent chance of keeping global warming below 2°C.

Fossil fuel extraction companies have more to lose than just a few millions here and there, or a slight decline in their share values. Renewables hit at the heart of their operations and business model. Almost all of them are only fossil fuel companies. Negligible or no renewable energy investments. No other activity. Drill, baby, drill. Or these days, frack, baby, frack. In the past it has worked well for them – more exploration, more sales, more profits, higher shareholder returns leading to more exploration, more sales and so on...

Oil and gas companies alone increased their fossil fuel exploration investments from about US\$250 billion in 2000 to close to US\$700 billion in 2013. And they need to protect these investments – this makes logical economic sense. But does ploughing this extra money into exploiting conventional fuels in increasingly remote and risky areas not eat away at their profits? Not at all. Global oil prices have tripled since 2000. Digging in these once impossible-to-reach places is very profitable.

Indeed, the joint profits of the five largest private oil companies – Exxon, Chevron, BP, Shell and Conoco – rose from US\$77 billion in 2010 to US\$137 billion in 2011, US\$118 billion in 2012 and US\$93 billion in 2013.

And as a good friend from the financial sector told me recently: “Most CEOs and board members of these companies get additional annual bonuses and benefits when

they show their shareholders at year end that the company increased its fossil fuel assets and reserve base.”

**SOUND ECONOMICS AND  
MATURE RENEWABLES  
TECHNOLOGY WILL NOT DO  
THE TRICK ALONE. FOSSIL  
FUEL DIVESTMENTS FROM  
THE FINANCIAL SECTOR  
WILL ONLY HAPPEN IF  
PROFITS DECLINE**

With such a lot of money at stake, fossil fuel extraction companies have to resist the move to renewables with all their might, through advocacy, policy approach, corruption and counter-propaganda. And as they are (hopefully) big taxpayers, governments listen to these cash cows for the benefit of their national budgets. We have to counter that by empowering national governments and influencing international action. Sound economics and mature renewables technology will not do the trick alone. Fossil fuel divestments from the financial sector will only happen if profits decline. Unfortunately, equity for new exploration is cheap, as we see presently with the shale boom in the US. Making renewables dominant requires a massive power struggle with the profiteers of fossil fuels, who are getting richer and richer by frying the planet. This will not be easy. But we need to be prepared to question their entire business model – and so do governments that say they take climate change seriously.

# IN SEARCH FOR REAL FREEDOM

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**Tabaré A Currás**

WWF Global Climate and  
Energy Initiative, Renewable  
Energy at Scale

**“For to be free is not merely to cast off one’s chains, but to live in a way that respects and enhances the freedom of others”**

Melson Mandela

Our commitments on climate change mitigation have never been more significant. Climate change is one of the biggest environmental threats of all time, and a major danger to sustainable development. The responsibilities we assume now to deal with it and break its drivers will without doubt shape global freedom in the decades to come; to a large extent, they will define levels of human dignity and equality in the future.

Real freedom can be defined as humanity’s right and ability to build a sustainable future – one in which people can live in harmony with nature. This is a universal vision that must be incorporated into everyone’s life and that everybody should be entitled to pursue in earnest.

Climate change puts it under serious threat. The increase in global mean temperature and the subsequent changes in the climate system pose all kinds of dangers to economic, social, cultural and humanitarian liberties. We risk death, injury and disrupted livelihoods; food insecurity; severe harm to both large urban populations and rural communities; infrastructure breakdown; and loss of ecosystems and the services they provide. Overall, climate change endangers the possibility of a more peaceful, prosperous and just world in the future.

However, such disaster can be avoided, if we act now, envisioning global progress being powered by nature and truly exploiting existing opportunities to make a renewable economy a reality.

Now is the time to stop burning dirty coal, oil and gas and ensure a decent future for our own kind. Fossil fuels are the main contributor to the increase in atmospheric CO<sub>2</sub> concentrations, and a prime driver of climate change. We cannot keep compromising future generations’ opportunities to live in real freedom. Now is the time to abandon the dirty highway we are on, leading to a future of environmental and human devastation, and embrace a cleaner and safer path for our and the next generation’s wellbeing.

**THE DUTIES AND  
RESPONSIBILITIES WE  
ASSUME NOW TO DEAL  
WITH CLIMATE CHANGE  
WILL DEFINE OUR LEVEL  
OF HUMAN DIGNITY AND  
EQUALITY IN THE FUTURE**

WWF’s *Energy Report* shows that renewable energy has the potential to meet the world’s energy demand entirely, while co-existing with sustainable development. It shows that high shares of electricity being supplied by renewable sources means we do not have to depend on declining fossil fuels, if energy efficiency is maximized and there are reductions in global energy consumption and demand for energy services. Overall, the report shows that a cleaner path is achievable, based on currently available technologies and favourable long-term economics.

Advancing the global economy toward large-scale, clean and reliable energy provision and access over the next decades will determine our success in achieving real climate safety at low cost. Ensuring the transition to a fully renewable energy system while achieving substantial GHG emissions reductions at the pace needed presents significant challenges that only collective commitment and accountability will overcome.

Climate change is a global problem, and as such, it demands global efforts to come up with solutions. Without explicit global cooperation and determination to achieve reductions, GHG concentrations will keep rising and containment of the worst climate change impacts will be impossible. We will all be affected, so we all need to work together to cut emissions.

**REAL FREEDOM IS THE RIGHT AND ABILITY OF HUMANITY TO BUILD A SUSTAINABLE FUTURE, ONE IN WHICH IT CAN LIVE IN HARMONY WITH NATURE**

Collectively, we must start believing in clean energy as our new normal. We must promote and develop existing and new renewable energy sources in an ecologically and socially respectful manner, to provide enough sustainable energy for all.

Collectively, we must end the energy poverty about 3 billion people on Earth live in. We must provide clean and reliable electricity access to everyone, while fostering sustainable energy use and conservation practices.

Collectively, we must invest in decarbonizing the energy sector; in keeping energy demand reductions at an ambitious pace by developing and using cleaner and more energy efficient products and buildings; and in switching to renewables to provide sustainable heat and electricity. Collectively, we must foster the adoption of policies that encourage such investments; and together, we must stop financial reward for environmental and human harm and divest and stop subsidizing conventional energy.

Collectively, we must stop food waste. We must choose food that is sourced in an efficient and sustainable way to free up land for nature and sustainable forestry and bioenergy production. Together, we need to eat less meat, so everyone has an equal right to healthy levels of protein in their diet.

Collectively, we must reduce, reuse and recycle to minimize waste and save energy. We must develop durable materials and avoid unnecessary consumption of unnecessary things.

Collectively, we must encourage greater use of public transport, and reduce the distances we and our goods travel. We must promote electrification wherever possible, and support research into clean fuels for shipping and aviation.

Collectively, we must develop national, bilateral and multilateral action plans to promote research and development in energy efficiency and renewable energy.

**NOW IS THE TIME TO STOP BURNING DIRTY COAL, OIL AND GAS AND ENSURE A DECENT FUTURE FOR OUR OWN KIND**

Collectively, every decision we make must be framed within the context of sustainability. We must ensure at all times that our wellbeing is compatible with global environmental and development goals.

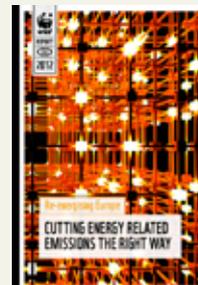
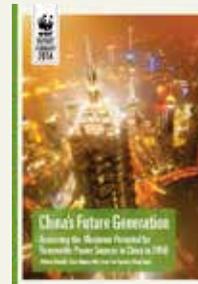
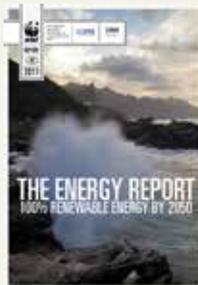
Collectively, we must act on climate change and ambitiously pursue climate and energy agreements, to provide global guidance and promote global cooperation on renewable energy and efficiency efforts.

Large-scale renewable energy and energy efficiency are both preconditions to limit global warming to no more than 1.5°C and to avoid unbearable risks and losses. A world fully powered by nature's energy is worth achieving, and is possible if we encourage people to change their perceptions and make greener choices now.

**CLIMATE CHANGE IS A  
GLOBAL PROBLEM, AND AS  
SUCH, IT DEMANDS GLOBAL  
EFFORTS TO COME UP  
WITH SOLUTIONS**

WWF believes 100 per cent renewable energy is possible, if we strive for a new energy paradigm today to contain the impacts of climate change. Renewable energy and energy efficiency are essential if we want to improve social and environmental wellbeing, live in a way that respects the future, and realize real freedom in harmony with nature.

# FURTHER READING



# THE WWF NETWORK\*

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## WWF Offices

Armenia	Guyana	Solomon Islands
Azerbaijan	Honduras	South Africa
Australia	Hong Kong	Spain
Austria	Hungary	Suriname
Belgium	India	Sweden
Belize	Indonesia	Switzerland
Bhutan	Italy	Tanzania
Bolivia	Japan	Thailand
Brazil	Kenya	Tunisia
Bulgaria	Laos	Turkey
Cambodia	Madagascar	Uganda
Cameroon	Malaysia	United Arab Emirates
Canada	Mauritania	United Kingdom
Central African Republic	Mexico	United States of America
Chile	Mongolia	Vietnam
China	Mozambique	Zambia
Colombia	Namibia	Zimbabwe
Cuba	Nepal	
D.R. of Congo	Netherlands	<b>WWF Associates</b>
Denmark	New Zealand	Fundación Vida Silvestre (Argentina)
Ecuador	Norway	Pasaules Dabas Fonds (Latvia)
Finland	Pakistan	Nigerian Conservation Foundation (Nigeria)
Fiji	Panama	
France	Papua New Guinea	
French Guyana	Paraguay	
Gabon	Peru	*As at January 2014
Gambia	Philippines	
Georgia	Poland	
Germany	Romania	
Ghana	Russia	
Greece	Senegal	
Guatemala	Singapore	

# Seize Your Power

## ENERGY EFFICIENCY IS A KEY

Energy efficiency is a key requisite to meeting global future energy needs from sustainable renewable sources.

## ABUNDANT RENEWABLE ENERGY RESOURCES

Total technical renewable energy potential can exceed 100 times present global energy consumption.



## RENEWABLE ENERGY CREATES JOBS

More than 5.7 million people worldwide work directly or indirectly in the renewable energy industry.

## RENEWABLE ENERGY REDUCES CO<sub>2</sub> EMISSIONS

Quadrupling current renewable energy consumption by 2035 could avoid up to 23% of the CO<sub>2</sub> emissions abatement needed to be on track with the 2°C target.

100%  
RECYCLED



### 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.

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