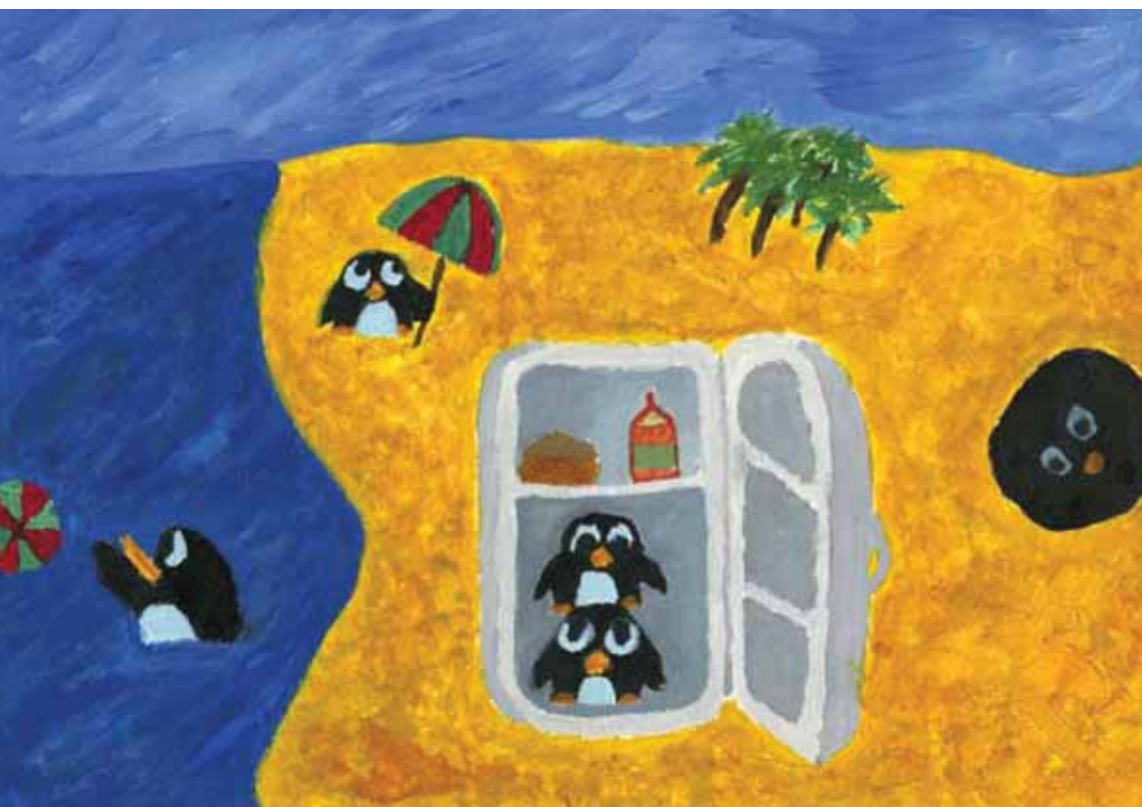




for a living planet®



The NEW climate deal



A pocket guide

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Climate and the economic crisis

*"This is the generation that must stop the spread of the pollution
that is slowly killing our planet...
Rolling back the tide of a warming planet
is a responsibility that we have to ourselves,
to our children, and all of those who
will inherit creation long after we are gone."*

Barack Obama, Strasbourg, April 2009

The year **2009** will be remembered
as the year of the financial crisis, right?

Wrong, we hope.

2009 needs to be remembered as the year **the world**
found an answer to climate change,
the year it found **the political will to meet the challenge** and
found hope and opportunity in doing so.

For out of crisis comes opportunity. And out of the twin perils of
financial and climatic crises comes **the opportunity to bring the**
global economy back in line with global ecology;
to put the future development of the world economy – **for ALL its**
citizens – on a sustainable foundation.

*THAT is the challenge and
opportunity of 2009.*

"The financial crisis is a result of our living beyond our financial means. The climate crisis is a result of our living beyond our planet's means."

Yvo de Boer,
Executive Secretary of the
United Nations Climate Convention

The world's financial and climate crises have a common cause: living beyond our means. The world is running up **huge ecological debts**, just as it has run up huge financial debts. Neither is sustainable. Our leaders cannot successfully put capitalism back together again without at the same time fixing the **greatest single consequence of unsustainability – climate change**.

The links between finance and climate are not always obvious because of the way the world's economy is accounted. **Nature, our most fundamental capital asset, does not appear on company balance sheets or in most national economic data**. So its depreciation goes unnoticed. Nobody is called to account for the fact that we are spending our natural capital like there is no tomorrow.

When the financial system crashed, some countries bailed it out by printing money. When the planet's life support systems are trashed, **no such solution is available. We CANNOT make another planet.**

By filling the atmosphere with the gases that cause climate change we are undermining the planet's basic life support system. As the former World Bank chief economist, Lord Stern, argued in his influential report on the economics of climate change in 2006, **the failure to put a price on those emissions is "the greatest market failure the world has seen"**.

But fixing that failure is a great enterprise. Our economic system – our civilization – is only possible if the basic resources of the atmosphere, oceans, forests and soils, and fundamental processes like the climate system and its carbon and hydrological cycles, remain intact. **To make economics and ecology into enemies is to doom both. But to reconcile them is to open up the possibility of a richer, more sustainable, more profitable and fairer world.**

Yet, while **politicians** have spent recent months throwing trillions of dollars at a solution to the financial crisis, they **have yet to truly address** the still more serious crisis of **a crashing climate system**. The chance to make good that mistake comes in Copenhagen in December this year, when the world comes together with the intention of setting rules for controlling the gases that are creating that crisis and deciding how to **deal with the unavoidable impacts of climate change**.

Unless that failure is put right at the United Nations Copenhagen Climate Conference, **2009 will come to be seen as the year of one of the greatest political failures the world has ever seen.**

Crisis and opportunity

Nobody should underestimate the task faced by **climate negotiators this year, nor its urgency**. Climate change is **already contributing** to severe droughts, floods and hurricanes, and spreading diseases such as malaria and dengue fever. It is damaging critical ecosystems including the **Great Barrier Reef**, the **Amazon** rainforest and the **Arctic**. Scientists say the heat wave in Europe in 2003, which killed 30,000 people, could not have happened without global warming.

The world is on course to see **entire island nations disappear** as sea levels rise. In addition to the almost 1 billion food-insecure people, many more in developing countries will face food insecurity if deserts spread, if the Asian monsoon system is substantively changed, or if the freshwater supply from melting mountain glaciers such as those in the Himalayas becomes increasingly erratic. The UN's authorized climate institution, the Intergovernmental Panel on Climate Change (IPCC), calculates that unchecked climate change will **cut global food production** by up to **40 per cent** by 2100.

Worse still, the planet may be close to **"tipping points"** – with entire ecosystems "flipping" into a new state – beyond which the planet will be transformed in ways we will not be able to put right. These tipping points will "catapult" the global climate into a new and more fragile state, and **destabilize** the **polar ice sheets** in Greenland and the Antarctic, causing a sea-level rise of many metres. A warmer climate may also unleash **billions of tonnes of planet-warming methane** from **melting permafrost**, and CO₂ from forests increasingly exposed to droughts, insect damage and fires, all of which could cause runaway climate change. And eventually the **ocean circulation system** could be **switched off**.



People, culture and ecosystems have a right to survive. That means
THE WORLD HAS A DUTY TO ACT

To **prevent such disasters**, scientists say we should keep global warming well **below 2°C**. To ensure that, we must **cut emissions** of the gases that cause climate change by **at least 80 per cent** by 2050 compared to 1990 levels.

That is within the **LIFETIMES**
of power plants being designed and built today.

Unfortunately, all countries are building **new coal-fired power stations**. But there is a key difference between **China, India** and **developing nations** on the one side and **the rich nations** on the other: the former still have much lower per capita emissions and much less wealth whereas the latter have been polluting the atmosphere for decades. The real problem lies with **rich countries** such as the United States of America and Germany, who **stick with coal-power** projects **when they have** many **other options**.

The **SWITCH TO LOW CARBON** needs to come; there can be **NO DELAY**.



The good news is...
WE CAN DO IT



We have the technology, and it won't wreck the world's economies. In fact, green energy technologies are the key not just to stabilizing the climate but also to a future that uses its diminishing natural resources more efficiently and sustainably.

We have globalized the world's economic system.
Now **we HAVE to globalize environmental management** to protect the planet's life support system.

Fixing climate is the **key** to a sustainable future.

There is
NO TIME TO SPARE.

Analysis by universities, research organizations and non-governmental organizations like **WWF** shows that we have to **START immediately** if we are to have a chance of building the new industries in time.

A green world is **NOT A NIRVANA** for some distant future. It has to be **BEGUN HERE AND NOW.**

WWF says there are **six key tasks** that have to be agreed upon at the Copenhagen meeting:

- Rich countries, as a group, should set **strong binding emissions reduction targets** of 40 per cent below 1990 levels by 2020. Most of those reductions should be undertaken domestically.
- **Funds and technology cooperation** must be established to support the implementation of **low-carbon economies in the developing world**.
- With the appropriate needs-based support, developing countries should **commit to emissions 30 per cent lower** by 2020 than those they are currently projecting.
- Actions by developing countries should include the **halting of forest destruction** and its concomitant emissions.
- **Rich nations need to leverage support** to help the most vulnerable countries, communities and ecosystems, which are hardest hit by climate change, and finance their **adaptation** work.
- **All countries** need to agree that **global** greenhouse gas emissions must be at least **80 per cent below 1990 levels** by 2050.

Agreement on these targets will ensure a **peak in global emissions** of greenhouse gases **within the next decade and a rapid decline thereafter** – a precondition for fending off dangerous climate change.

Some would define the task as “expensive”. Indeed, it will require **trust** between nations as serious cuts in emissions of greenhouse gases are **pledged**, along with large flows of **money and technologies** from rich to poor nations.

BUT IT IS ESSENTIAL.

It will be based on the **polluter-pays principle**, on the historically high emissions of developed nations and on the capacity of the rich nations to help the poor. **And we will all benefit from this North/South “burden sharing”.**

After almost **two decades of procrastination** since **the science became clear**, **Copenhagen represents A LAST CHANCE** for the world to summon

the political will to make it happen.

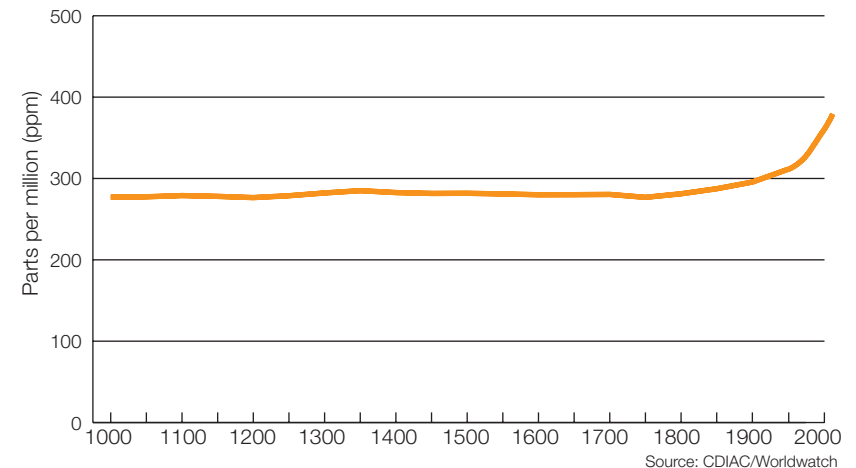
TIMELINE: years of world climate

1865: John Tyndall postulated that gases such as water vapour and CO₂ in the **“atmospheric envelope”** retain the heat.

1896: Svante Arrhenius predicted that **increases of atmospheric CO₂** from burning fossil fuels would lead to **global warming; a doubling of atmospheric CO₂ could cause global average temperature to rise by 5°C**. The predictions of this Nobel Prize laureate (1903) went unnoticed for more than half a century.

1958: First continuous **monitoring** reveals **rapidly rising CO₂ levels** in the atmosphere.

Atmospheric concentrations of carbon dioxide, 1000–2005



1970s: Beginning of period of atmospheric warming known as **“global warming”**.

1988: UN establishes the **Intergovernmental Panel on Climate Change** (IPCC) to assess the science of climate change.

1990: IPCC's **First Assessment** is published. The year is subsequently established as the **baseline year** for future emissions targets.

1992: Earth Summit meets in Rio de Janeiro. Governments agree on the **UN Framework Convention on Climate Change** (UNFCCC), which commits them to preventing “dangerous climate change”.

1995: After a fierce debate, in particular with OPEC nations, the IPCC Second Assessment establishes the strong **link between human-induced greenhouse gases and climate change**, saying that “the balance of evidence suggests....” that **global warming is caused by mankind**.

1997: Kyoto Protocol is agreed under UNFCCC. It includes the first **emissions reduction targets** for industrialized countries, covering 2008-2012; all major nations sign up.

1998: Warmest year in warmest decade in warmest century for at least a **thousand years**.

2001: Nations agree on methodological and other details of the Kyoto Protocol in Marrakech. The **USA** and **Australia refuse** to ratify the protocol.

2003: European heat wave, which kills more than 30,000 people. Scientists later conclude it is the first extreme weather event definitely attributable to human-induced climate change. **Scientists report a third of the world afflicted by droughts**, double the figure for the 1970s.

2005: Drought temporarily turns **Amazon** rainforest from a **carbon sink to a carbon source**.

2007: Massive summer ice loss in the Arctic brings fears of an ice-free north; IPCC Fourth Assessment warns of **faster and irreversible climate change**; Bali Climate Conference lays out timetable for agreeing successor to Kyoto Protocol.

2008: Poznan Climate Conference in Poland; **slow progress** on negotiations as many wait for the new Obama administration in the USA to declare its hand.

2009: Make or break year for the climate, with negotiations continuing for a **Copenhagen Protocol** set to conclude in December.

Copenhagen people



“The financial crisis is a result of our living beyond our financial means. The climate crisis is a result of our living beyond our planet’s means.” **Yvo de Boer, the UN’s top climate official**, widely revered for his good humour, devotion to duty and diplomatic skills.



“South Africa, joined by many of our partners in the developing world, [is] committed to doing much more to combat climate change. We stand ready to contribute our fair share towards our common responsibility for the future.” **Marthinus Van Schalkwyk, Minister of Environmental Affairs and Tourism, Republic of South Africa**, Cape Town, 2008.



“We do not doubt the science, we do not doubt the urgency, and we do not doubt the enormity of the challenge before us. The facts on the ground are outstripping the worst-case scenarios. The cost of inaction – or inadequate actions – is unacceptable.” **Todd Stern, US climate change envoy**, announcing an end to the Bush years of climate obduracy, Bonn, April 2009.



“China hasn’t reached the stage where we can reduce overall emissions, but we can reduce carbon intensity.” **Su Wei, Chinese climate negotiator**, April 2009, as China repositioned itself following US overtures on climate.



“The financial crisis has shown that the global sense of urgency can bring about unmatched political will and cooperation. The magnitude of the climate challenge calls for commitment of the same magnitude. History will judge us on our collective achievements.” **Connie Hedegaard, Danish Minister for Climate and Energy**, who will chair the Copenhagen negotiations.

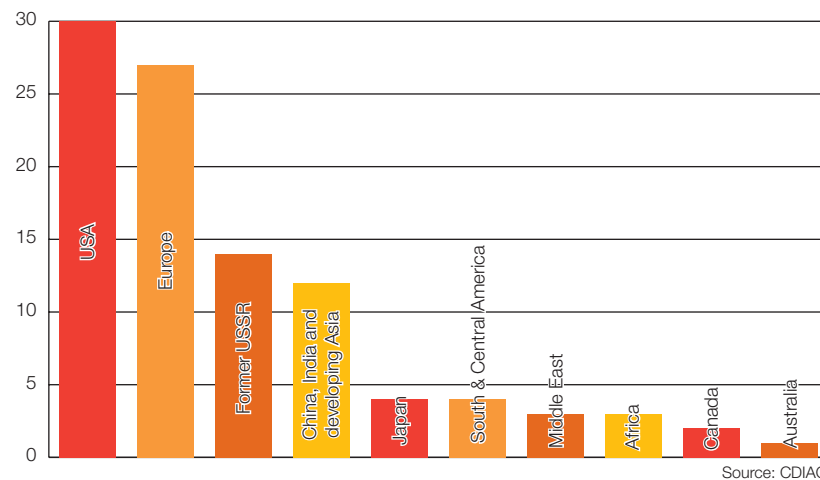
The science... in a nutshell

We know **greenhouse gases** such as CO₂ warm the air by trapping heat radiating from the Earth's surface. That is 100-year-old science. The first calculations that doubling CO₂ in the atmosphere would raise temperatures by 2-6°C were done over a century ago by Swedish chemist Svante Arrhenius. Today's climate models broadly agree.

We know the **world is warming**, on average by 0.74°C during the past century, with most of that since 1970.

Human-made CO₂ is responsible for the vast majority of the warming. Concentrations of CO₂ in the atmosphere are now almost 40 per cent above those of 200 years ago and emissions to the atmosphere have been rising by more than 2 per cent a year since 2000. This extra greenhouse gas stems overwhelmingly from humans burning fossil fuels and destroying forests, both of which are made of carbon. It would contradict 100 years of physics if this CO₂ were not warming the planet.

Historic carbon emissions from fossil fuel burning, 1900–1999
(% of total)



Moreover, **there is no alternative explanation** for the observed warming. Solar cycles have contributed on average less than 10 per cent in the past decades whereas volcanic eruptions and other known natural influences on global climate have been having a cooling influence since 1970 – the period of greatest overall warming and of the largest increase in atmospheric CO₂ and other greenhouse gas levels.

The prognosis

The **IPCC** has reported regularly on climate change science for 20 years. Its last report was **“unequivocal”** that **climate change is with us, and is set to get drastically worse unless we take urgent action.**

Nature, through both oceans and forests, currently absorbs about half the CO₂ we put into the air. The rest of it stays in the atmosphere for centuries. However, the amount of carbon soaked up by natural ecosystems is declining steadily. So **stabilizing emissions is not enough.** Every tonne of CO₂ we emit makes things worse. To stabilize temperatures at a sufficiently low level, **we have to stop emitting as fast as we can.**

WHAT IF WE DON'T?

“Business-as-usual” looks bad for business – and just as bad for people and nature. Global temperatures will continue to rise – by at least 2-4.5°C by late this century. Warming will be greatest on land, especially continental interiors, and in the polar regions.

As a result of warming, with more heat energy and water vapour in the atmosphere, **climate and weather of all kinds will become more extreme.** Storms, including hurricanes, may become more intense and more frequent. Wet areas will generally become wetter and dry areas drier. Droughts, which are already more frequent, will get longer and more intense, and extend to new areas – including the Mediterranean, Middle East, Central Asia and southern Africa, which can all expect substantially less rain.

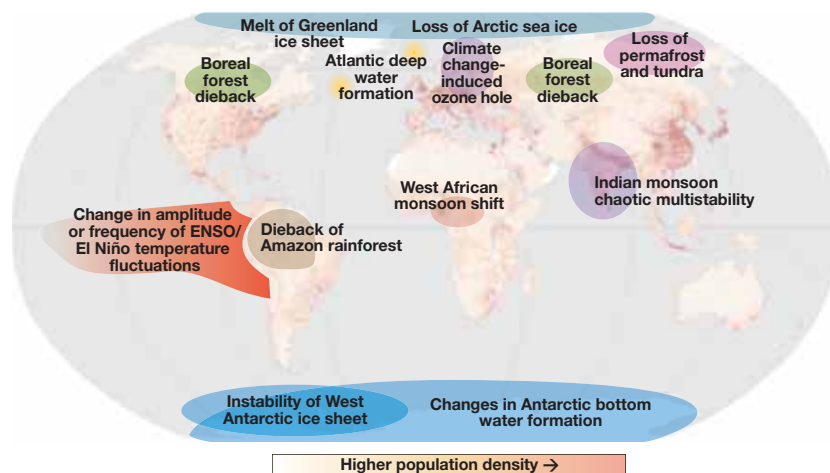
Melting glaciers and ice sheets on land will raise sea levels. According to analyses published since the IPCC's Fourth Assessment, we can expect more than a 1-metre sea-level rise by 2100, enough to displace at least 100 million people in Asia, mostly in eastern China, Bangladesh and Vietnam; 14 million people in Europe; and 8 million each in Africa and South America. However, sea-level rise will not stop in 2100.

All that could be just the start...

“There are tipping points in the climate system, which we are very close to, and if we pass them, the dynamics of the system take over and carry you to very large changes which are out of your control.” **James Hansen, NASA, June 2008**

POSSIBLE tipping points include:

- **Physical break-up of land-bound Greenland and/or West Antarctic ice sheets.** These sheets are 3 kilometres thick and cover more than 2 million square kilometres each. Melting either would raise sea levels by 6 or more metres. Some climate models say 1.7°C of warming could trigger an unstoppable disintegration of the Greenland ice sheet.
- **Die-back of the Amazon rainforest** – from heat, drought and fires. This would release CO₂ and warm the planet further, possibly destabilizing other forests, causing more warming, as well as meaning we lose one of the planet's most important carbon sinks and unique sources of biodiversity.
- Release of billions of tonnes of **methane** gas trapped in permafrost. Methane is a greenhouse gas, so this would add to warming. Researchers have implicated methane releases as triggering sudden global warming episodes in the past.
- **Breakdown of ocean circulation system**, causing major climate changes including a radically cooling Europe and possible failure of the Asian monsoon. The monsoon's regular and predictable onset is crucial for water supplies and food production in most of Asia, the world's most populous continent.



Source: Based on Lenton/National Academy of Sciences

SCIENCE FICTION? We **KNOW** that past natural change in climate often happened abruptly. For instance, much of the warming at the end of the last ice age 10,000 years ago happened within a few decades.

The current risks of runaway change are not yet fully quantified by scientists. But **they are real**. One recent study put the chances of a breakdown in the ocean circulation this century at perhaps as high as one in three. In any event, the uncertainty is a cause for concern rather than complacency. It underlines the need for **frequent scientific reviews** to make sure climate negotiators know the latest science.

CARBON BUDGETS...

how to keep below 2°C

Despite the uncertainties, there is a growing consensus that **preventing dangerous and irreversible climate change requires keeping as far below 2°C of global warming** compared to pre-industrial levels as possible. This may not sound a lot, but it would leave the world warmer than at any point for probably a million years.

Going in the other direction, only about 6°C separates today from the depths of the **last ice age**, when most of Europe and North America were covered in a thick sheet of ice and **sea level** was some **tens of metres lower**.

To stabilize temperatures, we have to stabilize atmospheric concentrations of CO₂ and other heat-trapping greenhouse gases manufactured by humans. For convenience, scientists lump these gases together into a single figure known as "CO₂ equivalent". The **current CO₂ concentration is 386 parts per million (ppm)**. With the other gases, it is the CO₂ equivalent of about **462 ppm and rising**.

To ensure long-term climate stability, with temperature rise limited to less than 2°C above the pre-industrial average, requires eventually **returning concentrations to the CO₂ equivalent of 400 ppm** and ultimately to pre-industrial concentrations.

BUT IS THAT POSSIBLE?



Yes... it is!

IN THE LONG RUN, oceans and forests will absorb more of the CO₂ we put in the air. And **we have a few decades to act**, as there is a time-lag between emissions and rising temperatures and because, for now, we are being protected from some of the warming by a thin veil of pollutants from smoke and other non-greenhouse emissions that reduces the sun's intensity. We can probably only afford to put about **another 1,000 billion tonnes of CO₂, or 1,400 billion tonnes of CO₂ equivalent**, into the atmosphere between the years **2000 and 2050**.



That is only around 20 years' worth at current emissions rates from burning fossil fuels, deforestation and changing land use. And **more than one third** of this "carbon budget" **has been emitted between the year 2000 and today**. In addition to the substantive reduction in greenhouse gas emissions, we need to embark forcefully on taking CO₂ out of the atmosphere.

This will require not only massive re- and afforestation, but also carbon capture and storage technologies with sustainably grown bioenergies replacing fossil fuels, and new technologies to reduce atmospheric CO₂ concentrations. As the IPCC has noted, **low-carbon pathways require** a world that **by mid-century** has been turned into a **carbon sink**. Reducing emissions is not enough anymore – we need to prepare to go further.

*We are sailing very close to the edge.
There is little margin for error.*

NATURE'S SINKS AND SOURCES

About half of CO₂ emissions from human activity are swiftly absorbed by the two major natural reservoirs of carbon on the planet's surface: **forests and oceans**. This is lucky. The world would be a lot warmer without this free service from nature. So preserving these "carbon sinks" is vital to slowing the pace of climate change.

But we are failing to protect these natural reservoirs. Instead we are destroying them. And as we destroy forests, for instance, the carbon that they have been storing pours into the atmosphere. Instead of being **carbon sinks** they **become carbon sources**. Today, deforestation is contributing about one fifth of all greenhouse gas emissions.

While surviving forests continue to soak up CO₂, deforestation is turning the world's forests from an overall sink to an overall source. That is why **STOPPING deforestation** is so important for protecting the climate.

A further big danger is that, even if we halt deforestation, under continued climate change many forests will succumb to global warming and release their carbon into the air, accelerating warming. During a drought in 2005, many trees died or stopped growing – and became a **carbon SOURCE**. That year, the **Amazon rainforest emitted 5 billion tonnes of CO₂**, equivalent to the annual CO₂ emissions of Europe and Japan combined.

Some oceans may also be **losing their ability to absorb CO₂** as they warm. The Southern Ocean around Antarctica, previously one of the planet's largest natural carbon sinks, has been **absorbing less carbon** in the past 25 years. Nobody is quite sure why, but it is probably a combination of several factors, including limited absorption capacity due to rapidly rising emissions, enhanced gassing-out of CO₂ from warmer waters, and warmer surface waters inhibiting the growth of algae which take up most of the excess atmospheric CO₂.

"I am concerned that if the temperature keeps increasing, we won't have any living coral to take tourists to see."

Carlton Young Junior, dive master and tour operator, Belize



THE DEAL

A brief guide to the KYOTO PROTOCOL

The Kyoto Protocol was agreed by 184 governments in the ancient Japanese city of that name in **December 1997**. It came into legal force in 2005, requiring **37 industrialized countries to reduce their emissions by an average of 5 per cent below 1990 levels** during the period 2008 to 2012.

The protocol was an **historic “first step”** to controlling greenhouse gases, providing a basic framework around action to combat climate change. It has led many industrialized countries to put in place the **institutions and policies needed** to achieve emissions cuts, and some countries and regions are actually beginning to reduce their emissions. But its impact on the rising trend in global emissions has been very small, and some of its mechanisms are questionable.

Countries can achieve their targets partly by investing in emissions-cutting projects in other countries. Presently, the biggest of these “flexibility mechanisms” is the **Clean Development Mechanism (CDM)**, which allows investors in emissions-saving projects in developing countries to offset the savings against their own emissions back home, or to **sell “carbon credits”** on the open markets to other polluters.

The CDM has so far registered more than a thousand projects, with another 4,000 in the pipeline. **These could eventually result in reductions in emissions greater** than the combined current emissions of Australia, Germany and the United Kingdom. Projects range from wind turbines in India to capturing and using methane from landfills in Brazil to geothermal plants in Central America.

But there has been concern that, while a few countries (China, India, Brazil and Mexico, in particular) have attracted the chief share of projects under this mechanism, the **least developed nations – particularly in Africa – have been left out**. There is also concern that too many projects deliver few real cuts in emissions. Reform of the design and areas of use of the CDM is widely seen as necessary to ensure that it really does deliver reductions in emissions.

Countries with Kyoto targets can also redistribute their emissions entitlements among themselves (as the European Union countries have done) or trade them. These trades are intended to make climate protection more **cost-effective** by maximizing emissions reductions where it is least costly to carry them out.

“I have photographed the annual polar bear congregation on the Hudson Bay in Canada for 20 years. The winter is coming later every year. Each additional week they can’t get out onto the ice to hunt means the polar bears have less body fat and are less healthy. They are getting smaller and lighter. If the trends continue, polar bears on Hudson Bay will be a thing of the past within the next 20-30 years.”

Daniel J. Cox, wildlife photographer, Canada

Developing countries have their own Kyoto obligations but **NO binding emissions targets**. By engaging in the CDM they can, for example, receive funds for reducing emissions intensity. Industrialized countries have the obligation to support developing-country efforts through financial help and technology transfer.

Next to securing emissions reductions, the recent negotiations also set up an **adaptation fund** to help the most vulnerable countries cope with changing climate. It is funded by a 2 per cent levy on CDM transactions. But **NO projects have yet been funded** under this mechanism.

The protocol’s **sanctions against backsliders** have had little **LITTLE EFFECT**. Canada is currently racking up emissions more than 25 per cent above 1990 levels, when its target is a 6 per cent cut, and the USA withdrew from the protocol altogether in 2001.

The Kyoto Protocol is far from perfect, but it is still important. And now, with its current emissions reduction targets **EXPIRING** at the **end of 2012**, the next steps must be taken as a matter of urgency – building on its basic framework and creating something **more ambitious and broader in scope** that addresses the scientific imperatives of climate change.



CUTTING EMISSIONS

by 80 per cent



Copenhagen has to do better than Kyoto.

The world is hotter today, climate change greater, and global emissions of greenhouse gases 25 per cent higher than in 1990. Thanks to a decade of science and two more IPCC reports, we also **know with greater certainty** (and alarm) the dangers we face if we do not act.

Most nations agree on the need to keep warming below 2°C. And they agree, in theory at least, that the world needs to establish an emissions trajectory for the coming decades to **ensure stabilized concentrations** of greenhouse gases in the air at a level low enough to achieve that. No more *ad hoc* deals: Copenhagen must be based on a **rigorous scientific assessment** of what needs to be done to prevent climatic disaster.

The science currently suggests that we should not emit more than about 1,400 billion tonnes of CO₂ equivalent between 2000 and 2050 if we are to give the world a **chance of staying below 2°C** of global warming. That will require reducing global emissions to at least 80 per cent below 1990 levels by 2050. Global emissions will need to **peak around 2015** and then to start **FALLING sharply**. Even so, we will almost certainly require negative emissions after 2050 to get atmospheric CO₂ concentrations down to acceptable levels. That is, we will need to **suck CO₂ out of the air** – by planting forests or by other **technological** means.

"We live on an island and frequently witness nature's fury with cyclones, storms and tidal surges. The sea washes away our houses, land and cattle. When it retreats, our land is highly saline and useless for cultivating crops. Things are changing fast. I have already lost two homes and now I fear for my third. We are completely helpless due to lack of advance warning. We can't even collect our belongings and move to safer places." Intaz Sah, coastal India

The targets for 2050 must involve all industrialized countries. But they will also need to involve **all other major emitters**. Certainly, the highest-emitting countries that collectively produce 80 per cent of the world's emissions need to be involved as soon as possible. By then, however, we should expect the world to be **embracing** a future of zero carbon emissions using **clean energy technologies** out of choice rather than "burden sharing". We will have kicked the carbon habit in the same way that 20th century industrialized countries decided to banish killer coal smogs.

Action must be taken in industrialized countries (and the USA needs to rejoin a global climate framework) and should also involve newly industrialized countries like Malaysia, the Republic of Korea, Saudi Arabia and Singapore, and emerging economies such as China, Brazil, Indonesia, India, South Africa and Mexico.

So how do we ensure that global emissions peak and then decline within the next decade?

Taking RESPONSIBILITY... targets for industrialized nations



Based on IPCC science, the Bali Climate Conference in 2007 noted that **industrialized nations** should aim to **cut their emissions by 25-40 per cent** from 1990 levels by 2020 as an interim, with much deeper cuts later to keep global warming at a low level. By early 2009, **most nations' promises** remain **below** this range.

The **European Union** is the only bloc offering reductions close to it, proposing 20 per cent and setting its limit at 30 per cent if others follow suit. However, the EU's proposal has too many options for offsetting, which would in effect mean

emissions reductions at home of no more than 5 per cent between now and 2020.

The **US administration** has announced its intention to bring emissions back **down to 1990 levels** by 2020, with further cuts under consideration. Canada has made little if any effort to curb its emissions in line with its Kyoto commitments, and Japan and Russia have so far not committed to any meaningful emissions reductions after 2012.

This is not good enough. The fewer cuts we make, the more we lock ourselves into dirty infrastructure, and the more we risk exceeding the 2°C threshold. WWF asks that **ALL industrialized countries** make binding commitments to achieve cuts of 40 per cent from 1990 levels by 2020. Most of these cuts must occur at home.

Failure by industrialized countries to reach such a target will also dramatically reduce the world's options in future decades. In particular it will **use up atmospheric "space"** for emissions that should be left for poorer countries as they develop their economies. This especially applies to the least developed nations. In this zero-sum game, **every tonne emitted by a developed country is a tonne that cannot be emitted by a developing country.**

Nor can we leave things till 2020. There cannot be a gap between the Kyoto compliance period of 2008-2012 and the next. Copenhagen needs to agree targets for a compliance period running from 2013 to 2017. And it should set a date for negotiations on **targets for 2018-2022 to begin not later than 2013.**

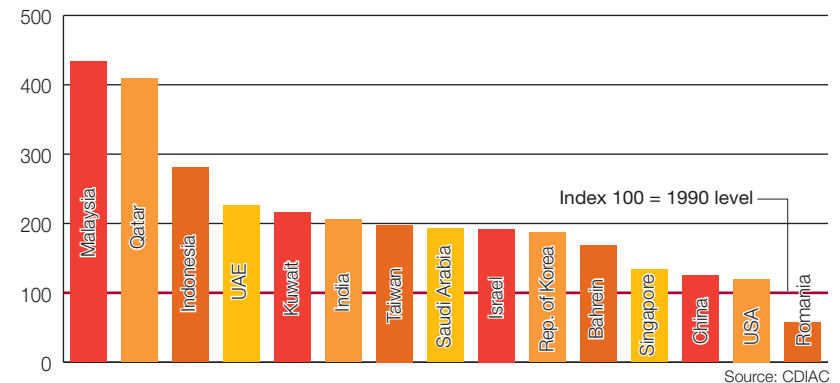
WWF also believes there should be an emergency review clause, so the world can react promptly to any worsening in the news from scientists.

Tigers MUST come to the table

The **Kyoto Protocol** divided the world between rich industrialized nations that were given emissions targets (so-called Annex 1 countries) and the rest. But the world isn't quite so simple. Some non-Annex 1 countries have become **newly industrialized**, and are now richer than some Annex 1 countries such as Romania and Ukraine. And thanks to their booming economies, several now have higher per capita **emissions** and higher per capita **income**.

WWF believes these countries can no longer shelter behind their formal status as developing countries. They must accept their responsibilities as newly industrialized economies and **commit to binding emissions targets.**

Change in carbon emissions from fossil fuel use, 1990-2005 (index)



For instance, per head of the population, **Malaysia's** emissions from burning fossil fuels are now the same as those of Britain, and more than twice those of Romania. **Taiwan, the Republic of Korea and Israel** have doubled their per capita emissions since 1990, again to European levels. **Singapore's** emissions are up by nearly 50 per cent and now higher than most European countries'.

Many Gulf States, having been excused from Kyoto Protocol targets, have even higher emissions. **Saudi Arabia** has almost doubled emissions since 1990 – they are now higher per capita than for any European country except Luxembourg. The **United Arab Emirates, Bahrain, Kuwait and Qatar** now occupy the top four slots in the per capita league table. The top spot is held by **Qatar**, whose emissions have **risen more than four-fold** since 1990 and, per capita, are now **three times** those of the USA.

HISTORIC deal to save the planet

In Kyoto, **developing countries** such as **China, India and Brazil** accepted many **responsibilities**, but **without** emissions **targets**. With the exception of the newly industrialized countries, their emissions per head of the population remain small compared to those of industrialized countries. **China**, for instance, **emits AS MUCH CO₂ as the USA**, but has a population four times greater, so its per capita emissions are lower. Also, their historical contribution to the gases accumulated in the atmosphere is smaller than their current emissions. For comparison, the 100 least-emitting countries are together responsible for only 3 per cent of all global emissions.

Nonetheless, **developing countries' emissions are rising** as their economies grow, and now make up around half of global emissions. Nobody on the planet – rich or poor – can afford for their economies to follow the same “business-as-usual” development route as their dirty forbears.

WWF says the emissions from developing nations need to deviate from business-as-usual as quickly as possible, reaching **30 per cent lower than they would otherwise have been by 2020**.

THIS IS A MAJOR AND CONTROVERSIAL CALL ON DEVELOPING COUNTRIES, but there is a planetary imperative, and it can be done in a way that is **fair**.

The planetary imperative can be reconciled with **basic fairness** if rich nations pay for the extra costs involved in this new greener pathway to development. It is, after all, only necessary because developed countries have warmed the planet and taken up most of the atmospheric “space” for greenhouse gases.

“The monsoon is arriving later and for a shorter season. Because of the changes, not as many blue crabs swim here from the south China sea. The harvest has dropped from 300 grams for every trap to just 30 grams. In December 2008 I lost the contract to supply crabs to a factory which supplies the US market.”

Christopher Kong, crab fisher, Sabah, Malaysia



The good news... for **DEVELOPING** countries

is that by “**leapfrogging**” conventional technologies and adopting low-emissions methods and processes, they can avoid many of the unpleasant downsides of those technologies – the local pollution, ill-health for people and damage to nature. **The green low-carbon technologies are also more efficient.**

They will save money in the long run.

The good news... for **DEVELOPED** nations

is that the planet's life support systems may yet be able to escape the consequences of **pollution-intensive industrialization**.

A handful of developing countries are already taking up the challenge.

South Africa has committed to ensuring that its emissions peak and start to decline by the early 2020s. **Mexico** has promised to reduce its emissions by 50 per cent between now and 2050, and in April 2009 agreed a deal with the Obama administration to cooperate on cutting emissions. **China, Brazil and India** are reducing the carbon intensity of their economies and building renewable energy industries. Recently the **Philippines** agreed on a 50 per cent renewable energy target for 2020, and large deforesting nations such as **Indonesia** and **Brazil** embraced very ambitious objectives to reduce deforestation by about 70 per cent by 2020.

WWF proposes that developing countries draw up national low-carbon action plans. These should be based on their own priorities for sustainable development but should meet the target of 30 per cent deviation from business-as-usual. Some of these “deviation actions” will pay for themselves. Many others will require investment and technological support from industrialized countries – reflecting the **historic responsibility** of the long-term polluters.

The **least developed countries** may want to draw up low-carbon development plans as part of their development strategies, and **WWF encourages them** to do so. But they should **NOT HAVE** to take such actions for the time being.

Bunker fuels... an emissions BLACK HOLE

The Kyoto Protocol does **not control** emissions from international **aircraft and shipping** because negotiators could not decide who should be responsible. Should it be the country from which the **ship or aircraft departs**, the country where **it arrives**, or the **nationality** of the **vessel** or **passengers** or **goods**? The protocol left it to the International Maritime Organization and the International Civil Aviation Organization to take action.

NOT MUCH HAPPENED. But meanwhile, emissions from **aeroplanes** and **ships** **continue to rise**.

Resulting from their stronger impact on the atmosphere compared to CO₂ emissions on the ground, aviation emissions alone (based on conservative assessments) may be responsible for more than 5 per cent of global warming, the order of magnitude of the emissions reductions asked of developed countries in the Kyoto Protocol. Coming up to Copenhagen, **everyone agrees this loophole must be plugged**.

BUT HOW? Today there are even **more options** on the table.

The simplest option remains to agree on **which country** must take responsibility for emissions (the port of embarkation, say) and then add emissions to national totals and integrate them into the targets for industrialized countries. **Industrialized nations oppose this**. They say we need a global solution as these are global sectors. They say it will discriminate unfairly against their air and shipping lines.

They suggest instead that **both industries** should, in effect, be **treated as "countries"** on their own. So international aircraft emissions would have their own targets, controlled and enforced by the industry. Likewise for shipping.

But this proposal falls foul of developing countries. It infringes their current right not to face legally binding emissions targets. **Small island states worry** that this might impact badly on their vital tourism industry and on food imports. With **no obvious compromise** available, this could turn into one of the more contentious issues in Copenhagen.

WWF believes that integrating emissions from these sectors into the national targets of developed countries would deal with the majority of their emissions. Equally, the developing world should take action. In addition, a **tax on bunker fuels** could raise funds for adaptation to climate impacts, while promoting low-carbon development.

The deal... ADAPTATION

Climate change is with us. It is already damaging lives, livelihoods and nature's life support systems. The natural disasters it is aggravating are **killing people**. The world has to adapt to inevitable climate change while working to prevent yet worse from happening. If the weather is going to be more dangerous, we need to build into our world a new resilience to everything it can throw at us.

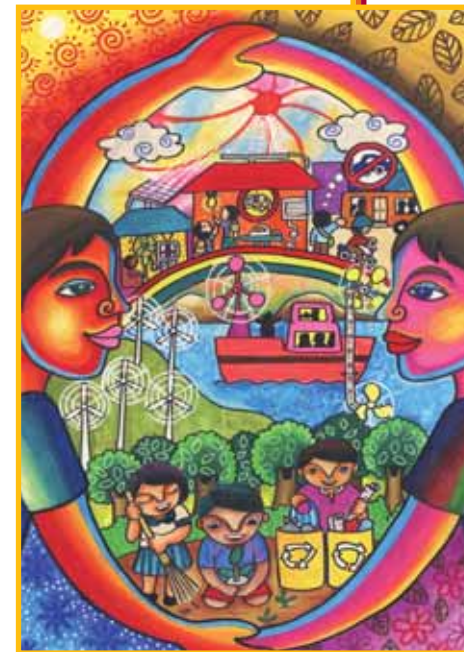
Many of the nations **most in the firing line** from climate change are those **least responsible** for it. Around 100 countries account for about 3 per cent of emissions. They are poor and in parts of the world where the climate – already a dangerous beast – is becoming increasingly threatening.

The average emissions of some **150 million Bangladeshis** are one-sixtieth of those of **the average American**. But that won't protect them from rising sea levels, storm surges, salinated soils and more intense typhoons.

Typical of many African countries, **the personal carbon footprint** of the average citizen of Burundi is roughly **the same** as that of a **Western householder's TV in standby mode**. But climate change is predicted to cut the yields of their farms by 30 per cent or more through drought and heat.

Vulnerable island states in the Pacific and Indian Oceans like **Tuvalu** and the **Maldives** face storm surges, coastal erosion and rising sea levels that may make them uninhabitable within the next half century. Where do we expect the inhabitants of these islands to go? Will the industrialized countries with the greatest responsibility for causing climate change give them refugee status?

And is it **FAIR** for them
to be **FORCED** to move?



Here too, developed countries have **an obligation to fund adaptation** among poor nations that are victims of climate change. International law, based on the well established “polluter-pays” principle, suggests there is a **legal duty** on major CO₂ emitters **to protect** such countries.

A good starting point is the **Adaptation Fund**, the only fund established on climate change that is democratic, with proper representation for developing countries. Its main source of money is a 2 per cent levy on the Clean Development Mechanism.

WWF says that is not enough. After eight years, the Adaptation Fund is still not operational. The industrialized countries, which are mainly responsible for climate change so far, have to accept their responsibilities by paying to protect the most vulnerable victims. One way would be a “polluter-pays” tax on airline tickets or a levy on shipping. In addition, countries need to create an international insurance mechanism to help victims of climate disasters.

PAST BROKEN PROMISES

Under the Kyoto Protocol, **the 48 least developed nations were provided with money** to draw up **National Adaptation Programmes of Action** (NAPAs). The idea was to identify the most urgent actions needed, such as making glacial lakes in mountain regions safe, or shoring up coastal defences. A fund was established at the Global Environment Facility.

To date, **39 NAPAs** have been completed and nine more soon will be. **But there is no money** to carry them out. As a result, only a handful of specific projects identified in the programmes have been drawn up in detail and submitted for cash. The programme has stalled. **The promises made** by industrialized countries to fund adaptation to climate change in countries that are least to blame **sound hollow.**

WWF says industrialized countries should quickly – this year – **release US\$2 billion** into the Adaptation Fund to allow projects to be carried out. This is an urgently needed gesture of faith that **would improve the atmosphere** for talks in Copenhagen.

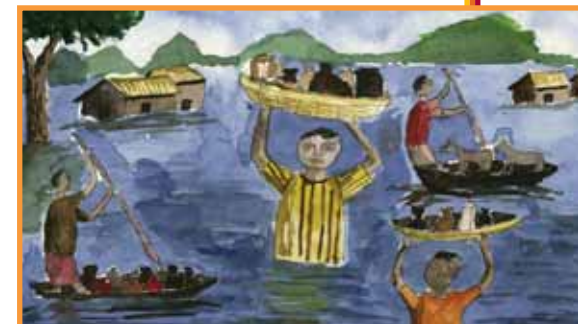
HOW adaptation CAN work

Sometimes people need engineering urgently. As the Himalayan glaciers melt, huge lakes of meltwater form in narrow valleys behind often flimsy natural dams made of debris. As the lakes fill, they can become **unstable and eventually the dams break**, unleashing a wave of water down the valley. **BHUTAN** has more than 2,000 glacial lakes, of which 24 have been identified as candidates at **risk** of causing sudden floods. It needs engineers to assess the lakes and drain them before disaster strikes.

“I can still hear the loud roar that came before the waters from Dig Tsho lake crashed past my home. The lake filled with water from a melting glacier and it suddenly burst. I was just a teenager then. We watched as the water mangled 14 suspension bridges and damaged many of our homes and businesses. Five people died in our village. Today I rely on income from tourists who come to my lodge. I doubt that my family would be able to recover from another flood.”

Ang Maya Sherpa, Nepal

Sometimes, people need **early warning** and help **preparing for disaster**. Rising sea levels leave coastal zones ever more vulnerable to high tides and storms that can wash away whole communities. Bangladesh **lost 138,000 people** in a cyclone in 1991. Since then, it has done a lot to make its citizens safe by building flood shelters on top of dykes. What it now needs is better cyclone warning systems so that people know when to head for the shelters.



People need good and applicable science...



As climate changes, tens of millions of **subsistence farmers** will need new seeds so that they can resist higher temperatures and longer droughts. Parts of **southern Africa** already face reductions in crop yields of 30 per cent or more, unless their crops are made **more drought tolerant** and thus **climate proof**. As diseases spread with climate change, new **vaccination programmes** will also be needed – for farm animals as well as humans.

Ecosystem-based adaptation

Often what is most needed is the **protection of ecosystems** that **buffer** climate change and its effects. Nature provides many “**ecosystem services**” for us. Using nature is often the cheapest way to protect coasts from storms and rising tides.

For 15 years now, Vietnamese communities organized by local chapters of the Red Cross Association have been **planting mangrove forests** on shores most vulnerable to typhoons. Mangroves break up waves and absorb storm energy.

In 2000, when typhoon Wukong hit, **areas** that had been planted **remained safe**, while neighbouring provinces suffered badly, with broken houses and dead bodies littering the shoreline. So far, 12,000 hectares have been planted at a cost of about US\$1 million, **SAVING** an estimated **US\$7 million** in bills for maintaining dykes.

Inland, **rainforests stabilize soils**, protecting against lethal landslides after storms. They also stabilize river flows, generate rain and protect against droughts. Brazilian agriculture and rainforests are often seen as competing for land. But the **farms need the rainforests**, because they provide the rain on which the farms depend. **Remove the forests** and everything will turn to **wasteland**.

WWF says nations need to make a special effort to maximize the benefits of ecosystem-based adaptation. It will probably deliver the best value-for-money. **Protecting this natural infrastructure** is at least as important as maintaining infrastructure like roads and coastlines.

The deal... TECHNOLOGY

The phrase “**technical fix**” has become pejorative.

But the truth is that **technology will be at the heart of any solution** to climate change. It has to be.

In the coming half century, the **world's population is bound to grow**, even though it may be stable by around 2050. We will have to **feed, clothe and sustain 8-10 billion** people. So consumption of many resources is also bound to grow, even if richer countries manage to restrain themselves. Top of the list will be the need for energy. Some **2 billion people** round the world are still **without basic electricity** supplies.

So if we are to provide 8-10 billion people with energy while reducing emissions by 80 per cent, we **need to transform** how we generate and use energy – in homes, factories, offices and public spaces, and for transportation.

That requires efficient technologies combined with **redesigning our lifestyles** and living environments – for instance by building urban areas where local services can be reached on foot, and the rest by mass transit systems rather than cars.

We need to get the **new ideas and technologies** fastest to the countries that are developing their energy infrastructure most rapidly. The International Energy Agency estimates that, in total, US\$26 trillion will be invested worldwide in energy between 2006 and 2030, and more than half of that will be in developing countries.



Developing countries need to “**leapfrog**” to the new technologies without passing through the dirty and polluting route that most industrializing countries have taken to date.

We know most of the technologies that will be required.

Wind energy technology is well developed and **not expensive**.

Industrialized countries such as Germany, Spain, Denmark and the USA are investing heavily in it. Among developing countries, it is chiefly India and China that have adopted it on any scale. But many others could take similar steps if supported by investment from rich countries. They need **training, technical skills, and help** in compiling wind atlases and integrating wind power with more conventional electricity generators in a grid.

Solar power is fast emerging too. Until recently this has mostly meant **photovoltaics** (PV), in which sunlight is converted directly to electricity. Buildings can be built with PV cladding to power and air-condition themselves from the sun. But there is also growing interest in **concentrated solar power**, which uses mirrors and lenses to focus solar energy to heat water that then runs conventional power turbines. The first such power stations to be operational at industrial scale are in Spain and the USA. In theory, large areas of desert from Nevada to Algeria to India could be covered in mirrors catching the sun's energy. Making concentrated solar power work is of global interest as a **potential large source** of clean energy.



Future vehicles are likely to be driven by either electricity or hydrogen (which, however, requires large amounts of electricity for manufacture). Electric cars, just by means of physical laws, are inherently much more efficient than those fuelled by liquid hydrocarbons such as oil. **Electric cars** are the political **"flavour of the year"** in 2009. But how climate friendly they are depends crucially on **how the electricity is generated**. If we end up burning more coal the gain is small. The future is a super-efficient transport system run on electricity produced from renewable sources.

Electrification of public transport also makes mass transit much more environmentally friendly. Trams, electric buses and trains must replace urban and regional diesel-powered systems. **Electric high-speed trains** between city centres such as those in parts of Europe do already substantially reduce the need for aviation. In addition, freight must go back on rails.

Other natural sources of energy that can be harvested include **tidal** and **wave power**, and **geothermal energy** (hot rocks).



Biofuels have been heavily criticized for taking the land and water needed for growing food. Some also have a large carbon footprint during production. But future biofuels, particularly those **using waste products** from farming and those from agroforestry and woods, may be a better bet. Biofuels may also have a long-term future for aviation. **Solid biomass** generally, in particular from new and sustainably managed forests, is a crucial renewable means of replacing coal in power generation and providing reliable fuelwood for many poor communities in developing countries.

Carbon capture and storage is a set of technologies that would capture CO₂ emissions from large installations that burn fossil fuels, and store it permanently deep underground in old oil and gas fields or in some types of aquifer. The technology still has **some way to go** to become commercially available on the scale needed – and does itself produce some emissions. But it could one day reduce emissions from burning coal by 90 per cent and more – in other words well below those of burning natural gas. Carbon capture and storage could also be used with biomass fuels, making electricity production **"carbon negative"**. In addition, it could be applied on **a large scale** to other carbon-emitting and energy-intensive processes such as cement and steel production.

The potential of **nuclear power** as a source of large-scale electricity is often **overrated**. WWF believes that the **risks** of nuclear proliferation, waste disposal, accidents and future shortages of uranium fuel make it an unsafe, unwise and **unsustainable option**.

Methods for **capturing and using methane** emissions from agriculture, landfills and gas pipelines are **quick, cheap** and have a **fast climatic payback**. Methane only lasts in the atmosphere for about ten years, but during that time it is 20 times more potent as a greenhouse gas than CO₂.

Energy efficiency

Above all, there is **huge potential** in almost every sphere of life for much greater **efficiency** in the **use of energy**.

From heavy industry to transport, buildings and consumer electronics, cost-effective modifications and redesign can **typically cut** energy use by **30-80 per cent**. Energy conservation and efficiency measures are, in the long run, the most cost-effective options to reduce emissions and **decrease dependency** on expensive and volatile **oil and gas** imports, which are limited anyway. The trick is to leverage funding for the relatively high capital costs of the most efficient equipment.

In addition to the energy-related technologies, there is a great need to develop and mainstream **new materials** such as lightweight carbon fibres, which are much less carbon- and energy-intensive and have a long life-time. Eventually, the world needs to base its **economic wealth** on **renewable resources** and replace fossil-fuel materials (plastics, wrappings, etc.), cement, steel and aluminium with wood and other biomass-based resources. New and innovative market entrants such as those from the **nano-**, **bio-** and **information** technologies offer **huge opportunities** for developing new and highly efficient materials.

The key is to develop all these **technologies** and more, **make them cheaper** and spread them round the world. Time is of the essence now.

Research for WWF shows that, despite very high and early growth rates for newly emerging technologies, no industry (including renewable energy) can grow for long periods at more than 30 per cent a year once a certain scale has been reached. The researchers investigated the available energy technologies and concluded that if the world is to keep global warming below 2°C, we have to **start** that **30-per-cent growth** rate for a wide range of energy technologies as soon as possible, but by 2014 at the latest. If not, the target may be missed.



So why delay? Transition to a low-carbon economy can be a **launching pad** for **NEW JOBS** and **INDUSTRIES**, new markets and a more efficient and productive as well as greener economy – **locally, nationally and globally**.

Technology action programmes

Under the **UNFCCC**, countries agreed to develop and ensure the **transfer** of **emissions-reducing technologies**. Some progress has been made through the Clean Development Mechanism and the Global Environment Facility.



BUT it has been **too little** and **too late**.

Progress has often been stalled by a sterile argument between rich and poor nations about who pays to transfer rich-world technology to the poor world. The poor world has demanded access to the technologies unhindered by patents and other intellectual property rights. The rich world sees patents as crucial to encourage innovation and believes the free market is the best mechanism for technology transfer.

We need to get beyond that argument. We need to recognize that the poor world has good technologies too; that a lot of **“technology transfer”** is not limited so much by patents as by access to **training** and **know-how**.

WWF believes the key is to **foster technological cooperation** through developing **Technology Action Programmes** for developing and spreading key technologies.

These include many of the **energy technologies** listed earlier and many more. Ideas under discussion also include satellite systems to **monitor deforestation**, early **warning for natural disasters**, carbon saving in cement manufacture, **indigenous biofuels** such as Brazil's use of rainforest palms, and **water-saving technologies** like drip irrigation and rainwater harvesting – which can play a critical role in adapting to climate change.

The green grid

WHAT would a future world DOMINATED BY RENEWABLE POWER look like?

Most **renewables** are **easily** transformed into electricity. In fact modern societies tend to replace traditional fuels with electricity because it is inherently more efficient and causes less pollution at the point of use.

Electricity – better, renewable electricity – has a **huge potential** to replace not only conventional, risky and polluting fuels such as coal and uranium, but also the use of fossil fuels for transport, buildings and manufacturing. **Renewable electricity** could become effectively unlimited – and an appropriate response to concerns on security of supply.

One plan now being talked about in Europe, and increasingly in North America, is to create a continent-wide **“super-grid”** of high-voltage direct-current cables to link up the many possible sources of green electricity. It could be the missing link that will turn renewables from being a niche source of energy into the powerhouse of Europe.

The super-grid would connect the **big European nations** like Germany, France and the United Kingdom with big sources of green energy. It would tap into **Iceland's geothermal power**, the vast **solar energy** resources of **North Africa**, **wind turbines** in the North Sea, **hydroelectric dams** in Scandinavia, **hot rocks** in the Alps, and **bioenergies** in Central Europe.

It would be more than just a “European” grid – it would also be a **peace dividend** for the politically less stable and poorer regions of North Africa and the Middle East, **replacing European oil and gas** dependence with enhanced investments in **solar power** in those regions. Such a grid requires strong and harmonized cross-border management to tap and deliver the right amount of renewable power at the right time to those who need it.

The idea of a **super-grid** to transport renewable electricity over **long distances** is seen by some as the exact opposite of the conventional “green” idea of local renewables for local use. The super-grid **makes big beautiful**. Of course local use of renewable energy such as solar-thermal heating and PV-panels on roofs will have its place, but it cannot provide the amount of energy needed by large cities and industrial manufacturing in highly developed infrastructures. The plan for a super-grid has attracted the attention of the Obama administration, which **wants to build a “smart”** national US electricity grid to move solar energy from the deserts of the southwest and wind power from the plains of the Midwest to the industrial and population centres in the east.

The **SUPER-GRID** addresses the biggest disadvantage of renewables: their **variable power supply**. Higher wind speed provides more power than lower wind speed, and when the **wind stops** blowing, the turbines don't turn. Solar power shuts down at **sunset**. But a super-grid in combination with good power storage capacity gets round that.

When **the wind** is **blowing hard** in the North Sea, and when not all electricity is needed by the customers, for instance, the energy can be stored by pumping water into reservoirs in Norway, ready to power hydroelectric turbines when the wind drops.

When the **sun sets** in the Sahara, Germany could switch from African solar power to geothermal energy from the Alps or Iceland, and biomass power from Eastern Europe. **Excess renewable energy** could also be **stored** in the form of hydrogen, which in turn may be used to fuel the cars of the future.

There are already a few super-grid links in place. Thanks to a submarine cable in the Channel, Britain taps into French nuclear power. Denmark swaps its wind power with Norwegian hydroelectricity. The national grids of Italy and Greece are linked beneath the Mediterranean.

IT COULD BE A blueprint for India, or northeastern Asia or the North American continent or southern Africa. In all these areas, by linking up different sources of renewables, we can make them much more reliable, because each provides back-up for the other.



The deal... FINANCE

The bills for fighting climate change will be large. But the bills for letting climate change go out of control will be much larger.

Industrialized countries, which are responsible for the majority of the greenhouse gases in the atmosphere, must find the money to **green their own economies**. But they are **also liable**, at the court of world opinion and fairness, for funding many of the emissions reduction plans and adaptation requirements of the “victim” countries – those hit hardest by a problem that they have **no responsibility** for creating.

A study by the consultants McKinsey identified the potential for reducing global emissions by 35 per cent from 1990 levels by 2030 (or 70 per cent below a likely business-as-usual trajectory). Notwithstanding the cost of necessary lifestyle changes and some more expensive technologies, the **total worldwide cost** for most of the technologies and actions investigated would be in the region of **€200-350 billion annually** for the next **two decades**. This annual figure is less than 1 per cent of global gross domestic product (GDP) in 2030. Something like half of it would be invested in developing countries.

By 2030, wind, solar and other **renewable energy** could meet almost a **third of all global power** needs; energy efficiency could reduce greenhouse gas emissions by more than a quarter; and deforestation in developing countries – one of the biggest drivers of climate change and a major threat to sustainable development – could be almost fully halted. And all at a cost of **less than 0.5 per cent** of global GDP. This figure is only a fraction of a per cent of the global economy, but it **still dwarfs** the handful of billions of dollars that developed countries have so far committed to tackling climate change and its consequences in developing countries.

For WWF, it remains a prerequisite for an **equitable** and **fair** deal in Copenhagen that developed countries **commit to a substantive reduction** in greenhouse gas emissions in developing countries – in addition to their commitment to low-carbon development back home. In the end, the costs **should not be the key driver** for action, nor must negotiations reach an impasse on “how much for what?”. Crucial is the **environmental effectiveness** of the measures financed, and their implementation in close collaboration with developing countries to meet their needs-based demands. What now seems to be “costly” **may turn out** to be extremely **cheap** in a few years’ time when new technologies become available on a large scale. We see it everywhere, not only in some energy technologies such as wind power, but also with non-energy technologies like IT – including computers and cell phones – where **costs** are **reduced** by several magnitudes once the **consumers start purchasing**.

How should that 0.5 per cent of global GDP be generated?

There could be a **simple charge** on **rich countries**, a percentage of their GDP (say, 0.5-1 per cent). Or there could be a **tax on all carbon emissions** in all countries above a certain threshold level of emissions per head of the population. For example, Switzerland has proposed that a levy of US\$2 per tonne should apply to all countries with annual per capita emissions above 1.5 tonnes of carbon. Another idea is to charge according to historical responsibility for emissions.

WWF’s recommended option is for the money to be generated from either national or global **auctions of pollution permits**. Even 10 per cent of the revenues could potentially **fund what is needed**.

How should the money be managed? On the whole, industrialized countries want any cash they provide for climate action in developing countries to go through existing bodies like the Global Environment Facility (one of the UNFCCC’s existing financial mechanisms) or the World Bank, or they prefer bilateral funding. But most developing countries, which have been at the receiving end of these institutions for decades, say they are undemocratic, being largely controlled by the donors.

They want new and **more democratic institutions**, based at the UN, perhaps managed through a **single climate change fund**. WWF agrees with this view. The precise mechanisms and formulae to manage and apply the budgets are crucial. The other key element in the run-up to Copenhagen is that **money is put on the table**. If it is not, there is little chance that poor nations will accept that their economies need to develop differently from business-as-usual.

They will simply – and not unreasonably – say to the rich world:

**“You created the problem;
YOU solve it”.**



Whose cash?



Who will fund all this?

The **private sector** will clearly be a major player. It makes up 86 per cent of global investment and financial flows. Trillions of dollars of private-sector money **will be invested** in new and replacement energy and transport infrastructure in the coming decades. So retooling the world's economies for a low-carbon world will only happen if there is **private profit to be made** from building infrastructure that cuts emissions, rather than creating them.

To make that happen will require **concerted government action**, however. That will include:

- **creating carbon markets** that penalize emissions and reward low-carbon solutions
- **targeting research** and development (R&D) and “seed-corn” investment to new technologies
- **building electricity grids** that can carry and distribute green power
- **designing cities** and public transport systems that reduce reliance on the car
- setting standards to **reduce the energy consumption** of buildings
- **imposing ambitious low-carbon regulations** and energy efficiency standards on consumer products
- **addressing the drivers** of deforestation by introducing ecosystem service payments and changing consumption patterns, such as reducing beef consumption.

Public-sector involvement will also be **vital** to prevent a boom-and-bust carbon economy that undermines long-term investment. Left to its own devices, the market will only encourage one or two emerging renewable technologies at a time. That is why wind power has been the dominant renewable technology of the last decade in many countries. But to meet the **tough targets** for future decades, **a range** of technologies must be **developed and expanded** together.

One key lesson of the current global financial downturn is that governments have to resume their places as **regulators** of economies. That includes the task of **creating a global low-carbon economy**.

Carbon markets

The principle behind a carbon market is **simple**.

The world needs to **limit carbon emissions**. So we create a system in which you need a **permit** to emit CO₂ or other greenhouse gases. Governments in countries with national emissions reduction targets can give out “**pollution permits**” to major emitters, or sell them at auction. The permits can also be bought and sold by emitters who need them – governments **create a market** for these pollution permits. This is “**cap and trade**”.

So, both the level of the target (the cap) and the remaining permits to pollute place a price on emitting carbon. Emitters have **an incentive to cut** their emissions, because they will have to buy fewer permits and may be able to sell any spare. Some industries and some companies (and some countries) will find it easier and cheaper to cut emissions than others. In a carbon market, they will make cuts in emissions and sell the permits to those who find it more difficult. This means the world should get **more emissions reductions** for a given amount of investment. That is the principle behind Europe's internal carbon emissions trading system, and the ones being set up in Australia and under discussion in the USA and Mexico.

In a perfect market, all this **should minimize** the cost of emissions reductions. But in practice, as the world has recently discovered in the financial crisis, markets are far from perfect. The price of carbon, like anything else, can rise and fall dramatically. Such fluctuations can seriously undermine the long-term investment decisions needed to find solutions to climate change.

Markets also suffer from herd instincts among investors. All the money rushes to one technology or country. For example, all the money could go into, say, wind power, starving solar and other renewables. Such outcomes might obey the short-term imperatives of the market, but they would fail to deliver the low-carbon economy the world needs. The bottom line is that the market must be **structured and managed** in a way that delivers what the world requires.

For WWF, carbon markets are no silver bullet. If conducted properly they have their place. However, recent experiences with the European Emissions Trading Scheme resulted in strong over-allocation of pollution permits and too many offsets which all brought the carbon price down and in turn stifled low-carbon investment.

WWF strongly recommends supplementing emissions trading with **Emissions Performance Standards**, such as those enacted in California, where no coal-fired power stations may be built without carbon capture and storage in place. In addition, the **transport, construction and forestry** sectors, amongst others, are likely to **benefit** much more from specific legislation on **legally binding standards** than from being put under **a cap-and-trade regime**.

The deal...

SAVING THE FORESTS

"We are prepared to deploy almost our entire rainforests, which is approximately the size of England, in the global battle against climate change."

Robert Persaud, Guyana Minister of Agriculture,
Bali Climate Conference, 2007

Deforestation causes up to a **fifth of current greenhouse gas emissions** from human activity. **Ten countries** are responsible for **87 per cent** of global deforestation. After including their forest emissions, **Brazil** and **Indonesia** are, respectively, the world's fourth and fifth largest greenhouse gas emitters.

Reducing rates of deforestation can be one effective way of cutting greenhouse gas emissions. And depending how it's done, it also meets other environmental and development objectives like protecting biodiversity, soils and water supplies.

Currently there are **no incentives** in climate law for developing countries – where more than 90 per cent of deforestation takes place – to protect their forests. Most forests still being lost are in tropical countries that have no emissions targets. The problems are aggravated because **international trade**, including demand from rich nations for cattle and beef, timber, soy and palm oil, creates huge short-term financial incentives for **forest destruction**.

Many forested countries are also **poor**. The immediate need to generate wealth and reduce rural poverty is high, and the ability to police conservation laws is often low.

But it can be done. Take Costa Rica. This small Central American country was once a hotspot of deforestation. Forest cover fell from 80 per cent in the 1950s to just 21 per cent in 1987. But since then, Costa Rica has reversed its forest loss by paying farmers to protect the forests, and is getting extra income from millions of tourists coming to see the wildlife. Today forest cover is back **above 50 per cent**.

Other nations are starting to take action too. Brazil recently announced it would **cut** its deforestation in the Amazon region by **70 per cent by 2020**; Indonesia has committed to **stopping the conversion of old growth forest** into plantations in Sumatra; and Paraguay confirms the success of its forest policy, reducing deforestation from historic rates of 300,000 hectares per year (in the late 1980s) to less than 50,000 in 2004, and is committed to **zero net deforestation by 2020**.

REDD – **Reducing Emissions from Deforestation in Developing Countries** – aims to repeat what happened in Costa Rica and Paraguay on a global scale by **providing incentives** for conserving forests rather than converting them. It was first proposed by a Coalition of Rainforest Nations led by Costa Rica and Papua New Guinea in 2005, and was **supported in Bali** in 2007. If REDD gets adopted in Copenhagen, the idea is to mobilize international funds to pay countries to reduce and ultimately end forest loss.

This is a **challenging task** both technically and politically. First, it must happen on a large scale. There is no point paying to protect one forest, if the loggers and farmers simply go somewhere else and tear that down (in the jargon, this is called "leakage") – or come back in a couple of years after REDD has paid out (the challenge of "permanence"). **REDD** should focus on achieving **a fall in national deforestation rates**.

Another problem is that paying countries to stop deforestation potentially **rewards** those with the **worst current rates** of deforestation. They can generate REDD money by being a bit less bad, while the good guys who protected their forests get nothing.

One way around this problem would be to encourage **countries with low deforestation rates** to maintain this. An idea proposed by the government of Guyana has been to recognize the **economic value of forests** in **all** developing countries. That way, countries like Guyana that have **sacrificed income** by protecting their forests would benefit as well as those that had gone ahead and deforested. This **might be fairer**. But to ensure that rapid emissions cuts are achieved, it must not be at the expense of addressing deforestation in countries that are emitting.

Again, there is the question of **who pays**. Some countries want REDD to be run as a commercial carbon market. Since cutting emissions from forests could be cheap, this might be popular among industrialized nations seeking to "offset" their industrial emissions. But some fear the **potential** for **cheap REDD** carbon-saving projects is so great that it will swamp the carbon market and undermine incentives for clean energy. Others fear that an abundance of forest carbon credits will undermine domestic action in industrialized countries. And some forested countries, notably Brazil, fear **losing control** of their forests to international markets.

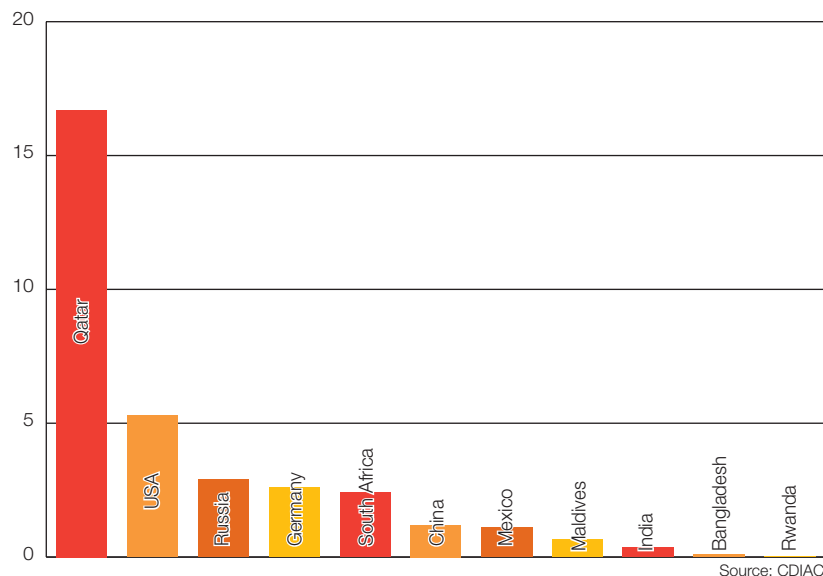
WWF BELIEVES the world should be able to **use REDD** to cut net deforestation worldwide to zero by 2020. This would probably mean a cut of gross deforestation by about 75 per cent compared to today, equivalent to avoiding about 15 per cent of global greenhouse gas emissions. REDD can be used as a lever to protect forests as a means to reduce emissions, but the broader values of forests, including **biodiversity**, must also be maintained and the **rights of local** and **indigenous communities** upheld. They must be able to benefit from REDD while managing their land in the way they prefer.

"Let's not reduce the role of the forests to a carbon sink. I'd like to see Copenhagen as the first step on the road to putting nature's capital at the centre of our economic thinking." Karen Suassuna, WWF-Brazil

Fair shares

The **fairest way** to assess how countries contribute to climate change is to look at their **emissions per head of the population**, and their capacity to act. The **differences** in emissions between citizens in different countries are **huge**.

Annual per capita carbon emissions from burning fossil fuels (tonnes)



Per capita figures represent **current emissions**. But what about past emissions? Because much of the gas stays in the atmosphere for centuries, this is a critical component of current responsibility for climate change. Taking a **historical perspective**, the responsibility of **industrialized countries** is even **greater**. This represents the legacy of early industrialization.

The **USA** and **Europe** contributed **30 per cent** and **28 per cent** respectively of the CO₂ released during the 20th century. While the fast-growing economies of **Asia** are contributing more to emissions each year, they are still only responsible for around **12 per cent** of historic emissions.

These figures underline the obligations of rich industrialized nations both to help protect developing countries from the consequences of climate change and to **invest in low-carbon technologies** that will allow them to develop on a **different path**.

Carbon intensity and energy saving

Carbon intensity is a measure of how much carbon economies emit for every dollar of GDP they produce. It is an **alternative way** of identifying the planet's **"big emitters"**.

Some countries with high emissions **generate** very little **wealth** from those emissions, because their economies are very **"carbon intense"**. Typically they burn coal and use the resulting energy wastefully. Others, by using renewable fuels and using energy wisely, have much lower carbon intensities. Generally, rich nations use energy more efficiently, but some poor economies are also very efficient (and vice versa). The **largest decreases** in energy intensity (energy consumed per unit of GDP) since 1990 have been achieved by **developing nations**, in particular India and China, who have reduced their energy intensity by 40 per cent and 60 per cent respectively.

So, both Switzerland and Cambodia produce around US\$9,000 (market rate) of GDP for every tonne of CO₂ emitted. But the USA, Australia and Laos produce only US\$2,000 of GDP per tonne. At the high-intensity end, both Russia and China produce only around US\$400 of wealth per tonne of emissions.

Changing fuel use is clearly one **key** to cutting carbon intensity. But for most countries and industries, rich and poor, high-tech and low-tech, using energy more efficiently is the easiest way to reduce emissions and improve carbon intensity. Mostly it **saves money** too, by **cutting energy bills**.

China's current five-year plan has set a target for cutting energy intensity by 20 per cent between 2005 and 2010. This is the **most ambitious** percentage **target** in the world. Carbon-intensive industries like cement manufacture and iron and steel have been charged with meeting the target.

But **individual** Chinese citizens and **communities** can **contribute** too. WWF has begun a campaign in China to help with **"20 ways to 20 per cent"**. Ideas include energy-saving light bulbs, unplugging appliances, using public transport and buying energy-saving versions of equipment like air conditioners.

Says **Ang Li** of WWF China:

"If all of China's 1.3 billion people follow the 20 tips, they can save 300 million tonnes of coal each year."



GOING neutral

Seven countries have declared their **intention** to become **carbon neutral**, joining the United Nations Environment Programme's (UNEP's) Climate Neutral Network. They are pioneers for a new world we will all have to inhabit before the end of the century.

Costa Rica: Its target date is **2021**, the country's bicentenary. Most of Costa Rica's electricity comes from **low-carbon hydropower**. By reversing deforestation, it has turned its forests into a carbon sink that can soak up carbon emissions.

Iceland: Almost all Iceland's electricity comes from its **abundant renewable resources** – geothermal and hydroelectric power. It wants to pioneer hydrogen vehicles (including its fishing fleet), and it plans to turn its large land area into a carbon sink by revegetating its land surface, which has suffered from long-term erosion and desertification.

Maldives: The **very survival** of the Maldives, a country of low-lying islands in the Indian Ocean, is threatened by sea-level rise. It has announced a desire to go carbon neutral by **2019** and asked experts for advice on how to go about it.

Monaco: **Solar heating** and energy efficiency in buildings, plus public transport, are the main strategies behind minimizing the principality's emissions, augmented by offsetting abroad.

New Zealand: Thinly populated New Zealand wants to generate **90 per cent** of its electricity from **renewables** by 2025 and be **carbon neutral** for energy by **2040**. Half its emissions are from agriculture, which it wants to offset through forestry and other projects that will turn its natural landscape into a carbon sink.

Niue: The tiny Pacific island nation of 1,700 people is investing in **energy efficiency** and plans to develop wind and solar power.

Norway: Promises to be neutral by **2030**. It plans to **capture emissions and store** them in old North Sea oil wells. Norway has pioneered the carbon market and plans to use it extensively to reach the target. Critics say Norway is not taking responsibility for the North Sea oil and gas it sells.

Achieving equity

There are many approaches to how national **greenhouse gas emissions** should be **contained** and **cut**.

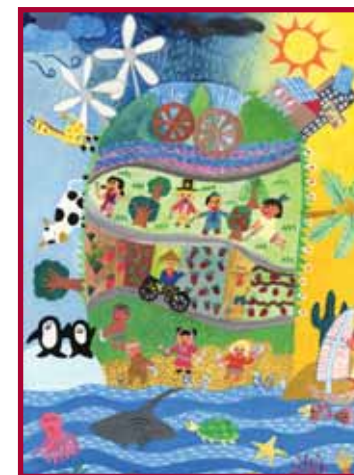
BUT how fair are they?

One approach (the essence of the **Kyoto Protocol** for Annex 1 countries) is simply to require emissions **cuts** as a proportion of past emissions, which effectively means allocating emissions rights on the same basis. If, in addition, those emissions rights are given for free – without auctioning – this is often called “grandfathering”. But it is **unfair if caps are not ambitious** and **pollution permits** are given for **free**, as this allows the major emitters to maintain higher emissions than others. It rewards past offences against the climate.

A **fairer system** is to issue **emissions rights** to nations **according to** their **population**. One tonne per head, say. Many poor nations would have spare permits. They could profit by selling them to rich industrialized nations that needed more. Hopefully, they would invest the proceeds in taking a **low-carbon development path**.

Some have proposed that targets should be based not on absolute emissions, but on **reducing the carbon intensity** of national economies (see page 43), as it would **reward carbon efficiency**. This might be an approach for countries without national emissions targets, and it is already central to China's climate policy. But it does not address the fundamental scientific need to limit greenhouse gases in the atmosphere and is utterly inappropriate for developed nations.

Emissions rights could also be allocated according to a formula that combines elements of the above. One such is the proposed **“responsibility and capability” index** based on Greenhouse Development Rights. The index would combine a measure of responsibility for climate change (such as past and present per capita emissions) with a measure of capability to reduce emissions (such as current wealth and/or the lack thereof). Some believe this kind of formula could form a **practical halfway house** from the old, unfair “grandfathering” approach to an ultimate aim of **equitable** national and per capita **allocations**.



A green new deal

The world needs a **Green New Deal**. Some governments can already see that the idea of a Green New Deal combines three highly desirable goals: **social equity** through job creation, **environmental sustainability** through investment in green technologies, and **financial benefit** by helping the economy recover from recession. Germany already has about 1.8 million jobs in the green sector. The USA has similar plans under Obama's economic recovery proposals. The Republic of Korea has published a US\$34 billion recovery package of which 80 per cent is earmarked for green projects that should create almost a million jobs.

GOOD. But we also need to see the Green New Deal as an **international strategy**. Just as national economic recovery is not possible without global economic recovery, so national climate plans make no sense outside a global context. The bottom line in our globalized economy is that enterprises have to be able to **make money** out of **cutting emissions** rather than increasing them. The central political challenge is to reorganize our economies at all levels to make sure that happens.

There is a precedent for international engagement aimed at both national and global security. Sixty years ago, the USA launched its Marshall Plan to invest in Europe. This was partly to ensure that Europe's economy recovered from the ravages of the Second World War, but also partly to underpin US national security in an emerging cold war. Today the **threat is far graver** – the collapse of planetary life support systems. But the same enlightened self-interest among national governments on a global stage can **secure a deal** in Copenhagen.

The **good news** is that fixing the climate is **doable**. It will take some serious investment, but that **investment** is also the **key** to both economic recovery and long-term sustainability, to protecting nature and our own civilization. For too long, we have regarded nature as an enemy to be tamed and exploited, rather than a provider of life support systems that must be protected. That thinking has reached a dead end.

By **helping nature** we can ultimately **help ourselves**. The climate and financial crises provide the world with the opportunity to recognize that simple fact. Climate change is a wake-up call to change our ways, but also an opportunity to create a **cleaner, greener, more sustainable world**.

A good deal in December means **we all win**. Lives are protected, corporations make profits from cutting emissions, governments see their people better off and their national security enhanced – and **our world is saved**.

Jargon buster and acronym decoder

Adaptation Fund. A fund set up under the Kyoto Protocol to provide money for poor countries to adapt to climate change. Currently receives 2 per cent of transactions under the Clean Development Mechanism.

Annex 1 countries. OECD and other industrialized countries including Russia given emissions targets under the Kyoto Protocol.

Bioenergy, biomass. Include biofuels which are crops that are converted into liquid fuel. For instance corn is turned into ethanol to replace petrol, and vegetable oils like palm and soy are turned into a substitute for diesel. Biomass is solid, mostly wood-based material used for heating (woodchips), cooking (fuelwood in developing nations) and increasingly for power generation to replace coal.

Carbon budget. A set amount of carbon that can be emitted in a given amount of time by a country, a set of activities or the whole planet. Part of a strategy to limit climate change by capping greenhouse gas concentrations in the atmosphere.

Carbon intensity. A measure of how much carbon economies emit for every dollar of GDP they produce, or for every unit of product, for example CO₂ per unit of steel.

Carbon trading (cap and trade). Any system where countries, companies or others trade in rights to emit CO₂ into the atmosphere. An approach already adopted in Europe and now planned in the USA and elsewhere is "cap and trade", in which major emitters are given or sold a certain allocation of a limited (capped) number of permits and then allowed to trade the permits among themselves.

Carbon sink. Any natural store of carbon that can absorb CO₂ from the air, such as forests, grasslands and oceans.

Carbon source. Any natural store of carbon that releases CO₂ into the atmosphere. Note that

soils, forests and oceans can be both sinks and sources at different times.

Common but differentiated responsibility and respective capabilities. Principle adopted in the Rio Declaration from the 1992 Earth Summit. It describes the different responsibilities of countries for a given situation, and takes into account their relative capacities to act – wealth, education, health, etc. Under this principle, the Kyoto Protocol indicates that all countries have responsibilities to control greenhouse gas emissions, but only some have specific targets.

CO₂ equivalent. A term used to describe the global warming potential of greenhouse gases in terms of the equivalent amount of CO₂. For instance, CO₂ concentrations in the atmosphere are now approaching 390 parts per million (ppm). If other greenhouse gases added by human activity are included the figure rises to above 460 ppm of CO₂ equivalent.

CDM – Clean Development Mechanism.

A system under the Kyoto Protocol that allows industrialists or others to obtain "carbon credits" for investing in projects in developing countries that reduce greenhouse gas emissions. The credits can be used to offset emissions in countries where they are limited under the protocol. They can also be traded.

Dangerous climate change. A term embedded in the UNFCCC. It is not defined, but the world's governments have agreed to prevent it.

Fossil fuel. Any fuel made of fossilized carbon – the remains of ancient vegetation and animals. Coal, oil, natural gas and the bitumen in tar sands are all examples.

Grandfathering. Allocating emissions permits (e.g. to a country) on the basis of past emissions.

Greenhouse Development Rights.

A framework for achieving urgent reductions in global CO₂ emissions by allocating emissions rights according to national historic responsibility

*This is not just about polar bears ANY MORE.
It is about US, Homo sapiens, and OUR SURVIVAL*

for the climate problem and economic capacity to dedicate resources to the problem.

Greenhouse effect. The term used to describe the warming of the atmosphere due to an increase in heat-trapping gases. Most of the energy from the Sun that hits the Earth penetrates the atmosphere and heats the surface. The warmed surface radiates heat. Some of this escapes into space, but a proportion is trapped by greenhouse gases. These gases are naturally present in the atmosphere, but the more there are, the less heat can escape. Mankind is adding these gases to the atmosphere faster than natural processes can remove them.

Greenhouse gas. Any gas that traps heat in the atmosphere. The Kyoto Protocol covers human-induced emissions of six gases: carbon dioxide (CO₂, the most important), methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

IPCC – Intergovernmental Panel on Climate Change. Set up by the UN in 1988 to produce consensus reports on the science, impacts and mitigation of climate change, it has now produced four major assessments, the latest in 2007. All go through extremely detailed reviews by both experts and governments before publication.

Kyoto Protocol. Agreed in 1997, and subsequently ratified by most nations except the USA, it gives industrialized nations legally binding emissions reduction targets for six main greenhouse gases, covering the period 2008–2012. They can do this partly by investing in emissions-cutting projects in other countries, through protocol instruments like the Clean Development Mechanism.

NAPAs – National Adaptation Programmes for Action. Plans being developed by the least developed countries to help protect their citizens, ecosystems and economies against climate change.

Leakage. Failure of a scheme like REDD or the Clean Development Mechanism to deliver what

is intended because the rules are not water-tight. For instance, leakage would occur if a country was compensated for ending deforestation in one forest, when the destroyers simply moved somewhere else.

MRV – Monitorable, reportable and verifiable. A checklist for accountability on measures for emission reductions, adopted at the UN Conference in Bali in 2007.

Per capita emissions. Emissions (usually of a country) divided by the number of inhabitants. Often seen as a measure of fairness or emissions entitlements. (The CO₂ emissions of China and the USA are about the same, but because China has four times as many people, its per capita emissions are only a quarter of those of the USA.)

Photovoltaics. Method of converting solar energy directly into electricity using solar panels.

REDD – Reduced Emissions from Deforestation in Developing Countries. A proposed system for compensating developing countries that reduce emissions linked to cutting down forests, and protect forests as planetary “carbon sinks”. Proposal supported at the Bali Climate Conference for awarding carbon credits or other incentives, and looks set to form part of the climate agreement in Copenhagen.

Renewables. Any form of energy generated from natural forces like wind and solar energy that are not used up.

Tipping point. Any point of no return, after which change is sudden and irreversible. In climate change, this might be runaway global warming, the collapse of an ice sheet or the shutting down of an ocean current which won’t switch back on even if you go back to the old climate conditions.

UNFCCC – UN Framework Convention on Climate Change. Signed in 1992 at the Rio Earth Summit and ratified by 192 nations. It commits them to stabilizing climate-changing emissions and to preventing “dangerous human interference with the climate”. Its parties meet every year. The next meeting is in Copenhagen in December this year.



In celebration of young people's immense enthusiasm and commitment to the climate change cause, the **paintings** used in this publication are entries to the International Children's Painting Competition on the Environment

organized by UNEP, the Foundation for Global Peace and Environment, Bayer and Nikon. The theme of the competition was climate change. They were also part of the Paint for the Planet campaign (www.unep.org/paint4planet).

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ISBN 978-2-88085-300-6

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A BANSON Production
Cambridge, UK

Printed by The Lavenham Press (UK) on FSC papers using vegetable-based inks.



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conserving the world's biological diversity

ensuring that the use of renewable natural resources is sustainable

promoting the reduction of pollution and wasteful consumption.



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