nef

The price of power

Poverty, climate change, the coming energy crisis and the renewable revolution

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We aim to improve quality of life by promoting innovative solutions that challenge mainstream thinking on economic, environmental and social issues. We work in partnership and put people and the planet first.

economics
real wealth
means well-being

Current priorites include international debt, transforming markets, global finance and local economic renewal

environment
lifestyles must
become sustainable

Current priorites are climate change, ecological debt and local sustainability

society
communities need
power and influence

Current priorites include democracy. time banks, well-being and public services

nef The New Economics Foundation is a registered charity founded in 1986 by the leaders of The Other Economic Summit (TOES), which forced issues such as international debt onto the agenda of the G7/G8 summit meetings. It has taken a lead in helping establish new coalitions and organisations, such as the Jubilee 2000 debt campaign; the Ethical Trading Initiative; the UK Social Investment Forum; and new ways to measure social and environmental well-being.

The lack of access to reliable and clean energy supplies is a major barrier to improving human well-being around the globe – there are an estimated 1.6 billion people living in the rural areas of developing countries who lack access to electricity – but so is dependence on fossil fuels. Climate-driven 'natural' disasters also threaten far worse. Rather than just failing to improve the human condition, we could be about to witness the great reversal of human progress.

Contents

Overview and summary

A decade-long wave of enthusiasm about ending human poverty and suffering is coming to an end. After the close of the Cold War, optimists thought that nothing now stood in the way of a new progressive internationalism that would see old enemies working together. They would help each other and those countries previously caught in the cross-fire of super power politics.

Towards the end of the millennium eight ambitious targets were agreed to tackle poverty and, to a much lesser degree, promote sustainable development. They were mostly to be achieved between now and the year 2015.

Millennium development goals

- Eradicate extreme poverty and hunger.
- Achieve universal primary education.
- Promote gender equality and empower women.
- Reduce child mortality.
- Improve maternal health.
- Combat HIV/AIDS, malaria, and other diseases.
- Ensure environmental sustainability.
- Develop a global partnership for development.

But in early 2004, two of the driving forces behind the goals conceded defeat. Britain's Chancellor of the Exchequer, Gordon Brown, who also chairs the International Monetary Fund's key committee, and the President of the World Bank, James Wolfensohn, jointly penned an article that showed how we were drifting away from meeting the targets rather than closing in on them. In particular, they showed that Sub-Saharan Africa was more than a century off-target to meet its goals of expanding primary education, cutting child mortality and halving poverty.

Wolfensohn and Brown comment that, "To have a chance of meeting the millennium goals, a new deal between developing and developed countries must be forged."[1]

But even this rather depressing picture fails to take account of two huge, outstanding issues. For years, one has been the poor relation amongst development

issues – energy – and the question of how the poorest can get access to the power they need for their homes, and their health and education services. The other is related and potentially devastating; it is the crisis of global warming.

The lack of access to reliable and clean energy supplies is a major barrier to improving human well-being around the globe – there are an estimated 1.6 billion people living in the rural areas of developing countries who lack access to electricity[2] – but so is dependence on fossil fuels. Climate-driven 'natural' disasters also threaten far worse. Rather than just failing to improve the human condition, we could be about to witness the great reversal of human progress.

Yet it doesn't have to be like this. Clean renewable energy sources have huge, barely tapped potential. Not only can they provide all the energy needed for human development, they can also abate the pollution that adds to climate change and kills countless people every year. They can supply *power* to communities, but where the technology is developed, implemented and maintained by local people, they can also *empower* communities who have in other ways been marginalized.

A further benefit is, as yet, only poorly appreciated. Two forces are at work that will revolutionise the global energy markets. First there is the need to radically reduce fossil fuel consumption in the face of climate change. Secondly, and matching it for impact, is the emerging gap between the rising global demand for oil and its production. Most industry analysts predict that oil production is about to peak and ultimately decline.

Both of these dynamics are likely to have a significant impact on the price of fossil fuels, raising them unpredictably and probably dramatically. In this scenario, some oil-producing developing countries might see short-term superficial advantages as they earn more for their energy exports. Long term, however, the spike that a hike in prices will jam into an oil-dependent global economy will rebound on developing countries. Past experience of oil crises shows that global downturns tend to hurt those in the bottom half of the economic pile.

But there are many other reasons for the world to want to break its addiction to dirty fuels and shift to renewables.

- **Tackling poverty:** Global warming endangers the millennium development goals. It must be stopped if they are to be reached. Without a halt to dangerous climate change, there is the real threat of an opposite dynamic: a great reversal in human progress.
- **Preventing economic shocks…** Relying on fossil fuels to promote human development will be ultimately self-defeating in both economic terms – because of the coming shock that will follow divergence between oil production and demand – and in environmental terms – because the economic costs of global warming are set to spiral and will affect the poorest and most vulnerable countries worst.
- **…and carbon corruption:** Reliance by poor countries on fossil fuel imports or fossil fuel industries leaves them vulnerable to a range of problems including: economic shocks due to price volatility, major health problems from pollution, inefficiency due to economic distortions from fossil fuel subsidies, and corruption and social instability stemming from competition for access to natural resources.
- **Tapping plentiful 'free' energy:** Fossil fuel technologies are often only 'cheaper' than renewables and more readily available because they have, for years, been supported by the financial feather-bedding of massive government subsidies. A super abundance of renewable energy sources combined with readily available technologies, conservation and demand management mean that all human energy needs could be met this way. A shift of investment towards clean renewables will both improve and save millions of lives in the majority world.

- **Empowering communities and creating energy security:** Conversely, small-to-medium scale renewable-energy technologies are both 'development friendly', giving people more control over the power they need in their day-to-day lives, supplying power to communities marginalized from conventional power grids, creating jobs, reducing economic dependency and representing a feasible, sustainable future for energy systems, especially for rural populations.

- **An answer to ecological debt and sharing the global commons of the atmosphere:** A widespread shift of subsidies and investment from fossil fuels to renewable energy is a necessary but not sufficient condition to tackle climate change and poor people's lack of access to energy. Developing countries are understandably reluctant to constrain their energy options when rich countries have burned fossil fuels in an unrestrained manner for centuries. Such baggage has created a political obstacle to clean energy development paths. For this reason global warming has become an issue of 'environmental justice' as well as climatic threat. Consequently, its solution needs to include a framework in which the ecological debts of high-polluting countries can be reconciled, and equal entitlements, per person, to the global commons of the atmosphere can be shared out.

Renewable energy: the missing link

Energy is the neglected issue of the development debate. Renewable energy is the great, barely tapped solution to the two great challenges of the coming century – poverty and global warming. Not only can renewable energy provide a clean, flexible power source for homes, schools and hospitals, at the micro-to-medium scale it has huge potential to create meaningful and useful jobs. By literally taking control of their own power supply, marginalised communities and marginalised people within communities can also be empowered. In this way renewable energy provides immediate improvements to people's lives, but it also gives a key to a different roots-up model of human development in which people are more in control of their own lives and livelihoods. This report reveals that:

- One year's worth of global fossil fuel subsidies could comfortably pay off Sub-Saharan Africa's entire international debt burden with billions left over.

- At the moment, only one to three per cent out of the $40 billion spent annually on energy investment in developing countries goes towards renewables.[3]

- All of non-electrified Sub-Saharan Africa could be provided with energy from small-scale solar facilities for less than 70 per cent of what OECD countries spend on subsidising dirty energy every year.

- By spending just five per cent of their total annual overseas aid budget on clean-technology stoves for poor households, OECD nations could help save over 25 million lives over the next decade.

- One year's worth of World-Bank spending on fossil fuel projects, if redirected to small-scale solar installations in Sub-Saharan Africa, could provide *10 million* people on the continent with electricity.

- The annual amount tied to investments in coal, oil and gas projects in the developing world between 1992 and 2002 by the United States' twin export guarantee agencies could have provided over *30 million people* in Sub-Saharan Africa each year with solar electricity.

Whether to do with health or education, poverty or environmental sustainability, none of the international development targets can be hit, or stay hit, without the massive expansion of renewable energy world wide. This report shows both the scale of the challenge, and the enormous potential facing us.

Climate shock and ending poverty: pulling the rug on the millennium development goals

At the turn of the century, when the world's leaders agreed on the millennium development goals, they forgot another key goal: to combat climate change. The implications of global warming has particular impact on the lives of the world's poor and could not only undermine all current and future efforts to reach the agreed targets, it could also completely reverse development as we know it.

Global warming is a reality and unsustainable use of fossil fuel is set to warm our planet at a faster rate than at any time in the past 10,000 years. The impacts of climate change are already being felt. Nine of the 10 warmest years on record have occurred between 1990 and 2001,[4] and in the past decade, the number of weather-related disasters has doubled. They are now up to an average of 331 per year – nearly one per day.[5] The world temperature has increased by around 0.4°C since the 1970s.[6] Other impacts of climate change are yet to come. Scientific projections have shown that in the future wet areas will get wetter and dry areas will get drier. Rising sea levels are already putting small islands under threat.

Poor countries are particularly affected by climate change as they rely heavily on climate-sensitive sectors, such as agriculture and forestry, and their lack of resources, infrastructure and health systems leaves them at greater risk to adverse impacts. Many live in marginal environments or depend directly on natural resources for their livelihoods. For small farmers, disruption of rainfall patterns represents not just an economic inconvenience, but a potentially disastrous impact on livelihoods.

In 2003, poor countries – those categorised by the UN as having 'low human development' – accounted for over half of the total number of deaths and a disproportionately large share of affected people. Yet they represented only 11 per cent of the people exposed to natural hazards.[7] In 2002 alone, 300 million people in India were affected by drought, with damages amounting to over US$900 million.[8] In the same year, monsoon floods killed more than 780 people and displaced some 24 million in the eastern and north-eastern states.[9] In China, in 1998 alone, more than 3,000 people died and four million were rendered homeless as a result of floods.[10]

Where rich countries have developed mechanisms for protection against weather-related disasters, the poor have in general few ways to cover their economic losses.[11] The combined cost of global natural disasters in 2003 amounted to US$60 billion, US$5 billion more than the previous year. Out of this, only US$15 million was insured losses.[12] As poor countries have less developed infrastructure,

however, the majority of the losses still account for wealthier countries, which makes it impossible to truly assess the full economic impact on the world's poor with these figures.

It is not surprising that the progress to reach the targets of the millennium goals is already well off track. With just over a decade to go to the main deadline in 2015, one of the targets is already doomed lost, and it is doubtful that any of the targets will be met on time. In Sub-Saharan Africa the outlook is so desperate that most of the targets are unlikely to be met until well into the next century.[13] Even more disturbingly, all these projections are made without considering the implications climate change could have on reversing the progress even further.

Poverty

So far little progress has been made on the first goal – to eradicate extreme poverty and hunger – and some of the poorest countries have gone into reverse. Anything which makes life harder, like global warming, will hit the poorest first and worst. More than one billion people are living still on less than US$1 per day and increased droughts, heavy rains, floods and storms will make it increasingly difficult for them to access food, and protect their homes and livelihoods in the future. It's been estimated that due to global warming, poorer regions of Asia, Africa and Central America are likely to suffer from reduced cereal yields, which could increase the number of malnourished people worldwide by several tens of millions over the century.[14]

Education

The failure to combat poverty will inevitably have an effect on the second goal – to achieve universal education. Parents living under the poverty line are highly unlikely to send their children to school for a longer period and there are currently 115 million children that do not attend schools at all. Seventy countries are, thus, likely to fail to achieve universal primary education by 2015. For Sub-Saharan Africa, it looks extremely dire, and the target is not expected to be met until 2129.[15] Increasing floods and storms, caused by climate change, can make the matter even worse. More than one million classrooms across Latin America and the Caribbean are vulnerable to natural hazards and Hurricane Mitch alone destroyed one quarter of all schools in Honduras in 1998.[16]

Gender

The impacts of global warming are set to exacerbate conditions of extreme poverty. It is well established that under such conditions girls are less likely than boys to be sent to school. This has serious implications for goal number three – to promote gender equality and empower women – and it has already been established that the 2005 target to ensure for girls the same opportunities in primary and secondary education as boys is going to be missed.[17] There is a strong correlation between lack of education and lack of employment for women. Two-thirds of illiterates are women and the rate of employment among women is also two-thirds that of men.[18] As women produce 60–80 per cent of the food in developing countries, weather-related disasters are also likely to put severe stress on women's work and incomes.[19]

Health and diseases

According to the World Health Organisation (WHO), the United Nations Environment Programme (UNEP) and the World Meteorological Program, at least 150,000 people die unnecessarily each year as a direct result of global warming.[20] Warmer and wetter conditions could be triggering unprecedented levels of disease outbreaks in both humans and the natural world, which could undermine goal number four – to reduce child mortality; number five – to improve maternal health; and number six – to combat HIV/AIDS, malaria and other diseases. The target on child mortality is already well off track. None of the countries has reached the target and in Sub-Saharan Africa, it is not expected to be reached until 2165.[21] Every year nearly 11 million young

children die from mainly preventable illnesses.[22] Climate change, in the year 2000 alone, was estimated to be responsible for 2.4 per cent of worldwide diarrhoea, a disease that claims the lives of nearly two million children every year[23] and malaria, which is already the second leading cause of death in the world for 5–14-year-olds, is expected to reach unprecedented levels under climate change.[24] It has been estimated that 260 to 320 million people are likely to find themselves living in areas with potential malaria infestation by the year 2080. This will lead to increased expenditure for poor countries. The treatment of victims of dengue fever, which is currently widening its barriers in subtropical regions, cost Puerto Rico US$12 million during an outbreak in 1994. Climate-change-related disasters in themselves can also drain public resources for health care. Global warming is expected to exaggerate the world's hydrological cycle. Variations in extreme weather typically associated with the *El Nino* cycle are likely to become a more average condition. As an example of the likely economic knock-on effects, spending on health care in Bolivia, Chile, Ecuador and Peru fell by 10 per cent, due to the fall in gross national product after the *El Nino* cycle in 1982–83.[25]

Environmental sustainability

Goal number seven – to ensure environmental sustainability – includes the target to halve the proportion of people without access to safe drinking water. Today, about 18 per cent of the world's people do not have access to safe drinking water, which is an improvement since the beginning of the 1990s. This rate of progress, however, is unlikely to continue under climate change. As weather patterns become more extreme, water supplies are expected to decrease in many areas. Lake Chad in Africa, which has 20 million people in six African countries relying on it for water, has shrunk by 95 per cent in the last 38 years.

The goal aims also to achieve significant improvement for slum dwellers. Across the majority world, economic and social dynamics are pulling more people into cities where basic services like health, sanitation, housing and drinking water are already over-stretched. Worse still, 16 of the world's growing mega cities are on coastlines, where even a slight rise in sea levels or a shift to more extreme weather patterns would have a devastating effect.[26] Climate change looks set to worsen conditions for slum dwellers in direct contradiction of the millennium goal. By forcing people to leave rural areas due to increasing climate-related hardships, it could also increase their number. In 2002, one million people in Bangladesh were estimated to have become homeless as a result of flooding.[27] The drought in Central Asia 1997–2001 forced up to one million people in Afghanistan alone to leave their homes. There are no official figures for environmental refugees – those people forced to flee by primary environmental push-factors – but academic estimates suggest that in the mid-1990s the number was around 25 million, more than the number of political refugees.[28] In Africa alone, famine forced by climate change could result in more than 50 million environmental refugees by 2060, with a global figure of over 150 million.

Global partnership for development

Goal number eight – to develop a global partnership for development – gives targets for action and co-operation to ensure successful achievement of the goals. Most targets refer to the development of partnerships around trade, debt and aid, but none refer to combating negative environmental changes that already have devastating effects on the world's poor. Aid to ensure that poor countries are better prepared to deal with weather-related disasters is important, but, in the long run, will not be enough. More importantly there needs to be frameworks to combat the causes of climate change, with particular sensitivity to the world's poor. If not, climate change could effectively block any attempt to reach the millennium goals and result in the end of development.

Energy shock and ending poverty

It is the paradox of the global warming era that both the use of, and the loss of oil supplies threaten global upheaval: the former through climatic instability and the latter through economic destabilisation. Both hit headlines in early 2004.

In March, climate scientists from the US National Oceanic and Atmospheric Administration reported a rise in carbon dioxide concentrations well above expectations and the average for the previous decade. Although no definitive explanation was offered, there was speculation that new environmental feedbacks, triggered by human-driven climate change, could be responsible.[29] In April, Shell, the world's third largest oil company admitted that they had deliberately exaggerated their level of known oil reserves by around 25 per cent, causing a sudden drop in their share price. Oil prices, on the other hand, rose consistently through to the summer of 2004 raising fears that they could trigger a global economic depression.

Nations both North and South, rich and poor are still heavily dependent on oil. Almost all aspects of our economies are hooked. Apart from obvious uses such as fuel for transport, residues from the petrochemical industry can be found in every room of our houses and in everything we do. In the majority world, where too many people live close to, or below the breadline, farming depends enormously on products that need large amounts of fossil fuels.

Any interruption to that supply, either in terms of price or simple availability, means the global economy going cold turkey. Everyone will be affected, but some more than others. Quite apart from climate change, it is this threat to conventional energy supply that means any long-term efforts to improve the human condition will need to be linked to renewable energy sources. Collective insights from recent decades about what makes for 'real' development, also point to the need for micro, small- and medium-scale technologies that local people can control, rather than large, centralised and distantly-owned systems.

The moment at which production reaches a maximum and starts to drop off is called the Hubbert Peak after the geophysicist King Hubbert. In 1956, he correctly predicted when US oil wells would pass their peak. The reason this moment is so important is because it sets in train a domino effect with impacts on the climate, our lifestyles and the economy. The moment that production and demand head in opposite directions we can expect a sudden price explosion. The poorest oil-importing countries will be hardest hit. But the impact on general global peace and security will probably be terrible as the world's dominant and heavily oil-dependent countries like the US go to even further lengths to guarantee access to cheap fuel. For example, the International Energy Agency (IEA), a body of the OECD

(Organisation for Economic Cooperation and Development) predicts that, even in a best-case scenario of maximum diversification and technological advance, by 2030 Saudi Arabia and its immediate Middle Eastern neighbours will provide for two thirds of the expected increase in demand for oil.[30]

Natural gas is expected to hit its Hubbert Peak about a decade after oil. A worrying likelihood is that, as oil production declines, governments will switch to coal, and not just any coal, but the dirtiest types of coal that are most readily available. Coal is cheap and there is much more of it than oil and gas; but it's also much more polluting. For every unit of power produced, coal will belch out around one third more carbon dioxide than oil and nearly two thirds more than gas.

But there will be other major effects. Oil powers about 90 per cent of the world's transport system. Farming and our food supply is already threatened by global warming. But it is also very heavily dependent on oil for fertilisers and pesticides. As oil production dives so will the output from conventional high-input farming. More than 10 calories out of 11 from farm products are subsidised by oil.[31] So, as we become greedier for a shrinking oil supply, we may also become hungrier in the real sense.

How hooked are we?

For anyone concerned about climate change or economic stability, official projections for the global energy markets make disturbing reading. Looking forward to the year 2030, the IEA predicts:

> *"A future in which energy use continues to grow inexorably, fossil fuels continue to dominate the energy mix and developing countries fast approach OECD countries as the largest consumers of commercial energy."*[32]

Even discounting the last observation – which is disingenuous because it glosses over the fact that, per person, OECD countries will still be consuming fossil fuels at a much higher rate than the rest of the world – this projection charts a course that, in the context of trying to restrain climate change, appears to be disastrous.

In 2001, coal oil and gas collectively accounted for 79.5 per cent of the global primary energy supply. Renewables represented just 13.5 per cent. For the rich countries of the OECD, the fossil fuel proportion was slightly higher at 82.9 per cent, while renewables stood at just 5.7 per cent. This is mostly because the rest of the world outside the OECD includes less industrialised countries that depend on a much higher proportion of biomass such as fuel wood in their supply mix.[33]

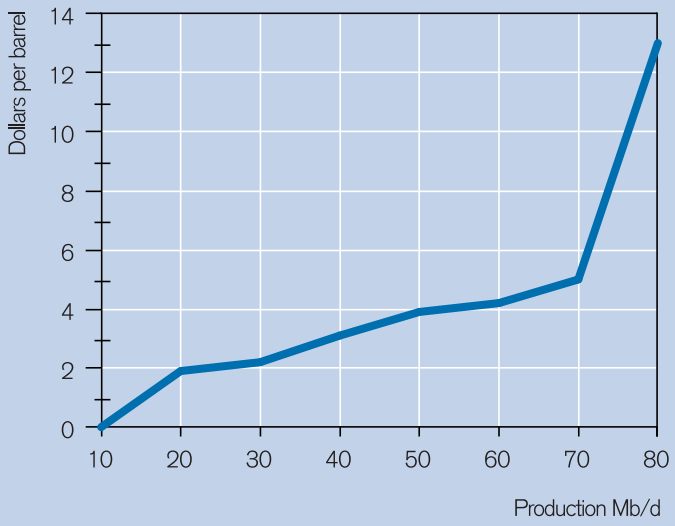
The next oil shocks

Oil accounts for 43 per cent of global energy consumption. Transport systems are almost entirely dependent on it. An increasingly globalised economy is, therefore, especially vulnerable to disruptions in supply or changes in price. Several factors mean that our oil dependence creates great volatility – political, economic and environmental. It is the product of the laws of nature, the dynamic of the market and international gunboat diplomacy for control of the natural resource. Ever since premature warnings were given in the 1960s about oil running out, it has been considered foolish, irrelevant or heretical to remind policy-makers or the public of our precarious dependence on oil.

Fortunately, if a little late, a steady trickle of revelations continues to emerge from official and private sector sources that show, often shockingly, how bad the situation is. A number of dedicated websites and organisations like the Association for the Study of Peak Oil work to focus on likely consequences and the need for action.

Typical predictions include that within five years a gap will emerge between the amount of oil extracted from wells and rising global demand, and that other

Figure 1: World oil production costs



Source: European Commission (2000) / ASPO (2003)

sources, like natural gas, will be unable to compensate. Key sectors like transport and agriculture will suffer particularly. In the early stages of such an oil shock, poor oil-importing countries will be especially badly hit.

Price shock

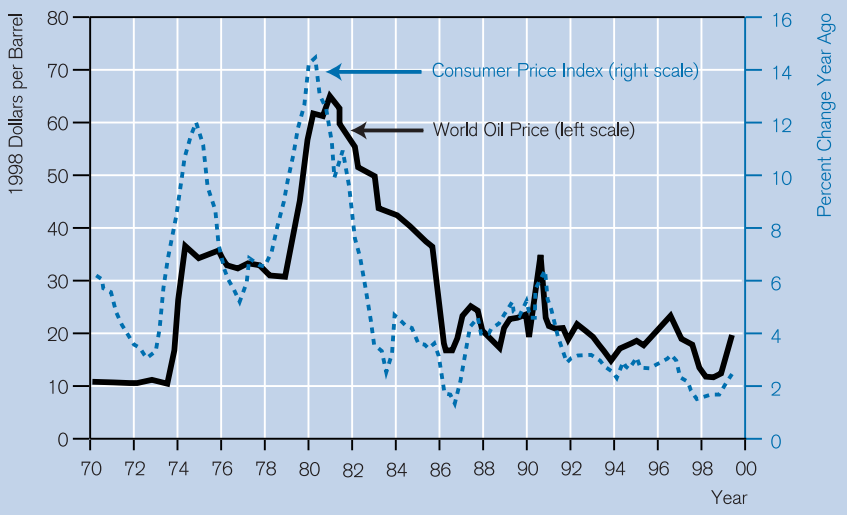
Few, it seems, are prepared to directly confront the impact on price that a sharp gap emerging between the demand for, and production of oil implies. Dr Emilio Martines of the Instituto Gas Ionizzati del CNR in Italy drew attention to Figure 1, first published with little explanation by the European Commission in 2000 in a Green Paper on the Security of Energy Supply.[34] Although it requires several caveats, the basic message it conveys is that a sharp increase in the price of production will follow attempts to meet demand beyond about 70 million barrels per day. Those extra costs will, of course, be passed on to the consumer.

Economies are vulnerable because the price of oil has a strong influence on the general price of goods in the shops. Figure 2 from the Energy Information Administration (EIA) of the US Government shows how close the correlation is.

Some fossil fuel industry analysts make the case that higher oil prices trigger global economic growth and that only 'extreme' prices of $75 per barrel or more will trigger economic depression. The case is also made that such growth is needed to prime future oil production which, in an upward spiral, is needed for further growth.[35] There are two problems with this analysis: first it misses the climatic imperative of breaking the fossil fuel addiction of the global economy, and secondly, it underestimates the impact of higher oil prices on the poorest countries.

Different government responses to oil price rises can radically alter the consequences for developing countries. Following the 1973 oil price shock, relaxed monetary policy in rich countries meant low to negative real interest rates on hard currencies. As well as maintaining demand for poor countries' exports this also laid the foundations for the Latin American debt crisis. But following the 1979 oil price shock, rich countries' fear of inflation created a triple blow for their poorer relations. Economist David Woodward describes the consequences of tightening monetary

Figure 2: Movements in world oil price and inflation



Source: EIA (2000) US Government

policy, 'demand contracted, developing countries' export prices collapsed, and real interest rates increased dramatically to historically high levels.'[36] As a consequence the price of oil imports doubled 'overnight' and interest rates on commercial foreign debts doubled over the next three years.

Even at oil prices prevailing in early 2004, the IEA believed that oil-importing developing countries were being seriously disadvantaged.[37] As the International Monetary Fund (IMF) observes of the most economically disadvantaged group of nations, although the Heavily Indebted Poor Countries (HIPCs) "account for only a small share of global GDP, many of them are among the most seriously affected by higher oil prices". The Fund points out that 30 of the 40 HIPCs are net oil importers, making them particularly sensitive to price. Their problems are compounded by several interconnected economic factors including: low per capita incomes, high level of oil imports relative to GDP, large current account deficits, high external debt, and limited access to global capital markets. Altogether, according to the Fund, this means that, "the impact of higher oil prices on output is relatively large, as it will have to be met primarily through a reduction in domestic demand". This is economists' speak for the poor getting poorer.[38]

Political shock

Corruption is highlighted consistently as a barrier to poverty reduction. Few industries, except perhaps arms, have been as closely linked to corruption as fossil fuels. Since the earliest days of the coal and oil industry, the centralised structures of such extractive industries lent themselves to what academics call 'rent seeking'. Alternatively, highly diversified and localised energy supply industries are much harder for a few powerful and possibly corrupt players to 'capture'. Renewable energy sources ideally lend themselves to such a model.

It is a sad reflection on economic relationships between rich and poor countries that, according to the UN's specialist body on trade and development (UNCTAD), the largest share of a relatively small flow of investment heading into regions of low human development such as Sub-Saharan Africa goes to oil and mining.[39] These industries are notorious for passing on only a small share of their economic benefits to local people. The consequences, not least unfair, are also highly divisive.

From Angola to Nigeria, oil has been and remains the source of struggle, conflict, debt and exploitation between rich and poor.

In 2002, Nigeria was producing around two million barrels of oil per day. Crude oil accounted for 80 per cent of government revenue and 90 per cent of foreign exchange earnings. The approximate $11 billion earnings from oil sales, shared equally would give each Nigerian about 27 cents per day. But Nigeria racked up financial debts of $5.6 billion at market rates under its military dictators. Just servicing its debts in 1999 and 2000 cost Nigeria $1.4 billion each year. Several mainstream banks including Barclays, HSBC and Merill Lynch were censured by City regulators for flouting anti-money-laundering rules in relation to accounts linked to Nigerian dictator General Abacha. He stole an estimated $4 billion from his country. Other parts of Nigeria's debts are made up of foreign-funded projects that have failed due to dependence on foreign inputs, equipment and technical support.

Nigeria, however, still has to keep paying with the revenue from its oil. Simultaneously the cost of environmental degradation in Nigeria – much of it in the oil-producing Niger Delta, for a long time an active economic interest for companies like Shell, Mobil, Texaco and Chevron – has been put at $5.1 billion. By early 1998, around 14,000 compensation claims for oil-related damages had been presented by groups, individuals and communities to the Nigerian courts.[40] Harder to cost are the ethnic tensions exacerbated in the oil areas. The southern Delta State produces 40 per cent of Nigeria's oil. Violence, which is part of an ongoing struggle to control oil resources, during state and federal elections in early 2003, left hundreds dead and thousands homeless.[41]

In the last year alone, the world has been divided again by a conflict in Iraq with multiple causes, but amongst them, the control of oil. In South America, US interference with Venezuela is thought to have been motivated by fears over the price of oil.

In March 2004, the non-governmental organisation Global Witness released a report commenting that, "Across the globe, revenues from oil, gas and mining that should be funding sustainable economic development have been misappropriated and mismanaged." It highlighted five major examples in Kazakhstan, Congo Brazzaville, Angola, Equatorial Guinea and Nauru.[42]

Growing concern about the behaviour of the oil and mining sectors led to a major review of extractive industries under the auspices of the World Bank. The review's progressive recommendations proved controversial within the Bank and are explored more in the following section.

Global warming, conflict and the need to meet international-development targets all tell us that a future dependent on the still-growing exploitation of fossil fuels is no future at all.

Perverse incentives and dirty energy

One of the reasons that the world is still so hooked on fossil fuels is that oil, gas and coal have for decades benefited from huge direct and indirect government subsidies in most industrialised countries. Exact figures on global and regional energy subsidies are notoriously elusive, partly because subsidies take a variety of forms. Nonetheless, even the most conservative estimates suggest that spending on fossil fuels runs into the tens of billions of dollars annually.

One solid estimate based on a combination of sources puts the level of subsidies for fossil fuel energy by the advanced OECD nations at about $73 billion per annum between 1995 and1998; with a further $162 billion of subsidies to fossil fuels in non-OECD countries – a total of $235 billion every year in this period.[43] Other estimates put the level of subsidies even higher – between $250 and $300 billion.[44]

To put those figures into perspective, one year's worth of global fossil fuel subsidies – taking the conservative figure of $235 billion – could comfortably pay off Sub-Saharan Africa's entire international debt burden with billions left over. Meanwhile, the additional $0.4 billion pledged by the rich nations and due to be available from 2005 to help developing countries adapt to extreme weather events triggered by climate change is exceeded by the money spent by OECD nations on fossil fuel subsidies by a factor of 170.

Sometimes subsidies are subtle and elusive. For example, in Britain around £40 million of taxpayer's money is spent each year on subsidising research into fossil fuels. Meanwhile, private 'sponsorship' by industry of academic work on projects relevant to the 'upstream oil and gas industry' raises the figure to around £67 million. Most of this money goes not to questions of environmental impact but discovery and extraction of oil and gas.[45] Other indirect subsidies include tax incentives to fossil fuel power development and the failure to incorporate pollution costs of burning fossil fuels into their price.

The propagation of fossil fuels technologies also occurs under the rubric of international development. According to a study by the World Resources Institute (WRI), over 90 per cent of the $90 billion in public and private capital flows directed towards new power plants in poor countries between 1994 and 2001 went to large-

scale coal and natural gas projects, while just 8.5 per cent was directed towards smaller diesel-run power stations and a mere 1.5 per cent towards renewable power supplies.[46] A previous WRI study calculated that, between 1994 and 1999, the combination of fossil fuel power generation and oil and gas development accounted for nearly 40 per cent of the ECA-supported financial flows to developing countries.[47]

Spending by the British Government alone on fossil fuel projects in the developing world can be directly correlated with increases in CO_2 emissions from developing countries to the tune of some 14 million tonnes of carbon each year[48] – a figure roughly equivalent to the total annual carbon emissions of countries such as Bolivia, Jamaica, Jordan and Zimbabwe.

Much of the UK's support goes in the form of export credit guarantees, which are used by the Export Credit Guarantee Department under the Department of Trade and Industry to underwrite large-scale energy projects undertaken by British companies in the developing world. Export credits are used by most industrialised-country governments to promote trade and investment by domestic companies in developing countries. Through export credit guarantees, public money is used to provide exporters and their banks with insurance and guarantees against political, market and other types of risk.

According to environmental group Greenpeace, the UK has supported an average of £1.76 billion-worth of fossil and nuclear power generation projects every year since the UN Framework Convention on Climate Change was signed in 1992. This is a pattern repeated by Export Credit Agencies (ECAs) across the industrialised world. The two major US-based ECAs are the Overseas Private Investment Corporation (OPIC) and Export-Import Bank (Ex-Im). Between them, OPIC and Ex-Im invested about $32 billion in developing coal, oil and gas mines, and power plants in developing countries between 1992 and 2002.[49] One estimate calculates the support provided by these twin organisations to fossil fuel plants in the developing between 1992 and1998 alone could lead to 29.3 billion tonnes of CO_2 emissions over the lifetime of the projects.[50]

For many poor countries, the World Bank Group holds the key to development finance. If a country wants to attract international investment it needs a green flag from one of the Bank's lending or investment guarantee arms. Both international public finances in the form of aid, and private finances in the form of direct or portfolio investment tend to follow the financial institution's 'seal of approval'. This means that whatever sums of money the Bank lends, secures in the form of investment guarantees, or gives on grant terms, has a big 'multiplier effect'.

In 2003, fossil fuel projects represented 86 per cent of the Bank's energy portfolio spending, while renewable projects still accounted for just 14 per cent.[51] In the past few years, the Bank Group has provided support for projects ranging from a $125 million loan to the Baku-Tblisi-Ceyhan oil pipeline (one of the longest in the world); to helping to restructure the gas sector in the Sichuan province of China; to the 1,000km-long Chad-Cameroon oil pipeline. Each of these projects has raised grave local social and environment concerns and been vociferously opposed by a number of organisations. Between 1992 and 2003, World Bank lending for fossil fuel projects was well in excess of $10 billion.[52]

Perversely, much of the World Bank money directed into energy projects in the developing world – where it supports infrastructure ultimately operated by Western petrochemical multinationals – flows straight back out again in the form of oil revenues to industrialised countries. According to a study by the Sustainable Energy and Economy Network (SEEN), about 80 per cent of all oil projects the Bank invested in between 1992 and 2003 were for export back to Western Europe, Canada, the United States, Australia, New Zealand, and Japan.

As the authors of the study point out, "This means the World Bank is providing a subsidy, calling it 'poverty alleviation', to energy markets in the North – particularly for oil markets. In addition, though it is not included in this analysis, often the fossil fuel resources are developed with World Bank dollars in order to power export-oriented industries, like gold mining or aluminium smelting."[53]

Following mounting criticism, the Bank commissioned an external review of its involvement in the sector, the findings from which were published in a damning report in early 2004. The review, conducted under the leadership of the former environment minister for Indonesia, Dr Emil Salim, took evidence from a wide variety of stakeholders. It concluded that there was too little connection between support for the sector and the Bank's primary aims, which are poverty reduction and sustainable development. It also said social and environmental policies were inadequate and that there was too little respect for human rights. A series of recommendations were proposed, calling for:

- Integrated social and environmental impact assessments.
- Updating and full implementation of policies for resettlement and natural habitat protection.
- Greater transparency and better governance of projects.

Addressing the legacy of communities harmed by past projects, and giving communities more power through granting them 'prior and informed consent' throughout a project's cycle.

But perhaps the most significant and unequivocal conclusion in the report called *Striking a Better Balance*, was this:

> "The WBG (World Bank Group) should phase out investments in oil production by 2008, the year of the first commitment period under the Kyoto Protocol, *and devote its limited scarce resources to investments in renewable energy resource development, emissions-reducing projects, clean energy technology, energy efficiency and conservation, and other efforts that delink energy use from greenhouse gas emissions.* During this phasing out period, WBG investments in oil should be exceptional, limited only to poor countries with few alternatives." [emphasis added][55]

Non-governmental organizations welcomed such findings. Nur Hidayati of Indonesian NGO WALHI commented, "The benefits of oil, mining and gas projects are often questionable and… there is much evidence that the extractive industries violate indigenous peoples' rights and are associated with loss of livelihoods."[56]

The consequences of multiple subsidies to the world's fossil fuel industries are manifold. In a paper prepared for the June 2004 International Conference for Renewable Energies in Bonn, Jonathan Pershing and Jim Mackenzie from the World Resources Institute summarise the multiple economic, social and environmental dis-benefits created by fossil fuel subsidies as:

- Subsidies that lower consumer prices lead to higher energy use and reduced incentives for energy efficiency.
- Direct subsidies in the form of grants or tax exemptions act as a drain on government finances.
- Consumption subsidies in developing countries either create higher demand for fossil fuel imports (or reduce amount of energy available for export), acting as a drain on foreign exchange earnings.

A report by the Exxon-Mobil corporation projected that the world will require 40 per cent more energy in 2020 than it does today, and that consumption levels would reach 300 million oil-equivalent barrels per day (about 620 exajoules per year), with most of the new demand coming from increased energy use in developing countries.[54] Yet the report dismissed the role of clean renewable sources to meet this burgeoning demand, branding them as neither 'relevant' nor 'leading edge' to the global energy mix, and anticipating that the increased demand for power will be met primarily by natural gas, with oil playing a secondary role.

- Subsidies to specific energy technologies act as a drag on investment in research and commercialisation of other promising technologies.
- Subsidies tend to favour large-scale projects at the expense of small distribution systems, meaning that the main beneficiaries tend to be urban and wealthy consumers rather than the poor.

The urgency of the switch from fossil fuels to clean renewable sources was underlined by the head of the United Nations Environment Programme (UNEP), Klaus Topfer who, in October 2003, warned a group of bankers and investment financers in Tokyo that if the 'business as usual' fossil fuel mindset was not changed soon, it would result in serious and irreparable environmental and social harm. Citing a UNEP Finance Initiative study, Topfer also noted that continuing to invest in new energy infrastructure based on fossil fuel technologies over the coming years would accelerate the rate of climate change, increasing the costs of climate-related disasters to such an extent that such events would constitute a "major risk of the global economy".[57]

The arguments for switching public subsidies from investment in capital-intensive fossil fuel energy infrastructure to small-scale renewable supplies are almost indisputable. A 2002 report, *Reforming Energy Subsidies*, published by the UNEP and the IEA, confirmed this perspective, stating that subsidies supporting fossil fuel use are not only bad for the environment, but are also place a heavy burden on public finances, act as a disincentive for energy efficiency and bring "few benefits to the people for whom they are intended".[58]

In 2004, UNEP published a report assessing the use of energy subsidies in both rich and poor countries. The authors come to the tentative conclusion that – whether looked at from social, environmental or economics angles – subsidies to fossil fuel energy projects usually make little sense, even for developing countries. The report demonstrates that, with a few exceptions, subsidies to fossil fuel projects in both industrialised and developing countries lead directly to increased levels of pollution and greenhouse gas emissions. In India, for example, removing electricity subsidies would lead to a CO_2 emissions reduction of about 100 million tonnes every year, equivalent to 10 per cent of the country's annual emissions. Meanwhile, removal of oil subsidies in Chile could lower SO_2, NO_x and CO_2 emissions each by about five per cent.

"Removing subsidies that are both economically costly as well as harmful to the environment would be a win-win policy reform", the authors conclude. "As many fossil fuel subsidies fall into this category, governments should prioritise removing them."

Yet the report does not condemn the use of energy subsidies full stop, suggesting there may be:

> *"A good case for retaining subsidies in specific instances, especially where they are aimed at encouraging more sustainable energy use."*[59]

Clean energy and ending poverty

"Renewable energy flows are very large in comparison with humankind's use of energy. Therefore, in principle, all our energy needs, both now and into the future, can be met by energy from renewable sources."

Thomas B. Johansson, Kes McCormick, Lena Neij, Wim Turkenburg,
January 2004, Bonn International Conference for Renewable Energies

With coal oil and gas making up four-fifths of the global primary energy supply in 2001, and renewables accounting for not much more than one tenth, it would seem that there is a mountain to climb.[60]

Broken down by region, however, the picture varies considerably. In some areas renewable energy, broadly defined, makes a significant proportion of overall supply, as much as 50 per cent in Africa, for example. But, currently, in almost all regions, the cleanest renewable forms – including solar, wind, geothermal and tidal energy – account for only a very small share of total renewable supply: in Africa 0.2 per cent, Latin America 1.5 per cent and Asia excluding China, three per cent. China doesn't register at all, although it does have numerous renewable energy projects underway.

These figures are usefully compared to the energy that is potentially available in the world around us. It is easy to see from Table 1 that there is far more energy available from renewable sources than human society needs, even allowing for numerous technical difficulties, if only the energy supply industry was better geared to capture it.[61]

Table 1: Current operating renewable energy by type and region

Region	Renewables share of total primary energy supply (%)	Share of total renewables (%)		
		Hydro	Geothermal, solar, wind, tide	Combustibles, renewables and waste
Africa	50.1	2.6	0.2	97.2
Latin America	27.9	35.4	1.5	63.0
Asia	33.3	3.9	3.0	93.1
China	20.8	9.9	0.0	90.1
World	13.5	16.4	3.7	79.9

Source: IEA 2003

Table 2: Total world energy potentially available (x10^{12} watts)	
Solar	174 000
Geothermal	32
Tidal	3
Present world energy consumption (2001 @ average 2.1kW per capita)	**12.7**
Photosynthesis	40
Winds, waves convection and currents	370
Fossil fuel reserves	~2000

Source: Goldemberg 2004 & Hubbert 1971

For years, vested interests in the nuclear and fossil fuel industries have dismissed the cost and potential of renewable energy. Ironically, of course, even fossil fuels are the long-term products of renewable energies. José Goldemberg was Minister for Science and Technology in Brazil and is now Secretary for the Environment for the State of São Paulo. In his contribution to the 2004 Bonn conference on renewable energy he points out that, "Renewable energy is inexhaustible and abundant," and he adds, due to the environmental problems linked to fossil fuels, "It is clear therefore that in due time renewable energies will dominate the world´s energy system, due to their inherent advantages such as mitigation of climate change, generation of employment and reduction of poverty, as well as increased energy security and supply."

Others are even more unequivocal about the potential of renewable energy flows saying they are, "Very large in comparison with humankind's use of energy. Therefore, in principle, all our energy needs, both now and into the future, can be met by energy from renewable sources. Technologies exist that convert renewable energy flows to modern energy carriers or directly into desired energy services."[62] Energy flowing through the earth's ecosystems, even taking account of geographical and technical limiting factors, could provide an amount of energy for human needs that 'exceeds current energy use by many times'.[63]

The human cost of business as usual

Getting the answer to the energy question right will determine the success or failure of international efforts to meet the millennium development goals. Ready access to clean and reliable energy can soften several hardships for poor communities, such as cooking, and the need for heating, cooling, water pumping and sanitation and by replacing other expensive, polluting fuels. It can mean electricity in schools and that children can do their homework in the evening. It can provide higher efficiency for small-scale industry, as well as release women from tedious and time-consuming tasks, such as fuel wood collection, countering the costs of gender inequalities.

At the moment, 1.6 billion people globally have no access to electricity, four-fifths of whom live in rural areas. Projecting forward on current trends, the IEA predicts that this number will decrease only slightly, to 1.4 billion, by 2030.[64] In addition, the number of people who rely on biomass, mostly wood and dung, for the bulk of their cooking and heating needs, is expected to increase from 2.4 billion at present to 2.6 billion by 2030.

Table 3: Usable global renewable resource base (Exajoules per year)

Resource	Current Use[a]	Technical potential	Theoretical potential
Hydropower	10.0	50	150
Biomass energy	50.0	>250	2,900
Solar energy	0.2	>1,600	3,900,000
Wind energy	0.2	600	6,000
Geothermal energy	2.0	5,000	140,000,000
Ocean energy	–	–	7,400
TOTAL	**62.4**	**>7,500**	**>143,000,000**

Source: Johansson, McCormick, Neij, Turkenburg, 2004.[65]

a the current use of secondary energy carriers (electricity, heat and fuels) is converted to primary energy using conversion factors.

Such a scenario would almost certainly mean the failure of most of the MDGs 15 years after the latest target date of 2015 had passed. The combination of indoor and outdoor pollution is already a major environment-related health threat, claiming three million lives per year. Smoke trapped inside homes from cooking with these materials accounts for 2.2 million deaths – mainly women and children – and is responsible for five per cent of the total burden of disease worldwide.[66] Looked at in financial terms, UNEP estimates that this indoor pollution costs the world between $150 billion and $750 billion per year – 0.5 to 2.5 per cent of the world's GNP – mainly in lost production through sickness and death.

In India, for example, poor quality coal supplies and a high level of oil imports (already at about 70 per cent of domestic energy need) are major concerns for the energy sector. Respiratory infections linked to using solid and fossil fuels are estimated to cause 290,000–440,000 premature deaths per year in children under five years of age. Electricity shortages in the country are expected to double in the next decade if adequate capacity addition and reduction in losses are not achieved.[67] With a growing population demanding energy, pressure on traditional resources is increasing. Wood fuel and dung collection is leading to deforestation and desertification, and deprives the land of cover and necessary biological waste, threatening its fertility. This has extra knock-on threats for food production and food security.

To reach the MDGs and improve lives it is therefore crucial that the gap between the electrified and the non-electrified world does not get any wider. But the prospects of meeting the energy needs of the world's poorest people through the use of fossil fuels are not encouraging. Bringing grid electricity generated by fossil fuels to many of the more remote or hilly rural areas in developing countries is both impractical and uneconomical, and thus is politically unlikely.

Indeed, trying to plug the energy gap with fossil fuels is becoming an ever more fraught task for developing nations. The vulnerability of net oil-importing countries to a potential oil shock is immense. In early 2004, world oil prices hovered at around $35 per barrel. An estimated $5 per barrel price rise would, at current levels of consumption, increase the energy bill of developing by $90 billion per year – a figure far outstripping current total overseas development assistance to poor countries.[68] By May 2004, the oil price was steadily above $40 per barrel.

Oil prices in the early part of 2004 caused speculation that growth in global GDP would be reduced by up to half a per cent, more in the poorest countries. The IEA

has anticipated that, if higher oil prices last through to the end of the 2004, developing countries would suffer most, with most seeing their growth rates cut by around two per cent.[69]

As we come down from the crest of peak global oil production, oil-importing countries will be faced with an economic crisis directly proportional to their dependency on oil. While the exhaustion of world oil reserves may still be years away, once production has peaked – a point many believe we have already reached – prices will begin to rise sharply, with the heaviest burden falling on the poorest countries.

So, despite the importance of access to energy for poor people, it is clear that the drawbacks of fossil fuel in terms of increasing costs, health risks and increasing CO_2 emissions (with disastrous follow-on effects in terms of climate change) are too serious to ignore. These impacts will mean that any step forward towards the millennium goals with the aid of fossil fuels will mean, in reality, two steps back.

Weighing up the costs

Renewable energy is often deemed too expensive for the developing world, as many technologies demand large initial investments. This view was echoed by World Bank President James Wolfensohn in April 2004, when on the eve of the Bank's annual spring meetings he reiterated the Bank's reluctance to take on board the recommendations of the extractive industries review.

"Renewable energy, which represents two per cent of the overall global supply, is an interesting option," offered Wolfensohn. "But, even if this percentage is doubled in the next five years, coal and oil would still account for 70 per cent of the energy sources supply. We have to resort to gas whenever possible. But we also have to remain realistic: renewable energy is expensive."

This logic, at best, shows a bad grasp of basic economics, and at worst reflects the entrenched interests of the Bank's major donors' fossil fuel industries. Wolfensohn's suggestion that renewable technologies are too expensive to meet the energy needs of the poor fails to consider three crucial factors: the continuing use by rich and poor country governments of both direct and indirect subsidies to fossil fuels; the uneconomical nature of large-scale grid systems in most developing country contexts; and the short- versus long-term costs of renewables versus fossil fuels.

While it's true that commercial renewable supplies tend to be more expensive than their fossil fuel equivalents in the short-term, this is largely because the latter continue to benefit from heavy direct and indirect subsidies in the form of research and development, protectionism over politically sensitive extractive industries such as coal mining, tax breaks and direct support payments.

At the same time, the costs of mining and burning fossil fuels on human health and livelihoods – as well as the global atmosphere – entirely escape the market pricing of energy. Were the subsidies removed, and the true environmental and health costs of burning fossil fuel energy internalised, their price would rise considerably and renewables would become immediately competitive. The UK Government's Energy White Paper quoted damage costs from carbon emissions in the range of around $50 to over $200 per tonne of carbon.

Providing electricity through a centralised grid system linked to fossil fuel burning power plants is also a highly inefficient and uneconomical way of reaching poor and remote energy users in developing countries. Cowan Coventry, Director of the Intermediate Technology Development Group (ITDG) comments that, "Grid extentions will reach less than half the two billion waiting for access (to electricity) within the next thirty years." In Sub-Saharan Africa, analysts have noted that "the capital requirements of renewables are generally lower than those of conventional and centralized investments", allowing African countries to begin a phased

The Amazon Project, Peru

The remote community of El Paraiso is found in the Amazon region of north East Peru. It's an area which the national energy grid is unlikely ever to reach. Due to lack of energy, the Amazon communities in general find it impossible to provide certain basic services, such as vaccine and medicine preservation, proper education and communication facilities. Stomach and skin diseases are widespread, as well as contagious illnesses, such as hepatitis and tuberculosis. Lighting is one of the most important needs. Local people generally cope by using conventional, expensive sources of energy, such as kerosene, wax candles or diesel sets, though the supply of all these are unreliable.

Despite the general hardship, the Amazon communities have one major energy source right next to them – the river. Using the power of the river and with the help of ITDG, El Paraiso developed a river current turbine which has provided the community with energy. Due to its success, other neighbouring communities requested support to do the same. Two communities now have improved basic services, with a vaccine refrigerator, lighting for the community, health centres, education centres and other community priorities, benefiting about 800 people. Inter-community workshops have also been set up to transfer technology to other communities.

renewable energy programme that would not "…draw investment funds away from other pressing basic nutrition, health, education and shelter needs".[70]

Meanwhile, in India, the tendency is to extend the grid incrementally, reaching towns and settlements in order of increasing capital costs, which means that remote areas with small populations are likely to be the last to receive an electricity supply. These areas are left with options, such as kerosene, candles and dry-cell batteries, often at high costs. The cost of a kilowatt-hour of a dry-cell battery is close to US$100.[71]

In this context, local renewable energy options are not only more environmentally sustainable, but also imply huge cost savings for local people – and not just in India. In remote areas of the Amazon jungle, communities living by the many waterways within the basin have been able to benefit from energy derived from river current turbines, giving them the possibility of vaccine refrigerators, lighting for the villages, health centres and schools. It is in these communities and thousands like them around the world that renewable energy can make the biggest difference.

For the three billion people who remain unconnected to such systems, small-scale renewable technologies therefore represent the only cost-effective option for meeting local power needs.[72] This message was reinforced by the head of UNEP, Klaus Topfer, who in an October 2003 speech to a group of bankers and investment financiers in Tokyo argued that, for poor countries in particular, "…the reliance on fossil fuels and centralised infrastructure will not serve the vast majority of people in rural areas where the economic benefits of a modern energy system are elusive".[73]

Even where villages are connected to a grid system, the cost of providing power through large-scale fossil fuel systems means that the price of energy is still prohibitively high for the poorest people. Looking again at India, the Government's ambitious rural electrification programme has reached 80 per cent of the nation's villages and urban communities; yet just 31 per cent of connected households actually have electricity because they cannot afford to buy it off the grid. According to the IEA, this problem exists in all poor nations. Even with all the subsidies pumped into fossil fuel energy systems – the cost of accessing energy from the grid for an *urban* household in a developing country can run anywhere from $50 for a

Night light in the Himalayas

National grid systems are often inefficient and frequently fail to get power to remote communities where the costs of connection are high. According to Indian solar energy pioneer, Bunker Roy, the problems inherent in national grids mean that their days are numbered as the primary focus of energy policy. The work of his Barefoot College in Rajasthan in India has helped spread solar power to over 130 remote villages in the Himalayas improving the lives of 15,000 people. By training 'barefoot solar engineers' and the college helps oversee ambitious domestic electrification schemes that bring light and power to cash-poor households.

Winters can last six months in the region and temperatures drop to –40°C. Before the installation of solar power and lighting, families, often sharing buildings with animals, relied upon 'dim kerosene lamps and candles' for the duration of winter. To get one month's supply of kerosene meant a two-day walk with a 20 litre jerry can. Solar brings both cleaner air in the house and less eye strain. The technology helps generate local employment both directly in terms of installing and maintaining the clean technology, and sometimes in quite literal spin-offs that create new opportunities. Two hundred women gained work due to new solar powered spinning wheels and solar water heaters have been used in drying vegetables.

There are several fossil fuel savings to be made from replacing kerosene for lamps, diesel for generators and even petrol for transporting the fuels. The Barefoot College calculates that 15 years work in around 100 villages has saved 61,000 tons of carbon emissions. That makes an average saving of just over 40 tons per village per year.

They estimate that 100,000 villages in India lack 'conventional electricity'. If their experience was repeated across all these villages over a similar 15-year period it would represent a carbon saving of 61 million tons. Put another way, in admittedly hypothetical scenario, if their proven technology were implemented tomorrow India would see a carbon saving of a fraction over four million tons per year and, in the process, improve the lives of millions of people living in the villages.

single-phase connection, to several hundred dollars – prohibitively high for most poor people.[74]

The financial common sense of renewable technologies becomes even clearer when viewed over the medium-to-long-term. The use of water flowing through a stream to drive an irrigation pump or small-scale power generator has no fuel cost component; nor does it preclude the ability of someone else downstream doing the same. By the same token, wind currents and sunlight are still, for now, at least, free public goods, the use of which holds no negative side effects for other users. As the example from Sagar Island in India shows, once the initial investment is made into these technologies, the associated energy costs decrease over time, while fossil fuel costs tend to rise (see Table 4). Viewed in this context – as well as in the light of an almost guaranteed oil price shock in the near future and climate change – fossil fuels reveal themselves to be a potentially far more 'expensive' option for developing countries than renewables.

Turning the tide of globalisation?

The multiple costs of meeting the majority world's growing energy demands through fossil fuel technologies are likely, then, to be high. At the same time, the short-to-medium-term chances of the world's poorest people gaining access to

Table 4: Cost of Solar versus Diesel Electricity on Sagar Island, Sunderbans, India[75]

	Cost of Solar Electricity	Cost of Diesel Electricity
1996	50 cents/ kWh	5 cents/ kWh
2002	40 cents/ kWh	10 cents/ kWh
2002	25 cents/ kWh	20 cents/ kWh
2004*	20 cents/ kWh	30 cents/ kWh

*** Projected costs**

centralised energy grid systems are remote. The imperative to pursue clean micro, small- and medium-scale renewable energy technologies such as a wide range of solar solutions, biomass, small-scale wind technologies and micro-hydro installations is becoming harder to ignore.

The arguments in favour of bridging the energy gap in developing countries with these solutions rather than fossil fuel technologies are so strong; they question why Wolfensohn and others would want to do otherwise. An obvious explanation is that taking the renewables route means that investment in fossil-fuel projects would be significantly scaled back, upsetting vested industry interests.

Yet there is perhaps another, more deep-rooted reason why resistance to renewables-led development is so great amongst the world's major economic powers. Global energy markets based on fossil fuels form an integral part of the infrastructure of globalisation. Poor countries get hooked into this infrastructure through their reliance on oil, coal and gas imports, and end up caught in a nexus of dependency relationships with other nations, multilateral donors and foreign companies.

Financing fossil fuel projects can account for up to 40 per cent of total bilateral debts to export credit agencies; meaning that developing country governments become tied to policies dictated by the multilateral development banks and the major OECD donor governments.

Imagine a poor country that suddenly shifted all energy investments into locally-based renewable energy systems run on solar, wind, hydro or geothermal power. Before long, the economic perspective and priorities of that country would shift drastically. No need to borrow hundreds of millions to develop expensive energy plant and infrastructure systems; massive national energy bill savings as consumption of imported oil and gas plummets; greatly reduced geopolitical vulnerability to international events such as OPEC price hikes, or war, that could affect energy supplies and economic stability. In short; a massive tether to the global economy would be severed.

This scenario could lead to a more systemic rethink of the development process *per se*. Less debt and spending on energy imports would reduce the need to generate foreign exchange revenue through exports. Local economies could focus much more on meeting local and domestic needs, without needing to look to foreign investors or markets to pay for their development needs.

It may sound ambitious and long-term, but if such a scenario emerged in one country it would pose an uncomfortable challenge to established global thinking about development. If it emerged in several countries, it would begin to have major affects on global energy markets, as well as international imports and exports of

The Home Employment and Lighting Package (HELP), Nepal

The provision of energy to poor communities often suffers one key problem: the start-up investment. Some initiatives also fail where there is a lack of local technical knowledge and money to maintain the system. But there are examples where the communities are not only provided with energy, but also training to become self sufficient. The Home Employment and Lighting Package (HELP) in Nepal is such a project.

HELP aims to reach the poorest of the poor in remote villages in Nepal by providing an intrinsically combined package of solar photovoltaic lighting systems (SHS) and came up with a way of ensuring that the villagers can pay back the both the investment as well as having a future income. No cash is required from the village to start off the system. After formulating a community-based Solar Development Committee, villagers enter into an agreement with the committee to get a solar system, which is then installed by a local technician. The villagers get training in handicrafts and pay for their SHS via the sales of the products. Once the SHS is paid in full, the villagers earn cash income from the sales.

The project has several benefits. Apart from delivering energy to some of the poorest communities in Nepal, it has also given the villagers a chance of empowerment and self-reliance. They get a better understanding of environmental issues around energy provision, as well as the health benefits that come with clean energy, such as decreases in eye infections caused by kerosene lanterns. The consumption of kerosene is now down to zero, with approximately 93.6 tonnes CO_2 emissions cut every year.

There are also substantial cost savings to be made. For the past 18 months, on average, each family has saved rupees 3150.00 on kerosene and batteries, which corresponds to approximately 10 per cent of the annual family income. In addition, women are taking an increasing part in the provision of clean energy. As the main providers of traditional energy, they have felt that their participation in the transition to SHS has been crucial, and has created confidence and self-respect among the family members.

goods and services. Were it to spread across the developing world, it would fundamentally transform economic globalisation.

Further still, such technologies suggest an alternative approach to development in general. They suggest a genuinely *decentralised* system of production and consumption, with local economic activity rooted in the power provided by the local environment, and energy supplies becoming a community-owned and managed resource rather than an imported commodity – greatly reducing the vulnerability of supply to disruption or price fluctuation.

So, is this scenario realistic? Already there is growing evidence that communities in developing countries powered by renewable energy supplies are able to exercise a far greater degree of self-determination. Many examples of power generation through locally owned and controlled technologies not only enable communities and households to improve local quality of life through the electricity they generate; but also provide opportunities for local learning and political empowerment.

While this state of affairs might seem revolutionary to political leaders in the OECD nations, it may provide an increasingly attractive path out of poverty to local communities in the South, other than that those offered under the auspices of the World Bank, IMF and World Trade Organisation.

Less smoke sees more trees – Chardust, Kenya

Despite the major health risks associated with charcoal, it is by far the single, most widely used domestic cooking fuel among the urban poor of East Africa. The charcoal industry in Kenya alone is valued at more than £70 million per year. Most of the charcoal on the market is unsustainable and illegally harvested and, as the industry is effectively unregulated, no taxes are paid on any levels. The annual demand for charcoal in Kenya is estimated at one million tonnes.

But there are options that are not only more sustainably produced, but also cheaper. The Chardust project aims to provide viable substitutes for charcoal that serve to alleviate environmental pressures while allowing low-income sectors of society to reduce expenditure on domestic cooking fuel. It has developed a technique for producing briquettes with waste from charcoal traders, as well as other types of charcoal fuels. While urban charcoal prices are £0.15 per kg at retail level, Chardust offers briquettes at £0.10 per kg, which amounts to a saving of 33 per cent on energy bills.

The savings on the direct environment are also staggering. So far, the project has focused mainly on commercial sales, but by moving into the domestic sector they expect sales of 250 tonnes per month. This will mean that 30,000 tonnes of standing wood will be conserved each year, implying huge benefits in terms of soil cover protection, biodiversity and carbon sequestration. The use of briquettes will also contribute to less indoor air pollution and less emission of methane into the atmosphere, leading to numerous health benefits.

The future is here…. and it works

With the support of prominent religious leaders, an eco-friendly crematorium is being introduced in India to save on the enormous amount of precious fuel wood used in the traditional Hindu funeral pyres. We have only just begun to imagine the amazing range of applications of fuel efficient and renewable energy technologies. But if they can already be applied in the most sensitive areas of our lives, the potential of readily available technologies is vast. The number and diversity of renewable energy applications shows that – with the right combination of investment, technology and local participation – micro, small- and medium-scale renewable energy can meet multiple development challenges.

There are numerous examples where the long-term savings after installing renewable energy have been substantial. In Nepal, for example, families in remote villages have been able to save approximately 10 per cent of their family annual income on average by switching from kerosene and batteries to solar photovoltaic lighting systems.

In Kenya, a switch from charcoal to environmentally friendly briquettes could mean a saving of 33 per cent on energy bills. These kinds of savings could have huge impacts on poverty.

Gaining access to start-up capital to invest in local clean energy supplies can be a problem for very poor communities, as the up-front expense of renewable technologies can be as much as US$400 to US$800 per system, depending on the source and desired wattage.[76] These initial costs however, can be overcome by government subsidies and aid initiatives. There are already several examples where micro credit schemes have successfully helped.

In Sri Lanka, for example, at least 4,000 solar home systems have been sold on credit since 1998.[77] One innovative and successful initiative was used in the example from Nepal. Villagers received training in producing handicrafts and then

Climate friendly tortillas – The Ecostove, Nicaragua

Every day, over 30 million corn tortillas are sold in three major cities in Nicaragua. They are produced and sold by over 190,000 households and represent a common way of earning an income for single mothers and families where the husbands are unemployed. On average the sales generate a net income of US$3.5 per tortilla-maker per day, representing a crucial income for poor people in a country with a formal unemployment rate as high as 50 per cent.

The tortillas are generally cooked by women on traditional woodstoves, which although common, can be ruinous to health. The production of tortillas means working for hours over an open wood fire, exposed to heat, smoke and flames. It leads to severe eye irritation, respiratory complaints and other diseases related to indoor air pollution. But there are solutions that could have huge health benefits for the numerous tortilla producers, such as the Ecostove. Where modern fuel-efficient stoves replace the traditional woodstoves, the benefits have even been seen by local plastic surgeons that see a reduction in the amount of disfiguring complaints that result from using the old stoves.

The main aim of the Ecostove project in Nicaragua is to provide household tortilla businesses in Nicaragua with a modern woodstove that humanizes their working conditions. Apart from eliminating indoor air pollution by nearly 100 per cent, increased woodstove efficiency also saves 50 per cent in fuel-wood costs and minimises deforestation. A pilot survey has shown that the Ecostove can also reduce the emissions of greenhouse gases by 35 per cent. So far, the main problem with the Ecostove is the up-front price of US$60 plus delivery, but the project is hoping to use grants to promote the stove with a one third subsidy.

used the income from the sales to pay off instalments, which meant that they not only received clean energy, but also an additional source of income.

Renewable energy has massive employment potential for local technicians and other jobs associated with the energy production. Jobs in the renewable energy sector are also likely to be less dangerous and have less detrimental health effects than jobs in the fossil fuel sector. The UNDP estimated that coal mining alone results in at least 16,000 deaths every year. As 70 per cent of the world's coal production is located in the developing world, at least 11,200 of the deaths are likely to be there. China alone has at least 6,500 coal mining deaths every year.[78]

In many cases, renewable energy supplies can contribute directly to local livelihoods by providing an income to community members through the sale of electricity to neighbouring villages.

In addition to income creation through the technologies themselves, renewable energy can provide business with cheaper and more sustainable options to increase productivity. This could benefit businesses in poor and marginalised communities in particular, such as street vendors and cottage industries.

In India, for example, a pilot project in Bhopal, a city still suffering the after affects of its lethal chemical encounter with development, is providing cleaner and cheaper lighting alternatives for street vendors with solar lanterns.

In Mongolia, small household-scale wind turbines have been estimated to increase income-generating activities, adding up to US$30–US$150 per month to incomes and in Bangladesh, community solar-powered cell phones have produced up to

US$200 per month in revenue for the operators. The main beneficiaries here are women, as the phones are primarily operated by local women in their homes.[79]

The Bangladesh example proves one of the ways that renewable energy can have positive impacts on gender relations. Women are also often the main providers of traditional energy in developing countries, which means that they are in general the first to benefit from improved energy provision. Time savings are often quoted of particular importance, and a programme in Nepal has shown how biogas has decreased the time and labour for fuel wood collection and cooking for women.[80]

In Nicaragua, improved woodstoves could have substantial health impacts on the numerous women who now are suffering eye irritation and indoor air pollution as a result of producing tortillas for the market in their homes. The tortilla industry is huge and provides a crucial income to many poor families and the majority of workers are women.

There are also examples of less quantifiable, but highly significant, gender benefits with the implementation of clean energy systems. In the example of solar home systems in Nepal, women felt that as the main providers of traditional energy, their part in the transition to solar photovoltaic lighting systems was crucial and this has created self-confidence as well as respect among the family members.

A question of scale

Can the promise that these examples show for renewable technologies to meet the energy needs of the world's poorest people be extended to the hundreds of hundreds of thousands of rural villages and urban neighbourhoods worldwide that still lack access to electricity?

The number and diversity of current renewable energy applications suggest that – with a bit more imagination and political will – clean renewable energy technologies could deliver on this promise. For a start, all of these success stories have happened over a period of time when the vast majority of public and private investment in the South has channelled into fossil fuel technologies.

At the moment, only one to three per cent out of the $40 billion spent annually on energy investment in developing countries goes towards renewables.[81] Yet, within the next 10 years, renewable energy could meet a rapidly growing proportion of the populations of places as diverse as China, South Asia, East Africa and Central America. So what would the cost be, and how would this compare with current projected energy expenditures on fossil fuel energy? Making such estimates is notoriously difficult, depending on the type of fuels one is comparing and the time-scale considered.

Having said this, it is possible to make some rough initial calculations of costs. One estimate calculates that providing solar electricity to a village of 50 households would cost an average of $25,000.[82] For the sake of illustration, assuming conservatively that the average household size in Sub-Saharan Africa is five people, this works out at a cost of about US $100 per person.[83] If one multiplies this by the number of people in Sub-Saharan Africa (500 million) without electricity, the cost works out at about US $50 billion.

With a rough calculation, providing every single person in every single non-electrified community would cost about US$50 billion – a large sum, until one considers the current profile of energy spending. Rather than going towards expensive and costly fossil fuel projects, one year's worth of World-Bank spending between 1992 and 2003 redirected to small-scale solar installations in Sub-Saharan Africa could have provided 10 million people on the continent with electricity.

Watershed Regeneration and Micro-Hydro Power in the Philippines
On the island of Mindanao in the Southern Philippines, a group of local people in Polocón, near the city of Davao, used a small grant from the Global Environmental Facility (GEF) to take charge of their own energy needs while protecting the environment. With the help of a local NGO, the community used a $45,000 grant from the GEF to design, build, operate and maintain a 15KW micro-hydro scheme in the area. Local residents also conducted a survey of the watershed before building the micro-hydropower station. Rehabilitating the watershed is a key objective of the programme, since without the 70-hectare watershed, the river's flow would decrease and the micro-hydro plant would not work. So far, the project has had a number of positive outcomes, including:

- Quality lighting to 110 households, as well as to local public buildings.
- Diesel generators and kerosene for indoor lighting are no longer used.
- People in neighbouring villages can now come to Polocón to recharge their batteries and grind their corn using renewable instead of fossil fuel power.
- Local pastures and farmland have been reforested with native species and fruit trees, helping restore the local ecosystem following decades of government reforestation with exotic species. So far, 25 of the 70 hectares in the watershed region have been replanted.
- The community has institutionalized watershed protection, requiring each elementary school student to plant and care for 10 trees in order to graduate.
- The community has built their capacity to manage the micro-hydro plant, which has been integrated into the overall development of the community by channelling funds from milling and battery-charging services into the local school and other community needs.
- Community organisations have been strengthened, with active leaders and members and functional organisational structure.[84]

Similarly, the annual amount tied to investments in coal, oil and gas projects in the developing world between 1992 and 2002 by the United States' twin export guarantee agencies Ex-Im and OPIC could have provided over 30 million people in the region each year with solar electricity.

Looked at another way, all of non-electrified Sub-Saharan Africa could be provided with energy from small-scale solar facilities for less than 70 per cent of what OECD countries spend on subsidising dirty energy every year.

Solar energy represents the upper scale of costs for cleaner energy technologies, there are more immediate, cost-effective measures which could help bridge the gap for those three billion people who currently rely on 'dirty' biomass fuels for their household cooking and heating needs (this figure includes domestic coal burning as opposed to the 2.4 billion reliant on traditional biomass). In the poorest countries fuel for cooking is the primary energy need.

According to UNEP, some 2.7 million people die each year from respiratory diseases associated with air pollution released from the burning of biomass fuels.[85] This tragic situation could, however, be addressed with relative ease through the use of more efficient stoves. Such technologies are simple to build and relatively cheap to disseminate, yet could save millions of lives. According to another recent

The Solar Island

Six kilometres off the mainland in West Bengal lies the sacred Sagar Island. Although home to just under two hundred thousand people spread over 43 villages, each year in January more than one million visit on pilgrimage for the Gangasagar Mela festival. But Sagar Island is now becoming the focus for a new kind of pilgrimage, one where people are travelling to see how medium-scale solar power is meeting the needs of thousands of people who, like millions of others, are unable to access energy from a national grid.

Beginning in 1996, the West Bengal Renewable Energy Development Agency now operates nine stand-alone solar photovoltaic power plants that provide grid-quality electricity. The Agency works in cooperation with rural energy development cooperatives formed by the beneficiaries of the power supply, an original feature of initiative. Over 1,600 families also benefit from solar powered home lighting systems and 58 shops and businesses are getting stable power supplies. Before solar power arrived the island depended on expensive and inadequate diesel generators. More recently a wind/diesel hybrid power plant has been added to the energy mix.

The solar ambitions of Sagar Island are bold. Importantly the initiative to set up the power plants comes from the local village government 'Gram Panchayet' level. Apart from bringing electricity to homes, the mini-grids aim to power schools and health services too. The project also integrates power with water supply systems bringing drinking water to the island's homes. Jobs have been created directly and the local economy has benefited as new lighting and power allows local businesses, markets and home workers to work more cleanly, efficiently and safely outside daylight hours.

Gon Chaudhuri, the dynamic director of the Agency, emphasises that local people fully understand and promote the radical environmental improvements that solar brings, "Sagar Island has its unique ecosystem. It falls under the Sunderbans delta. Diesel power generation is responsible for environmental degradation not only in Sagar Island but in the entire delta zone. Solar energy is totally eco-friendly. There are no emissions and no sound pollution from solar PV. Local people are now very conscious about the protection of the environment of 'Solar' Island." Chaudhuri is unlikely to stop until everyone on the island has access to a solar mini-grid.

report, the total cost of providing these three billion people with access to healthy indoor air would be about US $2.5 billion per year over the next 12 years.[86] This means that, by spending just five per cent of their total annual overseas aid budget on clean-technology stoves for poor households, OECD nations could help save over 30 million lives over the next dozen years.

Approaching Africa's energy needs through a mixture of renewable energy technologies would cost considerably less than $50 billion. It is also worth remembering that, once installed, the basic source of energy – wind current, water flows, sunlight, and geothermal heat – is free, with costs limited to operation and maintenance. Furthermore, communities and governments save on the economic and social costs of the health burden caused by burning biomass and/or dirty fossil fuels – as well as contributing towards a reduction in the larger costs of climate change.

So what would the 'scaling out'[87] of micro-renewable energy technologies to tens of thousands more communities across the developing world mean to the people living in these communities? The projects discussed in the previous section suggest that the implications of such a scaling out process would have profound implications for global poverty alleviation.

New energy solutions

We possess the solutions to poverty and climate change. Both the resources and technology already exist. There are targets and timetables. But, unhappily, there are still numerous political obstacles and nations carry heavy loads of historical baggage. What blocks are there in the way to progress?

Dirty fuel is cheap and available. If, as we suspect, there are to be 'spikes' in oil prices, the simplest alternative in some of the world's most populace countries like India and China might appear to be turning to brown coal, one of the dirtiest fuels in terms of air pollution and climate change.

Developing countries also might feel they have a 'right to pollute'. For centuries, rich countries have taken more than their fair share of the world's fossil fuel inheritance. On a per-person basis, the majority world is so far behind in terms of greenhouse gas emissions that it might reject, quite reasonably, any attempts to restrain its burning of fossil fuels. Western environmentalists have even been attacked by their Asian counterparts – who are equally concerned about climate change – for lobbying to end World Bank support for fossil fuel projects.

At the official level, suggestions of parachuting energy models based purely on renewable energy into majority world countries are met with chilly responses. The reasons for this are to do with rich country hypocrisy and the inequity of the global economy. Industrialised countries are viewed as hypocritical, because they have themselves become rich to a large degree through the unrestrained burning of coal, oil and gas.

The inequity of the global economy, similarly, often blocks progress at international environmental negotiations. Why, developing countries ask themselves, should they act on rich country preoccupations with green issues such as climate change and tropical deforestation, while those same rich countries persistently fail to honour promises to reform an unbalanced global trading system, cancel unpayable debts or, indeed, take adequate action themselves on global warming?

The carbon debt

Between 1973 and 1990 emissions of carbon dioxide from burning fuel in the OECD group of rich countries increased by 3.4 per cent. Over the following decade, which saw the signing of the UN Framework Convention on Climate Change and much heightened awareness of the problem, emissions rose by 13 per cent.[88]

New figures calculated by **nef** (the new economics foundation) turn the world upside down in terms of who is really in debt, and who in credit in the international community. By using carbon accounts instead of dollar accounts, a different picture emerges to the usual one of aid-giving and aid-receiving countries. Taking a

Table 5: Annual per capita carbon dioxide emissions of selected countries and regions (2001)[89]

Country	per capita emissions (t/CO_2)
United States	19.84
United Kingdom	9.20
China	2.42
India	0.98
Nicaragua	0.71
Kenya	0.28
Regional averages	
OECD	10.99
Asia	1.13
Latin America	2.00
Africa	0.89

conservative threshold for the sustainable use of fossil fuels per person, it is possible to see how the world's conventionally poorest countries are, in effect, lending their environmental capital to the rich world. The rich world, in turn, can be seen to be running up carbon debts.

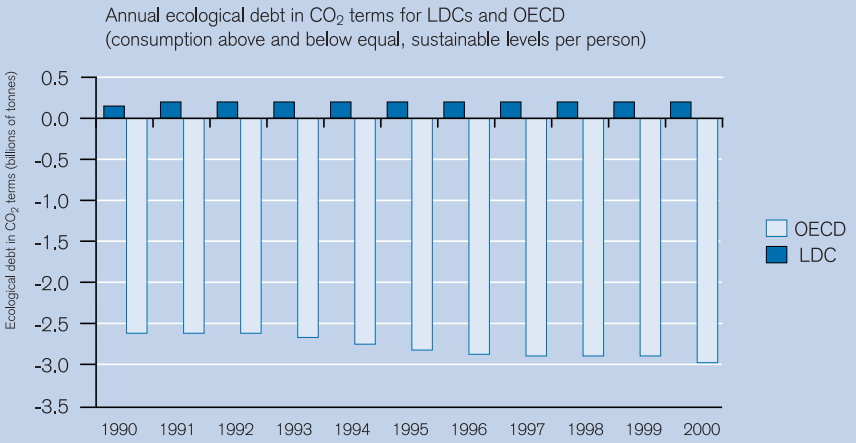
The figures were calculated in this way. The total global estimate for CO_2 emissions in 1990 was 6,126 million metric tons.[90] Using the IPCC's estimate of a minimum necessary 60 per cent cut in CO_2 emissions from 1990 levels to avoid uncontrollable climate change, the sustainable level of annual global emissions was set at 2,450.4 metric tonnes. The global population in 1990 was 5.281 billion people. The sustainable level of emissions per person per year was notionally then set at 0.464 tons to give a 'snapshot' of debts and credits at current and recent levels of national, per capita fossil fuel use.

For each country, an annual 'carbon' budget or basic income is worked out. The 'debt' for each year is the level of emissions above the sustainable level. Conversely, countries with less than the sustainable level are shown to be in credit. These figures illustrate a situation in which we assume each person in each country has an equal entitlement to a 'safe' level of fossil fuel use. Obviously this is not currently the case and the transition to such a state of affairs will require new global constitutional arrangements for how to cap, shrink and share a safe, worldwide carbon budget. Figure 3 does, however, illustrate how far there is still to go, and one of the major factors fuelling the political tensions of the climate negotiations.[91]

Ecological debt creates a historical context and a conceptual framework for the energy and climate change debate. The abundance of dirty coal in poor countries is a problematic geological and political reality. The big question is this: What price will developing countries demand to forego the same easy, high-polluting route to economic development already enjoyed by today's industrial giants?

In order to prevent runaway climate change, the world can probably afford to burn no more than about one third of known fossil fuel reserves. That means that the outstanding dilemma of worldwide energy and climate policy remains how to divide up entitlements to those fossil fuels that can still safely be burned. A free-for-all means that a safe limit could never be kept to. And any climate treaty that does not include all countries means that a lid could not be kept on how much fossil fuels get used.

Figure 3: Comparison of the annual carbon debt and credit of the Least Developed Countries (LDCs) and the industrialised nations of the OECD



There is no evidence that the small sums of money available through tools like the Clean Development Mechanism and Global Environment Facility stand a chance of pushing the big energy shift as far, or as fast, as is needed. In fact it is likely that the only way that sufficient incentive to change to renewables can be created, and the ecological debts reconciled, is a proper global framework that gives the majority, less developed world its fair and logical share of a declining global fossil fuel supply, and puts a safe cap on the major greenhouse gas emissions.

Such a framework is already gaining support amongst policy-makers. It is called 'contraction and convergence' (C&C) and was first proposed by the London-based Global Commons Institute. Under a 'safe' maximum atmospheric concentration of greenhouse gases rich countries reduce or 'contract' their emissions, while the poorest can increase theirs up to a point, with both sides ultimately 'converging' on equal per-capita entitlements by a pre-arranged point in time, for example the year 2030.

C&C sets a budget for acceptable emissions of greenhouse gases as fossil fuels are phased out and uses a logical and fair formula to share out the 'carbon cake'. As the atmosphere is owned by no one and needed by everyone, nothing less than 'equal rights' will be acceptable to the global South. The proposal also meets US objections to Kyoto that developing countries are not given targets. There are two great benefits of C&C. First it creates an enormous incentive to shift to renewable energy because any spare carbon emissions entitlements can be traded creating a new source of income (carbon trading is likely to become the world's biggest commodity market during the next century). Secondly, over time, developing countries whose populations, per person, are responsible for much lower greenhouse gas emissions will have a major new income stream to finance human development. Under this model, if the US, or another rich country, wants to use more than its fair share, it has to pay, recognising its historical and current ecological debts, and helping to finance poverty eradication in the process.

There are many creditable and important targets and timetables for the promotion and uptake of renewable energy. They stem from both official bodies and development agencies. For example, the task force on renewable energy set up by the G8 nations called for:

- The adoption of a renewable energy target of serving at least one billion people with renewable energy by 2010.

- The reform of International Financial Institutions (IFIs) and Export Credit Agencies to dramatically increase funding for renewable energies in developing countries.
- Phasing-out G8 government subsidies for fossil fuels and nuclear energy, while increasing research and development for renewable energy in order to create a 'level playing field' so that energy markets can function properly.

The World Bank Group's review of extractive industries came up with a list of significant recommendations yet to be incorporated into Bank policy. They include:

- Increasing the proportion of investment into renewable energy within the Bank's wider energy portfolio at the rate of 20 per cent per year.
- Phasing out all support for oil projects by 2008.
- Internalising the costs of greenhouse gas emissions into all World Bank Group decision-making.

These objectives are echoed by development and environment groups who go further still. An action plan promoted by ITDG and Greenpeace calls for:

- Access to clean energy for the world's two billion poorest people in 10 years.
- An immediate shift of 20 per cent IFI lending and support away from conventional fuels toward renewables.
- A 10-year plan to phase out subsidies to fossil fuels with flexibility built in for developing country economies heavily reliant on conventional fuels.
- Providing one billion people with improved, clean stoves by 2015, with a target of halving the number of deaths from indoor air pollution.

Many of these recommendations are good on their own terms. They need, however, to work within an inclusive global framework; one that is deliberately and explicitly designed to halt dangerous climate change, and which pre-distributes entitlements fairly to the global commons of the atmosphere.

Unless this happens, a negative domino-effect is likely. Poor countries will have insufficient incentive to turn their backs on 'dirty development', there will be no meaningful global climate deal to follow on from the strictly limited ambitions of the Kyoto Protocol, no significant new streams of income will flow North to South, increasingly dangerous climate change will occur, and the impressive millennium development goals will be blown away by an increasingly volatile and punishing global climate.

Renewable energy sources are here in abundance. The technology to tap them is mature. The world is rich enough to put them into operation if funding is redirected from fossil fuels. But, to-date, a globally acceptable framework is lacking in which to stage a managed retreat from the world fossil fuel economy. This missing link can be forged by the 'shrink and share' approach to dividing up the global carbon cake taken by the contraction and convergence model.

This report has looked at the roles that energy and climate change play in tackling poverty. It shows that all the economic, technical and political jigsaw pieces of a solution to both are available. Now that there are no excuses for inaction, the challenge is ours to create sufficient awareness that our political masters will have no choice but to act. The price of power will be too high unless safe, renewable energy becomes the option of choice to fuel an end to poverty.

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87 This term is used to mean the multiplication of the number small-scale renewable energy supplies, as opposed to the term 'scaling-up', which would imply a growth in the size of existing renewable energy systems.

88 Between 1990 and 2001.

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91 OECD debts rise over time because emissions rise and also because the population rises. Because of population growth, the sustainable level in 2000 would fall to only 0.41 per person. Our calculations allocate emissions on the basis of 1990 population figures. A benchmark year is used in order to stop their being a perverse incentive for countries to grow their population in order to increase their emission entitlements.

One of the other things we do

environment
lifestyles must
become sustainable

Current priorities are climate change, ecological debt and local sustainability

Local Works: Local people must be put back at the heart of their economies. Policies that favour the large and remote are threatening the vibrancy and diversity of our communities, bringing Ghost Town Britain. Giving real power to local people can reinvigorate our rural and urban economies.

nef is leading this campaign characterised by a highly diverse membership that seeks to combat the spectre of 'Ghost Town Britain'. It promotes the importance of local sustainability and self-determination. For example, Local Works was a big part of the campaign to defend community pharmacies. Taking as a starting point the fact that local communities should be more in charge of their own economies, education, healthcare, consumer and leisure needs, Local Works is campaigning for a legal framework that can make this happen.

The needs of communities must be at the heart of environmental, social and political justice. At a time of growing disenchantment with political processes, individuals and communities can and should have a real impact on how money is spent in their communities and what they invest in. Having a tangible impact on the delivery of services is a vital tool for political, social, environmental and economic reinvigoration in all of our communities.

Local Works recognises that there is no single blueprint, but that communities should draw up and implement their own plans to achieve these goals.

For more information please call 020 7820 6300

This report was written by Andrew Simms, Julian Oram and Petra Kjell with additional research by Jessica Bridges Palmer. It was edited by Mary Murphy.

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