

The Double Challenge

In support of a 'Green Energy Revolution' to simultaneously tackle the right to development and the climate crisis



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Understanding the Challenge: Energy, climate change and development

Understanding the Challenge: Energy, climate change and development

Energy use is responsible for some 75 percent of global greenhouse gas emissions, and emissions from energy use are rising faster than other emissions. But unless billions of poor people get better access to energy, they will have no prospects for development. If this development dimension of energy is ignored, there can be no global agreement on how to tackle the climate challenge.

Unequal access to energy

The last 200 years of development and human progress have been inextricably linked to increasing use of energy. Worldwide energy use multiplied 30 times between the years 1800 and 2000; over the same period, GDP multiplied by a factor of 100. But in spite of this economic growth, two billion people are still locked into poverty (surviving on less than 2 dollars per day).

Just like the benefits of economic growth, the access to and the use of energy is extremely unequally distributed. The total primary energy consumption, measured in kWh per capita per day, of the average person in the United States is almost fifty times that of Bangladesh, and fifteen times that of Tanzania. The gap in electricity use is even more striking: the per capita electricity use in the United States is nearly a hundred times larger than in Bangladesh, and over two hundred times larger than in Tanzania.

2 billion people excluded

In addition, there is a huge problem of actual exclusion from access to important energy services. Some 1.6 billion people – almost half of the population of the developing countries – have no access to electricity. Two billion more people only have access to unreliable electricity services.

Two billion people also depend on traditional biomass fuels – firewood, animal manure, agricultural waste – for cooking. This use causes serious health effects, for women and children in particular, and collecting the fuel requires much of their time. In terms of energy output much of this use is also very inefficient. And although these

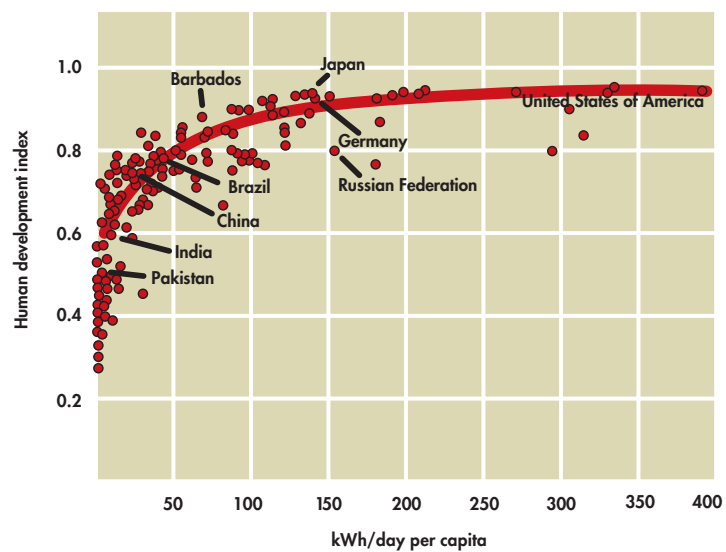
Country	Final	Electricity
US	167.07	39.01
Germany	98.09	20.39
Sweden	122.77	45.67
Korea	95.71	21.12
China	29.19	4.61
India	10.87	1.61
Brazil	30.39	6.41
Ghana	10.23	0.79
Tanzania	13.21	0.19
Bangladesh	4.11	0.42

Energy use per capita, kWh per day.
Source: WESS, United Nations 2009

Understanding the Challenge: Energy, climate change and development

fuels do not cause any net emissions of carbon dioxide (provided that they are indeed regenerated), they do contribute to global warming through emissions of hydrocarbons and soot (black carbon).

Solving the development challenge will depend on the continued expansion of new and better energy services in developing countries.



Source: World Economic and Social Survey 2009. United Nations.

Energy and human development

Energy use is essential for a whole range of human development indicators. The Human Development Index, HDI, measures of the status of countries in relation to a set of such indicators. A full score on all indicators would result in the maximum HDI value of 1. With regard to their use of energy, the nations of the world can be divided into three categories:

- **Low energy countries:** Nations where energy use is low (below 50 kWh per person per day) are also characterised by very low scores on the HDI. Within this group, however, very small increases in energy use result in much larger improvements in HDI scores. There are very large developmental benefits to be had from increasing energy use in these countries.
- **Medium energy countries:** In this category (50-100 kWh/p/d), the energy-development relationship is a great deal flatter, implying that the development benefits from increased energy use are less pronounced.
- **High-energy countries:** For these nations, which are also the richest countries of the world, the relationship is essentially a flat line. Thus, one might argue that much of the energy use in rich countries is unnecessary, as it apparently does not contribute to human development.

Access to electricity is also important to human development. No country has ever been able to reach high HDI scores, such as 0.8 or 0.9, without all of the population having access to electricity.

Poor people need energy that they can afford

The immediate reason for the inequity in access to energy is affordability. In the South, the main concern is not the price gap between the climate-friendly energy and fossil fuels. The issue is the affordability of *any* form of modern energy, and how to give more citizens access to cheap energy services.

The price of energy in developed countries is usually around 10-20 US cents per kWh, but consumers in developing countries generally pay less. In emerging economies they pay roughly 10 cents, and in low-income developing countries perhaps 4-5 cents. But how much energy people can afford to use also depends on their incomes. For instance, in India, the average income is about two dollars per day. If households can spend ten percent of their income on energy, the average daily energy budget of an Indian citizen is twenty cents. Even if the price is only 4-5 cents, the average person can only afford 4-5 kWh per day.

The energy that developing countries will opt for is any kind of energy that can be provided at prices that people can afford. The Chinese favour coal because, at a price of roughly three cents per kWh, it is affordable. Shifting to renewables that cost 15-20 cents would imply excluding significant parts of the population from access to electricity.

Developing countries can deal with the affordability problem by simply excluding large segments of the population from access to energy, or by reducing the quality of the services provided. Although from a health and environmental perspective biomass is anything but cheap, states often find it less expensive to shift poor people to burning firewood instead of providing them with modern energy.

Subsidies can increase access

Many developing countries also use targeted subsidies. In developed countries, industry pays less for energy than does households. In developing countries, the reverse is true: low-income households pay less for energy, high-income households and industry pay more. Similarly, the prices of diesel, kerosene, and petrol are kept low to stimulate public transport and other important sectors of society. Subsidies that are specifically targeted on societal benefits are in fact quite efficient, in contrast to many other kinds of subsidies.

But while these subsidies help increase access to energy, they generally do not help promoting renewable energy systems.

In industrialised countries renewable energy is promoted by the use of taxes or cap-and-trade schemes that raise the price of carbon-intensive energy. But the common goal of developing countries is to make *all* energy cheaper, so that a larger part of the population can have greater access to necessary energy services. A global strategy for promoting renewable energy must therefore seek to rapidly lower their costs, so that renewables becomes the natural choice for developed and developing countries alike.

The Green Energy Revolution

The United Nations (UN-DESA) has proposed a strategy that they call 'The Green Energy Revolution'.

The key messages are:

- Renewable energy is the key to economic development and a future without dangerous climate change.
- Renewable energy is too expensive for the world's poor, many of whom have no access to modern energy.
- Public policies can help produce a decline in the global price of renewable energy that will make it affordable within a decade.
- A "big push" in investment to scale up renewable energy will lead to rapid cost reduction, technology improvement, and learning by doing. This will generate a "virtuous cycle" of additional investment, economic growth, employment generation, etc.
- In the first decade, investments will have to be subsidized through globally funded guarantees or price supports (e.g. feed-in tariffs). The "virtuous cycle" will then make renewable energy the default option for new energy investment worldwide.
- Price supports will be complemented by a global extension program: research, technical, and policy support designed to accelerate the process.

A global 'Green Energy Revolution'

There is an urgent need for a 'Green Energy Revolution' to be developed and implemented on a global scale. The strategy must build on several different components:

- A cost-efficient system for investments in renewable energy solutions that will dramatically up-scale deployment and help push prices of the technologies down.
- A global financing mechanism, paid for by the industrialised countries, that can support these investments at a scale of some USD 100 billion per year.
- A radical increase in funding for energy research and development, and a clean shift of priorities to renewable energy, away from the current focus on fossil fuel and nuclear technologies.
- Revised rules and legislative frameworks for trade and intellectual property rights so that developing countries can get preferential access to climate-friendly technologies at prices they can afford.

These, and related, proposals are discussed in the other three briefings in this package.

Sources:

A Global Marshall Plan for Climate and Development: cost effectiveness and climate investments that make a difference Report from the fifth seminar in the SSNC seminar series "Key Issues for Climate and Copenhagen 2009".
www.naturskyddsforeningen.se/keyissues

World Development Report 2010.
The World Bank.
www.worldbank.org

World Economic and Social Survey 2009.
United Nations Department of Economic and Social Affairs.
www.un.org/esa/policy/wess

Climate Change

Key Issues

The Double Challenge

In support of a 'Green Energy Revolution' to simultaneously tackle the right to development and the climate crisis

The excessive use fossil fuels by a small minority of the world's population is the most important cause of climate change. Still, billions of people in developing countries do not have access to energy to meet even their most basic needs.

The fight against climate change must go hand in hand with massive efforts to improve poor people's access to affordable energy services. A clear commitment by the rich countries to invest in a rapid expansion of renewable energy for the poor is the key to bridging the trust gap in the negotiations.

In the proposal "The Green Energy Revolution", the UN outlines a plan to meet these objectives by pushing down the prices of renewable energy. A key component is a targeted program of guaranteed price support, "feed-in tariffs", that would greatly accelerate the scaling up of these technologies. This would propel a 'virtuous circle' of

investment, cost reductions and improved technologies, which would also help the necessary energy transition in developed countries.

This set of briefings discusses some of the key issues that need to be addressed in order to make cheap, renewable energy available to billions of poor people in developing countries. The package consists of the following briefings:

- Understanding the Challenge: Energy, Climate Change and Development
- Feed-in Tariffs and Front-loaded Investments
- Financing the Green Energy Revolution
- Technologies for the Green Energy Revolution



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Feed-in Tariffs and Front-loaded Investments

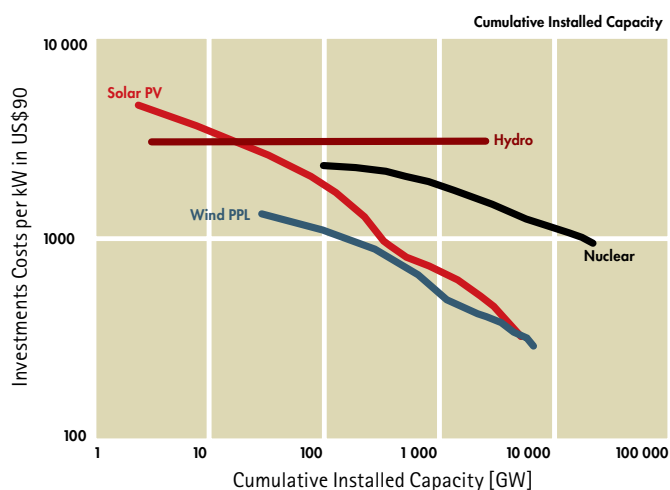
Feed-in Tariffs and Front-loaded Investments

What would be the best way of accelerating the deployment of renewable energy in developing countries? In industrialised countries, the main strategy has been to raise the price of conventional, carbon-intensive energy by the use of taxes or cap-and-trade schemes, in order to make renewable energy more competitive. These instruments do not necessarily work in the radically different economic and social context of a developing country that needs to make *all* energy cheaper, so that a larger part of the population can have greater access to necessary energy services.

A global strategy for promoting renewable energy must therefore seek to rapidly lower their costs, so that renewables becomes the natural choice for developed and developing countries alike.

Driving the costs of renewables down

The cost of producing renewable energy is already declining over time and nowhere is this decline more marked than in the wind and solar energy sectors. But the falling prices are actually more linked to the growing scale of deployment, rather than to time as such. Front-loaded investment with strong public support will speed up this process and make the prices come down faster.



The greater the installed capacity of an energy technology, the lower price for every new unit installed. Source: Nakicenovic, IIASA, 2009

Feed-in Tariffs and Front-loaded Investments

The 2009 World Economic and Social Survey (WESS), published by the UN Department of Economic and Social Affairs (UN-DESA), launched a set of proposals for using environmental investment as a driver for drastically increasing the demand for renewable energy technologies. This 'Green Energy Revolution' would significantly speed up development and scale up production, so that the cost of these technologies will fall rapidly. Lower prices will, in turn, facilitate a yet more rapid diffusion and deployment of renewables in both developing and developed countries.

A common, international target should be set that costs for renewable energy investment should drop to e.g. one USD per Watt of capacity. This is on a level with the current cost of investments in coal power in China. Once the cost gap is eliminated and renewables are affordable, we will have achieved a large part of the solution for much of the climate problem, as well as for the development challenge.

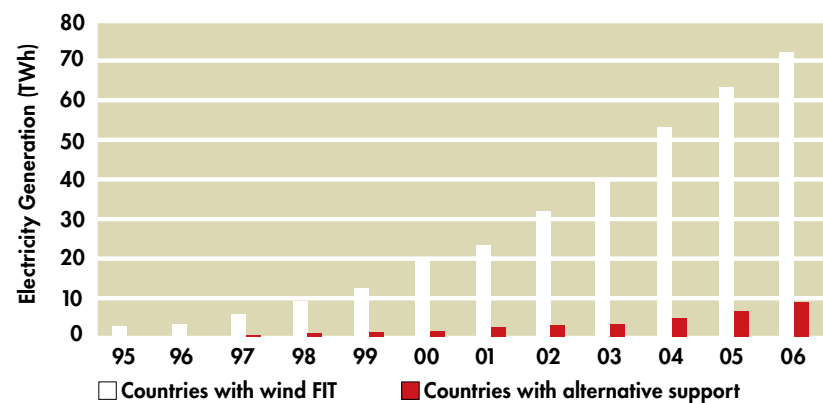
Feed-in tariffs

One of the key proposals of the WESS concerns the creation of a global feed-in tariff program for renewable energy. Feed-in tariffs have been used in some fifty countries around the world – including Germany and Spain, as well as Brazil, China and India – with very favourable results. In the case of wind power in Europe, almost 90 percent of the rapid expansion since 1995 has occurred in countries that apply feed-in tariffs for power suppliers.

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Expansion of wind power in EU countries using feed-in tariffs compared to EU countries using other forms of policy support for wind energy. Source: European Commission, 2008, cited by Johansson, 2009.

The principle behind feed-in tariffs is very simple. It is a guarantee that renewable energy can be fed into the grid at an agreed price. The price is set at levels which assure that producers can recover the cost of their investments, and also make a reasonable profit. The agreed price usually drops from year to year, which provides an incentive for new producers to join the system as early as possible.

Suppose a private company that sets up a solar power plant in India would need to sell it at twelve cents per kWh in order to make a profit. However, the Indian government sells electricity to its citizens at only four cents per kWh. Paying the remaining eight cents is what the feed-in tariff system is all about. The system provides support for poor consumers and low-carbon technologies alike.

International support

Feed-in tariffs *do* work in both industrialised and developing countries, but the scale

Advantages of Feed-in Tariffs

A global feed-in tariff system would have many advantages, all of which stand out in contrast to the current state of negotiations on climate:

- Climate and development are still largely viewed as separate or even contrasting agendas. But feed-in tariffs for renewable energy address economic and human development goals as well as climate objectives. Also, the reduction in the unit cost of energy helps the North as well as the South, because green alternatives for replacing obsolete power plants in developed countries will also become cheaper.
- The results are demonstrable. More often than not, the relationships between inputs and outputs in different support mechanisms are vague, and there are real concerns on the part of developed countries that don't want to put their funds into a 'black hole', with end results that are uncertain or unknown. But feed-in tariffs rely on so-called output-based funding. If a project is unsuccessful and does not deliver the expected energy output, no money will be paid. What a feed-in tariff rewards is only actual results on the ground.
- International support for a system of feed-in tariffs is a time-bound commitment. The production costs of renewable energy will be coming down. At the same time, increasing access to affordable energy means that the household incomes in developing countries will be rising. The amount of funding needed for the subsidy will decrease from below as well as from above. Depending of how rapidly scales are ramped up, the need for subsidies will disappear within a span of ten to twenty years.

at which developing countries can implement feed-in tariffs is constrained by what states can afford to pay. In order not to exceed the state budget, the government of India – or any other developing country – may have to limit the scale of the feed-in tariff so that only a few new solar plants will get built every year.

Large-scale international support for a global feed-in tariff program may well be the answer to this dilemma. The global scale of the program is necessary for boosting demand and accelerating industry growth all over the world, so that the costs can decline more rapidly. UN-DESA believes that contributions of 100 billion USD annually over the period 2010-2020, channelled through existing energy systems on the basis of output delivered, will be enough to bring about the transition to low-carbon societies and to lower the costs of renewables to the point where subsidies are no longer needed.

Complementary action

Feed-in tariffs is not the panacea that will solve all problems, and a number of outstanding issues need to be carefully considered in the design and operation of a global feed-in tariff program. There are also problems that feed-in tariffs may not be able to address, such as:

- Feed-in tariffs are most easily applied to grid-connected electricity generation. Complementary applications and/or alternative instruments need to be devised to promote the production and accessibility of off-grid electricity and of renewable energy sources other than electricity (such as improved fuels for cooking and for combustion engines).
- If the same incentives are given to all industries, it will be those low-carbon technologies that have the best cost structure that will become dominant in the end. However, obtaining the lowest possible cost of energy cannot be the only concern – the socio-economic and environmental impacts of using different technologies also need to be considered. This also includes the extent to which small-scale and informal producers can participate and benefit from the support systems.

Sources:

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Financing the Green Energy Revolution

Financing the Green Energy Revolution

A global program for providing guaranteed prices, or feed-in tariffs, for providers of renewable energy is one of the key components of the proposed 'Green Energy Revolution'.

The feed-in tariff is a guarantee that the output from all new renewable energy projects will be fed into the grid at an agreed price. If this price is higher than the price that poor people can afford to pay, the difference would have to be paid for by public funds. The price guarantee would serve to increase investor confidence, and speed up deployment of renewable technologies. For more detail on feed-in tariffs, see Briefing 2.

A global programme to support feed-in tariffs for renewable energy would need to mobilise very substantial funds – the UN suggests a need for some 100 billion USD annually over a period of at least ten years.

Responsibility to pay

The rich developed countries bear the main responsibility for the emissions that are causing the climate crisis – but people in developing countries, those that are least to blame, will suffer worst from the effects. Poor people also lack both the economic and practical capabilities to adapt to the changing climate.

On this basis the United Nations Framework Convention on Climate Change (UNFCCC) establishes the principle of "common but differentiated responsibilities and respective capabilities". The agreement imposes a legal obligation on the rich countries to help developing countries in several ways, including by providing "new and additional financial resources" to assist them in meeting their costs of adaptation to the adverse effects of climate change, and to meet "the agreed full incremental costs" of implementing measures to mitigate climate change.¹

Enhanced action on the provision of financial resources and investment for mitigation and adaptation measures is one of the four key issues that are being

1. UNFCCC Article 4.4 and 4.3 (including reference to para. 4.1 (b)).

Financing the Green Energy Revolution

negotiated in the process leading up to the Copenhagen meeting. So far, focus has been more on the mechanisms than on the money. Developing countries generally want to see a consolidated fund (or set of funds) under the authority of UNFCCC. But outside the conventions, rich countries and institutions like the World Bank and the EU have initiated a plethora of new funding mechanisms, over which they exercise a high degree of control. The EU, in particular, also pushes very hard for market based mechanisms to play a major role in funding.

The Green Energy Revolution in the negotiations on finance

A global programme of this kind is clearly best suited for funding through direct public investments and a centralised financial mechanism – carbon markets have little or no role to play here – and in the run-up to the Copenhagen meeting, funding for feed-in tariffs is included in the financial mechanism proposal that the largest group of developing countries supports.

Given the history of funding under the UNFCCC (see "Sharing the burden" on the opposite page), it may seem unrealistic to expect that developed countries will step forward and provide the climate funding that will be needed. Very substantial amounts of funding will still be needed for other mitigation measures, as well as for adaptation, but there are several good reasons why feed-in tariffs is an attractive program to support:

- It is a "payment-on-delivery" mechanism – the system only pays for demonstrable results. This also reduces the need for costly procedures of assessment and decision-making on projects, and minimises the risk of corruption.
- Support to feed-in tariffs is a time-bound commitment – the bigger the scale, the faster will the program push down the price of renewable energy, and the subsidies can be phased out.
- Falling prices will also create business opportunities and jobs in developed countries, and falling prices of renewables will be beneficial to their own energy transition.
- "Front-loading" the investments – providing more money at the earliest possible stage – will speed up the process and reduce the total cost.

But even if only smaller amounts are provided initially, the system can be scaled up as the benefits become evident.

Civil society concerns and precautions

A clear and binding commitment by the rich countries to provide sufficient and predictable funding for mitigation and adaptation measures in developing countries is a necessary component of any new international agreement on climate change.

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Some key points for the broader issue of climate financing are:

- The developed countries should agree to establish a new financial mechanism under the authority of the Conference of the Parties (COP) to the UNFCCC, along the lines of the proposal presented by the main group of developing countries.
- The governance of such mechanism(s) must be transparent and democratic, with balanced and equitable representation of all Parties, as well as representation of civil society organisations, social movements and indigenous peoples.
- Priority for programmes to be funded should be those that are based on national development strategies and climate action plans that have been developed in transparent processes and with the participation of affected groups and communities.
- Funds provided for climate change mitigation and adaptation must be additional to existing official development assistance (ODA) commitments (at least 0,7 percent of GNI for all OECD countries, higher for individual countries). Offsets – investments that developed countries (or their companies) make for the purpose of meeting their own mitigation commitments – must also not be accounted for as financial assistance to developing countries.

Given that it will be necessary to provide new funding on a scale that is at least several times larger than the current level of ODA, it is important that key experiences of managing large financial flows – ODA as well as foreign direct investments – are taken into consideration already when the programs are designed. With regard to financing for the Green Energy Revolution, it will be particularly important to:

- Base the choice of eligible technologies on transparent and participatory technology assessments that also consider socio-economic and environmental impacts (see also Briefing 4).
- Ensure that the program stimulates development of local and national economies and systems – including small and informal energy providers – and does not promote monopolies and neo-colonialism.

Sharing the burden...

In the 17 years that have passed since the UNFCCC was adopted, developed countries have channelled less than 3 billion USD through the convention's mechanisms for the financing of climate measures in developing countries.

Recent estimates put the cost for adaptation in the range from one hundred to several hundred billion USD per year, while mitigation funding needs are in the range from several hundred billion to one trillion dollars. The EU is offering to pay from as little as two billion euro per year, but possibly up to 15 billion. Even the higher amount is nowhere near the EU's legitimate share of the burden.

... and the benefits!

The Green Energy Revolution is a proposal that would help build trust and foster co-operation, which will be good for everyone. But it will also provide direct benefits for the countries that have to pay for the investments:

- Increasing demand for renewable energy technologies will create new business opportunities and jobs, also in developed countries.
- Falling prices of renewables will speed up their own energy transition, and reduce the costs.

Paying the polluters

The fossil fuel industry enjoys heavy subsidies from public funds. Instead of making the polluters pay, taxpayers are paying the polluters!

According to the World Bank, global subsidies to petroleum products alone amount to some 150 billion USD annually. Subsidies in developing countries may serve to improve energy access for the poor, but the estimated 67 billion USD that OECD countries provide annually to their fossil fuel industries serves no such purpose.

These 67 billion would go a long way towards financing the Green Energy Revolution.²

2. *World Development Report 2010*. The World Bank. *Redirecting Public Subsidies for Fossil Fuels in and from Annex 1 Countries*. OilChange International, 2009.

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Technologies for the Green Energy Revolution

Technologies for the Green Energy Revolution

There is an urgent need for expanding people's access to basic energy services in developing countries. About half of their population still do not have access to modern energy services. This means that the bulk of energy infrastructure in developing countries has yet to be built. The vast majority of energy investments in the next decades will be taking place in developing countries, and perhaps as much as 90 percent of all their energy installations in 2050 will have been built between now and then.

Now is the time

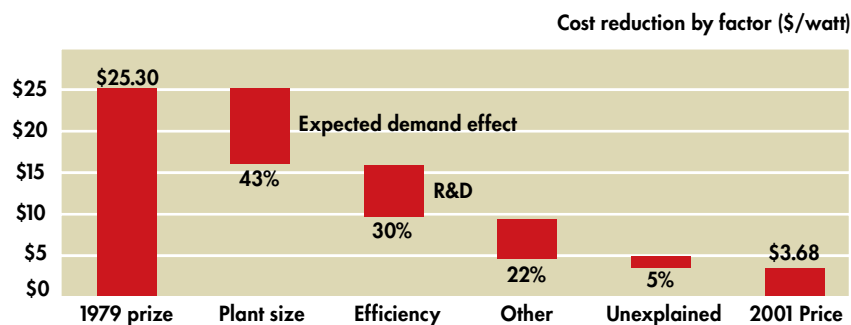
This provides a tremendous opportunity. Energy infrastructure investments are made for the long term: power plants are built to serve for 40-50 years or more. Now is the time to change course in order to ensure that as much as possible of these new investments are made in renewable and sustainable energy systems.

The United Nations *2009 World Economic and Social Survey*, WESS, launched the idea of a "Green Energy Revolution", a proposal for dramatically increasing the access by poor people to affordable energy from renewable sources. Massive investments in renewable energy solutions would dramatically up-scale deployment, and help push prices of renewable energy technologies down to the point where they become a more attractive choice than fossil fuels for further investments. Providers of renewable energy would be offered guaranteed prices (or feed-in tariffs, see Briefing 2) that cover the costs and leave a reasonable margin for profits, but these subsidies will decline over time. This means that investments will be drawn to those technologies that have a good enough potential to quickly reduce their cost.

Proven technologies

The Green Energy Revolution proposes to increase the demand for existing, well-proven renewable energy technologies with potential for considerable further improvements. It does not depend on hopes for the discovery of new wonderful technologies some time in the future.

Technologies for the Green Energy Revolution



Factors behind the reduction in the cost of solar photovoltaic power, from 1979 to 2001.
Source: World Development Report 2010. The World Bank.

The prices of renewable energy technologies are falling sharply, and demand is an important factor that helps push the prices down. Solar power – photovoltaics – is just one example: in about 20 years the price for one W of solar panel capacity dropped by 85 percent. According to the World Bank, nearly half of the effect was attributable to expected demand, and only about one third to research.¹ The price of solar panels has continued to decline, and may soon become as cheap as the same amount of coal power capacity. Wind power and several other renewables are showing similar cost curves.

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- Price supports will be complemented by a global extension program: research, technical, and policy support designed to accelerate the process.

Capacity and extension

While price is a major obstacle to the spread of renewable energy in both the developed and the developing world, it is not the only one. In order to make it possible for developing countries to leapfrog to renewables, economic incentives need to be supported by an enabling policy environment and institutions that facilitate the rapid spread of the best technologies.

The WESS proposes a large-scale program for policy and extension support. The two cornerstones are

- a network of Innovation Centres to support both the harmonization of policy and the adoption and adaptation of suitable renewable energy technologies; and
- a 'Global Climate Conservation Corps' of experts and extension agents who could backup the national institutions, and provide training and technical support.

Technical support through decentralised extension services is believed to be a particularly suitable model to facilitate the rapid dissemination of small-scale and off-grid renewable energy installations.

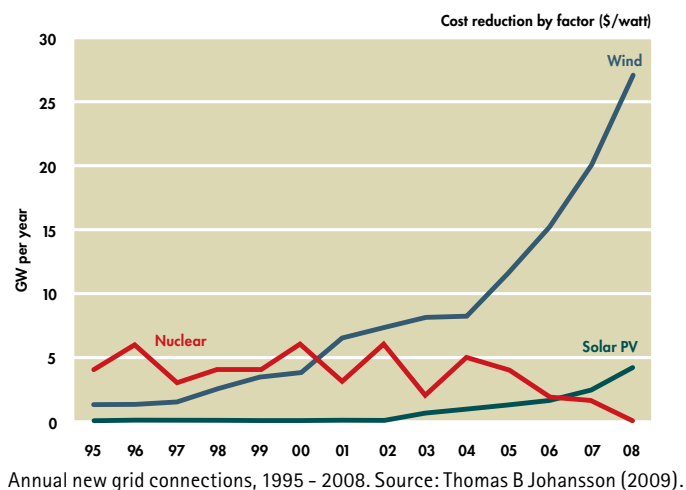
Barriers to access

The WESS also discusses how patents and other protection of intellectual property rights can act as a barrier to technology transfer. Ensuring that the best energy technologies are made readily available to developing countries will be not only for their benefit. As a response to the climate threat, it will be for the benefit of everyone.

1. World Development Report 2009, p 16.

Off-the-Shelf Renewables

In the last five years, global investments in renewable energy increased sixfold from USD 20 billion to 120 billion per year. Wind power capacity grew from below 50 to 120 GW (1 gigawatt, GW, is the capacity of one large nuclear power plant), and solar power from about 4 GW to 16 GW. During the same period, only about 13 GW of new nuclear power was commissioned.



Ownership of patents for renewable energy technologies is highly concentrated: the EU, the United States and Japan hold more than 80 percent of these patents, while China holds less than 2 percent. The monopoly rights that are given to patent holders may result in higher prices that restrict accessibility. But poor countries may also be disadvantaged simply by their limited capacity for dealing with the complexity of intellectual property protection systems.

Intellectual property rights need to be managed in a manner that is supportive of large-scale transfer of both available and emerging renewable energy technologies. Countries may be able to take better advantage of the limited flexibilities that exist within the international system – limiting patentability or making use of compulsory licensing – but there is also a need for reviewing the rules. In addition, measures like increased sharing of publicly funded and open-source technologies, and dedicated mechanisms to support technology development and transfer, will have to be developed.

Technology assessments – the missing element

Enhanced action on technology development and transfer is one of the four key issues that are being negotiated in the climate negotiations. The texts that were presented to the Copenhagen meeting speak of the need to provide financing for research, development and demonstration of technologies, as well as for deployment and diffusion. But the vital steps of assessment and evaluation of technologies have so far been given very little attention.

The careful assessment and evaluation of technologies is an issue of global, national and local concern. Most technologies may not best be assessed at the international level, as the potential risks and benefits of their use are largely dependent on local

Research

Investments in energy related research and development (R&D) have dropped sharply in the past decades. Since the early 1980's, the share of energy in publicly financed R&D has declined from over 10 percent to about 3 percent. Only about 10 percent of this research is on renewable energy – less, even, than the share devoted to fossil energy. Almost half of the money is still invested in nuclear power. In the private sector energy research spending has dropped, from 8 to 4,5 billion USD annually in the last decade alone.² Each year, the world today only spends 2 USD per capita on energy related research. Recent versions of the proposed texts for Copenhagen encourage developed countries to double expenditure on R&D for mitigation (which is mainly related to energy) and adaptation by 2012, and to quadruple them by 2020, which would however still be relatively modest sums.³

2. World Economic and Social Survey 2009. United Nations Department of Economic and Social Affairs.

3. Non-paper No. 36, 3 November 2009, paragraph 11(a). In Non-Paper 47, 6 November 2009, paragraph 12(a) this text is, however, only presented as an option.

Geo-engineering

Some corporations, scientists and even governments, argue that modifying ecosystems on a planetary scale through "geo-engineering" (technological interventions in the atmosphere, oceans and land) may be our only option for stopping climate change. But these unproven technologies could further destabilise the climate system and have devastating consequences. There is an urgent need for a critical public review of geo-engineering technologies. An internationally agreed regulatory framework needs to be established, and a strict moratorium enforced on all real world experimentation. Geo-engineering projects must also not be accepted as offsets under the UNFCCC. Read more in the following SSNC reports:

- *Retooling the Planet? Climate Chaos in the Geoengineering Age.*
A report Prepared by ETC Group for SSNC.
www.naturskyddsforeningen.se/keyissues
- *Technology – Curse or Promise?*
Report from the sixth seminar in the SSNC series "Key Issues for Climate and Copenhagen 2009".
www.naturskyddsforeningen.se/keyissues

social, economic and environmental factors. A technology that is considered to be 'environmentally sound' in one setting may have disastrous consequences in another – a case in point is much of the biofuel expansion in the last few years.

Assessments also tend to be particularly weak in capturing the social and economic impacts on the poorest and most vulnerable communities, and almost always fail to include secondary effects. The impact of the biofuel boom on food prices illustrates why it is so important that climate change must not be examined in isolation from other global crises – poverty, hunger, species extinction, biodiversity loss, ocean acidification, war – or the solutions that will be envisaged are liable to exacerbate other problems.

Technology assessments need to be performed at all relevant levels, and must be:

- Mindful of the precautionary principle, environmental integrity and human rights, and respectful of the principle of local free, prior and informed consent.
- Transparent, participatory and accessible to civil society organizations, indigenous peoples organizations and social movements so that people likely to be affected by its deployment can be heard.
- Independent of corporate interests.

Civil society organizations have a vital role to play in this debate, and maybe in particular to:

- Ensure that marginalized voices are heard and that climate change is not seen in isolation from equally important crises.
- Demand accountability from governments, corporations and scientists.

Climate Change

Key Issues

The Double Challenge

In support of a 'Green Energy Revolution' to simultaneously tackle the right to development and the climate crisis

The excessive use fossil fuels by a small minority of the world's population is the most important cause of climate change. Still, billions of people in developing countries do not have access to energy to meet even their most basic needs.

The fight against climate change must go hand in hand with massive efforts to improve poor people's access to affordable energy services. A clear commitment by the rich countries to invest in a rapid expansion of renewable energy for the poor is the key to bridging the trust gap in the negotiations.

In the proposal "The Green Energy Revolution", the UN outlines a plan to meet these objectives by pushing down the prices of renewable energy. A key component is a targeted program of guaranteed price support, "feed-in tariffs", that would greatly accelerate the scaling up of these technologies. This would propel a 'virtuous circle' of

investment, cost reductions and improved technologies, which would also help the necessary energy transition in developed countries.

This set of briefings discusses some of the key issues that need to be addressed in order to make cheap, renewable energy available to billions of poor people in developing countries. The package consists of the following briefings:

- Understanding the Challenge: Energy, Climate Change and Development
- Feed-in Tariffs and Front-loaded Investments
- Financing the Green Energy Revolution
- Technologies for the Green Energy Revolution



Swedish Society for Nature Conservation
www.naturskyddsforeningen.se/keyissues