The Clean Development Mechanism and Wind Energy

How to Come to an Effective Support Scheme for Renewable Energy within a Post-Kyoto Agreement

Published in December 2009
World Wind Energy Association
Charles-de-Gaulle-Str. 5
53113 Bonn
Germany
Tel. +49 228 369 40-80
Fax: +49 228 369 40 84
www.WWindEA.org

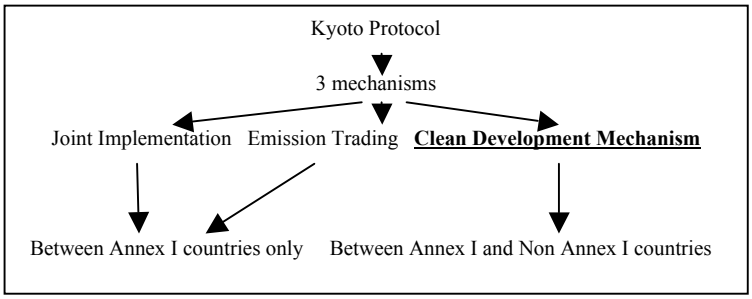
Abstract: *This proposal is built on the past experience with CDM implementation in developing countries, and suggests a new Global Renewable Energy Investment Fund, including a Global Feed-in Tariff programme, as well as a streamlined CDM for wind energy that is also applicable for other renewable energies. Such improved and additional programmes and funds will enable especially developing countries to increase more rapidly the renewable energy deployment.*

1) The Clean Development Mechanism

The Kyoto Protocol (KP) under the United Nations Framework Convention on Climate Change (UNFCCC) was adopted in Kyoto (Japan) on 11 December 1997 and entered into force on 16 February 2005. Its ultimate objective is to stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

Towards this general objective, the KP establishes legally binding commitments for the reduction of greenhouse gases produced by Annex I countries (industrialised countries), as well as general commitments for all member countries.

The Clean Development Mechanism (CDM) is one of the three mechanisms established by the KP to assist Annex I (industrialised) countries in meeting their reduction targets.



Apart from the CDM, the KP also establishes two other mechanisms:

- Joint Implementation (JI): any Annex I country can invest in emission reduction projects in any other Annex I country as an alternative to reducing emissions domestically. Between Annex I countries only.

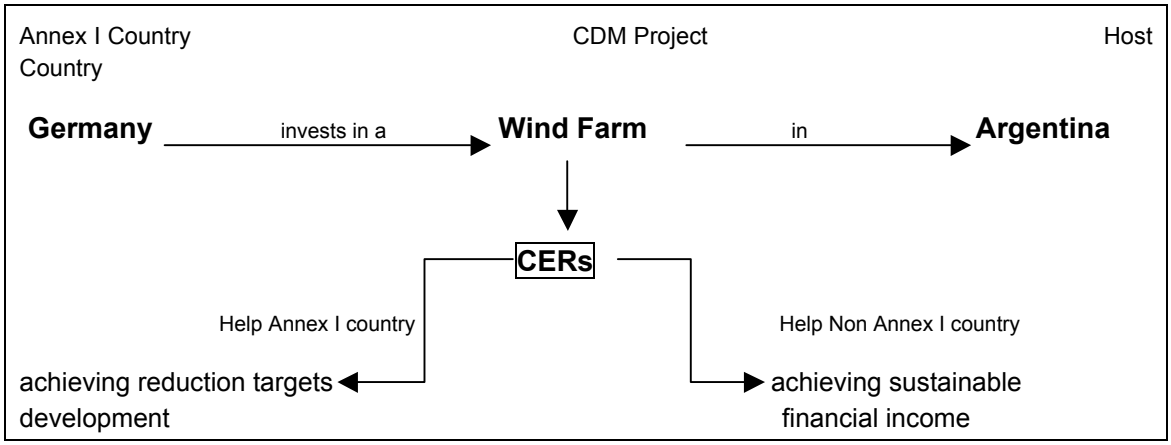
- Emission Trading (ET): is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. A central authority (usually a government or international body) sets a limit or *cap* on the amount of a pollutant that can be emitted. Companies or other groups are issued emission permits and are required to hold an equivalent number of *allowances* (or *credits*) which represent the right to emit a specific amount. The total amount of allowances and credits cannot exceed the cap, limiting total emissions to that level. Companies that need to increase their emission allowance must buy credits from those who pollute less. The transfer of allowances is referred to as a trade. Between Annex I countries only.

While these two mechanisms involve only countries which should meet targets reductions under the Kyoto Protocol, the CDM is the only mechanism established under the Kyoto Protocol that promotes co-operative measures between the industrialized (Annex I) and the developing (non-Annex I) countries.

The CDM allows Annex I parties (for example Germany) to implement projects (like a wind farm) that reduce greenhouse emissions in Non Annex I parties (for example

Argentina), this reduction produces Certified Emission Reductions (CERs) credits, each equivalent to one tone of CO2. CERs can be traded and sold, giving on the one hand Annex I countries the possibility of achieving more cost-effectively their commitments and, on the other hand, helping Non Annex I countries to achieve sustainable development.

Example:



CDM stimulate investments from Annex I countries in wind power and assist underdeveloped countries to achieve sustainable development and lower GHG emissions. The income earned by CERs increases the total income of a project and improves the competitiveness of wind power and other renewable energies against fossil power generators. Hence, in principle, CDM contributes to the internalisation of externalities of fossil energy utilisation.

The ultimate aim of the CDM is to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, GHG reduction, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments.

A CDM project qualifies through a clearly defined process designed to ensure real, measurable and verifiable emission reductions. Before actually generating income, the project has to go through the following steps:

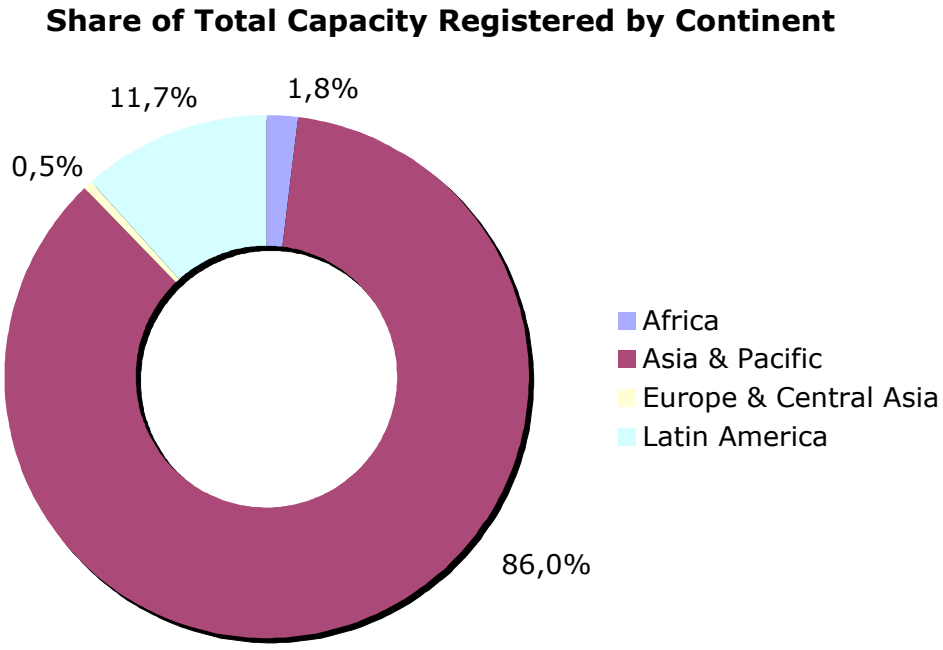
Project design
↓
Validation
↓
Registration
↓
Monitoring
↓
Verification and certification
↓
Issuance of CERs
↓
Distribution of CERs

2) Effectiveness of CDM for Wind Power

The wind energy sector has seen a very successful development since more than a decade, with average annual growth rates of 30 %. In 2008 wind energy was the most dynamically growing energy source, with a total installed capacity of 121 GW (end of 2008). The wind industry worldwide employs already today half a million people. Wind energy is seen by more and more governments and businesses as one of the best solutions to provide clean and affordable electricity. However, although diversification can be watched, still a concentration of wind energy utilisation can be identified with the top five wind countries accounting for three quarters of the global capacity. The countries in Latin America and Africa counted for respectively only 0,6 % and 0,5 % of the total capacity. One major hurdle is certainly the lack of financing – a challenge for which CDM was created as an answer.

Considering the increasing number of CDM projects in wind energy, CDM plays a certain role in financing of wind farms in various countries: At the beginning of July 2009, wind projects in 19 countries with a total capacity of more than 10 GW were registered as CDM projects (which does not mean that all of them have yet been implemented). After hydropower, the wind energy sector is the renewable energy source with most projects in the pipeline.

As it can be seen, CDM wind projects are concentrated in only few countries, and world regions: 86 % are in Asia, whilst Africa accounts for only 1,8 % of the wind capacity registered under the CDM (as of 9 July 2009).



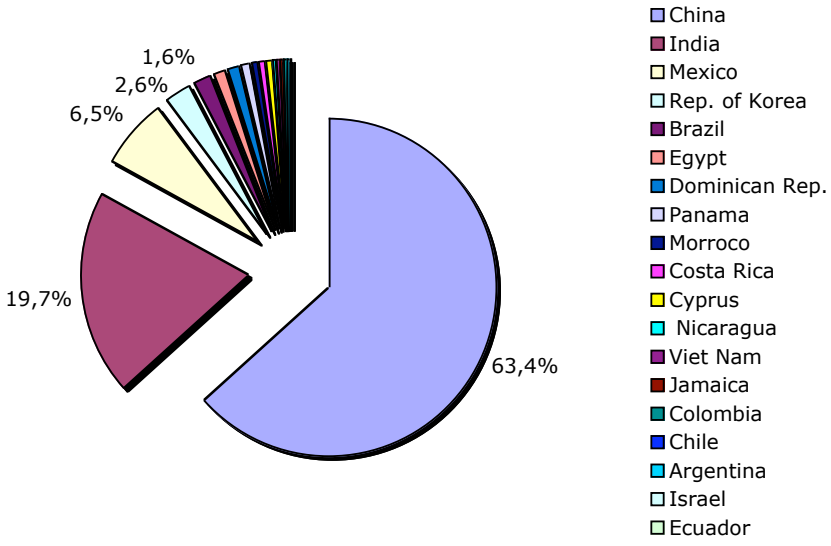
80 % of the wind CDM projects can be found in only two countries, India and China, which alone accounts for almost two thirds of the global CDM wind capacity. So far Egypt and Morocco are the only two African countries with registered CDM wind projects – on a continent with more than 50 countries.

As of 9 July 2009, the following countries have registered the following number of wind projects as CDM projects:

Country	[MW]	[%]	Registered Projects
China	6568,5	63,40%	120
India	2044,5	19,73%	81
Mexico	675,0	6,51%	4
Rep. of Korea	270,6	2,61%	8
Brazil	165,6	1,60%	4
Egypt	120,0	1,16%	1
Dominican Rep.	109,0	1,05%	1
Panama	81,0	0,78%	1
Morroco	70,2	0,68%	2
Costa Rica	66,4	0,64%	1
Cyprus	43,5	0,42%	2
Nicaragua	40,0	0,39%	1
Viet Nam	30,0	0,29%	1
Jamaica	20,7	0,20%	1
Colombia	19,5	0,19%	1
Chile	18,2	0,18%	1
Argentina	10,6	0,10%	1
Israel	6,0	0,06%	1
Ecuador	2,4	0,02%	1
World Total	**10361,1**	**100,00%**	**233**

A complete list of the number of registered projects per year in each country, including the total annual capacity, can be found in the annex.

Share of Total Capacity Registered by Country



At this point of time, altogether only 19 countries have registered CDM wind projects, although probably more than 100 countries would be eligible and would have sufficient wind resources to harvest wind for electricity generation. It is no surprise that especially

in the ongoing negotiations about an agreement that has to follow the KP, the underdeveloped countries are calling for more direct investment in their countries, including effective technology transfer and provision of sufficient financial resources. Obviously the CDM has not been able to fulfil its objectives and expectations sufficiently.

Obviously, the leading CDM countries like China and India have decided to use wind energy on a large scale and use the CDM successfully as an additional source of income. Especially in China CDM has played a positive role in the wind farm construction. It should be examined carefully why these countries have been able to benefit from the CDM and how they have been able to cope with the specific CDM challenges, as described below.

Some of the barriers why CDM has not been more effective in more countries can be identified when looking at the CDM rules as well as the practical experiences, and taking into account the special characteristics of wind energy investments.

Level and predictability of support

Usually the level of additional income from CDM is modest, related to the overall cost of a wind farm. Often the additional income from CDM does not make a project commercially feasible. Assuming a price of 12 € per CER and an avoided average emission level of 10 ton CO2 per MWh (baseline), a wind project would receive a maximum of 1,2 cent/kWh. Actually in many cases the income will be below such level because transaction cost have to be paid from this income and because the (nominal) avoided GHG emissions are lower in many countries (see below, “Baseline”).

Price development of CER Futures (2009) at the European Energy Exchange, source: eex.com

Another challenge for investors in CDM wind projects is the problem that the income form CERs is often difficult to predict. CERs are traded at spot markets and these markets have shown high degrees of volatility since the KP entered into force. This insecurity reduces further the level of income. In contrast to this volatility, the largest part of the costs of a wind farm is occurring when the wind farm is being built, as an initial investment (roughly 80 % of the costs are fixed initially), and the costs over lifetime are rather stable and predictable – capital costs are decisive for the commercial feasibility. Hence, the CERs’ price volatility makes the potential income from CDM even less interesting for the financing (bankability) of a project because potential income from CERs will be low and the income stream will hardly be accepted as a security for loans for the CERs investor.

Additionality

The KP specifies that only those reductions in emissions that are ***additional*** to any that would occur in the absence of the certified project activity will generate CERs. This means that the CDM project (let's say A) will emit less GHG than those that would have otherwise been emitted by a regular project (let's say B). The CDM project (A) is referred as an alternative, while the regular project (B) is referred to as the base case.

The GHG emission reduction is the difference between B and A. This concept is very important and challenging because it represents the environmental integrity of the approach. When a project is not additional it allows companies of Annex I countries to produce GHG emissions without genuinely offsetting them elsewhere. If the project does not satisfy the additionality condition, then the formal targets may be reached but there will be no actual GHG reduction. That is why according to the CDM rules the additionality of a CDM project has to be assured.

Furthermore, projects also have to prove financial additionality: Following a country specific benchmark analysis, the internal rate of return (IRR), including CDM revenues, has to be lower than this country specific IRR benchmark. This is an extra burden for project developers and investors.

It is easy to understand that the additionality requirements create serious problems and barriers. Clearly wind farms provide emission-free energy. However, countries which have set up favourable frameworks for wind energy may not benefit from CDM because new projects may not be seen as additional. It could be claimed that the investment would have taken place already without the CDM contribution, simply because of the existing, effective frameworks. Against this background, the existing CDM rules discourage governments to implement successful policies for wind energy and even may punish more proactive governments for their pioneer role in promoting renewable energy, like it has recently been discussed in the case of China.

Baseline

Another step in developing a CDM project that sometimes brings confusion and represents another barrier is the requirement of the ***baseline***. The baseline of a CDM project is the scenario that reasonably represents the anthropogenic GHG emission that would occur in the absence of the CDM project. This scenario is based on estimation, a prediction that can hardly be measured empirically. The levels that would have been emitted in the absence of the mechanism are defined in terms of a hypothetical situation, usually referred to as business as usual.

Similar to the additionality rules, the baseline approach can become detrimental for a rapid deployment of renewable energy because projects in those countries which already have a higher share of renewable energy will receive less CERs per generated energy unit than projects in those countries with a high share of highly polluting energy generation, such as coal power plants. The baseline approach gives an indirect incentive to developing countries to keep their dirty power generation plants in operation in order to get more income for single CDM projects.

In concrete practise: countries with a high share of renewable energy like Brazil (hydropower) get less CERs per kWh from a CDM wind project than a country with a

high share of coal power plants. From the perspective of an accelerated deployment of renewable energy, such rule does not make sense because all renewable energy installations avoid the utilisation of other, polluting energy sources.

Transaction cost

A different barrier associated with completing the CDM project cycle is the one related to ***transaction costs***. They represent a common hurdle especially for wind energy projects that are typically small-scaled. Cost and administrative efforts for certification, registration, etc. are very high in relation to the overall project size. Instead of setting up a major bureaucracy, a remuneration following the principles of successful feed-in laws would save costs and would be much simpler, simply measuring with a net meter the electricity fed into the electricity grid. In the case of offgrid applications, there might still be a meter sufficient for measuring the generated or utilised electricity.

Another problem is that transaction costs are incurred up-front, while CDM revenue is only generated once the project's methodology has been approved, the project registered and credits issued. Some emission reduction buyers, especially large institutional or national carbon funds, have been offering different types of in-advance payments to project developers in order to assist project developers to overcome the burden of the project's transaction cost. One model involves offering this advanced payment as a grant, separate from the funds used by the buyers to purchase emission reductions. Another model is to pay part of the price for the purchased CERs in advance before the project's inception. For example the Austrian JI/CDM Programme offers cover as a grant up to 50 % of project related documents (baseline preparation, validation fees, etc.) with a maximum of Euro 40'000.

National frameworks for renewable energy

At the national level, still many further barriers exist, such as the ***policy or legislative framework*** within which a CDM project operates, for example electricity related regulations that constrain generation by independent power producers, e.g. not allowing them to connect and feed electricity to the grid. Many countries still do not have the necessary industrial, human, and even administrative capacities to deal efficiently with a still new technology such as wind power.

All in all, the main difficulties in achieving a successful CDM projects are:

- **Level and predictability of support**
- **Additionality**
- **Baseline**
- **Transaction costs**
- **National frameworks for renewable energy**

3) The Future of CDM

One point of negotiation for a follow-up agreement that will continue beyond 2012 is how to increase the involvement of developing countries in GHG mitigation activities. As mentioned before, under the KP the project-based CDM is the main participation opportunity for Non-Annex I countries. During the recent UNFCCC negotiations these countries have stated clearly that they see the urgent need for easier access to clean technologies such as renewable energy technologies, including technology transfer and additional funds for deployment of these technologies.

As shown above, wind energy has made substantial progress in some parts of the world, providing in some countries and region already 20 % and more of the electricity supply. A discussion on how to improve the frameworks under the UNFCCC should draw lessons from these vast experiences on the national, regional and local level. Firstly, it can be stated from national support schemes that well-designed feed-in laws are most effectively and efficiently supporting the rapid deployment of wind energy and the creation of a domestic wind industry. One reason is because they provide long-term investment security, one key condition for investment especially of the typical small and medium sized investors that are emerging and driving such new markets.

The basic requirements for effective schemes for wind energy deployment are:

- **Level playing field or closed price gap**
- **Sufficient and long-term investment security (bankability)**
- **Market access for newcomers**
- **Simple, standard and transparent administrative procedures**

A reform of the CDM rules has to take into account these requirements. The CDM reform should also learn from the successful countries China and India and draw the right conclusions. E.g. it does not make sense to be stricter with the additionality criterion in the case of China only because this country has used CDM very successfully.

In addition, completely new approaches may be introduced, focussing more strongly on supporting national governments to set up favourable frameworks that provide sufficient funding.

Some approaches have already been proposed as an option for the post-2012 agreement aiming at up-scaling the finance for cleaner technologies in developing countries:

Programmatic or Policy CDM

Also known as Programme of Activities (PoA), it is a voluntary, coordinated action by a private or public entity that coordinates and implements policies/measures or stated goals (i.e. incentive schemes and voluntary programmes) leading to anthropogenic GHG emission reductions.

A Policy CDM project could e.g. be a national feed-in law that makes use of the proven effectiveness and efficiency of national legislation and combines it with the possibility of funding from international carbon funds – financing is one of the key challenges

especially for many underdeveloped countries, especially when it comes up to the introduction of renewable energy with their need for stable capital markets.

For off-grid applications a similar system could be introduced (premium per generated kWh of electricity). Alternatively, funds may be used for setting up micro credit programmes on a large scale.

Such a framework could address the current deficiencies of the CDM rules well. The funds for such Policy CDM could come from a CDM Carbon fund that sells CERs generated out of the projects undertaken under the Policy CDM project.

However, it has to be taken into consideration that through such a system, expansion of renewable energy will be bound to greenhouse gas emissions and thus would be limited. At the same time such a system would not reduce greenhouse gas emissions beyond the agreed caps.

Sectoral CDM

The difference between the CDM as of today and the sectoral CDM is that in the latter approach benchmarks are used to establish a sector baseline, which can then be used by all projects in a country or region in the respective sector. This reform on the mechanism aims at reducing the transaction costs for the project developers with regard to the establishment of the baseline. It seems only to address parts of the current CDM deficiencies.

National Appropriate Mitigation Action and Technology Mechanism/Cooperation

National Appropriate Mitigation Actions (NAMAs) could become an interesting tool, outside the CDM. Here, again, national governments could be entitled to set up favourable frameworks like feed-in laws. The financing may come not from selling CERs but, separately, directly from Annex I countries.

Similarly, new mechanisms for technology cooperation may provide funds that enable developing countries to get easy and fast access to renewable energy technologies. A special challenge would be in which form to provide the necessary know-how for these technologies. Usually governments do not own intellectual property rights or patents and do not have direct access either. In this context, it would make sense to focus on the creation of markets for renewable energy equipment so that domestic suppliers can sell a sufficient amount of their products and earn enough income to further invest in improving their own technologies, also in cooperation with international partners.

Another focus should be on capacity building, including basic research and training and education of all kind of staff, from engineers, workers, financiers etc.

A New Approach:
Global Renewable Energy Investment Fund and Global Feed-in Tariff programme

A large Global Renewable Energy Investment Programme could break up the blockage of the climate change negotiations by shifting the focus of the discussions away from burden sharing towards new economic opportunities and stimulation, leading to global economic recovery and a win-win situation for all parts of the world. The Fund shouls be financed by obligatory annual contributions from the Annex I countries.

The third world countries have stated several times that they do not see the existing mechanisms within the Kyoto protocol as sufficient in order to provide the necessary technology transfer. In order to come to the broadest possible dissemination of climate friendly technologies, especially these countries are demanding special funds outside and in addition to the existing Kyoto mechanisms.

E.g. the African Union has called for an annual amount of around 50 billion € to be spent to a large extent for transfer of climate change mitigation technologies. The European Union has started the discussion about an annual amount of several billion €. Some experts mention an annual amount in the range of 100 billion US$ or even € to be provided by the Annex I countries in order to assist the third world countries in climate change mitigation and adaptation.

According to the experience in many parts of the world, industrial knowledge and technology development can be fostered very effectively by creation of a long-term, stable and predictable market. In the case of grid-based electricity from renewable energies, feed-in tariffs have proven to satisfy investors' requirements and have worked as catalysts also for industrial development. At the same time it can hardly be expected that industrialised countries will agree on providing technology by handing over patents for free – just because usually they do hardly have direct access to such patents.

Feed-in tariffs also have the great advantage that they incentivise actual energy generation and thus can be applied very effectively and efficiently. However, still many third world countries indicate that they cannot afford to fund such crucial tools.

A **Global Feed-in Tariff programme** (Global FIT) should hence be introduced for grid-connected electricity generation to bypass the shortage of funds in the third world countries and in order to create investors' confidence especially in the reliability of the markets in the poorer countries.

Similar to national feed-in legislation, such Global FIT should define differentiated tariffs per technology (bioenergy, geothermal, hydro, marine, solar, wind), by size and in accordance with geographical circumstances.

A special **integration premium** should be included for integration of various renewable energy sources, offering electricity supply which follows the actual demand. Such integrated approaches can easily be achieved through combination of various technologies, e.g. wind turbines in conjunction with hydropower plants.

In addition, there should be premiums for expansion of electricity supply systems and for electrification of unserved areas.

The national feed-in programmes should be financed out of the **Global Renewable Energy Investment Fund**. Financing should follow the basic principles of existing national feed-in systems: The additional cost in relation to the existing market prices of electricity should be born by the Global Renewable Energy Investment Fund.

For offgrid and non-electrical systems, further intelligent financing mechanisms such as large-scaled microcredit and soft loan programmes should be applied, also to be financed out of the Global Renewable Energy Investment Fund.

Alternatively it may be considered whether such national feed-in systems could become part of the NAMAs.

It will be important to make sure that such a programme does encourage governments to continue with and expand existing support schemes for renewable energy and to launch ambitious new programmes. For this purpose, barriers like the “additionality” and “baseline” criteria should not play a role in such new approaches.

Conclusion

Obviously the CDM has only a limited potential to become an important instrument for climate protection, technology transfer and economic development in the post-2012 agreement. The UNFCCC frameworks should better take into account the special characteristics of key climate change mitigation technologies like wind and other renewable energies.

The reform of the existing CDM rules should follow these considerations and also build on the successful experiences in China and India.

It is proposed to introduce a new Global Renewable Energy Investment Programme which should include a Global Fit-in Tariff programme (Global FIT), to be financed out of a Global Renewable Energy Investment Fund.

Vast experiences with successful promotion schemes on the national level have demonstrated that feed-in tariffs and microcredits for off-grid applications provide the necessary sufficient and long-term investment security, also for smaller and new power producers.

Other promising options that do not yet exist could be the technology mechanism as well as the National Appropriate Mitigation Actions.

With such basic reforms and amendments the UNFCCC frameworks will be able to mobilise the accelerated deployment of renewable energy which will enable the world community to achieve ambitious, meaningful and effective climate targets.