

# **The Clean Development Mechanism: Energy Projects for Africa**

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## 1. Introduction - The Clean Development Mechanism

The Kyoto Protocol to the Framework Convention on Climate Change created a new possibility for North-South co-operation in mitigating climate change through joint projects. The Clean Development Mechanism (CDM), described in Article 12 of the Protocol, allows industrialised countries to purchase "certified emissions reductions" (CERs) from projects in developing countries which mitigate climate change. The CDM follows from the concept of Joint Implementation, where investors exchange capital and technology for emissions reductions from joint projects in developing countries. The significant difference is that the objective of the CDM, as stated in the Protocol, is to contribute to sustainable development and the overall objectives of the Convention, as well as assisting industrialised countries in meeting their emissions reduction targets.

The CDM provides an overarching accord for organising, structuring and financing initiatives which involve North-South collaboration with the objective of treating the global problem of climate change with mutual benefit to participating countries. If it is well constructed, the CDM will be able to focus on sustainable development in developing countries through an emphasis on avoided future emissions, while contributing to the emission reduction in Annex I countries. To achieve such a role, the CDM would need to be clearly defined, such as the criteria for baselines, and take into consideration the status quo of the collaborating Parties while not compromising the underlying principles in the UNFCCC. The CDM was defined only loosely in the Kyoto Protocol, and many questions on how it would operate and what the role of developing countries would be were left unanswered. Many of these issues will be decided at the 4<sup>th</sup> Conference of the Parties (COP) in Buenos Aires in November 1998. This paper highlights how the CDM could contribute to the African energy sector, and the issues which the energy sector raises for designing the CDM.

## 2. African Energy Priorities and Climate Change

### 2.1 The African Energy Sector

The African energy sector is a critical input to development on the continent, yet to date the sector has been plagued by problems which reflect the economic and environmental problems of many African countries: frequent power and fuel cut-offs, low access to 'modern' fuels and electricity, financially precarious energy sector institutions, and a chronic lack of infrastructure investment.

The lack of access to sufficient, affordable, and environmentally sustainable commercial energy is reflected by key energy indicators. Biomass continues to be the largest energy source, providing half of Sub-Saharan African energy. Per capita *commercial* energy use, among the lowest in the world, has actually been falling in recent years. Despite the low commercial energy use, energy intensity (expressed as energy use per unit GDP) is triple that of Europe, pointing to opportunities to significantly increase efficiency. Untapped commercial energy resources – hydropower, oil and gas - are significant, but concentrated in a few countries, necessitating better energy transport infrastructure (see below). In contrast, renewable energy sources, particularly solar, are abundant and well distributed, but major financial and other barriers to their use remain unresolved. Electricity generation is still limited outside of a few countries, with South Africa producing 52% of Africa's electricity. Total African generating capacity excluding South Africa is only one-twentieth of the Europe.<sup>1</sup>

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<sup>1</sup> Eskom 1996. Eskom Statistical yearbook.. Eskom Corporate Communication, Johannesburg.

## 2.2 African energy sector emissions

Given the small size of the commercial energy sector, it is not surprising that Africa's contribution to emissions of greenhouse gases is minimal. Total energy sector CO<sub>2</sub> emissions from Africa were only 3% of world emissions in 1990 (approximately 700 000 tons), even though Africa has 13% of world population. Sub-Saharan Africa, less South Africa, only accounted for 0.9% of world energy CO<sub>2</sub> emissions (WRI 1996). By contrast, the US commitment to a 7% reduction from 1990 levels under the Kyoto Protocol implies a reduction of 350 000 tons of CO<sub>2</sub>, or half of Africa's total current emissions. Clearly, then, Africa's participation in the flexible mechanisms under the Kyoto Protocol must be based on avoided future emissions rather than current emissions.

## 2.3 Energy priorities to energy projects

The CDM must bring together development priorities with emissions reductions. The starting point for thinking about CDM projects should be based on regional energy sector priorities. Building an energy sector that can fuel African development requires a range of approaches and strategies, which include the following:

- Structural energy sector reform to enhance performance, attract investment to the sector, and speed up widening access to commercial fuels, particularly electricity.
- Access to cleaner technologies for conventional fossil fuel systems.
- Regional energy trade and interconnections.
- Greater range of technological choice, financing mechanisms and technology support for rural and decentralised energy systems.
- Sustained capacity building for policy analysis and implementation.
- Regional co-operation on standards, technology development, and policy.
- Improved forest management, cook stoves, and charcoal conversion methods to ensure sustainable and environmentally sound use of traditional fuels.

Energy sector projects to address greenhouse gas emissions, by contrast, tend to address a much narrower range of issues. Typical examples of energy sector GHG mitigation projects include the following:

### *Energy*

- End-use efficiency improvements in household, industry, service sectors;
- Transmission systems;
- Fuel substitution;
- Renewable technologies (decentralised);
- Supply technologies (centralised): fossil fuels, nuclear and renewable.

### *Transportation*

- Efficiency improvements for vehicles;
- Switch to fuel systems with lower emissions;
- Improved transport system efficiency;
- Modal shifts;
- Managed transport demand.

In addition, biomass and traditional fuel accessibility are linked to afforestation projects, forest management projects, or reforestation, depending on how these projects are implemented.

The typical mitigation projects do not address many key areas for the African energy sector. For CDM to address the real issues in the African energy sector, therefore, the scope of CDM projects must be broader than conceived under Activities Implemented Jointly or Joint Implementation. One specific example, addressed in more detail in the section below, is the need for regional energy infrastructure. The point is that CDM projects must be more than technology development and project-level implementation efforts. The CDM will be most effective in reducing future energy sector emissions if it addresses the capacity, policy, financing, and technology issues that are critical to the development of a "sustainable" energy sector in Africa.

## 2.4 Regional energy infrastructure

In contrast to industrialised countries, throughout much of Africa liquid fuels for transport and electricity for all sectors are the largest portion of final demand. For electricity this is particularly problematic because capacity, and potential power development, is distributed unevenly. Regional electricity inter-connections are therefore one of the most important tools for improving access to commercial energy while reducing environmental impact. In Southern Africa, for example, greater sub-regional trade in electricity could substitute hydropower from Zambia, Mozambique and the Democratic Republic of Congo for dirty Southern coal-fired power stations, reducing both energy cost and related emissions. A 1993 SADC Energy project, for example, which focused on only five countries in the region, found that co-operation in power sector development could result in savings of more than 1.5 billion US\$ over a period of 15 years (SADC 1993); and this is without including South Africa, which is by far the largest producer and consumer of electricity on the continent. Investments in transmission infrastructure and maintenance are a prerequisite for taking advantage of regional co-operation. In addition, strong co-ordinating centres which can control supply switching, and ongoing capacity building in utilities and governments to manage a regional power system are necessary. Will the CDM be able to fund such efforts?

## 3. Sustainable development

The successful implementation of any project or program is heavily dependent on how well it is designed. If the CDM is to achieve its aim of balancing Northern demands for GHG emissions reduction with Southern aspirations for sustainable development, its strategic designing mechanism must include socio-economic and development indicators (Sokona et al, 1998).

The World Commission on Environment and Development defines sustainable development as meeting the needs of the present generation without compromising the ability of the future generations to meet their own needs. This is indeed a broad and general definition which undoubtedly requires closer examination to be put into context.

One of the leading climate change NGOs in Africa, ENDA Tiers Monde in Senegal points out that CDM can, if properly designed make a decisive contribution to sustainable development in Africa, primarily through the implementation of desperately needed large-scale infrastructure development projects and programs. Professor Davidson of Sierra Leone argues that Africa has an opportunity therefore to link mitigation to development, and by doing so integrate environmental and developmental issues, increase natural capacity and negotiate the transfer of technical and financial resources.

A recent meeting sponsored by Climate Network Africa laid down potential areas and criteria for sustainable development contribution of CDM projects. These areas include:

- sustained economic growth;
- poverty eradication;

- social development;
- meeting basic needs;
- reduction or elimination of foreign debt;
- real and meaningful technological transfer;
- awareness and capacity building;
- intra- and inter-generational equity ( Climate Network Africa, 1998).

Since the key African concern with regard to the CDM is the contribution it can make to sustainable development, the main task is then to define what is included within sustainable development (or a process to define it) and develop tools to measure progress on a project or country basis. Measuring sustainable development is one of the most difficult areas for CDM projects, because there is not universal agreement on definitions or methods for measurement. A critical question is whether sustainable development must be defined across all CDM projects, or whether individual host countries should be responsible for their own definitions. The trade-off here is that, while individual countries should be setting their own priorities, individual governments do not necessarily choose projects which are the most beneficial to society in the long run for a variety of reasons. Whether it is possible or useful to impose standards is an open question.

On a national level, the United Nations Development Programme's Human Development Index provides one broad measure of development. Certain countries have also instituted measures of development or, more importantly, policies and plans to achieve economic and social development. How well CDM projects fit into those development plans could be one measure of their contribution to sustainable development. In the AIJ pilot phase, for example, it was generally the host country's decision whether the project fit their development priorities and they accepted or rejected the project on that basis. This re-emphasises the need for national baselines that reflect national policy priorities.

It is also important to draw in regional energy co-operation mechanisms with a clear view on how to incorporate sustainable development strategies. Regional regimes like ECOWAS and SADC can provide opportunities for CDM projects to address sustainable development issues more successfully, provided there is genuine co-operation and collaboration on issues of common interest. Regional co-operation on CDM projects has the potential to address many of the pressing energy poverty concerns experienced in African countries.

## 4. Institutions

Of the ninety-seven AIJ projects under consideration by the UNFCCC secretariat in 1998, 30% are in developing countries, mostly in Central America, with the remainder in the transitional economies of Eastern Europe (UNFCCC 1998). Only one of these reported projects is in Africa. Why was Africa excluded from AIJ and what type of CDM and national institutions are required to ensure a regionally equitable distribution of projects?

Sokona, Humphreys and Thomas (1998) argue that Africa was largely excluded from the AIJ pilot phase because of the focus of AIJ on emissions reductions, on the one hand, and because of the reliance largely on market forces, on the other. Africa contributes little currently to global emissions and, therefore, stands to benefit little from CDM if the focus is not expanded to include avoided future emissions. Furthermore, Africa's comparatively small and weak markets do not make it attractive to investors and, therefore, Africa will stand to be excluded from CDM, as was the case in the AIJ pilot phase, if the emphasis remains purely on market forces. Finally, Africa is at a disadvantage in attracting both AIJ and CDM projects because it currently does not have the institutional and administrative infrastructure to develop climate change policy and proactively seek and implement projects.

## 4.1 Institutional structure of the CDM

A key concern with regard to the construction of the CDM is how to create a mechanism which distributes funding and other benefits with a measure of equity not previously achieved under AIJ, as well as accommodates the development and energy priorities of the African continent.

The Kyoto Protocol alludes to the institutional structure of the CDM stating that it will be administered through three bodies:

- the COP/MOP, which provides authority and guidance;
- the Executive Board, a supervising body;
- and operational entities to certify emissions reductions.

The roles of and linkages between these three bodies are not clearly defined and have been prioritised for clarification at COP4. Observers to the Protocol have identified three possible roles for the Executive Board (see Sokona, Humphreys and Thomas 1998):

1. *A certification body for projects involving transfer of emissions reductions:* The CDM acts as a regulatory body only, ensuring transparency and standards of application and crediting.
2. *A project clearing house:* The CDM will act as a contact point, bringing together private or public actors with projects and programmes to implement and those with the means to implement them.
3. *A project co-ordinating body and funding agency:* The CDM acts as a broker, actively seeking and accumulating funds and actively eliciting projects and programmes. The CDM would define criteria for the acceptance of projects and the allocation of funds, which meet the objectives of both emissions reduction and sustainable development and ensure an equitable distribution of activities and finances on a geographical basis.

In scenario one, the CDM is little more than an AIJ certification body. Projects would be developed and implemented bilaterally, prejudicing against investment in the large-scale and regional-based infrastructure projects (such as energy supply, transport and communications) which are required to stimulate markets and facilitate sustainable development in Africa. Emissions reductions are likely to be emphasised over and above sustainable development, and equity considerations are unlikely to be addressed.

Scenarios two and three both allow the CDM to function as a multilateral body. Scenario three, however, expands the role of the CDM to one that is more visionary and proactive. As a co-ordinating and funding body, the CDM could set criteria and apply standards to ensure geographical equity considerations are taken into account, ensure that the CDM dual objectives of emission avoidance and sustainable development are given equal weight, and that funding is available for projects initiated by host countries (Sokona, Humphreys & Thomas 1998). The obvious disadvantage of this approach is that a relatively large bureaucracy would be needed within the CDM to carry out all of these functions and monitor them. This could delay projects and reduce the total number of projects. On the other hand, it might mean that only those projects that truly meet both goals of the CDM were implemented rather than others focused mainly on emissions.

## 4.2 National institutions

One of the biggest barriers to the successful implementation of CDM in Africa is that the institutional capacity and organisational and administrative infrastructure required to develop and implement climate change policy is largely absent. Without strong and well-linked institutional structures, it is difficult for African countries to develop a strategic vision with regard to their involvement in the international climate change arena and more specifically, the CDM. The constraints on framing or shaping their involvement in the CDM

creates difficulties for Africa in ensuring that their developmental needs and energy priorities are given sufficient weight. Furthermore, this lack of institutional capacity raises the transaction costs and risks associated with conducting CDM projects in Africa. The creation and maintenance of strong institutions and efficient structural linkages between these institutions is thus essential for the implementation of the CDM in Africa (Sokona et al 1998).

Analysis of the AIJ pilot phase provides some insight into the structure and roles of the institutions required to develop and implement climate change policy and specifically the CDM. Most countries that have established AIJ/JI programmes have a central co-ordinating office. In some industrialised countries, for example the USA, these programmes have sizeable central staffs devoted to a whole range of functions. In most developing countries, however, the climate change co-ordinator has limited capacity and is restricted to an informational role (Hirst & Fecher 1998). An exception is Costa Rica, one of the most proactive developing countries with regard brokering AIJ projects, where the government has made a significant effort to set up a JI office and integrate climate change into its national policies and institutions. There are clear advantages to having a strong centralised co-ordinating institution which can:

- develop national climate change policy and define national CDM goals within the context of other national and regional policy processes;
- integrate CDM policy with other environmental, economic and social policy;
- formulate national CDM negotiating positions and contribute to regional and international debate;
- develop CDM procedures, criteria and guidelines for approval;
- engage in proactive project identification; and
- disseminate information.

To integrate CDM policy with other national and international policies, inter-departmental co-ordination must be fostered at the national government level. The USA, Mexico and the Netherlands have interdepartmental steering committees for JI to assist with co-ordinating AIJ and climate change policy with economic, natural resource and energy policy and to get input from these sectors (Hirst & Fecher 1998). The development and implementation of energy-based CDM projects will require co-ordination between the environment, energy and trade/industry sectors of government.

## 5. Linkages to stakeholders

To ensure the effective implementation and long-term sustainability of energy sector CDM projects, it is vitally important that affected and involved stakeholders are identified, consulted and invited to participate in the design and ongoing management of the project. Many technology transfer projects in Africa have not sufficiently involved local stakeholders and have thus failed to adequately define the needs, skills, training and financial requirements for sustainable intervention. The following provide examples of some of the concerns of implementing specific CDM projects in Africa.

**Forest management projects:** Africa depends on biomass fuels and fossil fuels for most of its energy requirements, with the former accounting for over two-thirds of the total (Davidson et al 1995). While a number of forest management and preservation projects were implemented under the AIJ pilot phase, the Kyoto Protocol does not include sinks under Article 12 on the CDM. Much debate has occurred since Kyoto with regard to whether sinks should be included or excluded from the CDM. Concerns have been raised around the ability to guarantee forest sinks which are fuel resources for local

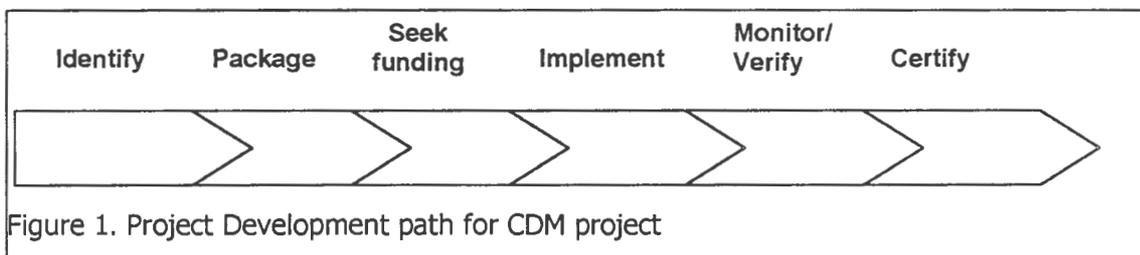
communities. While it may appear that these are competing demands, local communities are reliant on the sustainability of wood fuel resources and through encouraging the active and effective participation of these communities in the design and ongoing management of forest projects, the sustainability of the project can be ensured.

**Residential energy projects:** The successful implementation of residential energy projects requires, among others, an understanding of the energy consumption and behaviour patterns of the target households, the competing demands on household resources, and the informational, training and financial requirements for successful project implementation. Households in developing countries exhibit different energy use patterns to those in industrialised countries. CDM projects must avoid the pitfall of past investment projects which have transposed northern models to southern countries, without fully understanding the environment in which it is to operate. Research and development is required to ensure that the project is adapted to the local environment and meets the needs of affected or involved parties.

**Fossil fuel sector:** The mining and combustion of coal is a major contributor to CO<sub>2</sub> and methane (CH<sub>4</sub>) emissions and presents an opportunity for substantial emissions reductions. While many have argued against clean coal technology as a mitigation strategy, the fossil fuel sector is a productive, labour intensive sector in Africa, providing employment for a large number of people. CDM projects which aim to address emissions from the fossil fuel sector must be sensitive to employment considerations, keeping labour informed and including their concerns in the design and implementation of the project. In keeping with the sustainable development objectives of the CDM, projects should be employment generating, rather than employment shedding.

## 6. Project Cycles

The project cycle will include a number of steps, as shown in Figure 1. At each step, clarity is needed on the role of the CDM institution and how this impacts the viability of projects and the overall goals of the CDM.



**Identify and Package** – As discussed in the section on institutional structures, the CDM can play a major role to address the inequities of the AIJ and JI initiatives by being proactive about identifying projects in under-served areas such as Africa. In addition, packaging many small initiatives into a larger umbrella programme, which can only be done by a more active CDM brokerage model, can reduce the transaction costs for investors and allow the CDM to address the large, regional energy infrastructure projects or capacity building efforts which contribute to more environmentally sound energy policies.

**Funding** – The project developers, national CDM programme, and an international CDM institution all play a role in seeking funding for CDM projects. Initiatives which promote linkages between project developers in developing countries and investors in Annex I countries are necessary to increase the opportunities for CDM projects. A CDM institution

would also seek funding for projects in under-represented areas. This funding could come either from individual investors or from "carbon funds", which could bundle multiple investors into a single investment instrument.

**Implementation** – Almost all energy sector greenhouse gas mitigation projects will operate over a long period of time - typically 20 or more years. Implementation, monitoring, and certification are therefore ongoing processes, rather than finite tasks. Implementation must include not only initial technology transfers or injections of capital, but the sustained support for the projects, through training, maintenance, capacity building, and other measures. These ongoing needs, and responsibilities for them, must be clearly spelled out in the project proposal.

**Monitoring and verification** – Monitoring and verification will be the backbone of any successful CDM system. As models for how a certification regime could be implemented, two approaches are possible: a decentralised approach similar to professional accreditation, or a centralised approach similar to monitoring international weapons or election inspections. In the former, a central body would license individuals or firms to serve as accredited certification services, much the way certified accountants or lawyers have professional associations which accredit them. The advantages of this approach are: the central body does not have to be responsible or involved with every audit, and individual auditors have incentives to do their job effectively (so that they do not lose their license) and efficiently (so that they can afford to operate or make a profit if a private firm). The disadvantage is the risk of individual auditors "cheating" under pressure from project partners and not being picked up by the accrediting authority. A centralised approach would be analogous to United Nations election inspectors or nuclear weapons inspectors which are under direct control of the central body in each case. The advantage of this approach are that the centre has tight control over the outcome and process of each audit. The disadvantages are the potentially high costs of doing a large number of inspections around the world from one location, the costs of creating a new firm where capable organisations may already exist, and the lack of incentive to operate more efficiently.

Some private firms with experience in other areas of verification have already initiated plans to develop a greenhouse gas certification programme. NGOs are also involved with many of the current AIJ projects. Building on the skills available to develop an international network of qualified auditors under strict guidelines from the COP is likely to be the most cost-effective approach for certification and verification, particularly if the results of the audits are publicly available.

**Certification** – Article 12 of the Kyoto Protocol refers to "*certified* emission reductions" and *certified* project activities (para.6). Certified emission reductions (CERs) are essential components and incentive for private sector involvement. While monitoring and verification will be necessary for all projects under flexible mechanisms, CDM projects would require certification from whatever institution governs the CDM. This certification is required for a transfer of emissions reductions under the Kyoto Protocol. Given that projects continue for many years, the timing of credit transfers has major implications. Ideally, credits would be certified and transferred *periodically*, rather than only at the beginning or end of a project. Transferring all credits at the beginning of the project obviously would increase the risk of non-compliance given all of the uncertainties with mitigation projects. Waiting until the end of the project would be too long for investors, who want to see a "Carbon return" on investment in the short to medium term.

Energy sector projects lend themselves to periodic certification and crediting, because introducing a new technology or implementing a large scale initiative yields annual emissions reductions. Because the monitoring, verification, and certification processes all add cost of a project, it may be more cost effective to have certification and credit transfers every few years rather than annually. Implementation, monitoring, and

certification will should therefore be an iterative process, rather than a one-off transaction.

## 7. Conclusions

Much work remains to be done to clarify whether and how the Clean Development Mechanism can meet its dual goals of contributing to sustainable development in developing countries and assisting industrialised countries meeting their commitments to emissions reduction and limitation. This paper has raised a number of issues around the structure and operation of the CDM to meet the energy development needs of the continent.

Energy can play a key role African development, and the CDM can contribute to sustainable development through the investment in the energy sector if it focuses on African energy priorities, which are broader than one-off technology and demonstration project, and addresses large-scale regional initiatives, including capacity building or other activities not typical of GHG mitigation projects.

The CDM institution, should at a minimum, serve as a clearing house of projects and funding proposals, and a certifying body for CDM activities. To promote investment in regions such as Africa, however, a more systematic approach is necessary, which may involve the CDM serving as a broker or proactively seeking out projects. In this way the CDM can function as a multilateral funding body, channelling resources into regional energy and infrastructure projects which are necessary to sustainable development in Africa.

To ensure that Africa can effectively participate in the CDM, attention must be given to developing strong centralised institutional structures which can develop and implement national climate change policy; integrate CDM policy with other national and regional economic, social and environmental goals; negotiate positions in international forums; and actively develop and initiate CDM programmes.

Stakeholders must be identified and invited to participate in the design of CDM projects to ensure that the emissions reduction or avoidance objectives of the project do not conflict with the developmental needs of affected and involved parties.

In the development of the project, there is a need for CDM to package projects and seek funding to lower transaction costs and reach under-served areas. Independent certification is critical to the credibility of the trading system; a network of accredited auditors under the authority of the COP is likely to be more cost effective than having all projects verified by the CDM Executive Board or similar body. Periodic certification and crediting will reduce the risks associated with CDM projects. Energy projects lend themselves to such periodic certification.

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