

# CLEAN DEVELOPMENT MECHANISM (CDM) AND RENEWABLE ENERGY PROJECTS: POTENTIAL REVENUE WHILST PROMOTING SUSTAINABLE DEVELOPMENT

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## ABSTRACT

This paper explores examples of on going small scale renewable energy CDM projects. The picture of expected revenue and community's benefits resulted from those projects are described. Numbers of CERs requested and issued are selected shown. Bundling several small-scale CDM projects that not exceed a total of 15 MW is described. This paper emphasis the importance of community participatory and explorative approaches in identification of local potentials as well as in conducting feasibility assessments.

**Key words:** Bundling small scale CDM project, CDM, CER, Renewable energy, Sustainable development

## ABSTRAK

Makalah ini menggali contoh proyek CDM tentang energi terbarukan yang sedang berjalan. Juga diuraikan gambaran tentang nilai proyek dan keuntungan bagi masyarakat yang dihasilkan oleh proyek CDM tersebut. Jumlah pengurangan emisi yang disertifikasi dan dipublikasikan ditampilkan. Penggabungan beberapa proyek skala kecil yang totalnya tidak lebih dari 15 MW juga diuraikan. Makalah ini menekankan pentingnya keterlibatan masyarakat lokal dan pencarian pendekatan yang bertujuan menggali potensi lokal dalam melakukan kajian kelayakan.

**Kata kunci:** Penggabungan proyek CDM skala kecil, Mekanisme pembangunan bersih (CDM), CER, Energi terbarukan, Pembangunan berkelanjutan

## 1. INTRODUCTION

CDM project activities provide incentive for investment in renewable energy sector which can promote sustainable development. Developing countries have potential renewable resources; biomass, hydro, wind, wave, solar, that if suitably utilized will deliver not only economical but also social benefits for the communities, especially in rural areas where transmission and distribution of fossil fuel generated-energy can be difficult and expensive. Unfortunately, cost, limitation in technology and regulatory have been major constraints in widespread adoption of renewable energy to meet the needs.

As nowadays renewable energy technologies have been improving, the CDM under Kyoto protocol can be an opportunity to solve the financial problem. CDM allows developing countries to undertake reducing-greenhouse gases projects and gain revenue from the trading of resulted emission reduction certificates. Critics have been voiced that CDM is only benefiting the big companies and carbon traders. But in fact, there is possibility to gain advantage for small renewable energy projects owned by local institutions or local

government by use of small scale CDM scheme. Small scale renewable energy CDM projects can be a suitable approach for promoting rural sustainable development, especially when the access to energy could address the social and economic needs of local communities. The communities will not automatically gain income benefits from renewable energy projects unless it is linked or being part of community's income activities and intended to increase community's capacity.

Local institutions and local government can take this opportunity by inviting external party to invest on renewable energy CDM projects and as incentive is the share of revenue resulted from trading the emission reduction certificate. The benefit gained from the carbon credits can be shared among the stakeholders and it may act as well as alternative source of income for local government. It can be seen as gaining economical benefit while conducting sustainable development practice.

## **2. CLEAN DEVELOPMENT MECHANISM (CDM)**

Kyoto Protocol, which was outlined in Kyoto in 1997, legally bound 39 developed countries, so called as Annex-1 countries, to reduce their greenhouse gases (GHG) to the level that would prevent dangerous changes to the climate. These emission reductions must be achieved by 2008-2012 (Phase II). The other countries those without emission reduction obligation are called the non-Annex 1 countries. In order to achieve its emission targets and lowering overall cost, Kyoto Protocol defined three 'flexibility mechanisms' which enable Annex-1 countries to reduce or remove carbon from atmosphere in other countries. The idea underlying the mechanisms was that *while the cost of limiting emission varies considerably from region to region, the benefit for the atmosphere is the same, wherever the action is taken.*

The three flexibility mechanisms include *Joint implementation* (transferring emission allowances between developed countries, linked to specific emission reduction projects); *Emission Trading* (trading of emission allowances between developed countries); and the Clean Development Mechanism or CDM (Aukland. et al., 2002).

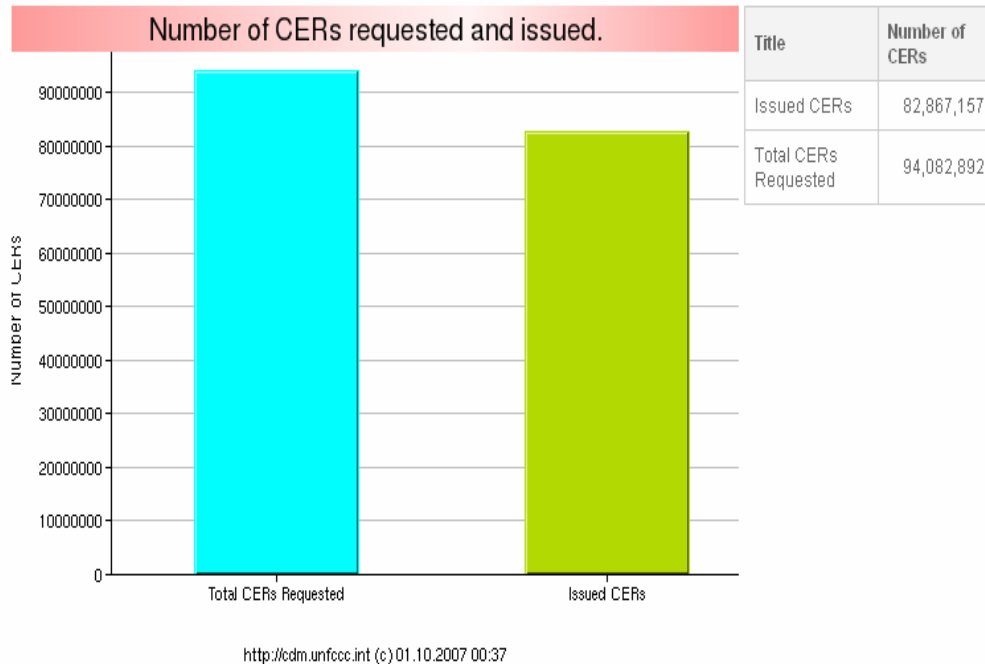
Among these mechanisms, CDM is the only mechanism that involves participation of developing countries. At present, developing countries have no obligations to constrain their GHG emissions. But they may contribute voluntarily to global emission reduction by hosting projects under CDM. In return, the Annex 1 Parties are allowed to take credits from reducing projects undertaken in developing countries in form of Certified Emission Reduction (CERs), which express tons of CO<sub>2</sub> emission avoided.

To date, the 'carbon credits' are bought and sold in environmental market as commodity. The CDM is expected to assist the developing country in achieving sustainable development through investment generation in developing countries, especially from the private sector, and promote the transfer of environmentally-friendly technologies in that

direction. CDM can be initiated by the private sector, non-governmental organizations or government agencies and can be conducted under large or small scale of CDM project activities. Furthermore, public funding for CDM project activities must not result in the diversion of Official Development Assistance (ODA).

### 3. CDM RELATED TO RENEWABLE ENERGY AND SUSTAINABLE DEVELOPMENT

Despite of the critics expressed that CDM project activity involves long procedures, high initial capital and risk that the proposed project might not be registered or might not deliver the expected emission reductions, the carbon market is increasing even predicted will continue post 2012 regime. The carbon market based on JI/CDM project activities grew to a value of about US\$ 5 billion in 2006, with average prices for CERs from developing countries were range between US\$ 8-14 (Capoor and Ambrosi, 2007). The estimated revenue from the sale of CERs generated by the CDM projects registered during 2006 is US\$ 1-1.5 billion per year and the estimated revenue from the sale of the CERs generated by the projects that entered the pipeline during 2006 is US\$ 1 billion higher. Furthermore, it is estimated that the CDM project activities in the pipeline in 2006 will generate investment of about US\$ 25 billion, of which renewable energy and energy efficiency projects account for 90% of the overall investment. One can say that the carbon market has influenced the flow of investment (UNFCCC Dialogue on Climate Change, 2007). If we look at the number of CERs issuance, the total CERs requested to date is higher than the number of issued CERs, see **Fig. 1**.



**Fig. 1. Number of CERs requested and issued per September 2007**

The conditions above demonstrate incentive provided by CDM project activities which can be used by developing country governments to promote and attract investment in sustainable energy efficiency and renewable energy projects. When the CDM project activities are intended for community development, it may provide an additional source of income or access to technical support for the communities where the project takes place, so the CDM will benefit the community in need while promoting sustainable development. Availability of renewable energy resources in many developing countries is potential for ensuring access to energy service for communities whilst reducing dependence on import of fossil fuel. In India, the government envisions a central role for renewable energy which is expected in 2050 will meet more than half the energy needs of the rural populations. In order to achieve this vision, the government of India is seriously exploring the possibility of utilizing the CDM and environmental funding opportunities (Babu, 2003).

Private sector enterprises will play key role in implementing the CDM. Therefore, if local government or local associations aim to use the CDM incentive to promote sustainable development in the area, it is necessary to explore the local potencies which fit into CDM project categories and promote them to attract investment. Cooperation with project developer or CDM consultant companies may be helpful to identify potential projects and make the project financially viable and more attractive to investors. Clear policies providing such as priorities area and the cooperation with stakeholders and communities shall be considered important to achieve the above objectives. Furthermore, shifting of worldwide investment due to carbon market to renewable energy and energy efficiency CDM project activities should be seen by government in developing countries as a good momentum to boost the development efforts toward more environmental friendly technologies and make maximum use of it during post carbon market regime.

Taking into account nature of development project in rural or remote area which usually consists of several small and scattered projects, the small-scale CDM scheme will be the most feasible project to consider. Small-scale CDM project has simplified modalities and procedure as well cheaper registration cost as long as it doesn't exceed the limit below.

- 1) Renewable energy project activities shall have a maximum output capacity of 15 MW (or an appropriate equivalent);
- 2) Energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, shall be limited to those with a maximum output of 60 GWh per year (or an appropriate equivalent);
- 3) Other project activities, shall be limited to those that result emission reductions of less than or equal to 60 kt CO<sub>2</sub> equivalent annually (UNFCCC, Decision -/CMP.2).

Even more, small-scale CDM projects can be bundled; several small-scale projects are brought together as one project, and it can be arranged as sub-bundles covering several projects in different locations, also can be heterogeneous or homogeneous bundle.

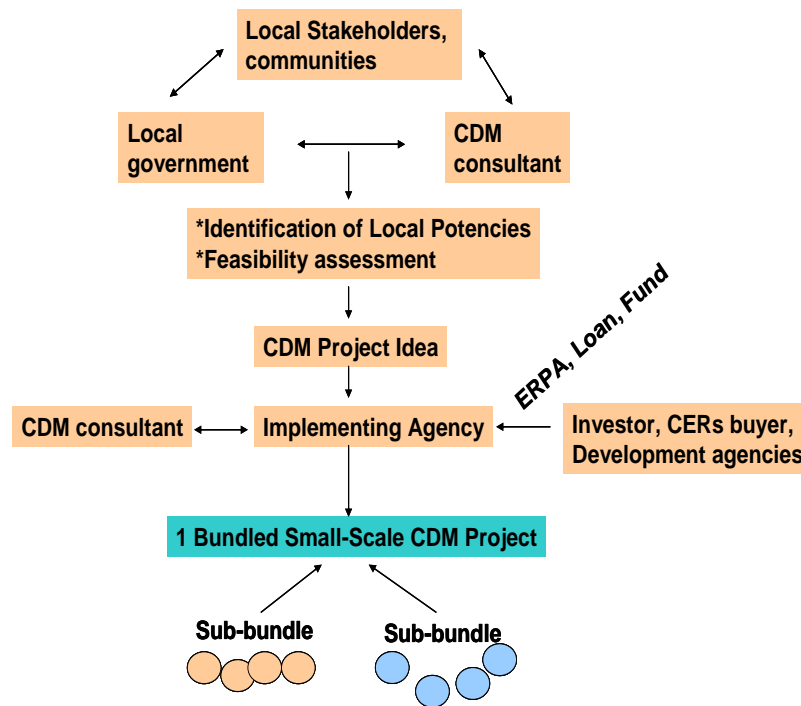
It is a good way to reduce cost, for example:

- 1 DOE for validation and verification,
- 1 Project Design Document (PDD) for all project activities,
- sampling allowed in monitoring plan,
- single entity can act on everyone's behalf and enhance access to carbon finance for small and scattered projects in rural area.

Bundling small-scale CDM projects may not exceed the limit as described above and should follow principles of:

- a. having same crediting period for all activities
- b. should be demonstrated that bundle will remain under the limit for that type, every year during the crediting period,
- c. if bundle goes beyond its limit, excess emission reduction generated will not be eligible (UNFCCC, Annex 21).

For example, Nepal Micro Hydro project owned by government of Nepal on behalf of all micro hydro operators consists of about 750 micro hydro stations range between 3-100 kW up to 15 MW in total, covered in 1 PDD (Site resources, World Bank).



**Fig. 2. Approach for utilization of bundled small-scale CDM project for sustainable development**

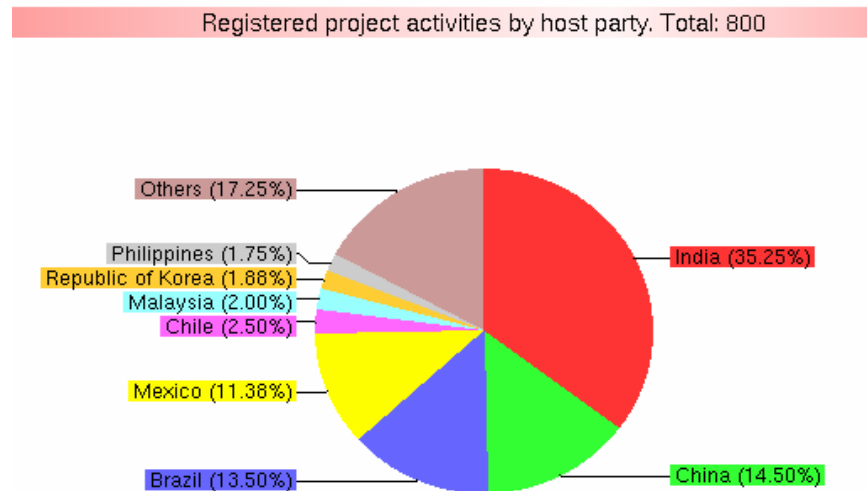
#### 4. RENEWABLE ENERGY CDM PROJECT (UNFCCC, Reg.CDM Project Database)

- 1) **Shanmugou Small Hydropower Project in China** (Registered 20 September 2007). This small-scale CDM project is aimed to utilize Guanliao River to generate zero emission electricity to the Central China Power Grid. The project with 10MW installed capacity is expected to reduce emission of GHG by an estimated 45,860 tCO<sub>2</sub>e per year (*with estimation of CERs price is in range of US\$ 10-14 per tCO<sub>2</sub>e, the revenue from the project is about US\$ 458,600 – 642,040 per crediting year*) during 7 years crediting period. The project increases employment opportunities in the area, enhance local economy through improvement the local investment environment, make use of hydroelectric resources, and the project will employ people throughout project operation, thus contribute to poverty alleviation.
- 2) **Bagasse Based Cogeneration Project at Pudukkottai, Tamil Nadu, India** (Registered 14 September 2007). The project activity involves implementation of a bagasse based cogeneration to increase efficiency of energy generation from sugar mill generated bagasse by replacing the existing low efficiency cogeneration system with higher efficiency. The project reduces 86,623 tCO<sub>2</sub>e annually for ten years of crediting period. The project reduce the use of fossil fuels by promoting usage of renewable sources for power generation and reduce negative environmental aspects of conventional power plant such as emission of particulates as the project applies most efficient and environment friendly technology. The export of electricity to the grid reduces power outages thereby improving industrial output resulting in economic development of the region. The improved power situation encourages new small and medium industries that improve rural employment scenario.
- 3) **Biogas Support Program – Nepal** (Registered 27 December 2005). This small-scale project received bilateral and multilateral funds from Community Development Carbon Fund (CDCF), the World Bank. The project sells biogas digester (biogas plant) utilizes dung of cattle (cows or buffalos) as feedstock to households located primarily in the rural areas of Nepal. It reduces GHG emission by displacing conventionally used fuel sources for cooking, such as firewood and kerosene. The power equivalent of the installed biogas plant ranges from 1.16 KW to 2.32 KW and the total installed capacity is 14.73 MW. The annual emission reduction of one biogas digester averages 7 tCO<sub>2</sub>e/year. The project has installed 9,708 small biogas digesters in 57 districts of Nepal, hence, estimated will result about 329,000 tons of net emission reductions over 7 years crediting period. The key elements for the project's approach are provision of financial support for end-users through Micro finance institutions and cooperatives, uniform technical design of biogas plant, social marketing through awareness and training program, implementation of a fertilizer extension to maximize the benefits of bio-slurry, a by product of the biogas. The project contributes to household benefit by reducing time and energy spent by women and children in collecting firewood for

cooking, biogas provide better sanitation, increase skilled people more than 15,000 people in construction, maintenance, marketing and financing biogas plants. Moreover, the use of biogas reduces smoke which means better family health. Residual biological slurry from biogas plant can be used as organic fertilizer to enhance agricultural yields. The project supports national program to improve energy access for rural poor and to reduce rural poverty by providing high quality biogas plants to poor households at an affordable price.

- 4) **Antonio Moran Wind Power Plant Project in Patagonia Region, Argentina** (Registered 29 December 2005). This small-scale CDM project is implemented by local cooperative which is intended to supply electricity to its member and to substitute electricity purchased from Patagonia grid, which is mainly fed by natural gas thermal and hydro power plants. The project has 10.56 MW installed capacity, consisting of 16 units of 660 kW generators, expected to reduce emission of 188,496 tCO<sub>2</sub> eq. for 7 years crediting period. The project creates job opportunities for the construction, reduce air pollutants emitted from natural gas thermal plants, and build capacities related to wind farm in Argentina through advanced technology transferred from developed country.

As the participation in CDM investment to date is mainly dominated by China, India and Latin America (Mexico, Brazil and Argentina), see **Fig. 3**. The Nairobi Framework was initiated with the specific target of helping developing countries, especially those in sub-Shara Africa, to improve their level of participation in the CDM.



<http://cdm.unfccc.int> (c) 24.09.2007 16:43

**Fig. 3. Registered CDM project by host country**

The framework was initiated by UNDP, UNEP, Worldbank, African Development Bank and the Secretariat of UNFCCC to build and enhance capacity of DNA to become fully operational, build capacity in developing CDM project activities, promote investment for the projects and improve information sharing /training.

## 5. CONCLUDING REMARK

Sustainable development efforts shall see the CDM as an opportunity to deliver more social and economic benefits for communities in developing countries, especially in the form of small-scale renewable energy CDM projects which are intended for poverty alleviation in rural and remote areas. Examples from different registered small-scale CDM projects have demonstrated how straightforward renewable energy technologies can contribute to rural livelihood. Cooperation with funding agency, local cooperatives and investors for implementation of CDM project has been proven successful in the example of Nepal, Argentina and India. One of key steps to develop CDM projects which promote sustainable development is the identification of the projects that fit into CDM categories while benefiting population and environment. For this purpose, this paper emphasis the importance of participatory and explorative approach in identification of local potencies and conducting feasibility assessment by involving local stakeholders, local community and include the function of CDM consultant further than only providing assistance during CDM cycle.

## REFERENCES

- Aukland, L., Moura Costa, P., Bass, S., Huq, S., Landell-Mills, N., Tipper, R. and Carr, R. (2002), "Saying the Foundations for Clean Development: Preparing the Land Use Sector. A quick guide to the Clean Development Mechanism". IIED, London. in <http://www.cdmcapacity.org/>
- Babu, N.Y. (2003), "The Clean Development Mechanism and Renewable Energy: India's Perspective", CDM Investment Newsletter Nr.3 / 2003.
- Capoor, K. and Ambrosi, P. (2007), "State and Trends of the Carbon Market 2007", Washington, D.C. May 2007.
- Siteresources Worldbank (2007), Bundling small scale projects. (<http://siteresources.worldbank.org/>)
- UNFCCC, Dialogue on Climate Change (2007), Investment and financial flows relevant to the development of effective and appropriate international response to Climate Change, Vienna, Austria, 27-31 August 2007.
- UNFCCC Decision -/CMP.2. "Further guidance relating to the clean development mechanism". ([http://unfccc.int/files/meetings/cop\\_12/application/pdf/cmp\\_8.pdf](http://unfccc.int/files/meetings/cop_12/application/pdf/cmp_8.pdf)).
- UNFCCC, Annex 21. "General Principles for Bundling".
- UNFCCC, "Registered CDM Project Database". [http://unfccc.int/kyoto\\_protocol/mechanisms/clean\\_development\\_mechanism/items](http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items)