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## Financing Solutions for Sustainable Development

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# Climate Credit Mechanisms - Clean Development Mechanism

Participate in climate crediting mechanisms, e.g. the [Clean Development Mechanism](#)

Climate crediting mechanisms, like other [carbon market mechanisms](#), enable entities, for which the cost of reducing emissions is high, to pay low-cost emitters for carbon credits that they can use towards meeting their emission-reduction obligations, or for voluntary or trading purposes. These mechanisms-e.g. the [Clean Development Mechanism \(CDM\)](#)-put a price on carbon, helping to internalize the environmental and social costs of carbon pollution, and permit trading, which lowers the economic cost of reducing emissions.

**Key words:** Climate change, greenhouse gases (GHGs) or carbon; carbon pricing: carbon tax; market mechanism; carbon markets; offset mechanism or crediting mechanism; emissions trading system (ETS) offsets; allowances; crediting period; reporting period; baseline; methodology; Designated National Authority (DNA); Designated Operational Entity (DOE); banking; safeguard; polluter pays; externalities; voluntary.

## How does it work?

Climate (often also referred as carbon) crediting mechanisms aim to lower the economic cost of reducing emissions by permitting the trading of instruments representing GHG emission reductions. This fiche focuses on the [CDM](#) and identifies how the [Paris Agreement on Climate Change](#) builds on it. International negotiations under the [United Nations Framework Convention on Climate Change \(UNFCCC\)](#) spearheaded the development of global carbon markets, first through the [CDM](#) and other “flexibility mechanisms” under the [Kyoto Protocol](#) (which entered into force in 2005), and more recently through a new market-based mechanism, established under the [Paris Agreement](#) (2015), which is slated to replace the Kyoto mechanisms in 2020.

The [CDM](#), established under the [Kyoto Protocol](#) of the [UNFCCC](#), is the largest global offset (or crediting) mechanism for greenhouse gases (GHGs). It provides the framework for developing-country projects that reduce, avoid or sequester carbon emissions to earn [Certified Emission Reductions \(CERs\)](#)—tradable offsets (also called carbon credits) which can be sold to enhance a project’s financial viability. Another Kyoto mechanism, [Joint Implementation \(JI\)](#), similarly provides for [Emission Reduction Units \(ERUs\)](#) to be sold by economies in transition. The Kyoto Protocol spurred the carbon market by:

- committing industrialized countries collectively to reduce their carbon emissions by an average of 5.2 per cent below their 1990 levels in 2008-12, which created demand for low-cost emission reductions;
- introducing three market mechanisms—[CDM](#), [JI](#) and [International Emissions Trading](#)—which offered flexibility in meeting these commitments; and
- articulating the governance framework that enabled the market to function.

Under the UNFCCC Bali Plan of Action (2007), developing countries were encouraged to put forward [Nationally Appropriate Mitigation Actions \(NAMAs\)](#) enumerating plans for verifiably reducing GHG emissions relative to business as usual, for the preparation and/or implementation of which they could seek support. The Paris Agreement builds upon the Kyoto instruments and NAMAs by:

- setting an ambitious but non-binding goal of curbing human-induced global warming to “well below” 2° C;
- requiring countries to put forth pledges known as [Nationally Determined Contributions \(NDCs\)](#) to climate-change mitigation representing their commitment to pursue actions, policies and regulations to mitigate GHG emissions; and
- introducing a new international market that allows countries to cooperate in meeting their [NDCs](#), through the use of “[internationally transferred mitigation outcomes](#)” (ITMOs).

The key differences between Kyoto and [Paris](#) are that the new mechanism:

- is *voluntary*, in that countries submit [NDCs](#) rather than complying with externally-set targets
- provides for *developing* countries to submit [NDCs](#), and for [ITMOs](#) to be eligible for use in their [NDCs](#) (whereas under the Kyoto Protocol, developing countries did not make pledges and did therefore not need [CERs](#) to help fulfil them);

## Summary

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## Financial Results



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## Instruments Used



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## Sources of Finance



- provides for *increasing ambition* over time, through “global stocktakes” every five years, to encourage Parties to “update and enhance” their NDCs.



Given the close similarities, the Paris mechanism is expected to build on the CDM and JI. The functioning principles of the CDM need to be explained, namely, 1. the creation of emission reduction certificates (CERs); 2. the role of market prices; and 3. the emergence of voluntary markets.

**1. Creation of CERs.** To generate CERs, a project must go through the CDM Project Cycle, a rigorous and public registration and issuance process designed to ensure that a project has produced real, measurable and verifiable emission reductions that are additional to what would have occurred without the project. This process, overseen by the CDM Executive Board, involves documentation of project design, host-country approval, validation, registration, monitoring and verification. CERs that have completed the cycle are issued and tracked by the Executive Board in the CDM Registry. The CDM project cycle includes:

- host country approval granted by the Designated National Authority based on eligibility;
- submission of a detailed project design document, describing, inter alia, the CDM methodology that will be used to calculate emission reductions;
- validation of the project by an accredited independent auditor, called a Designated Operational Entity;
- registration of the validated CDM project by the CDM Executive Board;
- monitoring of emissions in accordance with the project design document, and verification of emission reductions by a DOE; and
- issuance and registration of CERs by the Executive Board.

A wide range of projects are eligible for the CDM. Methodologies have been approved for a range of activities, including renewable energy, energy efficiency, methane mitigation and afforestation/ reforestation. Simplified methodologies have been approved for small-scale projects. Programmes of Activities (PoAs) may be approved under which an unlimited number of eligible CDM project activities may be added without paying additional registration fees or undergoing the complete project cycle.

**2. The role of market prices.** Market prices for CERs peaked in 2008 at US\$20/tCO<sub>2e</sub>, driven by demand from industrialized countries seeking to meet their targets under the Kyoto Protocol and the European Union Emissions Trading System (ETS), which allows covered installations (i.e. facilities that are required, under an ETS, to reduce emissions) to use CERs to help them fulfil their emission-reduction requirements, up to certain limits. These installations have contributed 1.45 GtCO<sub>2e</sub> of CERs. Given that these entities have used offsets equivalent to 90 per cent of the amount allowed through 2020, little additional demand is expected from the EU. In the absence of sustained demand after the end of the Kyoto Protocol’s first commitment period in 2012, market prices for CERs tumbled to an average of only US\$0.19/tCO<sub>2e</sub> in 2014 and are expected to remain low until new demand emerges. Some of the slack has been taken up by other regimes that allow limited use of CERs for compliance, or domestically-generated CERs against carbon tax obligations (e.g. the Mexican and Republic of Korea ETSs), by voluntary cancellation of CERs and deregistration of projects, and by targeted funds.

**3. Targeted funds and the voluntary market .** A number of buyers and development programmes were<or “are”> ready to pay premium prices for CERs that deliver additional sustainable development benefits, under long-term contracts at set prices and/or with other provisions that facilitate financing. For example, several CER purchasing programmes have been developed despite and in response to low market prices, typically focusing on least developed countries and on promoting technologies that have strong poverty impacts. A number of these programmes also offer technical assistance for CDM-readiness and other offset markets. For example, the Forest Carbon Partnership Facility and the BioCarbon Fund provided US\$13.6 million for Ethiopia’s REDD+ readiness, including support for project development. These include the following.

- The Carbon Initiative for Development, which helps the world’s poorest countries receive performance-based payments based on reduced emissions, particularly for projects that improve energy access ;
- The Norwegian Carbon Procurement Programme, under which 60 megatons (Mt) of pre-2020 CERs are expected to be purchased from CDM projects and PoAs, including from least developed countries.
- The Swedish Energy Agency’s purchase programme, which plans to purchase 21 million credits by the end of the decade at above-market prices, also focusing on projects in least developed countries, e.g. 4 MtCO<sub>2e</sub> of CERs generated by clean cookstove projects in seven African countries, and 1 MtCO<sub>2e</sub> from CDM projects in Uganda and Ghana respectively .
- The Pilot Auction Facility for Methane and Climate Change Mitigation auctions “put” options under long-term, fixed-price contracts, which grant eligible CDM project sponsors the right (but not the obligation) to sell CERs to the Facility at a price set by auction and fixed for five years. The clearing price (at the first auction in July 2014) was US\$2.40/tCO<sub>2e</sub>. Auctions are announced periodically, with varying but specific eligibility requirements.
- The BioCarbon Fund (BioCF) purchases CERs under long-term contracts from afforestation, reforestation, agricultural and REDD+ activities, providing advance payments and technical assistance to support not only CDM projects but also sustainable land management practices. These activities provide important economic, social and institutional co-benefits, many of which enhance local incomes. For example, restoring degraded land and improving land tenure have resulted in higher yields and incomes from agricultural and forest products. A new BioCF initiative for Sustainable Forest Landscapes (ISFL) addresses global deforestation challenges by scaling up smarter land-use planning across larger landscapes.

## Related SDG



## Related Sector



The voluntary markets account for large volumes of carbon purchases and retirements, at large multiples of market prices. In 2014, 87 tCO<sub>2</sub>e of voluntary carbon credits were purchased for US\$395 million at an average price of US\$4.54/tCO<sub>2</sub>e.

### Potential in monetary terms

Potential revenues from the sale of carbon credits depend on carbon prices, the volume of credits generated, and the length of the period of time over which credits may be generated (i.e. the crediting period) and sold. Nearly 8,000 [CDM](#) projects have been registered, of which energy projects comprise over 75 per cent and waste handling and disposal projects comprise 11 per cent. [CERs](#) have been issued for 2,824 project activities, totalling over 1.6 billion tCO<sub>2</sub>e of emission reductions. China is the largest issuer accounting for over 60 per cent of issued [CERs](#).

Carbon prices depend on supply and demand. Annual average market prices fell from a peak of US\$20/tCO<sub>2</sub>e in 2008 to US\$0.19/tCO<sub>2</sub>e in 2014). The higher the “level of ambition” and the scarcer the supply of credits, the higher the [prices](#) (e.g. [CER](#) prices plummeted when demand dropped and supply rose). Under the new Paris mechanism, demand will come from both industrialized and developing countries, which suggests prices will rise; however, given that the [NDCs](#) are non-binding, high prices may encourage some countries not to abide by their commitments, which would put downward pressure on the price.

The volume of credits generated depends on the crediting rules applied. Technologies that reduce emissions of gases with high global warming potential (e.g. biomass digestion, which reduces methane with a global warming potential 25 times that of CO<sub>2</sub>) tend to be able to generate [CERs](#) at lower cost than those which reduce CO<sub>2</sub> (e.g. renewables). Some methodologies heavily discount the emission reductions generated when [CERs](#) are calculated, e.g. to adjust for uncertainties. Default values for emission factors under small-scale [CDM](#) methodologies, for example, tend to be lower than for standard methodologies. It is expected that under the new market mechanism, [ITMOs](#) could be generated through a range of policy and regulatory mechanisms, rather than only through projects (as under [CDM](#) and JI).

## When is it feasible?

### Legal and/or other feasibility requirements

The legal and regulatory infrastructure for the [CDM](#) is fully developed but continues to be enhanced. For example, approaches have been developed to facilitate [CDM](#) projects in least developed countries, which have made limited use of the [CDM](#) to date. These include simplified, standardized baselines, default emission factors, small-scale methodologies, Programmes of Activities ([PoAs](#)) and methodologies that give credit for suppressed demand.

Programmes supported by concessional finance have been developed to promote and help finance these projects. A new framework is to be developed for the new Paris mechanism, which is likely to build on the [CDMs](#) but with provisions for policy-based crediting and other methodological simplifications.

Requirements for [CDM](#) project development and registration are complex, but assistance to project developers is available through many [DNAs](#), through the UNFCCC (e.g. its [Regional Collaboration Centres](#)) and from a range of consulting and other specialist firms. Some of this support infrastructure, however, has been dissipating as the volume of new [CDM](#) projects has dried up.

### Minimum investment required and running costs

Transaction costs for [CDM](#) projects vary significantly by type of project, with [CDM Programmes of Activities \(PoAs\)](#) and large projects that use complex methodologies at the high end, and [CDM](#) Project Activities under an existing [PoA](#) at the low end. Introducing a new methodology adds to the cost and time required to develop a project. In addition, monitoring and periodic verification costs, which again vary by project type and methodology need to be added. Verification reports can be produced at low incremental cost if monitoring is straightforward and verification can be done as an add-on to a broader audit engagement with a [DOE](#).

From the host country’s perspective, participating in the [CDM](#) incurs the cost of operating a [DNA](#) to vet projects, plus any costs associated with assisting project sponsors and/or developing programmes of activity. The [DNA](#)’s work usually dovetails with other work, such as preparing National Communications to the UNFCCC and developing [NAMAs](#) and [Intended Nationally Determined Contributions](#) (INDCs). Project development costs can however be defrayed in a number of ways.

- Many carbon funds cover part of project development costs and/or support technical assistance throughout the process hand-in-hand with project sponsors. Many of the carbon funds developed by the World Bank, for example, funded the development of methodologies used by projects from which they purchased emission reductions. Similarly, UNDP’s [MDG Carbon](#) supported the development and registration of five multi-country and multi-technology [PoAs](#).
- [PoAs](#) generally cover [CDM](#) development costs. Given the strong sustainable-development impacts of many [PoAs](#), donors have a strong interest in funding their development.

## What are the main risks and challenges?

### Pros

- Climate crediting mechanisms offer incremental revenues for low-carbon technologies.
- Long-term price stability can encourage realignment of investments towards low-carbon solutions.
- CERs are standard financial instruments that can be freely traded, and are eligible for use in a number of regimes in addition to the CDM.
- The CDM provides widely-accepted, robust processes for measuring greenhouse gas emission reductions.
- As a result, monitoring reports that follow CDM procedures are widely accepted by donors and other financiers as robust tools for monitoring and evaluation, and may therefore enhance a project or programme's ability to secure concessional finance.
- Although market prices are currently low, many buyers offer above-market prices, long-term forward contracts, and/or assistance with project or programme development, which may render projects viable.
- The new market-based mechanism established under the Paris Agreement signals a long-term commitment to the use of a global carbon crediting mechanism to promote public- and private-sector low-carbon investment.

### Cons

- At current market prices for CERs, the cost of undertaking a new CDM project is difficult to justify as it may exceed the ultimate revenues, particularly when discounted for time and risk. However, if a project is eligible for alternate purchasing programmes such as those described above, it may be able to secure a long-term carbon purchase agreement that would justify the investment.
- Financing project costs can be challenging, given that CERs are issued only after monitoring and verification—typically a year after project commissioning—and banks are generally unfamiliar with CERs. As a result, carbon revenues are not particularly helpful in securing financing.
- Identifying financing (not only for the CDM development costs but for the project itself) may be challenging, especially given that CDM-eligible technologies tend to have higher up-front costs than conventional ones.

### Risks

- Undertaking the CDM project cycle does not guarantee that a project will be approved, secure financing, generate CERs or recoup development costs. There are, however, ways to defray costs (as noted above), for example through PoAs and support from donor-funded programmes.
- Given the long lead time for investments and the volatility of carbon prices, price risk is a major concern for project sponsors. This can be mitigated by signing long-term offtake contracts with buyers.
- Similarly, project sponsors face regulatory risk, particularly given that it will take some time for the rules for the new market-based mechanism to be elaborated.

## How can the design be ameliorated to improve the impact?

The primary goal of climate credit mechanisms such as the CDM is to reduce greenhouse gas emissions and halt climate change. This entry does not provide a review of the vast literature that explains why halting climate change is good for the economy and the people, but it rather focuses on climate credit mechanisms' specific and measurable impacts.

The mandate of the CDM is already dual, as it—in principle—includes the delivery of sustainability benefits. In addition to the greenhouse-gas emission reductions (2,824 project activities have issued CERs, totalling over 1.6 billion tCO<sub>2</sub>e of emission reductions), CDM projects can and should deliver positive social/environmental impacts. However, less attention has been given to the question of how far the CDM will advance sustainable development goals. The range of sustainable development benefits provided by CDM projects depends on the sector and technology, but may include:

- reduced particulate emissions (e.g. mercury, black carbon) from displaced fossil fuels, leading to improved local air and water quality;
- job creation and/or labour saving from implementation of new technologies, as well as potential job losses from old technologies. For example, improving solid waste management may reduce rag-pickers' access to dumps (loss of jobs) but also reduces health risks (from exposure to hazardous waste) and creates jobs in implementing landfills, managing leachate (contaminated water that drains from landfills), recycling etc.;
- biodiversity protection, soil restoration and benefits related to afforestation and reforestation projects;
- access to affordable energy and waste recycling services.

These above-mentioned impacts can be enhanced in the following ways.

- Boosting the demand for CERs in the medium term in order to stabilize prices, thereby enhancing the economic impact and the "bankability" of CDM projects. In the shorter term, financial institutions' financing of eligible projects should be promoted, but also tied to a stronger monitoring of economic and social benefits. This support can take the form of contingent financing, first-loss reserves and mezzanine finance, and/or technical assistance, which can improve a project's risk profile. Green Africa Power, for example, offers mezzanine and contingent financing for new grid-connected renewable power generation in sub-Saharan Africa.
- Promoting the acceptance of offsets in ETSs. Offset prices are effectively driven by demand in carbon markets

that accept them. Strong commitments to reduce GHG emissions during the Kyoto Protocol's first commitment period drove CER prices to record levels; weaker demand in the second period has driven market prices nearly to zero.

- Channelling funds to CDM-eligible activities in the poorest countries such as through the Carbon Initiative for Development and Scaling-Up Renewable Energy in Low Income Countries Programme, a US\$796 million funding window of the Climate Investment Funds.
- Enhancing affinity with sustainable development through technological applications. For example, CDM projects that provide electricity or energy-efficient lightbulbs to underserved people increase the availability of electricity, facilitate education and jobs (electric lighting enables home workers and students to work longer and more effectively than fossil-fuel-based sources, and reduces indoor air pollution and fire risk), thus helping to reduce poverty and inequality. Similarly, cleaner cookstoves, which can be supported by CDM, reduce the need for collecting firewood and reduce indoor air pollution, with impacts on poverty as well as maternal and child health.
- Supporting the introduction and enhancement of verifiable systems and tools to assess the delivery of sustainable development benefits in CDM projects-e.g. the Sustainable Development Co-Benefits Tool-as well as mandatory safeguards to prevent negative environmental and social impacts. This would also likely require expanding research on technologies and project design that can increase the impact of CDM projects on sustainable development.
- Continuing to develop and/or enhance other offset mechanisms, including the UNFCCC's mechanism for "Reducing emissions from deforestation, forest degradation, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks" (REDD+).

## Guidelines and Case Studies

### Guidance

- UNFCCC: CDM Project Cycle, CDM Registry, CDM methodologies, CDM Programmes of Activities, Project registration, CDM projects in Africa
- World Bank Carbon Finance and Ten Years of Experience in Carbon Finance: Insights from Working with the Kyoto Mechanisms
- Status Quo of CDM Projects
- Connecting the dots: Results-based financing in climate policy
- State and Trends of Carbon Pricing
- CDM Sustainable Development Impacts

### Case Studies

- Bangladesh: Installation of Solar Home Systems
- Nepal: Biogas Program
- Madagascar: CAZ REDD Project
- UNDP MDG Carbon: Building Block for the Future

### Our work

International Guidebook of Environmental Finance Tools null



### Sustainable Development Goals



### Environmental finance

#### Our Perspective

09 Jul 2015

We should reach a consensus on the fact that macroeconomic policies in low-income economies need to also jettison the conventional wisdom of undue restrictiveness.

