

清洁能源发展机制 小水电项目开发者  
指南：开展清洁能源机制项目的基本要求和问题

**Shorthand Guide for Small-Scale CDM Projects:  
Basic Requirements and Questions for CDM Project Development**

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## 致项目开发者：

这篇文章旨在让项目开发者在设计小规模清洁能源发展机制（CDM）小水电项目时对项目的基本要求有大体上的了解。除了要回答检验工程是否有获得 CDM 资金的资格的问题，在联系买家和国际小水电中心之前，项目开发者还应该回答一些具体的问题。

CDM 是三个东京机制之一，它的目的是减少全球的温室气体排放量。CDM 允许附件 1 缔约方（如发达国家）与非附件 1 缔约方联合开展二氧化碳等温室气体减排项目。

CDM 的主要目的是减少温室气体的排放量，因此，申请的项目必须能证明代替了温室气体的排放。对于小水电项目，新增的装机容量必须代替或减少了其它燃料电站（如燃油或煤电站）产生的温室气体排放。

在评定项目理论上的温室气体减排量后，附件 1 缔约方会提供占项目总投资的 10% 的财政资助——每吨碳的价格会用美元或欧元支付。还必须知道，整个过程并不简单，在这些必须经过的官方案序中，申请的项目很有可能被刷下来。

除了可行性报告外，通读这篇文章的信息和回答是否具备申请资格的问题可以加速进程，还可以提高得到 CDM 资金的机会，这是一个竞争强又很复杂的过程。我们希望这些信息能够指引项目开发者。

- 国际小水电中心

## To Project Developers:

This short package is aimed to give an understanding for basic requirements when designing a small-scaled Clean Development Mechanism (CDM) project based on SHP's. Aside from a shortlist of questions that verifies eligibility to be considered for CDM funding, there are also lists of detailed questions to which developers can provide answers to, prior to contacting intermediaries and IC-SHP for assistance.

CDM, in short, is one of the three *Kyoto Mechanisms* (See next page) designed for the purpose of global Greenhouse Gas (GHG) emissions reduction. It is a system by which Annex I (i.e. industrialized states) countries and their companies can form a partnership with renewable energy or emissions displacing project developers in developing states.

As the main goal of this mechanism is to reduce global emissions of GHG gases, projects must be proven to effectively displace emission factors. In the case of SHP's, the added capacity should effectively displace or lessen the emissions from other GHG sources such as diesel or coal-fired thermal plants.

Annex I entities will then provide financial support (up to 10% of project funds) after assessing the theoretical reduction of GHG by the proposed project – prices will be calculated in terms of USD/Euros per metric tonne of carbon. It must be noted that the overall process is not a simple one and projects can be turned down during the many authorization process that it must go through.

Along with the feasibility report, going over this packet and providing verifiable answers will greatly hasten the process and increase the chance of being awarded CDM funds, which is overall a very competitive and complicated procedure. We hope that this packet will help guide developers when designing future CDM projects.

- *International Center for Small Hydropower (IC-SHP)*

## 清洁能源发展机制（CDM）相关术语编汇

**额外性（Additionality）：**描述 CDM 项目是否产生了额外的温室气体减排量，即如果没有这个 CDM 项目的存在，这些减排量就不能实现。根据马拉克什协议，额外性是建立在项目基准线的基础之上的。

**附件 I（Annex I）：**附件 I 国家包括属于经济合作与发展组织的国家以及指定作为“经济转型”欧洲国家。这些国家都签署了《联合国气候变化框架公约》（UNFCCC），有义务在 2012 年把温室气体的排放量降低到 1990 年的水平。

**基准线（Baseline）：**指一种在没有拟议的 CDM 项目活动时会出现的温室气体源人为排放的情景。

**二氧化碳（CO<sub>2</sub>）：**是人类各种活动产生的主要温室气体，是工业、交通、能源行业中燃料燃烧释放的主要气体。二氧化碳也是作为与其它温室气体的比较参数（二氧化碳当量）。大气中二氧化碳的比重在以每年 0.5% 的速度增长，比工业时期之前增加了 30%。除了燃料的燃烧之外，二氧化碳吸收源如森林的减少，吸收源可以从空气中吸收二氧化碳，它们的减少也加剧了问题的严重性。

**核证（Certification）：**由审计单位，可以是 COP 指定的、执行理事会授权的经营实体或监管委员会提出书面的保证，即在一个具体时期内某项目活动所实现的温室气体源人为减排量已经被证实。

**核证的排放减少量（CERs）：**CDM 项目所核实和核证的温室气体减排量单位，用每年排放的二氧化碳当量公吨数表示。

**计入期（Crediting lifetime）：**是指指定的时间周期，在该时期内的与基准线相比的减排额由指定的经营实体加以核实和核证后被计入，以便发放核证的减排量（CERs）。计入期有两种，分别是可更新的计入期为 7 年，或是固定的计入期为 10 年。

**缔约方大会（COP）：**是《联合国气候变化框架公约》的最高机构，由公约的签署国组成。详见“《京都议定书》的历史”中提到的 COP 和 UNFCCC。

**指定经营实体（DOE）：**一个由缔约方大会推荐的实体，有资格确认拟议的 CDM 项目的合格性，并核实和核证温室气体源人为减排量。

**执行理事会（EB）：**执行理事会由 10 名成员组成，是根据《京都议定书》的第 12 条设立的。成员包括 6 名非附件 I 国家的代表，决议的通过要有四分之三的成员同意。

执行理事会的义务有：

- 定义基准线方法和监测计划
- 推荐和委派经营实体
- 定义小规模 CDM 项目的简化规则

## **Brief list and definition of relevant CDM terms:**

**Additionality:** A term used to describe whether the CDM project contributes to a reduction of green house gases (GHG) that would not have otherwise occurred in a business as usual scenario. The Marrakesh Accord states that determination of additionality is based on the definition of the project baseline.

**Annex I:** Annex I Parties consist of countries that belong to the Organization for Economic Cooperation and Development (OECD) and European countries designated as “economies in transition”. These countries, as parties to the U.N. Framework Convention on Climate Change (UNFCCC), have pledged to reduce their greenhouse gas emissions by the year 2012 to 1990 levels, as stated in Article 4.2 of the Kyoto Protocol.

**(Project) Baseline:** Project specific scenarios of the GHG emissions that would have otherwise occurred if the CDM were not implemented (business as usual).

**Carbon dioxide (CO<sub>2</sub>):** The main greenhouse gas emitted from a variety of human activity the main source being fuel combustion in industry, transportation, and energy generation. CO<sub>2</sub> also serves as the reference of comparison to all other types of greenhouse gases (carbon dioxide equivalents). Atmospheric concentrations of CO<sub>2</sub> have been increasing at a rate of about 0.5% per year and are now about 30% above pre-industrial levels. Aside from fuel combustion, decreasing amounts of carbon sinks like forests, which actively take CO<sub>2</sub> from the atmosphere, are adding to the mounting problem.

**Certification:** The process by which auditing companies, either as Operational Entities designated by the COP, accredited by the Executive Board and/or the Supervisory Committee certify that the GHG reductions achieved by a project comply with a relevant set of standards or conditions.

**Certified Emission Reductions (CERs):** CERs are verified and authenticated units of GHG reductions from the CDM project in terms of tons CO<sub>2</sub> equivalent per year.

**Crediting lifetime:** The period during which the baseline of a CDM project is valid and CERs accrue. This is either a twice-renewable 7 years period (pending on review of the baseline) or a nonrenewable period of 10 years.

**Conference of the Parties (COP):** The supreme body of the UN Framework Convention on Climate Change (UNFCCC) that comprise of the nations that have ratified the UNFCCC. See “Brief History of the Kyoto Protocol” for the history of COP and UNFCCC.

**Designated Operational Entity (DOE):** An entity designated by the COP, based on the recommendation by the Executive Board, as qualified to validate proposed CDM project activities as well as to verify and certify reductions GHG emissions.

**Executive Board:** The 10 member Executive Board was established in Article 12 of the Kyoto Protocol. The members include six non-Annex I representatives and decides matters by a ¾ majority.

The EB has the following tasks:

- Definition of rules for designing baselines and monitoring plans
- Recommendation and accreditation of operational entities
- Definition of simplified rules for small scale projects

For a more complete list and definition of terms, download the “Glossary of CDM Terms”, available for download at the Brazilian Ministry of Science and Technology website –

<http://www.mct.gov.br/clima/ingles/quioto/pdf/pddgloss.pdf>

## 《京都议定书》的历史已经它的机制

《京都议定书》可以追溯到 1972 年在瑞典斯德哥尔摩举行的联合国人类环境大会，该大会决定每十年举行一次环境大会来解决全球的环境问题。16 年之后，为了用更科学的方式解决全球气候变暖问题，联合国专门设立了政府间气候变化小组（IPCC）。

IPCC 由来自世界各地的科学家和专家组成，它在 1990 年发表了第一次环境评估报告。这对以前气候变暖的讨论迈出了重要的一步。报告称，全球的气候在日益变暖，但更为重要的是，这并不是地球气候的自然变暖，而是由人类活动造成的。

两年以后，在巴西里约热内卢召开的联合国第二次环境与发展大会上，全球各国首脑聚集在一起，签署了《联合国气候变化框架公约》（UNFCCC，也可称里约公约）。该公约呼吁到 2000 年，在世界范围内减少温室气体排放。

1995 年，里约公约的签署国召开了第一次缔约方大会（COP）。1997 年，第三次缔约方大会在日本京都举行。这次会议更改了里约公约的目标，制定出了更加现实和准确的一系列目标，并通过了《京都议定书》。它的总体目标是在 2008 年到 2012 年之间，温室气体排放在 1990 年的水平上降低 5%。但是每个工业国家设定的目标都不一样的，例如欧盟的目标是 8%，德国是 25%，法国是 15%等。

1998 年，第四次缔约方会议在阿根廷布宜诺斯艾利斯召开。该会议制定了京都机制，以帮助更好的执行《京都议定书》。京都机制由以下三个机制组成：

1. *清洁能源发展机制 (CDM)*，允许附件 I 国家的投资者从其在发展中国家实施的、并有利于发展中国家可持续发展的减排项目中获取“经核证的减排量”（CER）；
2. *联合履行机制 (JI)*：允许附件 I 国家从其在其他工业化国家的投资项目产生的减排量中获取减排信用，实际结果相当于工业化国家之间转让了同等量的“减排单位”；
3. *国际排放贸易 (IET)*：允许附件 I 国家之间相互转让它们的部分“容许的排放量”（“排放配额单位”）。

接下来每年一次的缔约方大会又对《京都议定书》进行了进一步的调整，达成了一些协议。但是，直到 2004 年 11 月 18 日，俄罗斯正式向联合国递交了加入《京都议定书》的文件，才预示着《京都议定书》可以正式生效。因为这一议定书需要占 1990 年全球温室气体排放量 55% 以上的至少 55 个国家和地区核准之后才能生效。在俄罗斯加入议定书的 90 天之后，也就是在 2005 年 2 月 16 日，《京都议定书》正式生效。

为了实现 2012 年目标，CDM 是机制中最重要的组成部分之一，可以最现实地减少温室气体的排放量。同时，也为广大的发展中国家提供了可持续发展的指南，为它们争取利益

## A brief history and explanation of the Kyoto Protocol and its Mechanisms

The history of the Kyoto Protocol can be traced back to 1972 when the first Earth Summit was held in Stockholm, Sweden with the intent of meeting every ten years thereafter to determine the health of the planet. 16 years later, in an effort to approach the question of climate change in a more scientific manner, the United Nations created the *International Panel on Climate Change* (IPCC).

Composed of specialists from around the world, the IPCC released its first report in 1990. It was a significant step forward from previous discussions: The authors claimed that the planet was warming and more importantly, that this warming process was being triggered by human activity.

Two years later in Rio de Janeiro, Brazil, the *Second Earth Summit* became the largest gathering of world leaders ever and resulted in the creation of the *United Nations Framework Convention on Climate Change* (UNFCCC – also known as the Rio Convention), which called on worldwide stabilization of greenhouse gas (GHG) emissions by 2000.

Since 1995, countries that ratified the *Rio Convention* have convened the *Conference of Parties* (COP) every year. In the 1997 COP which was held in Kyoto, the original goals of the Rio Convention were modified to accommodate a more realistic and concrete set of goals. At this time, the goal was set to cut GHG emissions (at 1990 level) by at least 5% between 2008 and 2012. Different industrialized countries set higher goals, such as the EU target of 8% reduction, Germany 25%, UK 15%, etc.

At the 1998 COP IV in Buenos Aires, Argentina, the Kyoto Mechanisms were formulated to aid the implementation of the Kyoto Protocol. The Kyoto Mechanism consists of three pillars:

Clean Development Mechanism, in which industrialized (Annex I) countries gain credits through various measures to displace GHG emissions (including renewable energy and afforestation programmes) in developing nations;

Joint Implementation, in which Annex I countries receive credits for cutting emissions in another Annex I country; and

Emissions Trading, in which Annex I countries trade emissions credits amongst each other.

Subsequent COP meetings saw further adjustments and agreements among participating parties but it was not until November 18, 2004 when Russia ratified the Kyoto Protocol that it became legally feasible to be put in effect. This was because the Protocol had to be first ratified by countries who together were responsible for at least 55% of 1990 global GHG emissions. 90 days following Russia's ratification, the Kyoto Protocol officially entered into force on February 16, 2005.

In order for countries to reach the 2012 target and beyond, CDM is one of the most important mechanisms to effectively achieve reductions in GHG emissions while at the same time guiding sustainable development and providing benefits for developing countries.

## 小规模 CDM • 基本要求

小水电项目要符合下列要求，才有资格申请小规模 CDM 项目的资格。

1. 装机容量必须低于 15MW。
2. 小水电站不能是已经建成的或者是处于施工阶段的电站。
3. 必须要有证据说明，如果没有 CDM 资金的帮助，这个项目就没有足够的资金完成建设工作，因此，
  - a. 这个项目不能是政府项目，因为如果是政府项目，就不用考虑资金问题和减排量目标。
4. “额外性”：小水电站的建成必须替代电网内燃料电站的温室气体排放或家庭矿物燃料的使用，因此，
  - a. 小水电站所在电网内不能单单只有小水电站或其他可再生能源电站。
5. 小水电站的建设不能对环境造成不利的影晌，如大量的移民或大量土地被淹没。
6. 小水电站所在电网的基本资料可以帮助加快完成 PIN 的编写工作，这些资料应包括：
  - a. 各种不同能源种类电站为所服务电网提供的电量数据（单位为 kwh），平均热效率或电站效率，
  - b. 电网内最近增添的电站的情况，这些新增电站可定义为，20%大于 1MW 的建成的电站，或者是最近建成的 5 座电站。

## Small-Scaled CDM Projects – Basic Requirements

In order to save time and costs of assessing CDM eligibility of small hydropower projects, the following basic points should be checked.

1. “Small-Scale” is defined to be under 15MW net installed capacity;
2. The SHP should not already be built or under construction and should be accompanied with an official feasibility and environmental assessment study;
3. There must be proof that without CDM funds, the SHP project will not be financially feasible, and therefore:
  - a. The project cannot be part of a government project in which its construction is guaranteed regardless of CDM funds or emission reduction goals;
4. “Additionality”: The proposed SHP must replace emissions arising from thermal plants or household use of fossil fuel within the grid that it supplies electricity to, therefore:
  - a. The grid that the proposed SHP will be connected to cannot consist only of hydropower or emissions neutral renewable plants;
5. The proposed SHP must not cause adverse affects to its environs including sizeable relocation of people or submerging of land;
6. Basic information about the grid (which the proposed SHP will be connected to) that will help speed up the compilation of the project PIN include:
  - a. Energy generation data (in kWh) for all generating sources serving the target grid and their average heat rate or plant efficiency by fuel type,
  - b. Most recent capacity additions to the grid, defined to be the greater (in MWh) of most recent 20% of existing plants, or the 5 most recently built plants.

## 发展清洁能源机制项目的 14 个步骤

1. 发展项目设想。
2. 决定该项目是否是小规模项目或大规模项目。
3. 决定该项目是否是单边项目或在附录 I 国家中选择一个项目合作方。（附录 I 国家为合作方会更有利）
4. 联系东道国授权的国内机构，了解当地的参与资格及程序。
5. 开始发展项目设计文件。
6. 选择一个已批准的基准线和监测方法学或提出新方法。
7. 邀请当地利益相关者对项目做出评价。
8. 与项目参与方起草如何产生核定减排量的协议。
9. 选择一个指定的经营实体来审核项目设计文件。
10. 该指定经营实体会向授权的国内机构申请批准书。
11. 如果项目不需要重新审核，则在执行理事会注册。
12. 执行和监测项目。
13. 选择一个指定的经营实体核实和证明减排量。
14. 发放经核证的温室气体减排量。

## The 14 Steps of a CDM Project Cycle

1. Develop a project idea
2. Decide whether the project is small-scale or full-scale
3. Decide whether it is a unilateral project or choose a project participant in an Annex I country (Preferably to have an Annex I country partner)
4. Contact the Designated National Authority (DNA) in the country to ask for local eligibility criteria and procedures
5. Start to develop the Project Design Document (PDD).
6. Choose an approved baseline and monitoring methodology or suggest a new one
7. Invite local stakeholders to make comments on the project
8. An agreement must be written on how the Certified Emission Reductions (CERs) generated will be split among the project participants
9. Choose a Designated Operational Entity (DOE) to validate the PDD
10. The DOE will ask the involved DNA's for approval letters
11. Registration at the EB pending no further requests for project review
12. Project implementation and monitoring
13. Select a DOE to verify and certify the emission reductions
14. Issuance of the CERs

## 清洁能源发展机制项目（CDM）的基本问题

1. 开发此电站的目的是什么？
2. 电站描述
  - i. 电站的所在地
  - ii. 电站所在地的具体地理情况
  - iii. 电站所在地的水力资源开发潜力，有多少已经被开发
  - iv. 电站的技术参数（如水头、流量、水轮机等）
  - v. 电站所发的电将送往哪里以及通过什么途径
  - vi. 电站的施工起止日期
  - vii. 电站所连接的电网的情况以及当地的能源构成
  - viii. 电站所在区域最近建成的电站有哪些
  - ix. 电站有没有通过环境评估

### 电网和当地的能源构成

如果电站接入电网，请回答以下问题：

1. 此电站发的电是卖给哪个电网？占总发电量的多少？
2. 电网的总电量为多少？请给出该电网内运行电站的名称、容量（MW）、发电量（GWh）、发电效率、热效率已经电站种类。
3. 电站建成以后，当地的能源构成会不会发生变化（如火电站占多数 还是水电站）
4. 请给出最近建成的六个电站的名称，装机容量，发电量（2003 年和 2004 年），发电效率以及电站能源类型。

### 站址信息

1. 电站的开发商是谁？主要联系信息：
  - 开发商名称
  - 联系人
  - 公司类型：私有还是国有
  - 开发商的主要业务活动和经验？
  - 地址
  - 电话/传真号码，电子邮件地址，网址（如果有的话）
2. 请提供开发公司去年的财务报表。
3. 电站的建设期以及预计的完工时间。

### 投资情况

1. 这个项目的资金是通过什么渠道筹集的？有多少资金可以保证拿到，它们的渠道是什么？
2. 贷款的数额、来源以及还贷期。

3. 国家有没有拨款，能不能从银行贷款？请说明具体情况。
4. 这个项目花了多长时间寻找资金来源？
5. 这个地区的电价是多少？那些非小水电站所发的电的电价是多少？（火电站、天然气电站或其他）
6. 这个电站所发的电的电价是多少？
7. 项目的财政内部收益率是多少？

#### **关于电站给当地带来的受益的问题**

1. 当地有没有执行过或正在执行一些环境项目？如果有，它们的名称、主题是什么，这些环境项目能不能带来一些经济价值。
2. 请确定和描述电站的受益者，并提供受益者的地点、人口、社会构成、经济活动、主要问题等方面的详细资料。
3. 请列出并描述给当地社会带来的具体好处有哪些？例如，对经济、社会和环境带来的好处。
4. 请描述这些受益者将怎样参与计划、落实并管理这些利益的。
5. 请描述当地的贫困人口和少数民族，说明他们是怎么参与这个工程，并从中受益的。
6. 请列出会参与并支持这个工程并做出贡献的政府和或任何其他组织和机构（当地的、地区的或全国的），请描述他们提供利益方面的具体职能。
7. 请描述怎样衡量和证实这些受益。
8. 请描述在工程完工之后，这些利益将怎么继续持续下去？谁会对此负责？
9. 工程在为社区提供利益的同时，会不会产生一些环境、社会、经济方面的不利影响。如果有，请说明怎样消除这些不利影响。
10. 请确认是否有当地合作伙伴或少数民族股东在项目执行期间和当地电力规划期间作为联系人。

#### **其他问题：**

1. 当地有没有其它项目申请过 CDM？
2. 当地签订了多少电力购买协议？请说明具体情况。

## Basic Questions for CDM Project Design

1. What are the main objectives of the project?
2. Description of the project:
  - Where the project is situated
  - Some detail of the geology of the area
  - The hydropower potential in the area and how much has been tapped
  - The generation capacity and output of the station
  - Technical details of the project (components, head, flow rate, turbine, etc)
  - Where the electricity will be delivered to and how
  - Estimated time of construction of the project
  - Information regarding the type of grid it's connected to and its energy mix
  - If possible, identify other most recently built power plants in the area
  - Has the project been approved environmentally by any source?

### ■ Energy Mix and Grid Information

#### If your project is selling electricity to a grid please answer these questions:

1. To what grid(s) will the proposed SHP sell its electricity, and what proportion of its total generation?
2. What is the total energy generation (GWh) in the grid? Please give the name, capacity (MW), generation (GWh), average plant efficiency or heat rate, and fuel type of current power plants operating in this grid.
3. What will be the energy mix after the project is completed?
4. Please give the name, capacity (MW), generation (GWh), average plant efficiency and fuel type of the 6 most recently built plants within the grid.

#### If your project is not connecting to an existing grid please answer the following question:

1. What capacity factor do you expect your project to be running when completed?

#### Site Information:

1. Who are the project developers? Please give all their contact details.
  - Company name
  - Contact person
  - Type of organisation: state owned / private company
  - Summary of the experience of the project developer
  - Address
  - Telephone / fax number, email, and website address if any
2. Please give the developer's budget for the most recent fiscal year.
3. Identify construction period and expected date of completion.

#### Investment Structure:

1. How will this project be funded? How much funding has already been secured and from what sources?
2. Identify the amount of loans, its source, and payback period.
3. Are grants and loans available, if so please give details?
4. How long has the project been seeking funding?
5. How much is electricity sold for in the area currently (also for non-SHP electricity sources)?
6. How much will the electricity from this project be sold for?
7. What is the project's FIRR?

## ■ Community Benefit Questions

### Developmental issues:

1. Has any local authorities (of where the proposed project is located) implemented, in the process of implementing, or planning to implement any environmental programmes? If so, what are they? Please give the name, the main objectives and the amount of committed funds.
2. Please, identify and describe the communities that will benefit from this project, with details of their
  - a. Location
  - b. Population
  - c. Social composition
  - d. Economic activities
  - e. Major problems
3. Please list and describe any specific community benefits that will result from the project e.g. describe the economic, social or environmental benefits such as training, impact on industry, etc.
4. Please describe how these communities will be involved in planning, implementing, and managing these benefits and project execution.
5. Please describe any underprivileged or minority groups in the community and indicate how they will participate in and will benefit from the project
6. Please list government and/or any other organizations and institutions (local, regional, national) that will participate in the project and describe their roles.
7. Please describe how the community benefits could be measured and verified.
8. Please describe how the community benefits will be maintained and sustained after the project is completed. Who will be responsible for this?
9. Please describe any negative environmental, social or economic consequences that could arise from project implementation (i.e. submerging of land) and identify any strategies to mitigate this trade-off, such as compensation schemes and replanting of submerged vegetation.
10. Please identify community partners and minority shareholders who will act as points of contact during project implementation and local electrification schemes if there are any.

### ■ Other Questions:

1. Have any other CDM projects been attempted in the county?
2. How many PPAs (Public Private Agreements) have been signed in the County? Please give details.