An assessment of the CDM and voluntary carbon market potential in Bhutan

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Contents

1. Introduction

Bhutan, a landlocked country between China and India (see figure 1), is a Party to the UNFCCC and the Kyoto Protocol. Bhutan's greenhouse gas emissions are comparatively low with most emissions arising from agriculture, energy for transport and industrial processes. The large forest coverage in Bhutan acts as sinks and net emissions from Bhutan are negative. Keeping in line with its policy for environment conservation as part of its development philosophy, and also to highlight its commitment to combating climate change as a vulnerable but proactive member of the global community, the Royal Government issued a declaration in December 2009 that Bhutan will remain carbon neutral for all time.

Figure 1: Geographic location of Bhutan

While Bhutan intends to remain carbon neutral by ensuring that its emissions are not more than what its forests can sequester, emissions will continue to rise as the economy develops. Bhutan is presently a Least Developed Country (LDC) and it is anticipated that it will graduate from this status within the next 10-15 years as a result of its rapid development achievements.

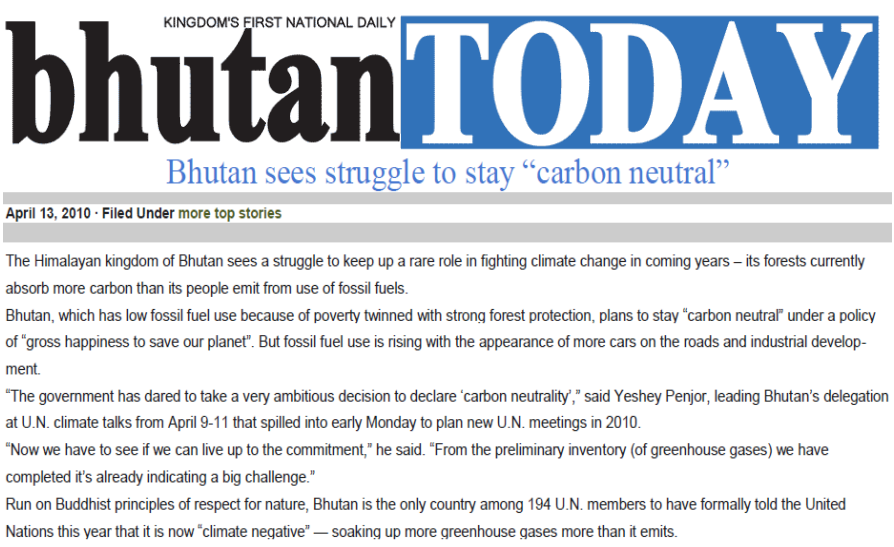
So far, due to many reasons, such as low baseline emissions and the small scale of the economy, Bhutan has not been able to make extensive use of existing mechanisms to support mitigation activities, such as the Clean Development Mechanism (CDM) or the voluntary carbon markets.

The CDM Executive Board (CDM EB) is gradually revising the CDM rules and regulations to make them more suitable for LDCs. However, at the same moment, the complexity of the CDM is increasing and the costs of the development of a CDM project is increasing too.

To remain carbon neutral (see figure 2) the government of Bhutan needs support of all available (financial) mechanisms, including CDM and the voluntary carbon market. To increase understanding of the current rapidly changing carbon markets as well the potential for CDM/voluntary carbon projects in the country, the government of Bhutan via the National Environmental Committee (N.E.C.) requested the support of UNDP.

From 26th of June till 3d of July 2010 a carbon advisor from UNDP Asia-Pacific

Regional Centre visited Bhutan and various meetings with key stakeholders were organized to built capacities and to identify the potential for CDM/voluntary carbon market projects. The mission coincided with a mission of a consultant assisting in the



KINGDOM'S FIRST NATIONAL DAILY

bhutanTODAY

Bhutan sees struggle to stay "carbon neutral"

April 13, 2010 · Filed Under more top stories

The Himalayan kingdom of Bhutan sees a struggle to keep up a rare role in fighting climate change in coming years – its forests currently absorb more carbon than its people emit from use of fossil fuels.

Bhutan, which has low fossil fuel use because of poverty twinned with strong forest protection, plans to stay "carbon neutral" under a policy of "gross happiness to save our planet". But fossil fuel use is rising with the appearance of more cars on the roads and industrial development.

"The government has dared to take a very ambitious decision to declare 'carbon neutrality'," said Yeshey Penjor, leading Bhutan's delegation at U.N. climate talks from April 9-11 that spilled into early Monday to plan new U.N. meetings in 2010.

"Now we have to see if we can live up to the commitment," he said. "From the preliminary inventory (of greenhouse gases) we have completed it's already indicating a big challenge."

Run on Buddhist principles of respect for nature, Bhutan is the only country among 194 U.N. members to have formally told the United Nations this year that it is now "climate negative" — soaking up more greenhouse gases more than it emits.

Figure 2: recent newspaper article regarding carbon neutrality of Bhutan

preparation of the climate change mitigation chapters of the Second National Communication to UNFCCC for Bhutan. By combining these missions synergies could be achieved. On Wednesday 30th of June a stakeholder's consultation workshop was organized to hear the views of all key stakeholders, collect missing data and share the results achieved.

The below report contains a summary of:

- The most important recent changes in the CDM rules and regulations relevant to Bhutan;
- An assessment of the CDM/voluntary carbon market potential in Bhutan and recommendations for next steps to be taken. The assumptions used for the assessments are mentioned, to allow for revisions in the calculations in case the circumstances change or more precise data become available.

Chapter 2 contains a short introduction to the CDM and the voluntary market, while chapter 3 focuses on recent CDM developments. In Chapter 4 the current CDM projects in Bhutan are being described and an assessment of the CDM potential/voluntary carbon market potential is being provided. Finally, chapter 5 contains recommendations for further steps.

2. Introduction to the CDM and the voluntary carbon markets

2.1 Clean Development Mechanism (CDM)1

The CDM is a mechanism which allows emission-reduction (or emission removal) projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO_2 (tCO_2e). These CERs can be traded and sold, and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol.

The CDM mechanism tries to stimulate the sustainable development in developing countries and achieve emission reductions at the same time, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets.

CDM projects must qualify through a rigorous and public registration and issuance process designed to ensure real, measurable and verifiable emission reductions that are additional to what would have occurred without the project (see figure 3). The mechanism is overseen by the CDM Executive Board, answerable ultimately to the countries that have ratified the Kyoto Protocol (COP/MOP).

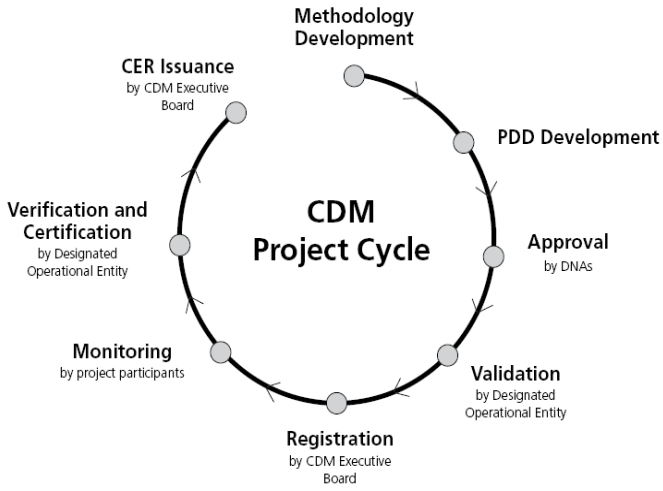


Figure 3: CDM process

The cost of developing a CDM project depends on many factors, including size and complexity of the project. Various experts and sources indicate that the transaction costs could mount to around 200,000 US per project (including baseline/feasibility study, Project Idea Note (PIN) preparation, Project Design Document (PDD) writing, validation and verification, Designated National Authority (DNA) approval, registration fees, monitoring report, Emission Reduction Purchase Agreement (ERPA) negotiations, etc.) [2]. In case of small relatively simple projects, the costs could be less. Though for large, complex projects, which face challenges in the CDM process (e.g. methodology revisions, changes in the design of the project, review cases, request for

[1] Source: http://cdm.unfccc.int/index.html

[2] E.g.: http://cdm.eib.org.my/useful_materials/Presentation/2.%20Transaction%20Costs%20%20CDM%20%20Fui%20Pin.pdf ,

deviation, etc.), the costs could be significantly higher. There are various business models in how the project and transaction costs could be covered e.g. some project developer may be willing to pay these transaction cost upfront with CER being used as bank collateral.

Prices paid for CERs depend on many factors and vary over time. There are several website which publish up-to-date CER prices, such as http://www.pointcarbon.com/ . Currently quoted prices are within the ranges mentioned in table 1.

Table 1: Current CER prices

Type of CER	Price [EUR][3]
high quality post-2012 vintages	7.5
medium-risk forwards	7.5-9
low-risk forwards	9-10
registered projects	10-11.5
BlueNext spot price	12.62

To cover the costs of the development of a CDM project, the project should generate sufficient CERs. Many project developers indicate that a project should at least generate 15,000 CERs per year to make it financially viable and worth investing.

In order to better understand the technical, financial and regulatory risk of developing CDM project, more detailed information are available at:

- http://cdm.unfccc.int/index.html
- www.cd4cdm.org
- http://cdmrulebook.org/
- http://www.pointcarbon.com/

2.2 The voluntary carbon markets4

The voluntary market caters for the needs of those entities that voluntarily decide to reduce their carbon footprint using offsets. There is no formal legal framework or a supervisory body like the CDM EB. The market is much smaller than the CDM market (see figure 4 and table 2.)

"Voluntary carbon markets" usually refers to all purchases of carbon credits not driven by an existing regulatory compliance obligation (such as the Annex I countries under the Kyoto Protocol). This includes transactions involving credits created specifically for the voluntary markets (such as Verified Emission Reductions or Carbon Financial Instruments), as well as transactions in which suppliers sold regulatory market credits (such as Certified Emission Reductions) to buyers seeking to voluntarily offset their emissions.

[3] Source: GTZ CDM Highlights Newsletter, Issue No 84, June 2010
[4] Source: Building Bridges: State of the Voluntary Carbon Markets 2010, A Report by Ecosystem Marketplace & Bloomberg New Energy Finance, 2010.

The voluntary carbon markets can be divided into two segments: the Chicago Climate Exchange (CCX) and the voluntary "Over-the-Counter" (OTC) offset market.

The OTC market is driven by "pure voluntary" and "pre-compliance" buyers. Pure voluntary buyers purchase credits to offset their own emissions and are driven by ethical or corporate social responsibility motivations. Hence, the demand curve for these pure voluntary offset purchases has as much in common with the markets for Fair Trade or organic cotton as it does with the regulated carbon markets.

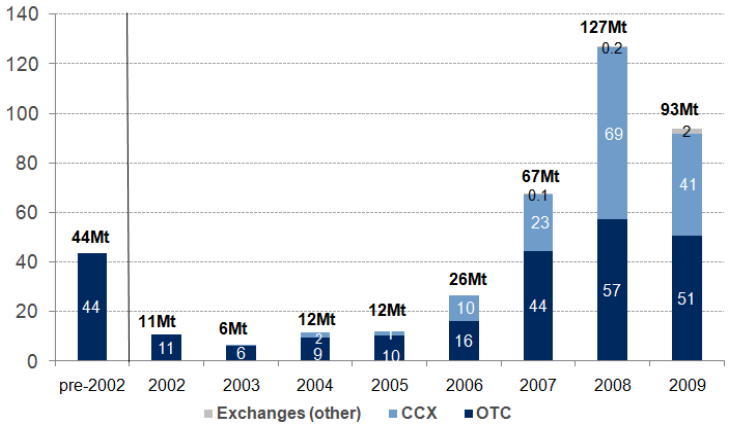


Figure 4: Volume of VER transactions

As the name already suggests, voluntary carbon credit transactions are defined by the lack of a regulatory driver. They do, however, operate alongside their regulated market cousins and are heavily influenced by them. Due to the lack of a supervisory body (such as the CDM EB in the CDM market), questions are being raised about the transparency, credibility and reliability of the voluntary market.

To address the issue of transparency and reliability, various standards, certification processes, and emissions registry services have been established, but there is no universally accepted standard for what constitutes an offset in the voluntary market.

Some standards are more widely recognized and accepted as a designation of credibility and hence may fetch higher carbon prices. Examples include: the Voluntary Gold

Table 1: Transaction Volumes and Values, Global Carbon Market, 2008 and 2009

	Volume ($MtCO_2e$)		Value (US$ million)	
Markets	**2008**	**2009**	**2008**	**2009**
Voluntary OTC	57	51	420	326
CCX	69	41	307	50
Other exchanges	0.2	2	2	12
Total Voluntary Markets	**127**	**94**	**728**	**387**
EU ETS	3,093	6,326	100,526	118,474
Primary CDM	404	211	6,511	2,678
Secondary CDM	1,072	1,055	26,277	17,543
Joint Implementation	25	26	367	354
Kyoto [AAU]	23	155	276	2,003
New South Wales	31	34	183	117
RGGI	62	813	241	2,667
Alberta's SGER	3	5	34	61
Total Regulated Markets	**4,713**	**8,625**	**134,415**	**143,897**
Total Global Markets	**4,840**	**8,719**	**135,143**	**144,284**

Source: Ecosystem Marketplace, Bloomberg New Energy Finance, World Bank

Table 2: transaction values various carbon markets

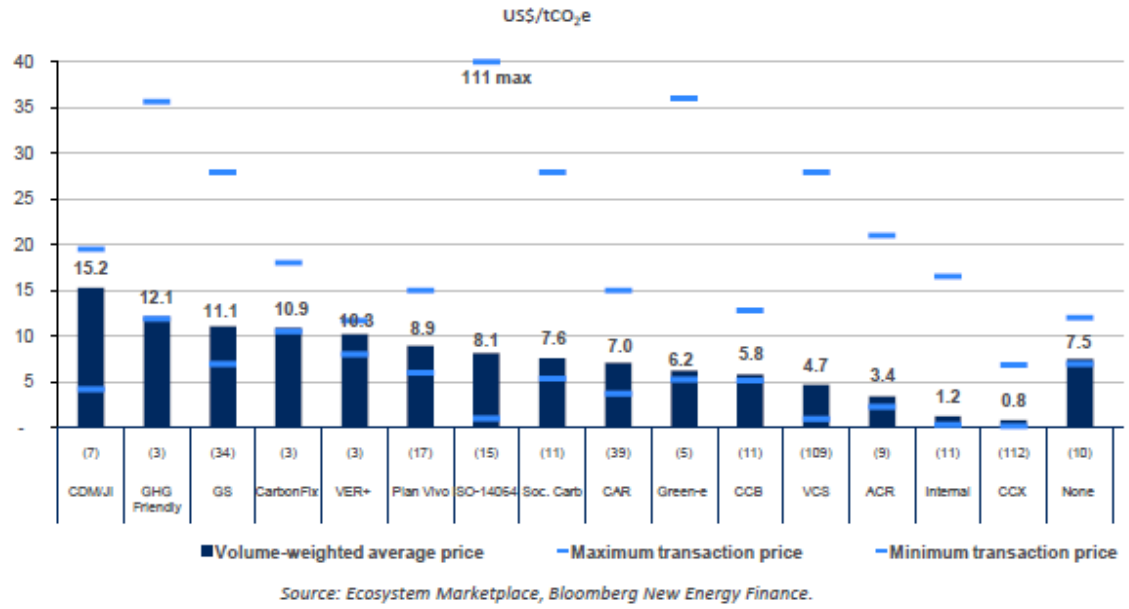
Standard; the Voluntary Carbon Standard (VCS), Climate Action Reserve, the GHG Protocol for Project Accounting; and the Climate, Community and Biodiversity Project Design Standards.

Compared to the regulated markets, the volume of credits traded in the voluntary market is relatively small (see table 2).

Prices paid for voluntary carbon credits vary a lot, Ecosystems marketplace indicates that in 2009 prices ranged from 0.1 $/tCO$_2$e to 111 $/tCO$_2$e. The volume-weighted average price of Voluntary Emission Reductions (VERs) transacted on the OTC market was around $6.5/tCO$_2$e (see figure 5).

For more information on the voluntary carbon markets, see the following websites:

- http://www.cdmgoldstandard.org/
- http://www.v-c-s.org/
- http://www.ecosystemmarketplace.com/
- http://www.climateactionreserve.org/



Source: Ecosystem Marketplace, Bloomberg New Energy Finance.

Figure 5: VER prices 2009

3. Recent CDM developments

The CDM is considered a complex mechanism by many project developers and stakeholders. Also the costs for developing a CDM project remain high. For many small countries, or countries with low baseline emissions such as LDCs, these factors form prohibitive barriers to develop CDM projects.

The CDM EB is aware of the above mentioned barriers and tries to make the small scale methodologies and procedure more applicable to these countries. Recently several changes have been adopted by the COP/MOP and the CDM EB simplifying the rules for small projects or for projects in countries where there are not many CDM projects yet.

The following simplifications, relevant to Bhutan, have recently been approved:

1) **Additionality**

Renewable Energy projects up to 5 MW or Energy Efficiency projects up to 20 GWh per year are automatically considered additional in LDCs.

"Project activities up to 5 MW that employ renewable energy as their primary technology are additional if any one of the below conditions are satisfied:

(a) The geographic location of the project activity is in LDCs/SIDs or in a special underdeveloped zone of the host country identified by the Government before 28 May 2010;"

"Energy efficiency project activities that aim to achieve energy savings at a scale of no more than 20 gigawatt hours per year are additional if any one of the below conditions is satisfied:

(a) The geographic location of the project activity is in LDCs/SIDs or special underdeveloped zones of the host country identified by the Government before 28 May 2010;

2) **Remaining lifetime of household equipment**

For CDM projects, credits can only be obtained till the end of the lifetime of equipment replaced. For household devices/appliances, the remaining lifetime may be disregarded.

3) **Registration fee**

The COP/MOP decided to *"defer the payment of the registration fee until after the first issuance for countries with fewer than 10 registered clean development mechanism project activities".* As Bhutan has only two projects registered, it means that new projects in Bhutan only have to pay registration fees after the first issuance of CERs.

4) Monitoring report format

A standardized format for a monitoring report was approved, which is based on the classical PDD structure. The new format is heavier than the formats commonly used by project developers and may increase costs of monitoring, but will enhance transparency and comparability and thus make life easier for the regulators.

5) Debundling check

Small scale projects have to perform a check to make sure they are not a debundled component from a large scale project (and hence have to apply a large scale methodology which can be more costly to implement and monitor). This requirement was removed for mini projects with a size of less than 1% of the small-scale thresholds. This revision creates consistency between Programme of Activities (PoA) and single project procedures.

6) Low carbon development growth

The COP/MOP encouraged the CDM EB to further explore methodologies which would allow for credits to be generated for situations where emissions in the future can be higher than the current levels.

" Encourages the Executive Board to further explore the possibility of including in baseline and monitoring methodologies, as appropriate, a scenario where future anthropogenic emissions by sources are projected to rise above current levels due to specific circumstances of the host Party"

This would not mean a quick change in CDM methodologies and many new opportunities for Bhutan (where current emission levels are low, but potentially could be higher in the future), but on the long term this might open up some new possibilities.

7) Increased transparency in registration procedures

New procedures for the completeness check were approved. These changes will speed up the process and increase transparency. The timeline now foresees 7 days for the completeness check and further 23 days for an "information and reporting" check. The single steps of the completeness check process will be published on the UNFCCC website for each project. The request for review period was shortened to 28 days.

4. CDM/Voluntary carbon market potential in Bhutan

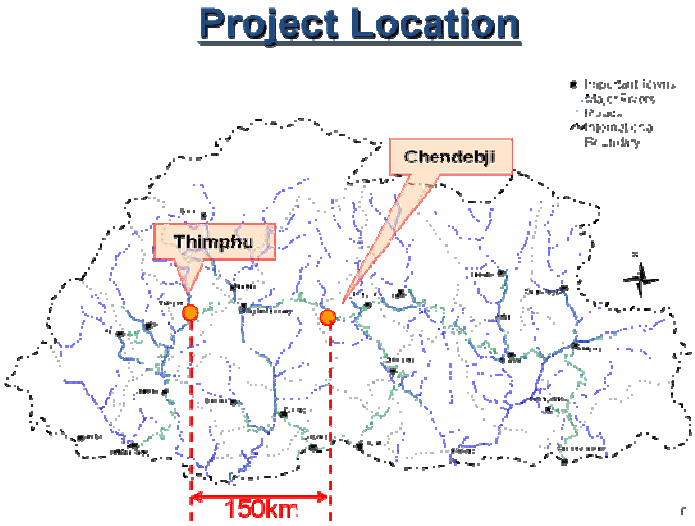
4.1 Current CDM/voluntary market projects in Bhutan

Currently, there are two registered CDM projects in Bhutan. The first project is a small hydropower project of 70kW installed capacity, the 'E7 Bhutan Micro Hydro Power CDM project' (see figure 6 and 7). 474 CERs have been issued for this project.

The second registered CDM project in Bhutan is the 'Dagachhu Hydropower project', a 114 MW hydropower project which achieved registration in February 2010. Its crediting period will start in 2012 and the anticipated CERs per year are around 500,000.

Figure 7: Project location

Figure 6: location of hydropower site



There are currently no other projects from Bhutan in the CDM project pipeline (either under validation or submitted for registration). A few initial CDM project ideas are emerging, especially in the hydropower sector.

There are no voluntary carbon market projects in Bhutan.

4.2 General

In general the potential for CDM projects in Bhutan is limited due to many factors. The CDM mechanism is most suitable for countries with practices which emit a lot of GHG from single sources and where emissions can be measured. This is not the case for Bhutan. Other factors limiting the CDM potential for Bhutan include:

- the small scale of the economy. Each source, e.g. a factory, is emitting a small amount of GHG.

- Already adopted green and sustainable practices. Over the years Bhutan has adopted green and sustainable practices in order to preserve its nature and culture, in line with the 4 pillars of the Gross National Happiness. (The four pillars are: the promotion of sustainable development, preservation and

promotion of cultural values, conservation of the natural environment, and establishment of good governance.). So the current emissions of GHG are low.

- More than 99% of the grid electricity is provided by renewable energy resources (i.e. hydropower), resulting in a grid emission factor close to zero. The surplus of electricity is sold to India.

-there are many small sources emitting GHG emissions. E.g. if you look at the agriculture sector, there are many farmers with only a few cattle. There are no large concentrated farms with large numbers of of cattle emitting a significant amount of methane.

4.3 Specific projects

During meetings with key stakeholders, various potential projects in Bhutan were discussed as well as the possibility that CDM could contribute to these projects and make them feasible. Below, for several project ideas an assessment of the CDM and the voluntary carbon market potential is being provided.

Figure 8: domestic biogas plant in Paro

4.3.1 Domestic biogas

A few domestic biogas plants have been installed in Bhutan (see figure 8), mainly around Thimphu. Due to its many benefits, such as reduced use of firewood and therefore reduced pressure on forests and good quality of the bioslurry which can be used as fertilizer, the government of Bhutan is very keen in promoting this technology.

Project activity: Installation of 1,500 domestic biodigesters	**Background and sources:** -SNV Netherlands Development Organisation conducted a feasibility study in 2008 and concluded that: "A small scale biogas programme for domestic use looks feasible in Bhutan however, there are challenges as well. About 20,000 biogas plants are technically feasible especially in southern parts and inner mountain valleys…. About 1,500 plants can be installed within 3 years especially in warm temperature areas." -ADB is considering supporting a domestic biogas programme in Bhutan. http://www.snvworld.org/en/Documents/Feasibility_study_Bhutan_2008.pdf
Applicable CDM methodology (ies):[5] **AMS I.C:** Replacement of kerosene and LPG with biogas for cooking and lighting. **AMS I.E:** Replacement of fuel wood with biogas for cooking and lighting (though CERs probably negligible as most/all fuel wood replaced might be considered renewable. For voluntary market, e.g. as per the Gold Standard requirements, the calculation method is different and might result in higher ERs). **AMS III.R:** emission reductions from changes in manure management practices (though CERs will be small/negligible as in the baseline situation animals are roaming around freely and manure is decomposed off mainly under aerobic conditions	
Expected CERs/VERs: -Maximally 2 CERs/digester/year, most likely below 1 CER per digester per year.[6] -During first 3 years around 1,500 plants can be installed, leading to maximally 3,000 CERs per year after 3 years.	**Advice:** -During the first years of the programme it will become clear whether domestic biogas is a technology accepted and preferred by the farmers. It will also become clear whether the installation targets can be met. For the digesters installed during the first years the voluntary market could be considered (simplified approach). -In case domestic biogas picks up and installation reaches 10,000 plants, CDM might become feasible.
Issues to pay specific attention to: -Definition of non-renewable versus renewable fuel wood (is the firewood being replaced considered renewable or non-renewable?) -Baseline scenario regarding the treatment of manure -Sampling requirements for surveys (see AMS I.E.)	
Lead to be taken by: -Department of Agriculture, Department of Energy, SNV and ADB.	

[5] For approved small scale CDM methodologies see: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

[6] A Programme of Activities (PoA) in Vietnam for domestic biogas is currently under validation. The estimated emission reductions are 2 CERs per digester per year, resulting from replacement of kerosene, LPG and mainly coal. The use of fossil fuels in the baseline situation for cooking and lighting in Bhutan is most likely lower than in

4.3.2 Solar home systems

Various solar systems (see figure 9) are being installed in the country, mainly in areas where grid connection is not feasible/possible. Limiting factors are the costs involved in installation and maintenance of solar home systems.

Figure 9: solar panel in Bhutan

Project activity: Installation of 50,000 solar home systems	**Background and sources:**
Applicable CDM methodology (ies): **AMS I.A:** Electricity generation by the user (solar home systems)	
Expected CERs/VERs: -installation of 50,000 solar systems of 100 Wp could lead to around (50,000 systems * 100 Wp / 1,000,000 * 0.8 tCO2e/MWh (default EF diesel grid as per AMS I.A) * 6 hours a day * 365 days) = 8,800 CERs	**Advice:** -Only in case of very large programmes in which many solar home systems are being installed CDM is a financial mechanism to consider. -For a small amount of systems (in case emission reductions reach a few thousand), the voluntary carbon market (simplified approach) could be explored.
Issues to pay specific attention to: -Many solar home systems are required to achieve a feasible CDM project.	
Lead to be taken by: -Ministry/programme taking the lead in installation of systems, NGOs	

Vietnam (often firewood is being used). Hence most likely the emission reductions are lower than in Vietnam. http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/FYHTWZ3QLWM91NKR9DB47YIHGQ5KSU/view.html

4.3.3 Rural electrification

The government of Bhutan plans to provide all its citizens with electricity by 2013. In most cases grid electricity will be provided (see figure 10), though very expensive and challenging to realize due to the mountainous terrain in Bhutan. In cases where grid electricity cannot be provided solar systems will be installed.

Figure 10: rural electrification in Bhutan

<table>
<tr><td>Project activity:
Rural electrification of 40,700 households</td><td rowspan="2">Background and sources:

-Within the coming years around 40,700 households will be electrified in Bhutan by either connecting them to the grid or providing solar energy.
-A survey indicated that in case of connection to the grid, each household saves around 230 kg of firewood per year.
-A household connected to the grid will use around 70 kWh per month during the first year. The usage will slowly increase over the years.</td></tr>
<tr><td>Applicable CDM methodology (ies):
-The current CDM methodologies are not compatible with the envisaged rural electrification in Bhutan. The existing CDM methodologies assume installation of e.g. a new RE plant, rather than ‘just’ a connection to a grid (which, however, is supplied for more than 99% with renewable energy in Bhutan).
-The most closely applicable CDM methodologies are AMS I.A (electricity generation by the user), AMS I.E (switch from non-renewable biomass for thermal applications by the user)</td></tr>
<tr><td>Expected CERs/VERs:
-To give an indication of potential emission reductions (assuming a revision to a CDM methodology/a new CDM methodology would be approved, allowing this kind of projects under the CDM):
40,700 households * 70 kWh per month * 12 months / 1000 * 0.8 tCO2e/MWh (default factor diesel grid as per AMS I.A) = 27,350 CERs per year</td><td rowspan="3">Advice: Currently the CDM methodologies are not applicable to rural electrification projects. They assume installation of e.g. a new RE plant, rather than ‘just’ a connection to the grid. First it needs be assessed whether revision of a CDM methodology is feasible to make this kind of projects eligible under CDM or a new methodology should be proposed.</td></tr>
<tr><td>Issues to pay specific attention to:
-Non-renewable versus renewable biomass (is the firewood being replaced considered renewable or non-renewable?)
-Applicability of CDM methodologies to rural electrification projects.</td></tr>
<tr><td>Lead to be taken by:
-ADB</td></tr>
</table>

4.3.4 Electrical and improved cook stoves

For many rural households firewood is an important source of energy. Often inefficient stoves are being used for cooking (see figure 12). A GEF, UNDP and DOE funded project aims to facilitate the installation of 20,000 improved cook stoves in Bhutan.

Also electrical stoves (see figure 11) are being introduced in Bhutan, mainly for large users, like monasteries.

Figure 12: Cooking between stones in Thimphu

Figure 11: electrical stove in a monastery in Bhutan

Project activity: Facilitation of the installation of 20,000 improved cook stoves	**Background and sources:** -A project funded by GEF, UNDP and the Department of Energy aims to install 20,000 improved cook stoves in Bhutan. Expected start date 2011.
Applicable CDM methodology (ies): -AMS II.G: Energy efficiency measures in thermal applications of non-renewable biomass	
Expected CERs/VERs: -20,000 * 1 CER per cook stove per year = 20,000 CERs per year	**Advice:** -UNDP GEF project to take lead on this, to ensure alignment with both GEF funding rules and CDM rules and procedures.
Issues to pay specific attention to: -Non-renewable versus renewable biomass (is the firewood being replaced considered as renewable or non-renewable biomass?)	
Lead to be taken by: -UNDP GEF project	

4.3.5 Landfill gas capture/methane capture from wastewater treatment

In Bhutan there are only a few landfill sites and a few wastewater treatment plants (see figure 13). The emissions from these sites and plants are very low.

Figure 13: Thimphu wastewater treatment plant

Project activity: Landfill gas recovery or recovery of biogas from wastewater	**Background and sources:** - The estimated total emissions from solid waste in Bhutan is around 38,900 tCO_2e. -The largest landfill in Bhutan is located in Thimphu. An estimated total amount of 50 tons of waste is every day decomposed off on the landfill. Half of it is organic matter. -For a feasible CDM landfill gas capture project of around 20,000 CERs per year, around 150 to 200 tons of fresh organic waste will have to be dumped on a deep landfill (> 5 m) every day under tropical conditions. -The estimated total emissions of biogas from wastewater in the entire country is around 7,400 tCO_2e.
Applicable CDM methodology (ies): -AMS III.G landfill gas recovery -AMS III.H wastewater treatment -	
Expected CERs/VERs: -	**Advice:** -The baseline emissions from solid waste and wastewater are very small. In case of a project reducing the emissions, the voluntary carbon market (simplified approach) could be explored.
Issues to pay specific attention to: -	
Lead to be taken by: -	

4.3.6 Hydropower sector

In Bhutan over 99% of the electricity is generated from hydropower and little change is expected for the future (see figure 14). Over 88% of the produced electricity is exported to India as surplus.

Figure 14: Chenbeji hydropower site

The theoretical hydropower potential for Bhutan is estimated at around 30,000 MW while 24,000 MW is technical and economic feasibility (DoE, 2003/2004). The current production is 1,448 MW which is about 5% of the potential and there is great opportunity for expansion.

Bhutan and India are planning more hydropower projects, totaling 10,000 megawatts (MW), in accordance with a mutual umbrella agreement. Carbon finance is considered to make these projects feasible.

<table>
<tr><td>Project activity:
Electricity generation from hydropower, exported to India</td><td rowspan="2">Background and sources:
-</td></tr>
<tr><td>Applicable CDM methodology (ies):
-AMS I.D and AMC0002</td></tr>
<tr><td>Expected CERs/VERs:
-10 MW * 8760 h* 0.8 tCO_2e/MWh * 0.7 (load factor) = 50,000 CERs</td><td rowspan="3">Advice:

-Hydropower projects exporting electricity to India (so the Indian grid emission factor can be used) are feasible and eligible under CDM.
-The Hydropower sector is one of focus areas of ADB/Japan support programme.</td></tr>
<tr><td>Issues to pay specific attention to:
- Prior consideration of CDM
- Additionality</td></tr>
<tr><td>Lead to be taken by:
-hydropower companies/DOE/ADB</td></tr>
</table>

4.3.7 Other industries

There are a few industries in Bhutan which emit GHG, for instance the cement industry, mineral and the mining sector. Most likely the emissions from these industries are very low, though detailed information is missing to make a complete assessment.

<table>
<tr><td>Project activity:
Energy savings/fuel switch in various industries (e.g. cement, mineral, metal or mining industries)</td><td rowspan="2">Background and sources:
-</td></tr>
<tr><td>Applicable CDM methodology (ies):
-AMS III.B and AMS II.D</td></tr>
<tr><td>Expected CERs/VERs:
-To achieve a feasible CDM project of 15,000 CERs per year, around 5,000 tons of fuel oil should be saved per year. (5,000 T of fuel oil * 3 tCO2e/T (please note the appropriate local emission factor for fossil fuels and based on TJ should be chosen) = 15,000 tCO2e)</td><td rowspan="3">Advice:
-sufficient data on the baseline emissions are missing.</td></tr>
<tr><td>Issues to pay specific attention to:
-</td></tr>
<tr><td>Lead to be taken by:
-Industrial facility</td></tr>
</table>

4.3.8 REDD+

Opportunities are emerging to convert the greenhouse gases stored (‘enhancing carbon stocks’) or GHG emissions prevented (‘avoided emissions’) from environmental and ecosystem services into carbon credits. One of the mechanisms currently under discussion and being developed is ‘Reduction in Emissions from Deforestation and Degradation’-mechanism (REDD +).

For more information on REDD+ and the UN supported REDD programme, please consult: http://www.un-redd.org/

UN-REDD is assisting Bhutan to map out the potential for REDD as an interface for integrating climate mitigation and adaptation strategy to protect the climate whilst creating sustainable livelihoods and reducing rural poverty.

5 Next steps for potential CDM and voluntary carbon market projects

5.1 CDM

In the above chapter an assessment of the potential for CDM and voluntary carbon market projects in Bhutan has been provided. In case a project is eligible and feasible under CDM, it is recommended to take the steps[7] indicated in table 3 below.

Table 3: recommended steps for development of CDM projects

Steps	Description
1	Initial feasibility assessment for the preparation of PIN
2	Submit letter to UNFCCC and DNA concerning 'prior consideration of CDM'
3	Start gathering documents to prove 'prior consideration of CDM' and to support the additionality argument and to meet the national sustainable development criteria
4	Baseline study/detailed feasibility study
5	Engagement and conduct due diligence of consultant/broker/CDM project developer, possibly signing of an ERPA
6	PDD preparation (including stakeholder consultation)
7	DNA approval
8	Validation by DOE
9	Registration at UNFCCC
10	Monitoring of emission reductions (monitoring report)
11	Verification by DOE
12	Issuance of CERs

5.2 Voluntary carbon markets projects

In the above chapter an assessment of the potential for CDM and voluntary carbon market projects in Bhutan has been provided. In case a project is not eligible and/or not feasible under CDM (e.g. due to its small size and too low emission reductions), the voluntary carbon market might be an option to explore.

The voluntary market is basically a market where the seller and the buyer agree on a transaction. There is no formal comprehensive regulatory framework and a supervisory body to regulate the market. However, to increase transparency and reliability of the market certain organizations provide standards to be followed (e.g. VCS or Gold Standard). So steps to be taken for voluntary carbon market projects depend largely on whether a standard is being followed and which standard is being applied. The suggested steps in table 4 and 5 for voluntary carbon market projects are therefore only indicative and have to be adjusted depending on the standard chosen. The steps suggested in table 4 are applicable to

[7] The order of the steps might differ, dependent on the project.

the larger voluntary carbon market projects which follow a standard like the 'Gold Standard'. The steps suggested in table 5 are for very small voluntary carbon market projects for which the costs involved in the 'normal' voluntary carbon market projects are still too high and are looking for applying a more informal approach.

Table 4: Recommended steps for development of large voluntary carbon market projects[8]

Steps	Description
1	Initial feasibility assessment
2	Send letter to DNA concerning intention to develop a voluntary carbon market project
3	Select appropriate voluntary carbon market standard
4	Select and engage buyer/consultant
5	Start gathering documents to prove additionality argument (if required)
6	Baseline survey (might already be part of the project)
7	Prepare project description or PDD (including stakeholder consultations)
8	Validation by DOE
9	Registration at Standard
10	Monitoring of emission reductions (monitoring report)
11	Verification by DOE
12	Issuance of VERs

Table 5: Recommended steps for small voluntary carbon market projects (simplified approach[8])

Steps	Description
1	Initial feasibility assessment
2	Send letter to DNA concerning intention to develop a voluntary carbon market project
3	Select and engage buyer/consultant and agree on next steps to be taken (standard?)
4	Baseline survey (might already be part of the project)
5	Prepare project description (probably already available)
6	Monitoring of emission reductions (number of systems installed and yearly survey to check how many systems are operating)
7	Validation and verification by 1 local expert from independent organization
8	Payment from buyer based on report from independent expert and trust between organizations

[8] The order of the steps might differ, dependent on the project.

5.3 Further contacts

For more information regarding CDM or the voluntary carbon markets in Bhutan, please contact the DNA of Bhutan at:

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