CAN-International Submission on Carbon Dioxide Capture and Storage in Geological Formations as Clean Development Mechanism Project Activities

***How different issues can be addressed in modalities and procedures*[1]**

21 February 2011

Climate Action Network – International is a coalition of 550 environmental and development non-governmental organizations worldwide committed to limiting human-induced climate change to ecologically sustainable levels.

At COP/MOP 6 in Cancun, CMP Decision[2] stipulates that carbon dioxide capture and storage (CCS) in geological formations is eligible as project activities under the clean development mechanism (CDM), provided that the issues identified in decision 2/CMP.5, paragraph 29[3], are addressed and resolved in a satisfactory manner.

The CMP Decision invited admitted observer organisations to make submissions to the secretariat, by 21 February 2011, on views on how different issues (referred in paragraph 3 of this decision) regarding CCS in geological formations as CDM project activities can be addressed in modalities and procedures.

The CMP Decision further requests the Subsidiary Body for Scientific and Technological Advice (SBSTA), at its thirty-fifth session, to elaborate such modalities and procedures with a view to recommending a decision to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) at its seventh session.

The Climate Action Network (CAN) International welcomes the opportunity to submit its views on this issue. CAN-International is a coalition of 550 environmental and development non-governmental organisations worldwide, committed to limiting human-induced climate change to ecologically sustainable levels.

In CAN's view, discussions about the future of the flexible mechanisms including the consideration of new project activities should be firmly grounded in an analysis of their performance so far. So far, the CDM has failed to meet its dual objectives of supporting cost-effective climate change mitigation and sustainable development in developing countries. Yet, even when accepting some of the well-known shortcomings of project-based CDM mechanisms, CCS is highly likely to fail most of the requirements in this specific offset framework. Therefore despite the abovementioned CMP decision, CAN does not believe including CCS in CDM is an appropriate way forward. Therefore this submission sets out reasons for CAN´s opposition to the inclusion of CCS in CDM and subsequently addresses the different issues referred in paragraph 3 of the CMP Decision It should be noted, however, that this submission does not refer to use of various CCS technologies outside the CDM and for general mitigation purposes both in developed and developing nations.

1. General

There could be a variety of views regarding CCS as a technology for mitigation. However, in CAN´s view, CCS technologies are not appropriate in the framework of the CDM and should not be eligible as CDM project activities for the following reasons:

[1] This submission is not endorsed by the following organizations: Environmental Defense Fund and Natural Resources Defense Council.
[2] The specific number of the decision is unknown as of writing.
[3] Those issues are: (a) Non-permanence, including long-term permanence;(b) Measuring, reporting and verification;(c) Environmental impacts;(d) Project activity boundaries;(e) International law;(f) Liability;(g) The potential for perverse outcomes;(h) Safety;(i) Insurance coverage and compensation for damages caused due to seepage or leakage.

- **Uncertainties:** CDM rules and implications as identified in decision 2/CMP.5 paragraph 29 have not yet been examined fully and no satisfactory solutions have been presented. I.e. the report conducted by the CDM Executive Board in response to decision 2/CMP.4[4] only presents a list of positive and negative implications but does not provide any solutions. Some of those issues arise from the current state of technologies and others from the lack of proper regulatory framework at national/regional/international levels. These uncertain implications and characteristics related to CCS technologies do not comply with the "safe and sound" requirement that technologies must fulfill in order to become eligible under CDM. CDM should not be used as a tool for experimenting CCS in developing countries.

- **Concerns about sustainability:** All CDM projects must contribute to sustainable development. However, CAN believes that there are no reliable precedents where an Environmental Impact Assessment (EIA) has been done in the full cycle of CCS in developing countries (and even in developed countries) and thus it would be very challenging to conduct EIA sufficiently as required by the CDM modalities and procedures for a CCS project.
    - The lack of experience with CCS in a proper commercial scale, the long lifetime of the projects and the uncertainty concerning the risk of leakage and seepage would pose immense challenges for conducting a CCS EIA.
    - Even under the current practice of existing CDM project activities, it is not possible to say EIA has been conducted sufficiently in general. In case of CCS, the risk is more severe because a faulty EIA could have regional or international implications if it leads to poor site selection or operating practices that result in leakage.
    - Short crediting periods of CDM would make it difficult to put the relevant management/monitoring schemes in place. There is the long-term risk of slow, continuous seepage, or sudden release of CO2 with massive emissions going back to the atmosphere with health and environment consequences if storage sites are not properly selected/managed/monitored and are accidentally penetrated by, for instance, drilling activities after site abandonment. The Intergovernmental Panel on Climate Change's (IPCC) Special Report on Carbon Dioxide Capture and Storage states that "if continuous leakage of CO2 occurs, it could at least in part, offset the benefits of CCS for mitigating climate change". Besides all the risks in terms of environmental impacts and public health, it is not possible to estimate those costs and to calculate a present value to internalize those costs in the project activity.
    - Another potential negative impact of geological carbon storage is contamination of potable water resources cause by the seepage of CO2 to groundwater. Sound ex-ante analysis is therefore required to prevent CO2 from entering the ground water.
    - A high degree of uncertainty, inherent of current CCS technologies, can only be reduced by a careful long term monitoring process which is intensive in both capital and technology.

- **Enhanced Oil Recovery:** Enhanced Oil Recovery (EOR) is a generic term referring to the techniques used to increase the amount of crude oil that can be extracted from an oil field. It is achieved by injecting a gas, for example CO2, into an oil reservoir. By using EOR, 30-60 % or more of the reservoir's original oil can be extracted compared with 20-40% using primary and secondary recovery. Oil reservoirs are favored sites for underground CO2 storage, notably because they are the only sites where CO2 capture could produce additional income. EOR is the only mature market technology for geological storage listed by IPCC in the Special Report on CCS. Supporting CCS through the CDM indirectly supports EOR. CAN believes that CDM was not conceived for providing subsidies for oil and natural gas production through, in particular for countries with on-shore production and very low costs of oil production. It is therefore very likely that CCS/EOR projects will not depend on CDM incentives and may therefore not be additional. However, CDM has shown poor performance of screening out non-additional projects so far. It is reasonable to assume there is a risk that some EOR-based projects enter CDM even if they are not additional. Fossil fuel producers do not need this type of subsidy, taking into account that current oil price is higher than 80 US$/bbl. Moreover, these companies have significant knowhow and investments in the area of CCS technology. CDM should also not be used to give incentives for extraction of methane from deep coal mine, or in-situ burning of coal.

[4] Annex II to the annual CDM EB report FCCC/KP/CMP/2009/16

Additionality is crucial for environmental integrity in the CDM and any non-additional credits are directly undermining Annex I emission reduction targets.

- **Undermining weak Annex I targets:** Let us assume CCS works very well and in deed manages sufficiently the seepage/permanence risks. The sheer potentially large size of credits that are expected from CCS projects in CDM could ridicule any useful Annex I target. This risk must be avoided.

- **Perverse incentives:** CCS CDM projects would generate credits within a short timeframe while failing to help transitions from carbon-based economies to decarbonized economies both in host countries and developed countries. It is important to recognize that CCS has a risk to end up buying additional time for the current fossil based economy if it is combined with the technology like "coal to liquids". The risk needs to be carefully considered and it is CAN's view that CDM has to be prioritized in the area of most favourable technologies such as renewables and energy efficiency. Inclusion of CCS in CDM could postpone important investment that could lead to the introduction of renewable energy technologies in the developing world. In addition, CCS in the CDM would generate large projects, particularly concentrated in a few countries. would prevent further equitable participation of non-Annex I countries under the CDM and certainly would create additional barriers for small-scale projects if such large-scale projects are favoured in the market. Inclusion of CCS within the CDM may place less emphasis on finding other more suitable financial mechanisms under the UNFCCC or government policies.

- **Energy Penalty and Costs**: There are significant costs associated with CCS: the additional energy used for the capture is enormous and referred to as the "energy penalty." According to the Hamburg Institute of International Economics this can range from 15-40% of energy output, pushing the cost of CO2 avoided up to somewhere in the range of €24–€52/t. It simply means more energy (i.e. costs) is necessary to generate the same amount of electricity and heat. Adequacy for CDM to help such activities, among other activities, remains doubtful

- **International law conflicts:** Existing international treaties and regulations are not sufficient to address the concerns related to CCS as CDM project activities. Although some legal and regulatory efforts under domestic legislation have been identified in some countries and there are a few attempts in international treaties like OSPAR and London Protocol, much remains to be done. Seepage may also occur in international waters which would introduce further complexities. This would also add legal implications with transnational liability problems, including possible transboundary problems among Annex I and/or Non-Annex I countries. None of the marine treaties in place were drafted having CCS activities in mind. This has further complications in relation to offshore geological storage.

- **Undermining the carbon price:** As of today, CCS project in general are still expensive to implement. However, if the cost of capture decreases and non-additional, economically-already-viable EOR/CCS projects enter CDM, it is likely that huge quantities of credits from CCS projects would drop CERs prices to a level which could undermine incentives for domestic emission reductions. Decreasing prices of CERs could also undermine incentives for renewable energy, energy efficiency and decarbonization of the economy. Small-scale projects, which already face difficulties, would become even less attractive and competitive.

- **Real emission reductions (**Article 12.5 (b) of the Kyoto Protocol): While some technologies avoid emissions, others might lead to increasing emissions if the possibility of leakage and seepage is considered. Moreover, one of the main characteristic of CDM project activities is that it generates credits within a short timeframe but it should generate real and measurable long term benefits. CCS activities in the CDM would generate a huge amount of credits in the short term, but the credited reduction is not necessarily permanent. This means that the question of whether CCS as a technology fulfils Article 12.5 (b) of the Kyoto Protocol that states that "the emission reductions resulting from each project activity shall be certified on the basis of real, measurable, and long-term benefits related to the mitigation of climate change" will always be dependent on stringent monitoring of the site. It should be noted that whether that is possible is still under exploration even in developed countries.

- **Risks of seepage:** Seepage can occur a long time after the crediting period. If seepage occurs in middle or long-term it will not affect allowances issued in the present for Annex I Parties. This means that carbon credits from CCS project activities would have to account for future potential seepage. Considering that seepage could occur in 200, 500 or 10.000 years, cancelling units after a verification of reversion would not affect allowances issued. There could be some approaches to this problem such as discounting, insurance mechanisms or collective pooling of credits but the seepage issue represents another example of inadequacy of CDM to deal with challenges related to CCS.

If at all, CCS in developing countries could be developed in another framework, using specific financial mechanisms, funding and partnerships under the UNFCCC, but not as an offset mechanism, generating carbon credits to be used by Annex I countries. Inclusion of CCS within the CDM provides perverse incentives as it would potentially place less emphasis on finding other more suitable financial mechanisms under the UNFCCC or government policies.

Yet, while CAN International believes that the CDM is not the right forum for CCS, we make reference to key principles that must be taken into account when discussing the potential inclusion of CCS as CDM project activities.

2. The selection of the storage site

Site selection could be one of the most important steps which can affect all the later stages of the CCS project. Therefore, site selection has to be based on robust criteria that ensure that only geological formations are selected that ensure that under any conditions of use there is no risk of seepage, and no environmental or health risks exist. These criteria should be agreed upon at international level after consultation with relevant stakeholders including admitted observer organisations. It is essential that local communities and Indigenous Peoples have full and effective participation in all elements of CCS, including in storage site selection, and their free, prior and informed consent for activities that affect them is given.

A specialised DOE should independently verify whether the criteria are met.

Following places should be excluded from the scope upfront:

a. CO2 storage in the water column, including storage on the sea ground, freshwater aquifers and potential underground sources of drinking water.
b. Storage reservoirs that could potentially be used for renewable sources of energy.
c. Geological formations that are prone to risks of eruptions

3. Boundaries of CCS in CDM

CCS is a combination of different technologies. If at all, any CCS project that would be eligible for CDM certification must therefore comprise the entire technology chain from carbon capture over transportation to sequestration.

Emissions throughout the whole project cycle, including i.e. indirect emissions from enhanced oil recovery or from several injection points from different project activities at different times must be taken into account

4. Stringent monitoring plans

It is evident that it is not possible to establish a monitoring plan for the time horizon needed to monitor a potential CCS plant and site. Carbon dioxide must be stored safely and permanently in locations that do not allow any leakage for thousands of years. The Intergovernmental Panel on Climate Change's (IPCC) Special Report on Carbon Dioxide Capture and Storage states that "if continuous leakage of CO2 occurs, it could at least in part, offset the benefits of CCS for mitigating climate change".

Any potential monitoring plan must address the whole CCS project cycles, including potential seepage during the pre-injection (CO2 capture and transportation), injection, and post-injection phases of a CCS project as well as monitoring outside the project boundary when necessary.

Monitoring of injection facilities has to be done regularly for the purpose of comparison between the actual and modelled behaviour of CO2. Any detected difference, including those related to sustainable development and the surrounding environment must immediately be reported.

The monitoring plan must be updated regularly to take account of changes to the assessed risk of seepage, changes to the assessed risks to the environment and human health, new scientific knowledge, and improvements in best available technology.

In addition to monitoring, regular inspections of all storage complexes for the purposes of checking and promoting compliance with the requirements and of monitoring the effects on the environment and on human health shall be carried out.

5. Suitability of the use of modelling

CDM modalities and procedures establish that both project emissions and emissions from leakage should be measured. However CO2 stored in reservoirs is not measurable, but only modelled. This method is not suitable because only the quantity of CO2 captured and injected can be monitored and verified.

6. Criteria for site selection and monitoring plans

A suitable national obligatory and regulatory framework for the environmentally safe capture, transport and geological storage of CO2 must be established before the CCS project can be implemented in the host country.

Monitoring plans must be site-specific taking into account geological characteristics of the selected sites for storage.

It must be ensured that geological storage of CO2 is permanent containment of CO2 all negative effects or risk to the environment and human health must strictly be avoided.

Well trained and well equipped agencies are basic preconditions for operation of underground carbon storage facilities.

All in all profound capacity building will be needed to implement CCS legislations in the host countries to ensure high standards of environmental integrity.

7. Risk and safety assessment

One of the biggest challenges regarding CCS under CDM is to identify who is liable in the case of leakage and migration of CO2 from a geological formation. The time frame of CO2 storage raises issues as the longevity of institutions and intergenerational liability.

The risk and safety assessment shall address the potential for leakage and migration during operations as well as over the long term (i.e. after closure of the storage site).

The risk and safety assessment must provide the basis for mitigation/ remediation /corrective measures plans for response to unexpected events.

Periodic updates to the risk and safety assessment must be conducted throughout the project life cycle based on updated monitoring data.

The risk and safety assessment should include site-specific information, such as the terrain, potential receptors, proximity of drinking water resources, faults, and the potential for unidentified borehole locations within the project extend.

The risk and safety assessment should include non-spatial elements or non-geologic factors (such as population, land use, or critical habitat) that should be considered in evaluating a specific site.
Pipelines located in vulnerable areas (populated or ecologically sensitive, areas) require extra due diligence by project operators to ensure safe pipeline operations. Options for increasing due diligence include among other things: decreased spacing of mainline valves, greater depths of burial, increased frequency of pipeline integrity assessments and monitoring for leaks.

The risk and safety assessment and all essential information shall be made public in order to guarantee a broad public participation in the decision making process.

8. Socio-environmental impacts assessment

CAN-I believes that there are no reliable precedents where Environmental Impact Assessment (EIA) has been done in the full cycle of CCS in developing countries and thus it would be very challenging to conduct EIA sufficiently as required by the CDM modalities and procedures for a CCS project. EU is elaborating EIA rules for CCS under emissions trading scheme, though there is no actual experience in a proper scale yet.

If CCS CDM projects occur at all, a full socio-environmental impact assessment for a CCS CDM plant would have to be carried out for CO2 capture installations, CO2 storage sites and CO2 transport pipelines addressing the following aspects:

- All air emissions (NOx, SOx, dust, Hg, PAHs, etc.), solid waste generation, and water use associated with current CO2 capture technologies.
- Impacts on peoples living conditions in the possibly affected area, regardless of any boarders or other administrative frontiers.

In order to guarantee a broad public participation, project operators have to ensure that all relevant information is made available to the public and to stakeholders and that they are extensively involved in the decision making process, in line with relevant regional and international legal instruments as applicable. It is essential that local communities and Indigenous Peoples have full and effective participation in all elements of CCS, and their free, prior and informed consent for activities that affect them is given. This is no different from any other project types but CCS needs extra precaution and significantly more interactive processes with stakeholders including civil societies to gain public acceptance.

9. Short-, medium- and long-term liability

Currently, the maximum length of crediting period is 21 or 60 years (for forestry projects). But no liability has ever been agreed upon that would last for centuries or millennia. This poses a significant challenge. Project participants and buyers of credits are typically private companies but it is not practical to assume their liability for such long-term for project's risks (e.g. seepage). Even if they can somehow be held responsible after crediting periods, it is difficult to assume so for a hundred years, let alone the thousands of years that would be required for effective CO2 storage. The current institutional structure does not provide for long-term liability of host countries, either. If not properly addressed, there is an issue of inequality because credits go to developed countries while liability can get left in developing countries.

Hence, rules related to long-term liability have to be put in place both at international and national levels before any projects to take place. This requires strong political, economic and institutional structures which some developing countries do not have. Any liability regulations must address all possible scenarios, including insolvency or bankruptcy of the operators as well as disappearance of States and governments.

In particular, liability provisions must at least address the following:

- If CCS is included in the CDM at all, an effective national obligatory and regulatory framework has to be developed and implemented which covers all liability before the CCS project can be authorised in the host country before authorizing the CCS CDM project in the host country. In addition to general responsibility under the existing CDM rules and national legislations in the host countries, such national obligatory and regulatory framework should include provisions for:
    a. Careful site selection criteria
    b. Responsibility of operators (project participants) during and after the crediting period or the closure for monitoring/reporting and accounting of emissions and corrective measures (remedies) in case of seepage.
    c. Requirements for operators to providing evidence of financial security to show management of storage sites for necessary timeframe is possible and obligation for closure of sites.
    d. Rules for sharing and transferring liability between project participants and the host country governments after the end of crediting period or closure of storage sites
    e. Long-term means of redress for Parties, communities, private-sector entities and individuals affected by the release of injected CO2 or any other adverse health and environmental impact from the CCS project, including restoration of damaged ecosystems and full compensation for affected communities
    f. Responsibility of operators (project participants) to notify the CDM Executive Board in case of significant seepage and/or irregularities and provide full information for the EB.

- International rules also have to be put in place and provisions should include the following
    a. Clear assignment of responsibilities and liabilities, and effectual accounting for emission reductions and any seepage in case of transboundary projects in terms of transport and storage sites/complexes.
    b. Conflict resolution system in case of disputes due to cross national border activities relate to CCS
    c. Measures to compensate CO2 reduction in case of seepage
    d. Possible sanctions on operators (project participants) in case of fraud reporting.
    e. Measures to deal with the uncertainty of permanence such as discounting, insurance, pooled funds, etc.

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Definitions:
Seepage refers to the escape of injected fluid from storage (migration of CO2 out of the storage reservoir and into the atmosphere). This is commonly referred to as leakage in the CCS context; however, in the UNFCCC context, leakage has a different meaning (Leakage in respect of carbon trading is the change of anthropogenic emissions by sources or removals by sinks which occurs outside the project boundary.)