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Item 8 (b) of the provisional agenda

Methodological issues under the Kyoto Protocol

Carbon dioxide capture and storage in geological formations as clean development mechanism project activities

Views related to carbon dioxide capture and storage in geological formations as a possible mitigation technology

Submission from Parties

Addendum

1. In addition to the four submissions contained in document FCCC/SBSTA/2010/MISC.2, one further submission has been received.
2. In accordance with the procedure for miscellaneous documents, this submission is attached and reproduced* in the language in which it was received and without formal editing.

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SUBMISSION FROM BRAZIL

Brazilian Submission on the possible inclusion of Carbon Dioxide Capture and Storage in Geological Formation (CCS) in the Clean Development Mechanism

1. The Government of Brazil, in response to the invitation contained in Decision 2/CMP.5, paragraph 31, welcomes the opportunity to submit views on the following outstanding issues as listed in paragraph 29 of the referred Decision:

- (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.

2. Brazil, as stated in previous submissions, understands that carbon dioxide capture and storage in geological formation is an option for the portfolio of mitigation options for stabilization of atmospheric greenhouse gas concentrations. According to Paragraph 29 of the Decision 2/CMP.5, the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol recognized the importance of carbon dioxide capture and storage in geological formations as a possible mitigation technology, bearing in mind the concerns related to the outstanding issues listed in to paragraph 1 above.

3. Brazil supports the acceleration of research on CCS technologies and supports the development, deployment and diffusion, including transfer of those CCS technologies that are already at least at demonstration phase, under the UNFCCC context of Common but Differentiated Responsibilities and respective Capabilities of Countries. Brazil is conscious that the application of CCS in developing countries will depend on the technical maturity, costs, diffusion and transfer of technology and assessment of environmental issues, bearing in mind that this process is intensive in both capital and technology.

4. Taking into account CDM modalities and procedures, CCS technologies have implications and characteristics which are incompatible with the nature and characteristics of CDM project activities. Issues as leakage, project boundary, long-term liability and permanence have many additional implications. Some of these issues have been examined by reliable institutions but no satisfactory solution was reached, especially if taking into account the

characteristics of a CDM project activity. Some other important issues regarding the nature of the CDM and possible economic and market impacts were not yet assessed.

5. The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, through Decision 2 / CMP 4, *requested* the Executive Board to assess the implications of the possible inclusion of carbon dioxide capture and storage in geological formations as clean development mechanism project activities, taking into account technical, methodological and legal issues, and report back to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol at its fifth session (CMP 5).

6. In response to the request by the CMP, the Board has conducted a study on the issues referred above. It agreed that the implication of the possible inclusion of CCS in CDM might be considered from different perspectives summarized in annex II to the Executive Board report (FCCC/KP/CMP/2009/16). The report was not conclusive. It has presented only a list of positive and negative implications regarding technical, environmental, methodological, legal and market issues. The positive and negative implications that have been listed in the report are totally opposite among themselves. These elements contain very different perspectives which reinforce the incompatibility with the nature and characteristics of CDM project activities. The inclusion of CCS under CDM would add an unmanageable complexity to the mechanism. Concepts such as project boundary, monitoring, permanence and additionality, which are the pillars of the mechanism, does not apply to CCS activities. Moreover, the CDM institutional structure would have to be radically modified with changing roles of DOEs, inclusion of insurance companies, etc.

7. While acknowledging that CCS is a possible option for climate change mitigation, particularly for Annex I Parties in their effort to reduce their historical emissions, Brazil believes that **CCS** technologies are not appropriate in the framework of Clean Development Mechanism (CDM) and **should not be eligible under the CDM**.

8. The outstanding issues contained in Decision 2/CMP.5, paragraph 31, are considered below:

(a) Non-permanence, including long-term permanence

9. CCS in geological formations encompasses a great number of different technologies and thus cannot be easily considered as emissions reductions type of activity. While some technologies avoid emissions, others might lead to increasing emissions if the possibility of leakage and seepage is considered. CCS does not necessarily mean long-term emission reductions because the storage might not be permanent. So it will not lead to real and measurable reductions which is totally against 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. 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 would lead to no long term benefit.

10. The time-scale between CDM project activities and CCS is different in nature. The longest horizon of CDM project activities other than Afforestation/Reforestation (A/R) is 21 years or 60 years for A/R activities while CCS time horizon is centuries or millennia.

11. Accounting of non-permanence for projects with a time horizon of one thousand years is not feasible. The reversal of any removal shall be accounted for at the appropriate point in time. The mechanism of canceling units after a reversion is verified would not be possible if the

reversion occurs in 200 or 500 years. Project emissions as well as leakage 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. Statistical approach to anticipate seepage is highly uncertain because it only takes into account tail emissions and not extreme events like a sudden release, to which is difficult to associate a probability. Accurately quantifying the project emissions or leakage in the form of seepage might be a huge and not feasible challenge.

(b) Measuring, reporting and verification

12. 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 modeled.

13. The time period for the verification and the dynamic nature of the monitoring would make verification challenging. Furthermore, only the quantity of CO₂ captured and injected can be monitored and verified.

14. CCS in the CDM would have many implications in terms of monitoring because it would require careful long term monitoring process. As defined in CDM modalities and procedures, and checked by the Executive Board in the process of approving CDM projects, one of the main elements of the PDD is a detail monitoring plan with clear responsibilities and description of monitoring procedures. It is evident that it is not possible to establish such a monitoring plan for the time horizon of a thousand years. Instead of a precise monitoring plan, only a dynamic monitoring approach could be defined, but in the Brazilian point of view dynamic monitoring with different monitoring plans changing over time is not a solution. In addition to that, the fact that project boundary can also be dynamic could make monitoring outside the limits of the project necessary. Defining the monitoring area is also complex due to the fact that many different injection points from different projects activities in different time frames can use the same reservoir. Lateral flows may expand the monitoring area and increase the risk of reaching areas with undetected fractures and faults. Finally, all these complexities have to be translated into economic terms for appropriate consideration in project activity and the economic theory has no solution for the anticipation of very long term values. In addition, protocols for long-term monitoring have not been established. It is clear that CDM modalities and procedures do not cover these complexities.

(c) Environmental impacts

15. In the Brazilian point of view, for CCS project it would not be possible to conduct a comprehensive Environment Impact Assessment (EIA) as required by the CDM modalities and procedures.

16. The lack of experience with CCS, the long lifetime of the projects and the uncertainty concerning the risk of seepage would pose challenges for conducting a CCS EIA. The terms of reference and review process for EIAs is currently solely within the purview of the host country. A faulty EIA could have regional or international implications if it leads to poor site selection or operating practices that result in leakage.

17. There is the risk of a sudden release of CO₂ with massive emissions going back to the atmosphere with health and environment consequences. 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.

18. Considering CO₂ storage in the Ocean, according to IPCC Special Report on CCS (2005), *adding CO₂ to the ocean or forming pools of liquid CO₂ on the ocean floor at industrial scales will alter the local chemical environment. Experiments have shown that sustained high concentrations of CO₂ would cause mortality of ocean organisms. CO₂ effects on marine organisms will have ecosystem consequences. The chronic effects of direct CO₂ injection into the ocean on ecosystems over large ocean areas and long time scales have not yet been studied.*

(d) Project activity boundaries

19. Project boundary is an important concept related to quantified emissions reductions in CDM project activities. A clear separation is requested for baseline emissions, project emissions and emissions from leakage. CCS projects would not fit into those definitions. A reservoir may cover different countries and after storage the plume migrates not respecting any previous plan or political borders. There is no solution for a clear separation and measurement of these emissions. This difficulties increase if there are several injection points from different project activities at different times.

20. Seepage may also occur in international waters which would introduce further complexities similar to those of international bunkers, whose emissions are not covered neither in national emissions nor in CDM. This would also add legal implications with transnational liability problems, including possible transboundary problems among Annex I and/or Non-Annex I countries.

21. Project boundaries for CCS are determined by modelling. The uncertainty inherent in a model approach may be difficult to manage within the CDM system.

(e) International law

22. Beyond the CDM institutional structure would have to be radically modified with changing roles of DOEs, inclusion of insurance companies, etc, a complex international regulatory and institutional framework may be required to deal with the international implications. None of the marine treaties in place were drafted having CCS activities in mind, which brings difficulties particularly to offshore geological storage.

23. Although some legal and regulatory efforts under domestic legislation have been identified in some countries, much remains to be done. It is quite premature try to consider elements under International Law when even domestic legislation remains under construction. Existing international treaties and regulations are not sufficient to address the concerns related to CCS as CDM project activities.

24. Finally we would like to comment on a frequent argument used in this debate that states that no country is obliged to accept CCS in its own territory because of the concept of voluntary participation. This is not directly linked to International Law, but it is part of discussions under the CDM regulation: Voluntary participation being one of the requirements for participating in the CDM does not mean that each country decides by its own judgment if a type of activity is eligible as CDM activity or not. CCS in geological formation encompasses a great number of different technologies which are not covered by the CDM regulation and the inclusion of new type of activity requires a COP/MOP decision and is not a matter of voluntary participation. In addition to that, considering that the injection of CO₂ in reservoirs is changing the sealing and the ecosystem of the reservoir, it should be considered as land use, land use change type of activity, a category in which only afforestation and reforestation are allowed in the first commitment period. It is clear that CCS type of activity is not covered by the Marrakech

Accords, nor by Decision 3/CMP.1. The inclusion of a new type of activity under CDM needs to be done by a COP/MOP decision.

(f) Liability

25. One of the biggest challenge 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.

26. As stated before, owner or operator liability is possible in the horizon of 21 or 60 years, which is the longest horizon CDM is dealing with, but not for centuries or millennia. The responsible for CCS activities are usually private companies. In the referred expanded time horizon questions of insolvency or bankruptcy of the operator is very likely and even States can appear and disappear. Stability in the long term does not exist in the liable institutional structure, including those linked to change in political administration and, based on this, host countries must not assume long-term liability because there is no means to ensure this kind of liability.

27. Recognizing that it is impossible for the project proponent to remain responsible for the reservoir for such a long time horizon, existent proposals suggest dealing with long term monitoring and all issues related to long term liability by transferring them to the host country. Transferring responsibility means transferring monitoring procedures, costs and remediation measures in the case of unexpected CO₂ escaping back to the atmosphere or to saline waters.

28. As mentioned previously, 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. These externalities cannot be measured, not even estimated ex-ante and the host country would have to afford them, which is unacceptable for it means that private profit in the short term will be supported by public loss in the long term. In addition, seepage is likely to occur in a future time when the CO₂ concentration in the atmosphere will be much larger than current CO₂ concentration taking into consideration that even the IPCC long term scenarios cover a period up to 2100 and the seepage could occur in a scenario beyond 2100 with CO₂ concentrations likely to be larger than expected CO₂ concentration in 2100 increasing the risk of greenhouse run-off.

(g) The potential for perverse outcomes

29. There are no studies to assess possible impacts of CCS in the CDM market. Probably, huge quantities of credits coming to the market would drop CERs prices to a level which could dismantle the carbon market. Decreasing prices of CERs would 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.

30. Brazil believes that CDM incentives should be rather used to promote clean and renewable technologies which point clearly to decarbonization of the production and consumption patterns and not to promote the enhancement of oil, gas and coal production. 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, such as the CDM. Inclusion of CCS within the CDM may place less emphasis on finding other more suitable financial mechanisms under the UNFCCC or government policies.

31. The risks inherent to new technologies would only be minimized with the possible consideration of commercial application of mature CCS technologies. The only mature market

technology for geological storage listed by IPCC in the Special Report on CCS is the enhanced oil recovery – EOR. Brazil believes that CDM was not conceived for giving subsidies for oil and natural gas production through, in particular for countries with on-shore production and very low costs of oil production. This type of project may not depend on CDM incentives and may not be 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.

32. As mentioned before, 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 an important amount of credits in the short term, but would lead to no long term benefit. The long term consequence would be to buy additional time for the current fossil based economy. Buying time is not without consequences. CCS in the CDM would generate large projects, particularly concentrated in a few countries. It would prevent further equitable participation of non-Annex I countries under the CDM and certainly would create additional barriers for small-scale projects. Moreover it would postpone important investment that could lead to the introduction of renewable energy technologies in the developing world. In this regard, CCS is clearly a technology that can be used by Annex I countries in its mitigation efforts, for these countries have an enormous infrastructure based on fossil fuels and need to significantly reduce its emissions in the short term. This is typically a “transition technology” to be used in the passage from a fossil fuel based economy to a low carbon economy. The Brazilian Government recognizes that it can be a long time before the world can feasibly rely fully on renewables to meet its energy needs. CCS could be one of the bridge technologies until countries can rely fully on renewables. But at same time CCS under CDM would create perverse incentives for the increase of fossil energy production in developing countries and would reinforce the existing technological gap between the developed and the developing world. As stated previously, inclusion of CCS within the CDM may place less emphasis on finding other more suitable financial mechanisms under the UNFCCC or government policies. So, Parties must look for means to enable Parties included in Annex I to the Convention and multilateral financial institutions to provide funding from sources other than the clean development mechanism for creating incentives to CCS in Parties not included in Annex I to the Convention.

(h) Safety

33. As stated previously, CCS in geological formation encompasses a great number of technologies. It involves many risks. The risk analysis has to take into account the area that could be affected and the time horizon of a possible leak. Although the risk of seepage reduces with time, the area that could be affected grows. Moreover, there is a 99% probability that after 100 years some of the CO₂ stored in geological formation goes back to the atmosphere. Seepage is likely to occur when CO₂ concentrations in the atmosphere are larger than current CO₂ concentrations. This would increase the risk of a run-off of greenhouse effect. A large number of abandoned and unmonitored wells represent a risk of fracture on the sealing mechanism of the reservoir. In the presence of water, the CO₂ have a corrosive action over the cement closure of the well heads. Besides that, the CO₂ injection is basically different from injection of hydrocarbon or water. There is no long term experience on sealing failure of injection of CO₂ in depleted oil/natural gas reservoirs. On top of this, a possible run-off of greenhouse effect in the future - because of higher GHG concentration in accordance with future scenarios - would have a larger impact in terms of temperature increase. 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.

34. Based on UNFCCC Common but Differentiated Responsibilities Principle as well as Historical Responsibility, developed countries, which shall lead the process of combating climate change, should be the first to use CCS in geological formation on large scale in their territories in order to acquire knowledge about the risks related to leakage, monitoring and liability before exporting premature experiences to developing countries. CCS has many similarities to nuclear power industry regarding the long term burden and the possible ways to address them with sophisticated insurance system and government surveillance. This model needs strong political, economic and institutional structures which many developing countries do not have.

35. CCS in developing countries could be developed in another framework other than CDM. As stated before, the use of specific financial mechanisms, funding and partnerships under the UNFCCC must be explored.

(i) Insurance coverage and compensation for damages caused due to seepage or leakage

36. As stated previously, project emissions as well as leakage 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. So, any kind of insurance will not cover seepage or leakage or project emissions that could occur in the middle or long-term. The damage caused in these time scales in terms of double emissions instead of reducing emissions will not be covered by any kind of insurance, because the allowance issued in the present for Annex I Parties will represent emissions of greenhouse gases in the present, but the damages caused due to seepage or leakage to the atmosphere will occur a long time after the crediting period. The contribution for global temperature increase will not be compensated by any kind of insurance.

Conclusion

37. In a nut shell, the appeal of large quantities of cheap credits for Annex I parties should not hide the negative consequences of taking CCS under the CDM. First, this would change the very nature of the CDM: it would be necessary to introduce significant modification in the rules already established and in the institutional structure to deal with the CDM. It would destabilize the carbon market, would be a perverse incentive to developing countries, would prevent small scale projects and would prevent further equitable participation. Finally, it would divert from the central idea of the CDM which is to promote long term benefits in the direction of low carbon economy towards creating subsidies to enhance fossil fuel production.

38. Based on the reasons presented, Brazil proposal is that CCS shall not be eligible under the CDM.
