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## **CCSA Comments on the treatment of Carbon Capture and Geological Storage in the *IPCC 2006 Guidelines for National Greenhouse Gas Inventories***

At its thirtieth session the SBSTA invited Parties to submit views, by 15 February 2010, on the methodological issues related to reporting when using the *IPCC 2006 Guidelines for National Greenhouse Gas Inventories* (hereafter 2006 IPCC Guidelines) including the reporting of Carbon Capture and Geological Storage (CCS) activities (FCCC/SBSTA/2009/L.11). The Carbon Capture and Storage Association (CCSA) would like to comment on the methodology for estimating emissions from CCS activities contained in the 2006 IPCC Guidelines.

The CCSA believes that the emissions estimation guidance for CCS contained within the 2006 IPCC Guidelines represents international best practice and provide assurance that CCS activities are developed in a manner that ensures the greatest protection of the environment. The CCSA urges Parties to support the methodological approach taken in the 2006 IPCC Guidelines, to recognise these as the most appropriate method with which to report emissions from CCS projects and to adopt the 2006 IPCC Guidelines for regular use at the earliest possible opportunity.

The 2006 IPCC Guidelines employ a Tier 3 methodology to the estimation of emissions from geological storage sites. The Tier 3 approach to emissions estimation requires the collection of a greater range of data than either the Tier 1 or 2 approaches and is a more accurate method of reporting emissions.

The Tier 3 approach detailed in the IPCC 2006 Guidelines is the result of a substantial body of work undertaken by the IPCC, is consistent and fully supported by the *IPCC Special Report on Carbon Dioxide Capture and Storage* and has been used as the basis for the establishment of other CCS reporting methodologies internationally. For example, the London and OSPAR Conventions and the regional legislation developed in the EU, Japan, Australia and elsewhere have all been based on the 2006 IPCC Guidelines approach to the reporting of emissions. As the 2006 IPCC Guidelines underpins the approach taken in other areas it is important that they are maintained as the common global basis for the reporting of emissions from CO<sub>2</sub> storage sites.

The 2006 IPCC Guidelines emissions estimation approach is based upon a sequential process of: site characterisation, modelling simulation, assessment of leakage risk, monitoring of stored CO<sub>2</sub>, and reporting of emissions. This approach places a strong emphasis on effective site characterisation, selection and monitoring as the key to ensuring the long-term, environmentally safe storage of CO<sub>2</sub>. Where CO<sub>2</sub> is injected into appropriately selected and managed storage sites and the monitoring of the

stored CO<sub>2</sub> shows it to be behaving as predicted and not leaking then it can be reported that there are no emissions of CO<sub>2</sub> from the storage site.

The priority given to site-specific characterisation, modelling simulation, selection and operation means that only the most suitable geological formations are used to store CO<sub>2</sub> and ensures the highest level of environmental integrity possible for CCS projects. This case-by-case approach is required as geological formations are highly diverse, natural structures and so vary substantially in their suitability as sites for the long-term storage of CO<sub>2</sub>.

Applying a Tier 1 approach to reporting emissions might simply require operators of CCS storage sites to use a default emissions factor for the estimation of CO<sub>2</sub> emissions from the geological formation, for example, the leakage of a given percentage of the stored CO<sub>2</sub> for each year of storage. While a Tier 1 approach would place significantly less data collection requirements on the operators of storage sites the CCSA believes that taking such an approach is inappropriate, not based on any detailed scientific understanding of the mechanisms of CO<sub>2</sub> storage and could negatively impact on the environmental integrity of CCS projects.

The use of emissions factors would require operators to report emissions from CO<sub>2</sub> storage sites based on an assumed average rate of leakage. However, there is no scientific basis for the assumption that geological storage sites will leak a fixed proportion of CO<sub>2</sub> over a given period of time. This approach also implies that eventually all of the stored CO<sub>2</sub> would leak out of the storage site. The widespread presence of naturally occurring accumulations of CO<sub>2</sub> that have been stored for millions of years provides evidence that the application of a steady leakage rate for stored CO<sub>2</sub> is inappropriate. Furthermore the assumption of a steady leakage rate for stored CO<sub>2</sub> runs counter to the scientific understanding of the physical processes that store CO<sub>2</sub> in the geological formation. Over time the risk of leakage is expected to decline as the CO<sub>2</sub> moves from being trapped primarily by the cap rock to even more secure forms of trapping such as storage within the rock pore space, dissolution into the surrounding reservoir brine and finally chemical binding to the reservoir rock.

The Tier 3 approach rewards good operator practice and means that a well selected and managed CO<sub>2</sub> storage site that is not leaking can report all of the injected CO<sub>2</sub> as safely stored and not emitted. Simply reporting to a default emissions factor would effectively cap liability for operators of storage sites and reduce the emphasis on the importance of site characterisation, selection and monitoring that underpins the Tier 3 approach to reporting. As site selection and characterisation are the most important element of a safe CCS project then reducing the emphasis on these activities has the potential to negatively impact on the environmental integrity of CCS projects.

The use of a Tier 3 methodology that combines a site specific characterisation and selection process with associated monitoring also enables unexpected events to be recorded and reported. For example, in the unlikely event of a sudden release of CO<sub>2</sub> from a storage site the monitoring programme component of a Tier 3 approach would enable this release event to be recorded and the emissions reported. The recording and reporting of sudden and unexpected events would not occur under an approach that simply applied emissions factors to report emissions from storage sites.

There is enough experience with the operation of CCS projects and with the use of analogous technologies to enable Annex I Parties to report emissions using a Tier 3 methodology. The technologies and processes used for site characterisation, modelling simulation, site selection and monitoring are well established and are similar to those used in the oil and gas exploration and production industry and can be adapted for use in CCS. There may be a need for Non-Annex I Party capacity building to enable those countries hosting CCS projects to report the emissions in a manner consistent with the 2006 IPCC guidelines.

*The view expressed in this paper cannot be taken to represent the views of all members of the CCSA. However, they do reflect a general consensus within the Association.*