

Bio CCS – commercial scale demonstration of biological sequestration of CO₂

Australia's current greenhouse gas emissions are close to 600 million tonnes per annum. The Bio CCS approach could cut Australia's total emissions by at least 25% within a decade and has great application for other countries especially China, India, Africa and the USA.

The companies outlined below are the initial proponents of three major Bio CCS demonstration projects in Australia that will demonstrate the scope, scale and speed of biosequestration of carbon dioxide at point of emission and drawdown of 'legacy' carbon from the atmosphere. The projects are in Victoria, South Queensland and Western Australia – and are open to all biosequestration systems, companies and farmers.

Each of these regional Bio CCS projects offers the opportunity to sequester 50 million tonnes of CO₂ per year, and in the process to rebuild more productive agricultural soils, and to give farmers access to the carbon offset credits market. And in the case of oceans - to help rebuild dwindling fish stocks.

However, this potential will only be realised with Government leadership on far-reaching policies including early incentives to catalyse change and unleash investment into capital expenditure – costs that will be recouped as operating costs decline, agricultural productivity increases, and a price on carbon takes effect giving value to biosequestration offset credits.

By treating CO₂ as a feedstock and removing excess CO₂ from a waste and pollution chain, biosequestration of carbon in soils, plants and oceans offers major commercially viable offset credits to the carbon market. It is therefore very important that biosequestration be included in Australia's emissions trading scheme. Reductions of CO₂ created by all forms of biosequestration should receive similar legislative recognition as afforded to geological sequestration.

Australia has some 450 million hectares of grasslands and 25 million hectares of cropping lands and around 120,000 innovative, adaptable farmers. Australia's stable political and economic status also allows us to be genuine world leaders in regenerative grazing management and biological farming/fertilisation systems. This is an opportunity to:

- Improve the environmental, financial and social sustainability of farming enterprises
- Create high quality long-term jobs in regional and rural Australia
- Show that an energy intensive nation can make the transition to a low carbon economy.

The original UNFCCC agreement in 1992 stipulated that all carbon sinks (biological – terrestrial and oceanic) should be included within the framework so that the full carbon cycle is appropriately represented. Australia is well placed to lead the world in implementing all forms of biological sequestration and to transfer this knowledge to the developing world – Bio CCS should therefore form an integral part of the CPRS.

UNFAO are calling for soil carbon to be recognised in Copenhagen to provide incentives to farmers worldwide to improve food supply/security. The CSIRO has confirmed that at least 25% of Australia's greenhouse gas emissions could be reduced by biosequestration. CSIRO has also confirmed that soil carbon can be measured – an international protocol is now needed to coordinate accountancy. Over a multi-year cycle Australian Government carbon accounting estimates show that drought and bushfires do not increase the average greenhouse gas emissions - in fact, biosequestration systems improve agricultural resilience to these natural events. In the USA the Waxman-Markey Bill includes agricultural offsets and soil carbon benefits. Scientists are increasingly warning that the atmospheric concentrations of greenhouse gases must peak as quickly as possible and then be reduced.

Biosequestration provides a large part of the solution to achieving this reduction in GHGs in time to avoid dangerous climate tipping points.

The Bio CCS group acknowledges the important work being done nationally and internationally on forestry, re-forestation and deforestation land-clearing avoided but emphasises that soil, ocean, crop, native vegetation sequestration of carbon should be given the same policy support domestically and internationally.

Founding members of the Environment Business Australia Bio CCS group

MBD Energy

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Using algae to synthesise CO₂ captured from coal-fired power plants (or other large emitters) significantly reduces carbon pollution while helping with fuel security and providing a healthy animal fodder that early trials demonstrate reduces methane output in cattle. Algal oil can be used to create plastics or biodiesel, animal meal to replace soy imports, and a fertiliser to rebuild both structure and mineral content of soils. Technology developed at John Cook University in Queensland.

MBD has signed agreements with three of Australia's largest emitters (Loy Yang Power, Eraring Energy and Tarong Energy) and Anna Bligh, Premier of Queensland, will launch the MBD Algal Research and Development facility on 20 November. This R&D facility is the largest of its kind in the world.

- Estimated capture of CO₂ per annum – 15 million tonnes (5 million per project) in early stage commercial development, increasing as new projects come on line and scale up. India and China showing significant interest.
- By 2020 a conservative 50 million tonnes of CO₂ per annum can be eliminated from Australia's emissions profile

Ignite Energy Resources/LawrieCo

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Using Gippsland brown coal deposits (high humic/fulvic content lignite) as the base for a soil fertiliser using the BioLogic system to rebuild soil carbon and biology levels and regenerate degraded soils, which in turn accelerates plant growth and photosynthesis of carbon dioxide to increase soil carbon via plant root structures. The process increases rain infiltration and rebuilds soil structure, resilience to drought, salinity and erosion at landscape scale. The reduced need for synthetic chemical fertilisers and pesticides/fungicides reduces chemical/nutrient run-off to waterways and has food and water benefits to public health.

- Estimated drawdown of CO₂ per annum – Current drawdown is approximately 7 million tonnes p.a. in Australia. The potential to sequester 75 million tonnes p.a. in Australia is based on just 20% of cropping land using biologic farming methods
- By 2020 a conservative 75 million tonnes of CO₂ per annum can be removed from the atmosphere

Soil Carbon

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The Soil Carbon company specialises in improvements to grazing/rangeland management that can significantly rebuild soil carbon levels in the planet's vast grasslands and intensively farmed agricultural lands. The approach reverses desertification and land degradation, supports biodiversity and ecosystem resilience, and the improvements to agricultural land productivity result in better food quality and quantity, community health improvements, strengthening rural and regional communities. By controlling stock movements grass/crop regeneration is faster, root systems grow stronger and deeper sequestering far greater levels of CO₂ through photosynthesis.

- Estimated drawdown of CO₂ per annum – Current drawdown in Australia is approximately 21 million tonnes of CO₂ sequestered. The potential is 2 tonnes CO₂ per hectare per annum, with 450 million hectares of grassland this gives an upper potential of 900 million tonnes per annum for at least 40 years. If just 10% of the Australian landmass was converted to carbon farming 90 million tonnes would be sequestered each year.
- By 2020 a conservative 90 million tonnes of CO₂ per annum can be removed from the atmosphere

Plantstone Technology

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Plantstone carbon (also known as silica phytoliths) is a practical and proven technology developed in Australia to enhance the secure and permanent biosequestration of carbon in silica that vegetation draws from the soil.

Research is underway to demonstrate the crop cultivars capable of maximum carbon sequestration. Grassy crops such as wheat, sugarcane and bamboo offer significantly high carbon sequestration in silica phytoliths. Not only is this of interest to Australian farmers but China is particularly interested to value-add to its extensive bamboo forests - the permanent carbon storage in the fibre, design and building materials, as well as residue left to build in the soil offer China considerable carbon offset potential which has yet to be included in international negotiations for carbon reduction targets. This form of biosequestered carbon can be readily quantified at plant/hectare level and the permanence of carbon storage is >1000 years as the silica 'shield' is impervious to fire or biological breakdown.

- Estimated drawdown of CO₂ – 50 million tonnes per annum in Australia in the next 5years and approximately 1.5 billion tonnes of CO₂ per annum globally, an amount equivalent to > 10 % of the current global increase in atmospheric CO₂.
- By 2020 a conservative 80 million tonnes of CO₂ per annum can be removed from the atmosphere

Ocean Nourishment

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Ocean Nourishment Corporation (ONC) is at the forefront of ocean based carbon biosequestration. Plants drive biological sequestration of carbon by photosynthesis. Ocean plants (algae), despite being only 0.2% of the planet's biomass, undertake about 50% of the world's photosynthesis. ONC have developed an agricultural process that through nutrient delivery enhances plant growth in surface waters over deep ocean sites. This significantly increases the natural drawdown of carbon to the planet's largest carbon sink (the deep ocean), where carbon remains stored for an estimated 1,000 years. Also, by enhancing the base of the food chain, the process stimulates marine productivity in barren areas of the oceans and thus can play an important role in development of fisheries.

- Estimated drawdown of CO₂ – each ONC site is estimated to sequester between 5 and 8 Mt CO₂ per annum and after 2-3 years of operation also contribute some 300,000 tonnes of fish. Suitable site locations are in waters greater than 1,000 m deep and typically have low plant growth due to nutrient limitation. 10 sites are currently being investigated.
- By 2020 a conservative 80 million tonnes of CO₂ per annum can be removed from the atmosphere

Environment Business Australia

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EBA is the peak body for the cleantech/low carbon and environmental goods and services sector. Globally this sector was assessed as a \$6 trillion industry in 2008 with rapid growth potential. EBA is a not-for-profit business think tank and advocacy group promoting commercial solutions to environmental challenges. EBA and its members have consistently pushed for far-reaching policies to help shape the marketplace for clean and efficient technologies and smart systems and ideas.