

ISSUES PAPER 1
CLIMATE CHANGE: LAND USE – AGRICULTURE AND
FORESTRY

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Abstract

The Garnaut Climate Change Review Terms of Reference, (ToR) includes the statement that the review should take into account;

- The weight of scientific opinion that developed countries need to reduce their greenhouse gas emissions by 60 percent by 2050 against 2000 emission levels, if global greenhouse gas concentrations in the atmosphere are to be stabilized to between 450 and 550ppm by mid century.

This statement makes the assumption that anthropogenic emissions of greenhouse gasses (GHG's) are the prime cause of the current mild global warming and that they must not be allowed to exceed 550ppm, and that this should be used as a basis, (presumably without question or debate), for actions to be undertaken to mitigate anthropogenic GHG emissions in Australia.

This submission argues that the science on this matter is anything but 'settled' and that the recent science indicates that the current warming is in fact part of a naturally occurring cycle of well documented, recurring warming and cooling periods and that there are convincing scientific explanations of how this may come about.

Further the assumptions employed to calculate the 16.8% of this nations GHG emissions arising from agriculture are fundamentally flawed.

Proposals for a Carbon Tax or Australian Emissions Trading Scheme (AETS) as a mechanism to achieve reductions in GHG emissions would be economically and socially devastating, and they would prove if implemented, to be totally futile in actually achieving their goal of reducing average global temperature.

In view of the new scientific findings that throw significant doubt on the veracity of the main underlying assumption stated above, it would be imprudent at this stage to recommend either of the above options without first considering and reviewing, with an open mind, all the science surrounding this matter.

Sustainable prosperity in a changing climatic regime, can most effectively be achieved by targeting and spending our scarce resources wisely and this is best achieved by developing cutting edge, widely accessible, education facilities, technology and research into the drivers and timing of climate change to maximize our ability to adapt to change, whatever form that may take.

Rushing in to adopt expensive and widely damaging GHG mitigation strategies without any substantive evidence to support the underlying theory, would be extremely foolish, particularly in view of the recent advances in climate change science (not included in the IPCC's 4th Report) which put a completely new perspective on the matter.

Introduction

The argument that the overwhelming majority of scientists support the IPCC view that it is anthropogenic emissions of GHG's that are almost certainly responsible for the current warming we are experiencing, even if it were true, is not a scientific argument or proof that the theory is correct. Science is not about consensus.

History is replete with examples of new science being derided and denigrated by the great majority of other scientists that later is shown to be valid. The theory of tectonic plates and their movement about the globe is just one example.

Even less standing can be awarded to computer modeling, particularly when it comes to the highly complex task of attempting to model our climate and predict what may happen in future, from an incomplete knowledge and data set.

Because of this lack of understanding the modelers resort to the use of best guesses, tweak the inputs and apply 'forcing factors' such as amplifying the effects of the GHG's by commonly, 2.5 to come up with an output that meets their pre-conceived ideas or to attempt to replicate past circumstances.

Whatever this is, it is not science, yet the outputs (or the averaged outputs of a number of sometimes widely varying models) have been accepted as scientific fact by many.

None of the models employed by the IPCC include the forcing effects of significant changes in the magnetic flux of the sun and the indirect but substantive effects this has on global temperatures.

This it is now becoming evident, is likely to prove to be the most significant single factor influencing global climate and temperature change.

Because of the fundamental nature of this new knowledge, and its importance to the work and recommendations of the Garnaut Climate Change Review, it is proposed to firstly concisely outline the method by which this occurs, so that a rudimentary, (and simplified) understanding of the process may be obtained and considered.

The enhanced role of the sun

The sun essentially provides all the energy to warm the Earth, allowing plants and all other biota to be sustained.

Direct energy radiation from the sun, or solar insolation, once thought to be constant, in fact varies. This is taken into account in the IPCC calculations but on its own is insufficient to account for the observed changes in temperature on Earth.

As a consequence the IPCC and others have postulated that increasing emissions of GHG's as a result of mankind's activities, particularly in respect of releasing fossil carbon accumulated and stored over millions of years, back into the atmosphere, adds to the normal greenhouse effect and could account for the additional warming.

Recent work by a number of scientists however has thrown considerable doubt on this theory, in particular by the work of Henrik Svensmark and colleagues at the Center for Sun-Climate Research at the Danish National Space Center.

It has been established that Earth's climate responds strongly to some aspects of the magnetic activity of the sun, the question was why and how?

Svensmark recognized the important part that low-level (<3000 m) cloud cover had on temperature control of the planet. These clouds typically cover a large area of the globe, are highly reflective of incoming sunlight, scattering back into space about half the incoming sunlight that falls on them and this has a strong cooling effect where they occur. This is in marked contrast to the modelers' uncertainty about the effects of clouds and a belief that they are generally passive participants.

Overall these clouds cut the global warming effect of the incoming sunlight by some 8% and if they were removed average temperatures would rise by an estimated 10°C, or alternatively an increase in low-level cloud cover by only a few percent would noticeably chill the world. NASA's Earth Radiation Budget Experiment found for example, that these low level clouds were responsible for 60% of the cooling of the Earth by clouds.

Svensmark also recognized that the individual water mini-droplets that make up clouds are formed where ions have been created by passing cosmic ray particles. This makes the formation of these clouds dependent on the varying intensity of cosmic rays so that cosmic rays control the powerful 'cloud valve' that regulates the heating of the earth. (Parker 2007).

Cosmic rays are created by supernova events, the explosion of massive stars, and the fastest and most powerful of these rays travel at just below the speed of light.

Sunspots, the dark areas that periodically appear on the sun during the 11 – 22 year sunspot cycle when the magnetic poles on the sun reverse (each 11 years), are intense magnetic storms and during these periods the 'Solar Wind', non-stop emissions of charged magnetic particles or plasma from the million degree corona of the sun, intensifies.

The Earth is well within the sphere of influence of the Solar Wind that acts as a barrier to reduce the number of cosmic rays reaching the Earth and penetrating its atmosphere.

When an energetic cosmic ray hits our atmosphere it disintegrates into a shower of sub-atomic particles of many different kinds, only a few of which reach the lower levels of the atmosphere. Only one kind of these charged particles reaches the Earth's surface in large numbers and with the loss of only moderate energy, the muon.

Muons have a mass 200 times that of an electron and a lifetime of just 2 millionths of a second, but because of the effect from Albert Einstein's explanation of time shifting, they stretch time to easily allow them to reach sea level, where they make up an estimated 98% of secondary cosmic rays present there.

It is the muon that is predominantly responsible for turning water vapour in the atmosphere into the minute white particles that form the critical low-level clouds.

The sun goes through periods of increased sunspot activity interspersed with more quiescent times and there is ample evidence from right around the world that during periods of reduced sunspot activity the earth cools. The last of these being the 'Little Ice Age' when for many years there were no sunspots at all.

Conversely when the sun is more active the Earth warms as in the current warming period, the previous Medieval Warming Period and prior to that the 'Roman Warming Period'. There have been eight identified major warming and cooling cycles over the last 12,000 years with an average cycle length of some 1,500 years +/- 500 years, with many minor additional perturbances such as the Sporer, Wolf and Dalton Minima occurring within them.

Increased magnetic activity on the Sun, which more than doubled during the twentieth century, results in a stronger 'Solar Wind' which means less cosmic rays penetrate our atmosphere, that means less clouds form and that means the earth warms. A simple, normal, logical and understandable sequence that has been occurring for millions of years and can explain with a much higher degree of confidence the present mild warming than the scientifically unsubstantiated IPCC explanation.

In one test of the theory, Svensmark used monthly records of cloud data over the oceans obtained from American, European and Japanese geostationary satellites and compared them with cosmic ray data from John Simpson's station at Climax, Colorado. The result was striking. Between 1984 and 1987 the Sun gradually became less stormy and more cosmic rays reached the earth. Cloudiness over the oceans increased progressively by nearly 3%. Then the cosmic rays declined until 1990 and the cloudiness decreased too, by 4%.

This clearly suggests that variation in cloud cover could have much more effect on the Earth's temperature than the small variations in the intensity of light coming from the Sun.

This is of huge significance because satellite measurements of global cloud cover and calculations of their effect on the Earth's temperature show a warming close to 0.6°C

for the reduction in cosmic rays and cloudiness between 1900 and 2000. (Marsh. N. & Svensmark)

This is very close to the total warming that occurred during the last century.

Svensmark, in an experiment called SKY, was able to demonstrate the ability of these cosmic rays in an underground cloud chamber, purged of all other charged particles, to turn water vapour surprisingly quickly into ultra-fine cloud particles. More elaborate experiments, called CLOUD, are currently being set up at the newly upgraded CERN particle physics laboratory in Geneva.

Limitations of the greenhouse effect

Water vapour is the major greenhouse gas, is responsible for up to 95% of the greenhouse effect and we have no control over its concentration in the atmosphere.

There is no observational evidence to support the notion employed in the IPCC models, that rising levels of carbon dioxide cause small increases in global warming which then cause a feedback increase, or significant forcing, in the level of water vapour in the atmosphere.

In fact the anticipated GHG signature resulting from GHG induced warming, evident as a strong warming about 10 km up in the tropical region of the troposphere, is entirely absent. Evidence that GHG is not the cause of the current warming.

The effect of increasing CO₂ levels on temperature is a logarithmic relationship with a calculated 66% of the effect being caused by the first 50ppm CO₂ and a rapidly declining response from each subsequent incremental increase.

We are now over 90% of the way along this curve, implying that a further doubling or quadrupling of CO₂ levels would result in only minor, inconsequential temperature increases, levels that would be swamped by the natural changes that are constantly occurring.

Further the newer more accurately analyzed Antarctic Vostok ice core record clearly indicates that CO₂ is not the cause of any of the previous warmings, rather that the warming is responsible, some hundreds of years later, for increases in atmospheric CO₂ levels, possibly released from the worlds warming oceans.

Carbon dioxide

Carbon dioxide is incorrectly described and treated in some circles as an atmospheric pollutant.

In fact CO₂ is a fundamental building block of all life and increasing levels of it in the atmosphere have many beneficial consequences.

Plants take in CO₂ through their leaf stomata to allow them to grow, and they release Oxygen and water vapour back out again in the process.

Increased levels of CO₂ increase the growth rate of most plants, it improves their root to shoot ratio, improves their water use efficiency and reduces their susceptibility to disease (by reducing the size of the leaf stomata openings). The yields of wheat and many other staple foods and grazing fodder that mankind is dependent on, have been increased by at least 15% as a result of the increased levels of CO₂ now present in the atmosphere, and this rate will continue to increase with much beneficial potential remaining.

It could be argued that if this were not the case much more of the worlds lands would have to be cropped to sustain the increasing human population, putting much more pressure on the environment and threatened species.

The fundamental reason why CO₂ in the atmosphere is critically important to biology is that there is so little of it. A crop growing in full sunlight in the middle of the day uses up all the CO₂ within a meter of the ground in about five minutes. If the air were not constantly stirred by convection currents and winds, the crop would stop growing.

About a tenth of the all the CO₂ in the atmosphere is converted into biomass every year and most is subsequently recycled back into the atmosphere (and soils) over varying periods of time. (Dyson. F. 2007)

In a study by Hasse *et al* and replicated by other researchers, elevated levels of CO₂ resulted in dramatic increases in root nodule numbers and mass, resulting in accelerated seedling development and a very beneficial boost in the capture efficiency of nitrogen from the atmosphere.

A study of the number of leaf stomata in well preserved European Beech leaves, and other species, in well-dated layers of peat bog, indicate that in relatively recent times the levels of CO₂ in the atmosphere were at levels equivalent to today. There is a well-known relationship of leaf stomata numbers to CO₂ concentration, the numbers increasing with a decline in CO₂ concentration.

The fact that this relationship exists, bears testimony to the fact that plants have had to develop a mechanism that can adjust to varying levels of this vital life pre-requisite and that they thrive when these levels are higher.

Agricultural Greenhouse Gas Emissions

The agricultural sector is charged with emitting some 16.8% of Australia's total GHG's, from emissions of methane and nitrous oxides.

This figure is calculated by the Australian Greenhouse Office, (AGO) utilizing the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol to that convention. Under Article 3.4 of that convention and subsequent Protocol decisions about greenhouse accounting (The Marrakech Accords) a methodology has been created that ignores the reality of the well established carbon cycle thereby introducing unacceptable distortions that render the calculations totally meaningless.

Emissions of methane and nitrous oxides originating from agricultural sources are calculated and counted. By ignoring the corresponding and inseparable part of the carbon cycle by failing to account for the recapture of these gasses from the atmosphere, the claims made that 16.8% of Australia's GHG emissions arising from agriculture are blatantly and undeniably incorrect.

This fundamental accounting error may not have had any major adverse implications on the industry in the past, although the unjustified adverse publicity arising from these demonstrably incorrect figures positions the sector unfavorably in the public mind.

However this no longer is the case as the Government is proposing to introduce measures, such as a Carbon Tax or AETS, to reduce GHG emissions and under the present rules agriculture is described as being the second highest emitter.

This will have obvious, significant and adverse financial implications for the sector if the basis on which these calculations are made remains unchanged and the Government proceeds to introduce measures along these lines.

It is accepted that agricultural emissions of CO₂ are subsequently recaptured and that the industry in respect of CO₂ is carbon neutral. The same recognition should also apply in respect to both methane and nitrous oxides.

Methane, which has a calculated CO_{2-e} of 21, is broken down in the atmosphere by tropospheric oxidation by OH, over a much shorter time (8.4 – 8.9 years)¹ than carbon dioxide (a half life of some 120 years) and the carbon can be recaptured by subsequent plant growth.

Methane levels in the atmosphere (about 0.00015%) are no longer increasing, despite increased emissions from the extraction of fossil fuels, particularly coal, indicating that agricultural emissions of methane are not adding to the greenhouse effect.

Nitrous oxides, which have a CO_{2-e} of about 300, have a residency lifetime in the atmosphere of about one day², breakdown in the tropics and in the summer mainly occurring by reaction of NO₂ with OH and in the extratropical latitudes and in winter, it is mostly by a non-photochemical pathway involving formation of N₂O₅ and hydrolysis to HNO₃. The sum of these two processes results in a lifetime of NO_x of the order of one day.

The exception is in some urban areas when excess NO_x emissions from vehicles, exhausts the available supply of atmospheric OH, causing smog.

When NO_x is broken down into Nitrogen, the most abundant atmospheric gas (78.08%) and Oxygen (20.95%) or other formulations, there is no further anthropogenic effect.

¹ McConnell et al 1971; Weinstock and Niki, 1972; Levy et al., 1973; Heicklen, 1971; Kerr et al., 1972; Demerjian et al., 1974.

² Dentener and Crutzen 1993. Potter, Coleman and Fishman, 2000.

Plants (and all life forms) need nitrogen to grow and as pointed out above, increased levels of atmospheric CO₂ improves the efficiency of the root nodule bacteria to capture nitrogen from the atmosphere in a form able to be utilized by the plants and to add to the store of soil nitrogen.

A Carbon Tax or Emissions Trading Scheme (ETS)

As pointed out above there are multiple flaws in the proposal to include agriculture in an emissions trading scheme.

When the inputs into agricultural production that include a fossil fuel component, such as fuel, fertilizer, chemicals etc., are deducted, (as they are covered in other sections of the protocol), and the actual recycling of carbon is recognized, agriculture would then correctly be shown as a carbon neutral industry.

Agricultural production is founded on natural processes that have been occurring for many millions of years, resulting in a general equilibrium that has always varied with other natural events such as droughts, floods, cyclical events such as the El Nino / La Nina oscillation, the Pacific Decadal Oscillation and all the other climatic and environmental changes that are a normal and natural part of this dynamic ever changing Earth.

It makes inconsequential difference to attempt to differentiate between say a cow eating grass, or that grass being burnt or allowed to decay with the aid of bacteria etc. The net result is the same. The carbon will be lost to the atmosphere. It will be recaptured with the subsequent growth that occurs. The only thing that will change would be slight differences in the timing, but in the long term the equilibrium would be maintained.

There are substantial benefits to be gained from increasing the carbon stored in our soils. Australian soils are by world standards naturally low in carbon (a generalization) and past intensive cultivation practices have in some instances reduced this still further.

However under the present inept Protocol arrangements, the only form of carbon sequestration allowed under the rules, is that stored in new plantings of trees on cleared ground, that may not be harvested or removed (or at least not for a very long time).

This is in many ways an astounding, inappropriate and short-sighted arrangement, unsuited to the resolution of the perceived problem, causing a number of likely unintended consequences and failing to capitalize on solutions with real potential to both sequester carbon and provide direct benefits to agriculture and those dependant on it (most people).

Tree plantations (wood is about 50% C dry weight) provide a short term, limited, once off opportunity to sequester carbon. Short term, because they only sequester carbon in their young growing phase and are carbon neutral when mature.

Once off, because if they are harvested, or are burnt or die, (under the rules) 100% of the carbon is assumed to be released back into the atmosphere.

Limited, because while there is some opportunity to grow trees on actively managed agricultural land, there are real restrictions on their numbers and density on both cropping and grazing lands before they start to reduce the productivity of those lands.

On the other hand, there is a much greater potential to store vastly more carbon in the soil if this was allowed under the Protocol, and this would increase both soil fertility and productivity.

In view of the rapidly expanding human population of the world, and no net increase in agricultural land available to be brought into production, it would be foolish indeed to contemplate reducing further the area available to provide the food and fiber to an increasing world population, by planting large areas down to long term tree plantations.

The costs of an emissions trading scheme, if structured to actually achieve a genuine reduction of GHG emissions of 60% of 2000 emissions by 2050, as promised before the elections, would be devastating to the Australian economy.

It has been calculated that by 2050 emissions would have to be reduced by some 85% when allowances are made for the increases in population by then and the increased demand for energy that would have occurred.

It is difficult to imagine and impossible to cost effectively the lifestyle changes and other implications that would be imposed on Australians to decarbonise society to this extreme degree.

And the question needs to be asked, even if this seemingly impossible target were achieved, would it actually result in a worldwide reduction in GHG's and the consequential decline in temperatures that this theory anticipates?

There are at least two major grounds on which to base an emphatic negative answer to this question.

Firstly, China, India and many other nations will not agree to reduce their chances of improving their standard of living by adopting similar emission reduction schemes. This was made abundantly clear at Bali recently.

China alone is adding one new coal fired power station every week, enough on its own to swamp any reductions we might make.

The USA is in the initial stages of what could develop into a serious recessionary period that may last many years with unpredictable but adverse economic and other ramifications around the world including Australia.

This would result in a most inappropriate time to be adding to the economic difficulties that would arise, by imposing a clearly costly and highly disruptive ETS.

Secondly, If the IPCC computer models are wrong in their basic assumptions and misidentify the primary causes of the current warming, because of amongst other things, the failure of the modelers to incorporate the latest science in relation to this matter, (they only included science available up to 2005) the expected reduction in temperatures would not occur and the whole sorry business would be an extremely embarrassing failure.

Conclusion

The assumptions underpinning the rationale for this report are subject to strong scientific challenge from the recent developments in this area.

The case made by the IPCC that the climate change we are experiencing is almost certainly the result of anthropogenic emissions of greenhouse gasses is crumbling.

The latest theory, supported by current and historic records, observation and knowledge, is that changes in the magnetic flux of the Sun which increased dramatically last century, increases the strength of the Solar Wind, and that reduces the number of cosmic rays penetrating to the lower levels of the Earths atmosphere.

It has been demonstrated that these cosmic rays are instrumental in forming clouds from water vapour present in the atmosphere.

A clear correlation between the incidence of cosmic rays and the degree of cloud cover has been observed.

The change in low-level (< 3000 m) cloud cover is the single most important factor in determining average world temperature.

These findings clearly indicate that the mild warming we are currently experiencing is likely to be predominantly a result of these naturally occurring events.

There is no observational evidence on the other hand to substantiate the IPCC theory and computer model predictions. The anticipated anthropogenic greenhouse gas 'signature' in the equatorial troposphere is not there, indicating that anthropogenic GHG is not the cause of the present warming.

CO₂ in the atmosphere is critically important to biology and all life and benefits from increased levels of it.

There have been 8 major cycles of warming and cooling recorded over the last 12,000 years, and evidence indicates that the current temperatures are not unique, and that the range of many species expands in warm periods and they flourish and that they contract during the tougher and harsher colder ones.

If the situation described briefly above, after further investigation by the Review is shown to have merit then obviously a different set of recommendations would be required.

Sustainable prosperity in a changing climatic regime, can most effectively be achieved by targeting and spending our scarce resources wisely and this is best achieved by developing cutting edge, widely accessible, education facilities, technology and research into the drivers and timing of climate change to maximize our ability to adapt to change, whatever form that may take.

In view of the above, it is suggested that the Garnaut Climate Change Review should take what is written here as an awareness raising exercise and initiate its own open-minded investigation into the latest climate change science, and let that science speak for itself.