



# The Sustainable Engineering Society

*...engineering in harmony with ecology*

## COMMUNITIES OF PRACTICE STATEMENT FROM SENG

### CLIMATE CHANGE

#### **Science:**

Climate change resulting from human caused emission of greenhouse gases, principally CO<sub>2</sub>, Methane and Nitrous Oxide, has been exhaustively documented by the science community. Principal references include the reports of the Intergovernmental Panel on Climate Change (IPCC) and in the Australian context, a series of comprehensive reports by the Climate Commission. CO<sub>2</sub> levels in the atmosphere have now reached 400 ppmv, having risen from the pre-industrial era level of 280 ppmv. The increased level of greenhouse gases causes the atmosphere to absorb increased amounts of long wave infra-red radiation from the earth giving rise to an increase in the global average surface temperature. Greenhouse gases other than CO<sub>2</sub> add to the warming effect and equate to an equivalent CO<sub>2</sub> level in excess of 450ppm, expressed as CO<sub>2</sub>-e.

#### **Impacts:**

The primary observed impacts of increased greenhouse gases is an increase of about 0.8 °C in global average air temperature, some 200mm rise in sea level and a 30% increase in acidification of the oceans (0.1 drop in pH) over the last century or so. Major manifestations include the steady reduction in arctic summer ice cover by some 60% since 1960<sup>1</sup>, increased frequency of hot weather and extreme precipitation events, the latter due to increased moisture uptake by the warmer atmosphere. In Australia, the mean temperature has risen by 0.9°C since 1910<sup>2</sup>.

#### **Projections:**

Future projections of global and regional temperature increases depend critically on assumptions of future emissions. Without effective emission reduction policies globally, temperature increases are estimated to range between 3.7°C and over 7°C by 2100<sup>3</sup>. The significance of this may be appreciated by considering that the change in global average temperature between ice ages and interglacial periods (like the present) over thousands of years is about 6°C. Global sea levels are projected to rise by between 18cm and more than 50cm depending on future emission scenarios.

#### **Risks:**

The rate of change of climate is now occurring far quicker than it did under natural influences, mainly variations in the earth's orbit around the sun. Hitherto, changes occurred on millennial time scales giving species some opportunity to adapt. Changes occurring now on decadal time scales pose grave dangers of extinction for many plant and animal species. Specific risks to the natural world and human society arise from rising sea levels, increased frequency of extreme hot weather events and wildfires, more frequent heavy rain and flooding, changing climate patterns adversely affecting agricultural yield, health consequences of heat waves and spread of infectious diseases.

<sup>1</sup> Climate Commission Critical Decade page 9

<sup>2</sup> CSIRO/Bureau of Met State of the Climate 2012 page 3

<sup>3</sup> AAS 'The Science of Climate Change' 2010 page 13

### **Mitigation - global:**

Global efforts mitigate carbon emissions take place principally through the UN Framework Convention on Climate Change, an international treaty of 195 parties. The parties to the convention have met annually from 1995 in Conferences of the Parties (COP) to assess progress in dealing with climate change. In 1997, the Kyoto Protocol was concluded and established legally binding obligations for developed countries to reduce their greenhouse gas emissions. In 2010 at Cancún, it was agreed that future global warming should be limited to below 2.0 °C relative to the pre-industrial level. If this goal is to be achieved, global emissions will have to be reduced to close to zero by 2050.

While a binding global treaty is not yet in place, national and regional measures are being taken. Examples include the EU emissions trading system (ETS), trial ETSs in a number of provinces in China, an ETS in California, regulatory measures in the US on carbon emissions and vehicle fuel economy standards. More details are available in the Climate Commission's report on International Action on Climate Change.

### **Mitigation - Australia:**

Australia is directly responsible for about 1.5% of global emissions. While this sounds small, Australia ranks about 15th in absolute terms and is the highest per capita emitter of any developed country. This is primarily because of Australia's electricity generation being mainly based on coal.

Following the recommendations of the Garnaut Report in 2008, Australia has adopted a unilateral emissions reduction target of 5% below year 2000 levels by 2020. Further reductions would be adopted in line with future agreed international targets. The 5% by 2020 is bipartisan policy by the two major political parties in Australia.

The current government policy is to achieve this reduction by its clean energy package comprising a fixed price on carbon starting at \$23 per tonne of CO<sub>2</sub> increasing 5% per year until 2015 when it will be linked to international emissions trading markets. Two government agencies have also been created to promote the development and deployment of renewable energy. The Clean Energy Finance Corporation's role is to finance on a commercial basis, renewable energy and energy efficiency projects and technologies. The Australian Renewable Energy Authority's role is to provide financial support to the renewable energy sector. A further key measure is the Renewable Energy Target (RET) which requires that 41000 GWh of electricity be generated from renewable sources by 2020.

### **Adaptation:**

Because of the inertia of the climate system, warming will continue to some extent even if emissions are curbed drastically and quickly. Therefore, societies must take action to mitigate the impacts of climate change that are already occurring and that will intensify in the future. Adaptation will be necessary in many areas across society including:

- Urban planning as low lying areas become flood or inundation prone due to heavy rainfall, sea level rise and/or tide surges;
- Flood mitigation through upgraded drainage systems and levee banks;
- Water conservation as rainfall declines in certain areas e.g SW Western Australia;
- Building and construction standards as cyclone prone areas expand south;
- Health services to cope with greater incidence of heat stress and tropical diseases;
- Agriculture - diverse strategies required for particular sectors and geographic location<sup>4</sup>;
- Biodiversity conservation as species become vulnerable to changing climatic conditions.

### **Future policies:**

Current policies are shaped by a reluctance to move 'ahead' of other developed economies in adopting stronger emission reduction targets because of perceived economic disadvantage for trade exposed industries. Furthermore, climate action has been politicised for short term electoral advantage and to protect investment in fossil fuel mining and consumption.

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<sup>4</sup> See for example 'Climate change adaptation options for Australian agriculture' - CSIRO 2008

Australia's exported emissions through coal and gas substantially exceed its entire national emissions but are accounted against the country where these fuels are burnt. Directly and indirectly, Australia is a significant contributor to global emissions. These exported emissions dwarf any reductions that result from domestic policies such as the carbon price.

Policy considerations for the future should take into account:

Australia's 'moral responsibility' as the highest per capita emitter among developed countries;

Its particular vulnerability to climate impacts;

Its ability as a mid sized advanced economy, to be an exemplar to other countries, possibly accelerating global action;

Long term benefits of phasing out coal mining and export, thus reducing world coal supply and hastening a global shift to cleaner energy sources;

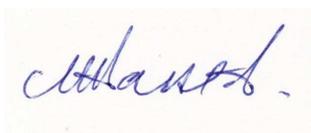
Economic benefits from being an early adopter in transforming industry to low emission technology and stimulating R&D in this sector.

**Prepared by:**

Michael Hassett

Sustainable Engineering Society

National Board Member



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**Endorsed by:**

Lara Harland

Sustainable Engineering Society

SENG National Board Chair



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