

03| Discussion Paper: Warming up in Queens- land? Climate change and policy responses on a multi-level playing field



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Warming up in Queensland?

**Climate change and policy responses
on a multi-level playing field**

**Discussion Paper 03/05 by the research project
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Abstract

This paper conceptualises climate change policy as a multi-level-process. It first highlights some possible effects of climate change in Queensland ecosystems as diverse as the Great Barrier Reef, the Wet Tropics, and agriculture. While potential vulnerability and climate change impacts are different in every locality, policy responses and adaptation strategies are shaped from the global to the local policy levels. With the North Eastern Australian State at the centre of attention, the paper investigates strategies to cope with climate change at different geographical levels of governance. It furthermore explores areas of accord and contradictions between these diverse policy responses and emission reduction strategies. One thread that emerges as common to all policy levels is the voluntary nature of mitigation strategies as well as the dominance of economic over sustainability considerations. Finally, the analysis considers the complex relationship between human activities and nature and reveals that political, social, cultural and economic interpretations of what constitutes the environmental crisis are part of the problem.

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1. Introduction

Climate change is a multi-level process. When analysing its causes and consequences, human activity is the starting point as it has growing influence on all of the world's ecosystems. Or more precisely: Nature and society become more and more inextricable. Both are linked in myriad ways. The world's leading scientific authority on climate change, the Intergovernmental Panel on Climate Change (IPCC), has found "new and stronger evidence that most of the observed warming over the last 50 years is attributable to human activities" (IPCC 2001a). It is primarily caused by the burning of fossil fuels such as oil, coal and gas over the last 250 years.¹ The availability and use of these most important energy sources depend on consumers' behaviour, lifestyle, purchasing power, economical and political interests, military power and technological innovations.

These dynamics of local greenhouse gas emissions and global warming are, at the same time, part of what we call globalisation. The term refers to interdependencies, intersections and interactions between local, national and international processes. Emissions in one part of the world cause environmental risks like rising sea levels, droughts and heat stress, flooding or the loss of biodiversity in other parts of the world. Equally, the emission of greenhouse gases in the industrialised countries changes human activities and agricultural conditions in developing countries. When forests are felled, both local weather and global climate are affected since the removal of trees causes shifts in humidity and temperature and stored carbon is released into the atmosphere. Global instruments like those elaborated in the United Nations Framework Convention on Climate Change (UNFCCC, 1992) and in the Kyoto-Protocol (1997) have far-reaching impacts on states and communities.

But climate change is not only a question of the interdependencies of space; it is also a question of time, more precisely of time delays. That is to say that change in the ocean-atmosphere systems, and especially the rising of sea levels, will continue long after the stabilisation of greenhouse gas concentrations in the atmosphere. Also, time lags in socio-economic systems which can be influenced by human decision-making have the effect that adaptation to the impact of climate change as well as emission mitigation strategies will take time to be devised and implemented and would be more costly if they needed to be put into practice rapidly. "The longer adaptation and mitigation measures are delayed, the more rapidly they may have to be undertaken later" (Pittock 2003: summary).

In this case study on Australia's reactions to global warming, I will explore the connections between local and global structures and processes as well as the relationship between nature and society. My key questions are: **(1)** What are the main strategies to cope with the problem of climate change defined through the international community, the federal government, the state government of Queensland and local communities? **(2)** How are they connected with each other? **(3)** And what are the contradictions between the different approaches to the issue of

¹ The IPCC suggests that the concentration of atmospheric CO₂, the main greenhouse gas, has increased from pre-industrial levels of 280 ppm around 1750 to 367 ppm in 1999. Without a reduction in the use of fossil fuels, CO₂ concentrations will reach 650 ppm by 2100 (IPCC 2001a).

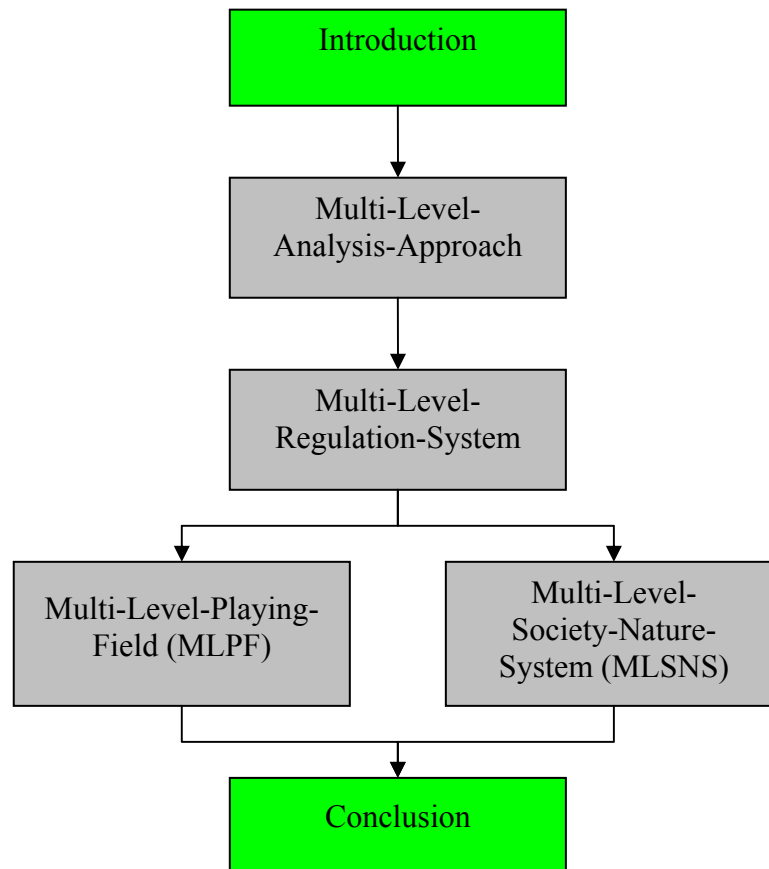
climate change? To answer these questions I take the following hypothesis as a starting point: We can only understand and analyse global change and climate politics if we take the interfaces between the different levels of impact, response, and the complex relationship between society and nature into account.²

Box 1: Dissecting the playing field (5 steps)

- (1) Define the *levels* (geographical, actors, political system etc);
- (2) describe the *responses* to the problem and analyse the scientific “interpretation” of the problem;
- (3) find areas of *accordance or contradiction*;
- (4) identify and analyse *patterns of regulations*;
- (5) formulate the *conclusions*.

The first step in my Multi-Level-Analysis-Approach (MLAA) is to select various ecosystems which, for purposes of analysis, are separated from each other. Apart from the Great Barrier Reef I will also focus on the Wet Tropics and on agricultural systems. I will then go on to analyse the different levels in the political system, that is to say a Multi-Level-Regulation-System (MLRS). This examination is also aimed at revealing how the *problem* is scientifically “interpreted” and responded to at different levels. The identification of patterns of political regulations and of areas of accordance among regulatory approaches as well as contradictions is part of what I call a Multi-Level-Playing-Field (MLPF). Last but not least, I will attempt to delineate elements of the complex relationship between society and nature or what I call a Multi-Level-Society-Nature-System (MLSNS).

² For example, in Tuvalu the sea level rise could result in salt-water intruding into the country’s limited arable land. Tuvalu’s Government has asked larger countries such as Australia and New Zealand to consider accepting “climate refugees” in the event that rising sea levels force them to evacuate. A Pentagon Report suggests: “...Climate Change and its follow-on effects pose a severe risk to political, economic and social stability. In less prosperous regions, where countries lack the resources and capabilities required to adapt quickly to more severe conditions, the problem is very likely to be exacerbated. For some countries, climate change could become such a challenge that mass emigration results as the desperate peoples seek better lives in regions such as the United States that have the resources to adaptation” (Schwartz / Randall 2003: 5).

Figure 1: Multi-Level-Analysis-Approach (MLAA)

In the theories of International Relations, the complex interaction of social processes, economic interests, ecosystems as well as space and time are not sufficiently considered. Rather, problems of global reach are traditionally conceptualised as state problems. However, global problems such as climate change are too complex for a government-driven approach to suffice to resolve them. International negotiations over the past 15 years – with their strong focus on the economy and international regulatory instruments – have so far been insufficient. This is the reason why this article takes an interdisciplinary approach to climate change and prefers the term “multi-level governance” to describe and analyse Australia’s different mechanisms for addressing the problem. In the final analysis, all economic, social, political and ecological elements should be taken into account. But it is still neither clear nor decided, if multi-level governance is becoming an analytical toolbox or even a theoretical framework.

2. How will climate change affect Australia?

Australia’s average temperature has risen by 0.7°C over the last century. Looking into the future, most of Australia will experience temperature increases of 0.4 – 2.0°C by 2030 and 1.0 – 6.0°C by 2070 compared to 1990 (CSIRO 2001a). But even at a low level of increase, the anthropogenically-induced warming has a profound impact on Australia’s ecosystems,

agriculture and living conditions (CSIRO 2001b, Reynolds 2002, Pittock 2003: Summary).³ Among the potential effects are the following:

- Increasing cancer risk due to the reduction of the ozone layer;
- climate-related death, most favourable conditions for mosquitoes;
- destruction of the Great Barrier Reef or damage from coral bleaching;
- rapid loss of species with narrow annual mean temperature ranges;
- increased frequency of droughts, reduced snow cover, or more frequent El Niño type conditions in the Pacific over this century;
- abrupt changes in Australian rainfall regimes;
- a possible increase in tropical cyclone intensity with higher peak winds;
- and rainfall intensities and a rise in sea levels of up to approximately 90 cm by 2100 due to the slow warming and consequent thermal expansion of the oceans.⁴

In this paper I will describe the impact of climate change on Queensland⁵, using the three examples of the Wet Tropics and the Great Barrier Reef (GBR) – two of Australia’s World Heritage Areas (WHA)⁶ – as well as agriculture. I will provide an overview of the potential effects of climate change and examine the complex relationship between ecosystems, social processes and economic interests. But it cannot be ignored that much of Australia is the subject of multiple ecological problems.⁷ Human-induced pressure on the environment includes the clearing of native habitat, habitat fragmentation, altered drainage patterns and flow regimes or pollution from agriculture and urban run-off.⁸

Wet Tropics: The Wet Tropics cover less than 0.1% of the Australian continent. Nevertheless the Wet Tropics are rich in biodiversity, containing significant concentrations of Australia’s plant

³ Worldwide the average temperature has risen by around 0.6°C over the last century and is predicted to rise a further 1.4 to 5.8°C before the turn of the next century (IPCC 2001b: technical summary). But global warming has not only negative effects: Scientists suggest that, for example, the New Zealand wine industry could become one of the main beneficiaries of climate change (Halliday 2004).

⁴ More than 80% of Australia’s population resides within 50 km of the coast, with further growth anticipated (CSIRO 2001b). The number of people exposed to flooding due to sea level rise in Australia is predicted to approximately double in the next 50 years, although absolute numbers will be low (Pittock 2003: 155).

⁵ In Queensland, the rate of warming is predicted to be similar to the rest of the world.

⁶ In total there are 15 Australian sites on the World Heritage List (e.g. the Kakadu National Park, the Willandra Lakes Region, the Lord Howe Island Group, the Tasmanian Wilderness, Uluru-Kata Tjuta National Park as of May 2004). For more details regarding the concept of World Heritage see www.unesco.org/whc. Information about the Great Barrier Reef can be found at www.gbrmpa.gov.au and for the Wet Tropics see www.wettropics.gov.au. Worldwide, 754 sites are listed in the WHL (as of May 2004): 582 cultural, 149 natural and 23 mixed properties in 129 State Parties.

⁷ “Research and conservation attention needs to be focused not only on global warming and each of the other stressors by themselves, but also on the synergism of several pressures that together are likely to prove to be the greatest challenge to animal and plant conservation in the twenty-first century” (Root *et al.* 2003: 59).

⁸ More research on such complex causalities is necessary. Nevertheless the Federal Government rejected a funding application of the North-Queensland-based reef and rainforest Cooperative Research Centres (CRCs) in April 2004. The signal to the CRC was that The aim is to drive research further towards commercialisation and, following from this, direct product innovations. This development not only concerns scientists. Tourism Tropical North Queensland is concerned that the tourism industry’s access to expert advice will be hindered while the region’s intellectual capacity is being significantly reduced. (Call for a review of research 2004) There is strong pressure on Australian scientists to justify their activities in terms of short-term economic gains rather than with respect to social or future benefit.

and animal species, including mammals, birds, frogs, reptiles, fish, butterflies and fern. Many of these are 'endemic' (i.e. found nowhere else on earth) and live or occur only in the cooler regions of the Wet Tropics where the mountain tops and higher tablelands exist as cool islands in a sea of warmer climates. These islands are separated from each other by warmer valleys and provide a scattered archipelago of habitat for organisms that are unable to survive and reproduce in warmer climates (Rainforest CRC 2003). Hence, most of the endemic organisms and the tropical forests of Northern Queensland itself are highly sensitive to climate change. Many Australian species, both flora and fauna, have evolved to cope with large year-to-year variability, but not with long-term change in the average climate.⁹

The evidence for climate change impacting on biodiversity and hence the latter's vulnerability is increasing all the time (Krockenberger *et al.* 2003, for a global scenario see Root *et al.* 2003: 57). But in the face of unprecedented climate change it is still difficult to predict the exact impact of global warming on flora and fauna or on ecosystem processes. Research results on rainforests from other parts of the world indicate, however, that the following phenomena probably reflect responses to climate change (, Rainforest CRC 2003):

- both latitudinal and altitudinal shifts in species ranges;
- changes in abundance and local extinctions;
- changes in growing season's length;
- earlier shooting and flowering of plants and earlier breeding of birds or earlier arrival of migrant birds;
- changes in morphology (e.g. egg and body sizes);
- breakdown in symbiotic relationships; and
- in general, spring activities have occurred progressively earlier since the 1960s.

With a larger increase in temperature, the habitat of a number of species will completely disappear and possibly drive these species to extinction. The conservation status of the Wet Tropics bioregion already includes 351 officially listed rare and threatened plant and 98 animal species, which is 39% of the Wet Tropics Regional Ecosystems (REs).¹⁰

Great Barrier Reef: The Great Barrier Reef Marine Park (GBRMP) is 2000 km long and covers an area of 35 million hectares making it the world's most extensive coral reef system.¹¹ Coral reefs are the most spectacular and diverse marine eco-systems on the planet. They contain a great diversity of species and habitats including different seaweeds, fish species, and whales,

⁹ Root *et al.* (2003: 57) gathered information from 143 studies for a meta-analysis on the impact of climate change on plant and animal species reaching the following conclusion: "... the balance of evidence from these studies strongly suggests that a significant impact of global warming is already discernible in animal and plant population".

¹⁰ 'Rare' refers to species or taxa not presently endangered or vulnerable but at risk because of small population size. 'Threatened' refers to those species that may be in danger of extinction due to natural or other processes including species of endangered, vulnerable and poorly known status. 'Endangered' refers to those species in danger of extinction and unlikely to survive unless threats are removed (Trott 1995).

¹¹ Contrary to popular belief, the reef is not a continuous barrier, but a broken maze of coral reefs and coral cays. It comprises some 2800 individual reefs, of which 740 are fringing reefs. These reefs range in size from less than one hectare to more than 100,000 hectares, and in shape from flat platform reefs to elongated ribbon reefs.

mangroves, coral systems, soft bottom communities and island communities. This area is already threatened by the 0.3-0.4°C rise in ocean temperatures that occurred during the 20th century and the water is predicted to continue warming at an accelerating rate throughout the 21st century (WWF 2003a: 5). The temperature increase is the cause of the frequency and severity of coral bleaching, a condition that can seriously damage and kill entire coral reefs worldwide. Since the 1970s, it has affected several areas in the GBR and other coral reefs (Hoegh-Guldberg 1999, Pittock 2003: 103-104).

Corals contain microscopic algae called zooxanthellae that provide the coral with food and give them their vibrant colours. Rising ocean temperatures cause corals to become stressed, and they expel the zooxanthellae and turn white or bleach. If zooxanthellae do not return to the coral's tissue the coral will die. The IPCC (2001a) concludes that "the most likely outlook is that mass bleaching, leading to the death of corals, will become a more frequent event on Australian coral reefs in coming decades". Every coral reef examined in Southeast Asia, the Pacific and the Caribbean showed the same trend (Hoegh-Guldberg 1999). They could be eliminated from most areas of the world in less than 100 years. As the Queensland Tourism Industry Council notes, „we are at risk of seeing the most pristine coral reef system degrade over the next few decades, with macroalgae (seaweed) taking over from the coral, and drastic changes to fish populations and biodiversity generally. This is already happening in large areas of the reef as a result of climate change and other impacts" (QTIC 2004).¹²

The impact of climate change on the GBR is furthermore exacerbated by other ecological stresses: Over the past 150 years, sediment and nutrient levels on the Reef have quadrupled, largely due to grazing and cropping expansion in its catchment area and loss of native vegetation, wetlands and riparian areas. At present, rivers carry an average of 14 million tonnes of sediment, 49,000 tonnes of nitrogen and 9,000 tonnes of phosphorus into the GBR each year (WWF 2003a: 4, CRC Reef Research Centre 2003). However, climate change differs from these problems in that the effects will be indirect and perceptible only in the long run, making the prediction of future problems difficult.

Agriculture: Global warming will also change agricultural production in Australia. Many commercial crops and livestock in Australia are already at the limit of their natural productivity and are vulnerable to added stress from higher temperature and changes in rainfall patterns. Passey (2003a: iii) projects that climate change is likely to reduce rainfall in the rangelands. This could reduce pasture productivity by about 15% and live-weight gain in cattle by 12% while substantially increasing variability in stocking. Dairy cows are projected to produce 30% less milk, and new pests are likely to spread in fruit-growing areas. Furthermore, increased heat stress-related livestock deaths are expected. Heat stress in Australian beef cattle has already

¹² Biodiversity is inextricably linked to climate change (see i.e. Krockenberger *et al.* 2003) but unfortunately the Biodiversity and the Climate Change Conventions of the United Nations (UN) are not systematically interconnected. The existing bodies are only at the beginning of coordinating their work: The Convention on Biodiversity has an Ad Hoc Technical Expert Group. The Secretariats of the Climate and Biodiversity Conventions as well as the Convention to Combat Desertification have established a joint liaison group to help link up initiatives related to the three conventions.

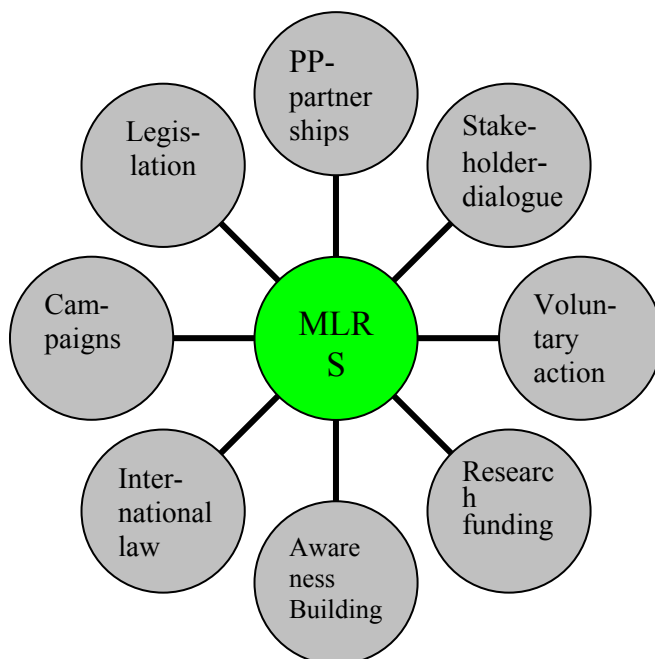
increased by 40% between 1957 and 1996 and is estimated to increase by a further 138% by the year 2050 due to climate change.

Additionally, warmer conditions are projected to lead to a 10%-reduction of the drinking water supply; the competition for an already over-allocated water supply will increase the price of agricultural products and place further stress on rivers and ground water systems supporting arable land. Moreover, evidence suggests that the observed warming trend in Australia has already contributed to an increased severity of drought through higher evaporation and water demand (Pittock 2003: summary). The drought experienced during 2002 is, according to Karoly *et al.* (2003), “the first drought in Australia where the impact of human-induced global warming can be clearly observed”.¹³

3. Australia’s climate policy –a multi-level approach

Several case studies on the Wet Tropics, the Great Barrier Reef and the Australian agricultural sector – some of them mentioned above – have indicated that anthropogenically-induced climate change can complement and reinforce detrimental effects of human exploitation and push species and ecosystem tolerances over their limits. The three given examples of potential effects of climate change clearly illustrate the complex relationship between nature and society as well as the relationship between global and local, highly heterogeneous processes. The question is now, how political, economical and social actors react to the environmental crises. Possible responses are shown in the figure below.

Figure 2: A Multi-Level-Regulation-System (MLRS)



¹³ Climatically, the 2002 drought was the worst in the last 100 years. The 11 months from March 2002 to January 2003 were Australia’s second driest period since 1890 (1946-47 was drier). “But high temperatures and record evaporation push this drought into a class of its own: dams dried, bushfires raged and irrigation allocations slashed” (Wahlquist 2004).

3.1. Australia's stance in international negotiations

In 1997, the Australian Government signed the Kyoto Protocol only after other countries conceded an increase of emissions to Australia, a privilege only few countries enjoy. However, Australia does not want "to be bound by the Protocol The Government has decided not to ratify the Kyoto Protocol at present because it is not in Australia's interest to do so. There is no clear pathway for actions by developing countries and the United States has indicated that it will not ratify. Without the involvement of all major emitters, the Protocol would deliver only about 1% reduction in global greenhouse gas emissions. The Government is committed, however, to Australia's target, agreed under the Kyoto Protocol, of limiting greenhouse gas emissions to 108% of 1990 levels over the period 2008-12" (www.greenhouse.gov.au, April 12, 2004). The reasons mentioned on the website of the Australian Greenhouse Office (AGO)¹⁴ are not convincing for at least two reasons:

First, regarding actions by developing countries, there is indeed a lack of a clear pathway for reducing or minimising (fast growing) greenhouse gas emissions. But the Kyoto-Protocol and especially the results of the negotiations of the Conferences of the Parties in New Delhi, India, in 2002 (COP8) and in Milan, Italy, in 2003 (COP9) specified details related to the flexible mechanisms for industrialised countries (Kyoto Mechanisms), among them the very ambitious Emission Trading System (ETS).¹⁵ It is internationally accepted – and embodied in the Climate Change Convention – that the industrialised countries, being the main emitters of greenhouse gases in the past, have to go ahead in the future. The European Union and its member states are already on the way to implement these instruments. Nevertheless, the ETS will not be established in Australia. The decision of Prime Minister John Howard and the cabinet represents a "big win" for the power companies, miners, aluminium producers and manufacturers who lobbied hard to stop the trading system (Bachelard 2003).¹⁶

The debate on the developing countries' part in addressing the problem of emissions and whether they need to make stronger commitments is necessary. But the debate about effective participation mostly seems to be a strategy to obstruct the international negotiation process by worsening the relationship between industrialised and developing countries. The debate diverts attention "from the real issue – implementation of the Kyoto obligations by industrialised countries" (Ott 2003). The Federal Government of Australia used this argument to justify its reserve to ratify the Protocol. At the same time, this position was part of the United States' strategy to prevent the Protocol from entering into force. Both countries prefer to build bilateral partnerships – and by this to weaken multilateral agreements. "Australia's bilateral partnerships

¹⁴ The Australian Greenhouse Office has the aim to lead "Australia's greenhouse action to achieve effective sustainable results" and "to contribute to Australia's role in international activities and negotiations on climate change and climate change response" (www.greenhouse.gov.au, 25 January 2005).

¹⁵ In August 2000 the Commonwealth ruled out the early establishment of domestic emissions trading in Australia: it would not be introduced until the Kyoto Protocol had been ratified by Australia and had entered into force, and an established international trading regime was in place (Saddler 2001).

¹⁶ The decision was a rebuff to the Federal Treasury and Environment Departments which had pushed the proposal for the trading system and co-sponsored it through their Heads, Treasurer Peter Costello and Environment Minister David Kemp (ibid.).

on climate change¹⁷ are, in this sense, part of the global picture of a new kind of international relations: they reflect a power shift from the international community and the United Nations to the United States as well as from multi- to bilateralism.

The *second* argument is that without the involvement of all major emitters the Protocol would not meet its target and is again not convincing for two reasons. Firstly, the Government refuses to ratify the Kyoto Protocol on the grounds that it would only deliver a reduction of approximately 1% of global greenhouse gas emissions, while the Kyoto Protocol is aimed at a 5.2% reduction. However, there is no reason why a single country could not go ahead in order to obtain first mover advantages (e.g. through investments in technologies for renewable energy or savings through early adaptation strategies). Secondly, this position does not explain why the Government still intends to fulfil its commitment made in the Protocol.

Table 1: Australia's problems and responses in international relations (global level)

Problems	Responses
<ul style="list-style-type: none"> - Difficulties to meet the "Kyoto-Target" (108 % CO₂ emissions until 2012 compared to 1990) - Ambiguous relationship to the United Nations - Threat to Australia's global competitiveness - Strong dependencies on the world market (exporting fossil fuels, economic growth). 	<ul style="list-style-type: none"> - Refusing to ratify the Kyoto-Protocol, despite the Government declaring that it will comply with the Kyoto commitments - Together with the United States Australia tried to prevent the Protocol from entering into force - Arguing that there is not a clear pathway for actions by developing countries - Supporting climate change research (impacts and adaptation), especially the IPCC - Strong partnership with the United States and with other opponents of the Kyoto-Protocol

¹⁷ Australia also entered bilateral partnerships with Japan, New Zealand, the European Union, and China (www.greenhouse.gov.au, 25 January, 2005).

This raises the question what are the reasons for Australia's incoherent "global" climate change policy. The Australian Government seems to follow three paths:

- a) The Australian Government, like the USA, takes part in international negotiations. Nevertheless, the government has not yet ratified the Kyoto-Protocol. The likely reason is that the government (together with other like-minded countries) may be able to influence the negotiations towards market-based policy approaches.
- b) Due to Australia's strong dependency on exports, such as fossil fuels, the Australian Government tries to spare industry from strict emission reduction targets and rather builds on voluntary action and bilateral public-private partnerships (PPPs) with the industry.
- c) The Australian Government strongly supports the position of the United States as a "benign" hegemony. Close economic ties between Australia and the United States form part of the background of Australia's strategic position.

3.2. National level: Federal Government and the Industries

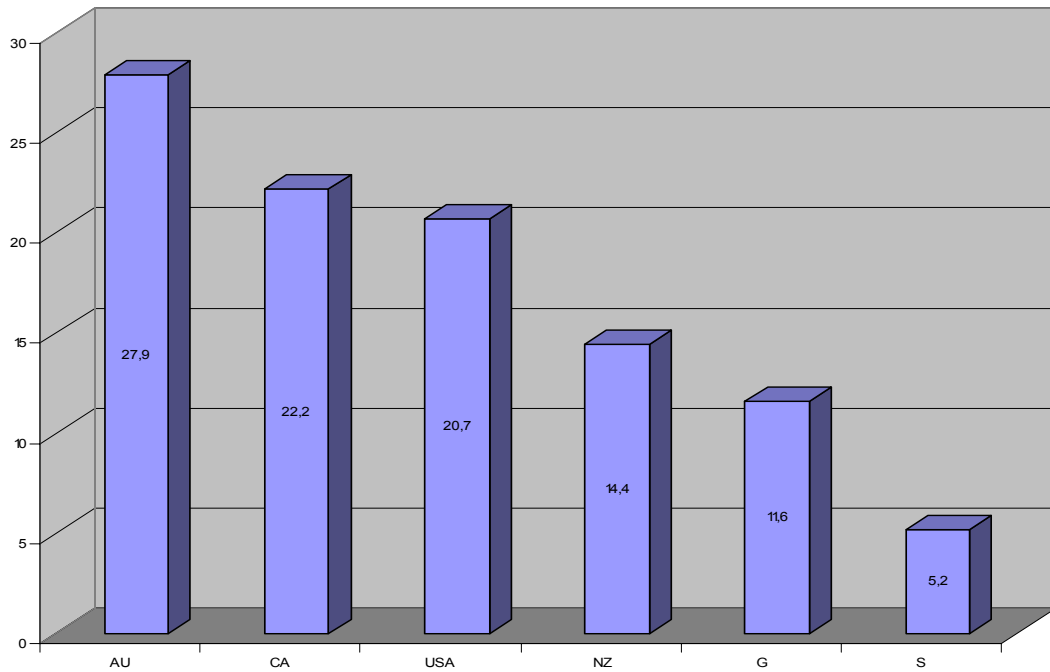
According to Pollard (2003: 6), the Australian Government is failing to define a clear nationwide strategy to reduce emissions in the long-term. His study for The Australia Institute, "Missing the Target", concludes that the largest government-funded program for the reduction of greenhouse gases, the Greenhouse Gas Abatement Program, "is biased against innovative technologies; contributes little to achieving the Kyoto target; and will prove a waste of money in the long run". But is this really the case? Before I discuss Australia's strategies to cope with climate change I shall outline the development of greenhouse gas emissions from 1990 to 2002 based on the National Greenhouse Gas Inventory (AGO 2004b).

Under the inventory accounting provisions for the Kyoto target¹⁸, Australia's net greenhouse gas emissions across all sectors totalled 542.6 Mt of carbon dioxide equivalent in 2001 and 550 Mt in 2002 – with great differences between sectors. Emissions in 2002 were 1.5% higher than in 2001 and 1.3% higher than in 1990. From 2000 to 2001, emissions declined by 0.4% (2.3 Mt). Total emissions were at their lowest point in 1992, and were at a high point in 1998. After 1998 they decreased every year until 2002, and were 0.1% lower in 2001 than in 1990. Because emission levels in 2001 and 1990 were so similar, changes in the other macro indicators (emissions per capita and emissions per unit of GDP) in effect reflect changes in the size of the population and in GDP. Population grew at an average rate of 1.2% per annum between 1990 and 2001. According to AGO (2004b), the CO₂ emissions per capita declined from a high level of 31.8 tonnes in 1990 to 27.8 tonnes in 2001 or by 12.5% over that period. According to other references, Australia's per capita emissions grew from 26.0 tonnes in 1994 to 27.9 tonnes in

¹⁸ The accounting provisions for Kyoto differ from those under the United Nations Framework Convention on Climate Change (UNFCCC), most notably in the way sinking forests are treated. Under Kyoto accounting, the credit for carbon sequestered in plantations will be accounted for in 2008–12 only. "However, the inclusion of an estimate in pre-2008 Inventories facilitates an understanding of Australia's emission trends in relation to the 108% Kyoto target" (AGO 2004b: 7).

1999 (Turton/Hamilton 2002). Economic activity grew at an average rate of 3.2% per annum between 1990 and 2001 (AGO 2004b).

Figure 3: Per capita emissions in industrialised countries in 1999



Source: Turton / Hamilton 2002 (own graphic)

The falling trend in emissions per unit of GDP can be explained by a number of factors, including structural change in the economy; the reduction in emissions from industrial processes; the relatively small increase in emissions from the agricultural sector; the reduction in emissions from land use change; increasing recovery of CH₄ in the fugitive emissions and waste sectors; and improvement in the average efficiency of energy use. The reduction in land use change emissions alone accounted for over a third of the decline in emissions per dollar of GDP. Because this reduction will not continue at the same rate in the long term, it will be difficult for Australia's Government to reach the 108% Kyoto target in the years 2008 to 2012. Overall economic growth and sector trends are critical factors in the growth of emissions as energy consumption has historically grown in tandem with economic output. In Australia's case, all sectors except for land use change activities (emissions which are highly uncertain) generated higher greenhouse gas emissions than in 1990.

The increase arose from sources related to production, processing and the use of energy, including the generation of electricity. Over the period 1990 – 1999, both greenhouse gas emissions and coal consumption for power stations increased in Australia. The trend of growing coal use has been more dramatic than the OECD-average and steeper than in countries like the USA (Diesendorf/Saddler 2003, see below). A widely expressed view mainly accredits this to an

increase in the output of energy intensive export commodities. But this is incorrect.¹⁹ Rather, it results from the consumption of electricity. Emissions also grew rapidly in transport while they increased only moderately in the waste and agricultural sectors and hardly at all in industrial processes.

Table 2: Australian Greenhouse Gas Emissions – Trends by Sector

	Total of net emissions in 2002	Trend compared to 2001	Trend compared to 1990
Energy	292.1 Mt (53.1%)	+ 1.4 Mt (0.5%)	+ 67.9 Mt (30.3%)
Transport	79.2 Mt (14.4%)	+ 2 Mt (2.5%)	+ 17.2 Mt (27.8%)
Industrial processes	26.4 Mt (4.8%)	+ 0.65 Mt (2.5%)	+ 0.25 Mt (0.9%)
Agriculture	105.6 Mt (19.2%)	+ 0.4 Mt (0,3%)	+ 10.5 Mt (11.1%)
Waste	17.6 Mt (3.2%)	+ 0.5 Mt (3.1%)	+ 2.3 Mt (15%)
Land use, land use change and forestry	29.2 Mt (5.2 %)	+ 3.3 Mt (12.6%)	- 91.2 Mt (-75.8%)

Totals and percentages may not correspond exactly due to rounding.

Source: Australian Greenhouse Office (AGO 2004a, b, c).

Let me now turn to the question of national strategies to cope with the increasing emissions in almost all sectors of Australia's economy.

Policies regarding fossil fuels: 85% of Australia's electricity is generated from burning coal (AGO 2004b: 26). After Poland (96% in 2000) and South Africa (92%) and followed by China (75%), Australia is therefore one of the few countries in the world that is highly dependent on coal for its electricity. 24 coal power stations are the largest source of greenhouse gas

¹⁹ Prospective export projects in such industries as liquefied natural gas (LNG), or direct reduced iron and magnesium metal, will, if they go ahead; significantly increase Australia's greenhouse gas emissions. By contrast, exporting coal has little impact on Australia's emissions since coal mining is not particularly emissions intensive. But using coal has a big impact on the emissions of the importing country (Saddler 2001).

emissions in Australia, pumping out 170 million tonnes of carbon dioxide every year. The pollution from these power stations is Australia's main contribution to the problem of global warming (Diesendorf / Saddler 2003). There are no indications that the Australian Government will change this dominant position, and strongly discontinue supporting the expansion of cheap energy options. Legal requirements to prevent greenhouse gas pollution from coal fired power stations do not exist, and there are no disincentives against building new coal-fired power stations (ibid.).

The budget announced by the Australian MP John Howard in May 2004, involves an environmental budget item of AUS \$70.3 million for a series of climate change projects. Extra funds will flow into emissions' management programs, into scientific projects designed to learn more about climate change, to the Australian Greenhouse Office, and the cooperation initiatives with the industry: "We are strengthening our partnership with industry, building on the success of the Greenhouse Challenge [Program] and delivering an expanded industry partnership program", said the Environmental Minister, David Kemp (Green focus on year ahead 2004). The commercial and industrial focus in providing environmental funding can hardly be overlooked. New legislation is not planned either. As a result, Greenpeace criticised the budget vigorously: "The key climate change failure of the Budget, is that it increases subsidies and research funding for fossil fuels rather than for renewable energy ... It's a tired government with no forward strategy on the looming challenge of climate change" (Greenpeace 2004).

The Federal Government is, furthermore, funding three Cooperative Research Centres (CRCs) devoted to fossil fuel industries. One of these has been renewed for 7 years from 1 July 2003 onwards, with an additional \$21 million of government funding. In the 2004 budget "the Government announced new concessions that will allow companies to claim 150%, up from 100%, of their exploration spending in designated areas as a deduction against their Petroleum Resource Rent Tax liability, which is levied at 40% of taxable profit" (Trounson 2004). The Federal Government is also providing approximately \$240 million in excise exemption and a \$35 million subsidy to develop oil shale (www.greenpeace.org.au/climate/government/index.html). The Stuart Oil Shale Project in cooperation with Southern Pacific Petroleum (SPP) is developing a technology to extract oil from shale rock in a process that produces nearly 80% more greenhouse gas emissions than conventional oil. It is investment in a deregulated energy market with speculative profits, rather than institutional transformation, which is supported by Australia's Government.

Renewable Energy (Electricity) Act 2000: The Renewable Energy (Electricity) Act 2000²⁰ established the Mandatory Renewable Energy Target (MRET) on the basis of 1997 renewable energy use. This requires Australian electricity retailers and other large buyers of electricity to collectively draw an additional 9500 gigawatt hours of electricity per annum from renewable sources by 2010 through to 2020. According to the Australian Business Council for Sustainable Energy (BCSE) the MRET "was a good start, but the target was too low" (Australian Business

²⁰ The Act originated as part of the Prime Minister's 'Safeguarding the Future: Australia's Response to Climate Change', announced in November 1997. The Act is supported by the Renewable Energy (Electricity) (Charge) Act 2000 and the Renewable Energy (Electricity) Regulations 2001 (the Regulations).

Council for Sustainable Energy 2004a).²¹ The Tambling Review Panel on the MRET²² even considered recommending that the target be lifted by 10% before 2010 (see also Queensland Tourism Industry Council 2004: summary). Climate change campaigners have been criticising the MRET for not encouraging renewable energies. In contrast, business lobbyists have blamed the Government for being too favourable in its response (Tambling report's winds of change 2004). The Government, however, even rejected a recommendation of the Tambling Review that the "MRET targets ... continue to increase beyond 2010 at a rate equal to the rate before 2010, and ... stabilize at 20,000 GWh in 2020" (AGO 2004d: 2). On the other hand, its White Paper 'Securing Australia's Energy Future' provides for \$134 million in new funding for the development of renewable energies, specifically their commercial development, storage technologies, and improvement of wind forecasting. An extra \$75 million flow into a Solar Cities Trial (Australian Government 2004).

In a growing market – over the last 25 years electricity consumption in Australia has grown 2.6% per annum – a 2% target will not keep up with the electricity demand. The Legislation also adopts a loose definition of 'renewables' which includes unsustainable biomass and large-scale hydro power.²³ In recent years, the Government has withdrawn strategic support for clean energy research and development (R&D) in renewable energy sources while the fossil fuel industry has received more than \$100 million in Government funding for three Cooperative Research Centres. At the same time, the Government declined funding for the proposed Solar Cooperative Research Centre (CRC) (Australian Business Council for Sustainable Energy 2004b; Chopping research ridiculous 2004). The proposed CRC was to be a co-operative project between five universities and six Australian solar energy companies. Instead, the Government focused on market based mechanisms to achieve the 2% increase in the proportion of electricity produced from renewable sources by 2010. In a so-called de-regulated market where the fossil fuel industry is heavily funded, renewable energy has become less competitive as crude market forces which have led to an increase in cheaper electricity generation from sources such as brown coal.²⁴

Adaptation in Agriculture: Australian agriculture is accustomed to a large year-to-year climate variability and therefore adaptation strategies to moderate the effects of extreme weather, such as droughts and heavy rainfall are already under way. The most important ones are: 1.) investments in new technology (Australian grain growers have boosted productivity by 4% each year during the past 20 years); 2.) changes in cultivation-strategies (e.g. the replacement of a

²¹ The BCSE has identified 2350MW of renewable energy projects that are already under development. Only 64% of these (1500MW) will be required to meet the existing MRET of 9500GWh (Passey 2003b).

²² Named after its chairman, Hon Grant Tambling, former Parliamentary Secretary and Senator for the Northern Territory.

²³ Another definition of renewable energy includes wind energy, solar energy, marine energy, geo-thermal energy, highly efficient and sustainable use of biomass, and small hydropower (less than 10MW).

²⁴ On a more symbolic note, Australia's post promoted renewable energies with a special issue of four stamps, celebrating Australian renewable energy production from sun (solar), water (hydro), wind and organic matter (biomass).

two-year rotation of wheat, grains, oilseeds or legumes and more efficient fertilisers²⁵; 3.) investments in farm management security's accounts (in June 2002, as the drought was starting to bite, 43,000 farmers had invested \$2.07 billion in these deposits); and 4.) Government drought support (because the system has several problems, the Federal Agriculture Ministry works on a new criteria for drought support²⁶). Also some general transformations of the farming sector may facilitate easier adjustment to potential drops in income: Between 1986 and 2001 the number of farming families in Australia dropped by 22%, and hence fewer farmers run larger farms. Additionally, many farmers now have two incomes after taking up jobs on their farms. But are these strategies sufficient to cope with the long-term change in the average climate trend caused by CO₂ emissions? The contrary seems to be the case: Although adaptation to climate change via new crops, technologies, and management practices may regionally be successful, in particular the investment in new technology will result in higher energy intensity. As shown above, emissions from agriculture were 10.5 Mt (11.1%) higher in 2002 than in 1990. In spite of this, the sector hardly invests in renewable energies or profits from subsidies promoting these. Furthermore, the general focus still remains on large-scale monocultural and often export-oriented agriculture which requires high fossil fuel inputs as well as fertilisers and pesticides. Long term effects of global warming on agriculture, such as potential threats to food security, have not even been discussed yet.

Environmental Protection Legislation: The Environmental Protection and Biodiversity Conservation Act of 1999 (EPBC Act) established a new Commonwealth regime for the protection and conservation of biodiversity. It is also intended to ensure that Australia meets its obligations under several international environmental agreements. Last but not least, the EPBC Act clarifies specific responsibilities for natural resource management among the Commonwealth and the States and Territories. It establishes a new Commonwealth environmental assessment process for the protection of matters of national environmental significance. A number of environmental organisations have been highly supportive of the Act while an equally passionate opposition exists not only among environmentalists but also – and increasingly – among the agriculture lobby groups (Macintosh 2002). The primary grievance has been that the act limits the Commonwealth's responsibility for environmental regulations to the listed matters of national environmental significance. Land clearing and climate change are not addressed. "As a result, the government has no mechanism to assess greenhouse emissions from major projects and activities, such as land clearing" (Greenpeace *et al.* 2000: 4). In 2000, the Federal Government released a draft regulation, proposing the inclusion of requirements that activities involving the release of 500,000 tonnes of carbon dioxide, the equivalent over a 12 month period be assessed and approved under the Act. But since inviting comments from the States and Territories the proposal appears to have lost momentum (Macintosh 2002).

The Greenhouse Challenge Plus Programme: "Greenhouse Challenge Plus builds on ... the Greenhouse Challenge programme (established in 1995), integrates two other industry focused

²⁵ The use of more efficient fertilisers would reduce the run-off into the Great Barrier Reef. At present, approximately 100,000 tonnes of nitrogen and 20,000 tonnes of phosphorus are applied in fertiliser to crops in the GBR catchment annually (CRC Reef Research Centre 2003).

²⁶ See Wahlquist 2004.

measures (...), and incorporates changes announced in the 2004 Energy White Paper '*Securing Australia's Energy Future*.' (www.greenhouse.gov.au/challenge/about/index.html) The 1995 Greenhouse Challenge Programme was a joint voluntary initiative between the Commonwealth Government and industry to abate greenhouse gas emissions. Businesses signed an agreement with the Government which continues to provide the basis for implementing and reporting on activities to reduce emissions. This programme is based on a no-regrets approach and voluntary action. As of February 2005, 780 of Australia's approximately 890,000 businesses – less than 1% – were a member of it. Environmental groups have criticised the programme because it has not contributed in any way to the stimulation of emissions reductions. The average emission trends presented in Australia's Greenhouse Gas Inventory 2002 indicated no success. Furthermore, the majority of the participants say that their main motivation for joining the Greenhouse Challenge is their 'corporate image' (Greenpeace *et al.* 2000: 4). It is also difficult to statistically prove companies' compliance: "The Greenhouse Challenge is a voluntary programme, which relies to a large extent on the initiative of individual enterprises to identify, undertake and report on measures that will abate greenhouse gas emissions. Complementing a self-reporting regime with random verification serves to ensure the credibility of the programme" (Independent Verification, www.greenhouse.gov.au/challenge/verification/index.html).

In addition, the Challenge Plus 2005 Framework has introduced a few mandatory requirements. For example, from 1 July 2006, all companies receiving fuel excise credits of more than \$3 million or proposing large-scale energy resource development projects will be required to become a member of the programme. Also the programme has been complemented by the Generator Efficiency Standards, aiming at reducing emissions from electricity generation and at improving power plants' efficiency when using fossil fuels, and the Greenhouse Friendly Certification Scheme. The latter encourages companies to offset greenhouse gas emissions generated by the production, consumption and disposal of a product by reducing emissions in other operations of the company. The reduction is then awarded with the Greenhouse Friendly logo for that particular product. While this scheme may raise awareness for emissions reductions it does not require consumers to change their lifestyle at all. For example, paradoxically even transport fuels can be certified if emissions are offset as described above but the programme does not address the problem of personal transport in general. (Cf. Australian Business chooses Greenhouse Friendly TM 2004)

"Despite polished government public relations", Greenpeace argues, "domestic action is characterised by ineffectual programs and 'business as usual' for fossil fuel industries" (Greenpeace *et al.* 2000: 4). Low support and the 2% target for renewable energy on the one hand, and strong support for the continuing expansion of fossil fuels and for coal-fired power stations on the other hand is without doubt a clear sign of Australia's priorities. The refusal to ratify the Kyoto Protocol, the excise exemption to develop oil shale, and last but not least Australia's growing economy in a global market and the strong partnership with the United States, reinforce the following result: a coherent energy policy focusing on fossil fuels rather than on renewable energy. At the national level it is hence impossible to identify a concrete and far-reaching policy aimed at mitigating climate change.

Table 3: Problems and responses of the Federal Government of Australia (national level)

Problems	Responses
<ul style="list-style-type: none"> - Nationwide effects of climate change on Australia's economy (e.g. agriculture, tourism) - Increasing greenhouse gas emissions in most sectors of the economy and high per capita emissions - High exporting rates of fossil fuels and aluminium - Mainly fossil fuel based energy market (supported by a strong lobby) - No legal instruments to reduce greenhouse gas emissions - Large distances to travel (road network) - Heavy automobile dependence 	<ul style="list-style-type: none"> - Funding for climate impact and adaptation research and for technological solutions - Funding for communication strategies (Australian Greenhouse Office) - Few incentives for renewable energies (Mandatory Renewable Energy Target, MRET) - Public-private partnerships (PPPs) with the industry (Greenhouse Challenge Program) - Governmental support for income losses (in agriculture) - An industry-friendly framework (win win-solutions) to integrate the issue into economic policy

Nevertheless, the Australian Government has improved its national communication strategies to raise awareness regarding the problem at a national and sub-national level. This, however, is part of a cost-benefit framework and not connected to new strategies that would cross previous management thresholds, especially in relation to long-term sustainability of society, industry and natural resources. Environmental organisations like Greenpeace, ACF and FOE (2000) are concerned about the fact that "... the Australian Government has intensified its attempts to create an image of a progressive country with a comprehensive range of climate change policies. In truth ... Australia's greenhouse performance is shameful ...; the Australian Government is failing to take serious action to tackle climate change" (Greenpeace *et al.* 2000: 3). This, in turn, is part of Australia's economic focus: Its economic success during the past decade has been achieved through the consumption of technology, not its production.

3.3. Regional level: Queensland governmental policy

Apart from their beauty, the Wet Tropics and the Great Barrier Reef represent crucial sources of income and resources due to their role in tourism, fishing²⁷, agri- and aquaculture²⁸, forestry, mining, and new biochemicals. These socio-economic human activities have a strong impact on both eco-systems. But the Wet Tropics' and the Great Barrier Reef's adaptation potential to climate change and other threats is low: For example, the depletion of biodiversity makes any ecosystem weaker in the face of other pressures. Furthermore, the ability of species to reach new climatically suitable areas will be hampered by habitat loss and fragmentation (Thomas *et al.* 2004: 147). And the ability of the reef to recover from an ongoing increase of sea water temperature over a short period is unlikely. The "modern" ecosystem with low resilience provides little flexibility to adjust to rapid environmental changes. "These changes may directly or indirectly affect Queensland's future economic and social development, in particular the impacts on trade, market access and industry expansion" (Queensland Government 2001). The reasons for a Government-driven policy approach are unquestioned. But how will the State Government cope with the complexity of the problem and how is its regulatory approach linked to the international and national level?

Environmental Legislation: The key Queensland legislation is the Environmental Protection Act of 1994, the Nature Conservation Act of 1992, the Marine Parks Act of 1982, the Coastal Protection and Management Act of 1995, and the Queensland Heritage Act of 1992. They are all administered by the Environmental Protection Agency. In addition, the Australian and the Queensland Governments have formulated cooperative protection plans. Together they have recognised the biological and economic importance of the GBR and the threats it faces. They are, therefore, putting the following initiatives into place (both launched in December 2003): a) The Representative Areas Program aims at conserving biodiversity "by protecting 'representative' examples of all the different habitats and communities in the GBRWHA and building upon the existing network of Green Zones (no-take areas)" (http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/rep_areas/). b) The Reef Water Quality Protection Plan: a plan to halt and reverse the decline in the quality of water flowing into the Reef, caused by poor land management practices in the catchments adjacent to the Great Barrier Reef World Heritage area.

The Federal and State Governments' Zoning Plan protects 33% of the Marine Park as no-fishing zones and entered into force on 1 July, 2004. Until 2004, only 5 % of the entire Marine Park was highly protected in green zones, where commercial and recreational fishing is prohibited (WWF 2003a: 2). Whilst WWF Australia supports this initiative, "the final plan needs

²⁷ Fisheries in coral reef areas are important beyond the mere generation of monetary wealth, as they are an essential source of protein for many millions of the world's poorer societies. Many people depend in part or wholly on coral reefs for their livelihood and around 15% of the world's population live within 100 kilometres of coral reef eco-systems (Hoegh-Guldberg 1999: 2).

²⁸ Aquaculture is a growth industry backed by Commonwealth Government policy. The Queensland component of the Australian aquaculture industry has been small to date, mainly due to stringent government controls (Hoegh-Guldberg / Hoegh-Guldberg 2004). But the growing coastal industry also discharges effluents into coastal waterways. These inputs are locally significant but are small compared with sediment, nutrient and pollutant inputs from agriculture (CRC Reef Research Centre 2003).

to take account of the future impacts of global warming” (WWF 2003a: 6). Currently the annual quantity of nitrogen and phosphorus contained in the water is even increasing (WWF 2003a: 4). Following experience from overseas, the Zoning Plan also proposes extensive aquaculture (meaning the addition of feed). However, this runs contrary to the reef water quality. The capacity of the reef to cope with pollution from the catchment area, intensive aquaculture and global warming is limited. But not only have these figures indicated that initiatives to mitigate the trends are urgently required.

Despite environmental legislation, Queensland has the highest rate of land clearing of any state in Australia. Of all clearing in Australia, 85% occurs in Queensland. The average annual clearing rate of 446,000 ha of remnant vegetation in Queensland between 1997 and 1999 resulted in the loss of an estimated 190 million trees per year. A scientific analysis of the impact of land clearing on biodiversity calculates that approximately 100 million native mammals, birds, and reptiles died yearly between 1997 and 1999 as the result of broad-scale clearing (Cogger *et al.* 2003). In May 2003, Australia’s Environment Minister, David Kemp and Queensland Premier, Peter Beattie outlined a proposal to phase out broad scale clearing of remnant vegetation in Queensland over three years. The proposal also protects vegetation ‘of concern’ immediately. In November 2003, Premier Beattie pledged to pass new legislation to control the broad scale clearing of mature bush land in Queensland (WWF Australia, MR April 21, 2004).

The announcement is followed by the adoption of a new law in April 2004: the Vegetation Management and Other Legislation Amendment Act 2004. The purpose of the Bill is to phase out broad-scale clearing of remnant vegetation in Queensland by 31 December 2006 under a transitional clearing cap, and to protect regional ecosystems “of concern”, whilst allowing clearing for necessary ongoing purposes and management activities.²⁹ The Queensland Government has committed \$150 million to assist landholders who are significantly affected by the legislation. Banning broad scale land clearing in the state will result in an estimated 3-4% reduction of Australia’s greenhouse gas emissions within eight years, in other words a reduction of 20-25 Mt per annum (State of Queensland 2004a). That represents a 60% drop in carbon dioxide emissions generated by land use in Queensland (State of Queensland 2004b). The Cairns City Council criticised the new law: it was too ambiguous and had caused confusion at the council, with some staff claiming it was too open for interpretation (Laws confusing, says council 2004).

Beside the Act, the State Government launched the Queensland Greenhouse Strategy in May 2004 (Queensland Government 2004). It deals with the environmental, social and economic impacts of climate change and the enhanced greenhouse effect. Queensland committed to tackling greenhouse gas production and managing climate change in areas including electricity generation; transport; land management; household emissions; business and industry; as well as state and local government. The so-called “three-part strategy” includes, firstly, the increase

²⁹ Despite the stop of broad-scale clearing, the loss of biodiversity continues due to the “extinction debt”: It can take decades or more for the full effects of broad scale land clearing and, hence, the consequences of the extinction process to appear. “We have ‘borrowed’ rich habitats for short-term gains and reduced their diversity, adaptability and long-term productivity through loss of species richness” (Cogger *et al.* 2003: 5).

of knowledge and understanding about climate change and how it will affect Queensland. Secondly, it aims at the reduction and balancing of emissions from various household, industrial, agricultural, energy and transport activities through the improvement of energy efficiency and the creation of carbon sinks. And, thirdly, the Government will lay foundations for adapting to climate change (State of Queensland 2004b). The strategy is the relaunch of Queensland's "Greenhouse Policy Framework: A climate of Change" from 2001 (Queensland Government 2001). In both strategy papers, in which the Government promotes the "Smart State", the lack of concrete steps towards greenhouse gas reductions is obvious. The "Principles for future action" are not strong enough to change "The way forward" (ibid.).

Agriculture and Forestry: Together with land clearing and the removal of forests, i.e. emission sinks, the combined rural sector generated 43% (58.6 Mt CO₂-e) of Queensland's greenhouse gas emissions in 1999. Agriculture contributed 42.8% (25.1 Mt) of these emissions whereby enteric fermentation (methane emissions from the rumen of cattle and sheep) constituted the largest part thereof (80%). Other sources of agricultural emissions, including nitrous oxide, are soils, savanna burning, animal manure, and field burning of agricultural residues. With methane and nitrous oxide being the main emissions from agriculture, the global warming potential of this sector is particularly large. Methane has a global warming potential 21 times larger than carbon dioxide while nitrous oxide has 300 times the global warming potential of CO₂. (Cf. Queensland Government 2004: B28-29)

In addressing these emissions the State Government focuses mainly on research funding. The reduction of methane emissions, for example, is supposed to entail the changing of the nature of animals' metabolisms: "Currently, only a limited scientific understanding exists of the methane-producing process in the rumen and how this process may be controlled. This knowledge gap will hinder the development of new products and management practices designed to eliminate and reduce animal methane emissions." (Ibid. B29) While foreseen studies on the effect of different agricultural management practices on emissions can perhaps highlight the climate impact of industrial agriculture the approach above reflects a society-nature-relationship characterised by human domination and control over natural processes.

Unlike agriculture, forestry contributes to removing CO₂ from the atmosphere. In 1999, Queensland forests provided sinks for 4.3 Mt of CO₂-equivalent.³⁰ Whereas the Commonwealth Government has announced that they will not devise an emissions trading scheme, the Queensland Government has made it possible for landowners to trade carbon rights while retaining the rights to the trees and underlying land. In 2001, the State Government amended the Forestry Act 1959 and Land Title Act 1994, in order to recognize the rights to CO₂ stored in native forests and timber plantations, as well as other vegetation. A more recent amendment of the same Acts also allows land lessees to trade carbon sinks emanating from timber plantations as long as the lease provides for this use. However, the lessees do not hold any rights to native vegetation potentially existent on the leased property. (Ibid. B30)

³⁰ „Greenhouse accounting for forestry in 1999, is based on commercial forestry activities, and assesses sources and sinks for approximately 4.5 million hectares of managed native forests and 0.2 million hectares of plantations." (Queensland Government 2004: B30)

Tourism: Tourism is by far the biggest reef-based industry and one of the most important economic sectors in Queensland³¹. The GBR attracts more than 1.6 million visitors annually and it is consistently rated as one of the top three attractions for visitors coming to Australia. Tourism contributes \$4.2 billion to the gross value of production (GVP) in the GBR catchment and is by far the largest employer with 47,660 employees. Total visitors' expenditure in Queensland increased by 4.5% per annum from 1985 to 1999, in inflation-adjusted prices at 2000-01 levels (QTIC 2004)³². However, the tourism industry is projected to become even more important: Tourism GVP is expected to increase by more than 50% by 2020 (WWF 2003a: 14f).

While the total economic value of the Great Barrier Reef can hardly be measured, the cost of ecosystem services is invariably undervalued. The Queensland Tourism Industry Council (2004) therefore demands from the Australian and Queensland Governments to "implement and effectively enforce: i) the new zoning plan for the Great Barrier Reef which creates a representative network of no-take zones throughout the Marine Park; ii) the new Reef Water Quality Protection Plan; [and] iii) Queensland Fisheries Management plans. Only with these strategies in place will the Great Barrier Reef have any hope of survival as a coral dominated ecosystem in the face of the increasing climate-induced stress that is inevitable over the next 30-50 years". To summarise, Far North Queensland is the most advantaged and potentially the most vulnerable region. Being the home of the largest and most lucrative parts of the tourist industry, it has displayed the highest rate of economic growth on the one hand, but also the highest rate of land clearing (in the past) and the highest loss of biodiversity on the other hand.

Renewable Energy: With 18% of Australia's population Queensland produces about 25% of the nation's greenhouse gas emissions: approximately 135 Mt a year. This high level of emissions is largely a reflection of the State's high energy consumption (Queensland Government 2001). Queensland is one of the world's leading exporters of coking (used in iron, aluminium and steel production) and steaming (used in electricity generation) coal. Coal is also the main fuel used in Queensland's power stations, accounting for over 90% of electricity production. Fossil fuels currently account for about 88% of the State's energy usage. Queensland's growing industrial base demands an increasing supply of energy in all parts of the State. These developments and economical interests make the transformation to a renewable energy-based economy difficult, although the conditions in Queensland are good. For the State Government, biogas (the waste from sugar cane processing) is by far the major renewable energy source with 10% of total energy usage, followed by wood and wood wastes (1%), and hydro (0.75%), with wind and solar energy accounting for the remaining 0.05% (www.energy.qld.gov.au).

³¹ The value of commercial fisheries is small relative to tourism, but remains socially and economically relevant. Recreational fisheries are socially important rather than economically, since they appear to be largely practised by local residents, and tourism therefore adds little to direct economic gain.

³² Driven by the growth in international tourism, tropical North Queensland has experienced economic growth rates of approximately 6% per annum in recent years (Hoegh-Guldberg / Hoegh-Guldberg 2004).

Table 4: Problems and responses of the State Government of Queensland (regional level)

Problems	Responses
<ul style="list-style-type: none"> - Climate change impacts on the Great Barrier Reef and the Wet Tropics (extinction risk, coral bleaching etc.) - Sea level rise on the coast line - Responsibility for the conservation of the World Heritage Areas (not legally binding, but rather portraying a good image for foreign visitors) - Expanding tourism (stress on the environment; need for new infrastructure and attractions) - Mainly fossil fuel-based energy sector (supported by a strong lobby) - Coal and aluminium industries as an important part of the regional economies (10.000 employees) - Methane emissions from cows and sheep - Cereal and pastoral industries need to clear trees - Differing interests among the industries - Little support from the Federal Government 	<ul style="list-style-type: none"> - Indirect legal instrument: Vegetation Management and Other Legislation Amendment Act 2004 - Few incentives for private and business actors to use technology for the production of renewable energy (subsidies) - Funding for communication strategies ('Smart State', Queensland Policy Framework, Queensland Greenhouse Strategy) - Research on an integrated assessment of the effects of climate change and options for adaptation (stakeholder approach)

There are only few incentives to improve this situation: As part of the Queensland Government's commitment to promoting greater use of sustainable energy resources and energy efficient technology and products, a number of rebate schemes have been established to provide

financial assistance to Queenslanders.³³ On the other hand Queensland has six coal-fired power stations (two in the South-East and four in the central region) which produce about 40 Mt of CO₂-emissions and are endowed with over 30 billion tonnes of identified resources of black coal. In May 2004, Premier Peter Beattie and Energy Minister Stephan Robertson formally gave a \$1.1 billion Kogan Creek power station the go-ahead. The power station will release seven million tonnes of CO₂ into the atmosphere annually. This corresponds with an estimated 5% increase of Queensland's total greenhouse gas emissions (The Courier-Mail May 25, 2004). As one might expect, the coal industry represents an important part of the regional economies in Queensland where over 10,000 people were directly employed by the industry in 2002-03 (www.nrme.qld.gov.au/mines/coal/).³⁴

The analysis shows that at the state level the intersections of socio-economical, socio-ecological and socio-political processes are more obvious than at the federal level. The Queensland Government plays a specific or even different role compared to the Federal Government, and legislative tensions between them do occur. Nevertheless, they elaborate common environmental legislation. Tensions especially arise when the Federal Government acts without strong participation of the State Government. The Vegetation Management and Other Legislation Amendment Act 2004, for example, "took a swipe at the Federal Government's lack of leadership on the issue" (The Cairns Post, May 5, 2004). This position, endorsed by Premier Peter Beattie (see State of Queensland 2004b), indicates that the State Government seems to be more responsible regarding the impact of climate change. This is underlined by the aim to harness any benefits from new global opportunities and, respectively, by the strong support for implementing the Kyoto mechanisms.

At the same time, a positive communication strategy seems to be as much at the centre of government action as it is at the federal level. The "Greenhouse Policy Framework" (2001) and the "Queensland Greenhouse Strategy" (2004) are, however, far away from taking any concrete steps forward. While the "Smart State" brand and the climate change-related initiatives have an informative and educational value, the legislative regulations or financial incentives are weak. Federal and State Governments share the opinion that voluntary action and partnerships with the industry play an important role in reducing greenhouse gas emissions at the lowest possible cost. This leads different economic sectors as well as environmentalists to voice great concern regarding the ambiguity or even inadequacy of adaptation strategies in the face of climate change. It is mainly the tourism sector that has a strong interest in the conservation of ecosystems and in a good infrastructure to attract as many people as possible from around the world to Queensland and the World Heritage Areas. More precisely, companies of this sector compete for visitors at the very local sites of natural icons. This leads us to the question which role the local and individual level plays in our multi-level governance system?

³³ The State Government subsidises domestic Solar Hot Water with up to \$750, domestic grid connected Photovoltaic Power Systems with up to \$4,000, Working Properties in Western and Northern Queensland with up to \$175,000, grid connected Photovoltaic Power Systems on Community Use Buildings with up to \$10,000, and provides a rebate of up to 50% for other households and commercial properties in off-grid areas (www.epa.qld.gov.au).

³⁴ The value of coal exported from Queensland in 2002-03 reached approximately AUS \$8 billion, representing over 30% in value of the State's total overseas exports of goods (ibid).

3.4. Local level: Queensland Communities and Individuals facing Climate Change

Communities and individuals have been adapting to the climate for centuries. However, today the key features of climate change are related to variability and extremes (e.g. cyclones, droughts, heavy and continuous rainfall). Between the years 2000 and 2100 maximum temperatures are expected to increase by about 4°C in the interior and by approximately 3.5°C in the Northern and South-Eastern regions of Queensland. By the year 2100 there will be more than twice the number of hot days (hotter than 35°C) between October and March and fewer than half the number of cold days from April to September (Passey 2003a: 6).

Effects on Human Health: Both variable and extreme weather conditions can result in the deterioration of the biophysical environment. Individuals may face mental problems or even heat-strokes. An increased incidence of disease or stress is, hence, a further consequence of climate change.³⁵ Let me therefore focus on the continuously changing interactions taking place between communities, people and nature.³⁶

A risk assessment regarding human health and climate change indicates how strong the ties between nature and society are. McMichael *et al.* (2003) examined the (future) impact of the climate on human health:

- the projected rise in temperature over the next 50 years is predicted to result in a substantial increase in heat-related deaths, mostly in crowded cities;
- the number of extreme rainfall events is expected to increase in almost all Australian States and Territories by 2020;
- annual flood-related deaths and injuries may also increase;
- the malaria receptive zone and suitable conditions for the transmission of dengue may expand southwards; and
- warmer temperatures and increased rainfall variability are predicted to result in higher intensity and frequency of food-borne and water-borne diseases.

The multiple ways in which people and nature affect each other are particularly obvious at the local level.³⁷ In the United Nations climate change negotiations this approach is structured around the two buzz-words of vulnerability and adaptation.

Vulnerability and Adaptation: Vulnerability to climate change is based on the description of the physical and social impact of climate change. It essentially reflects the combined (and interactive) outcome of biophysical risk and social response. In other words, the 'vulnerability' of a region to the impacts of climate change partly arises from biophysical factors and partly from

³⁵ Until now, there are only limited empirical observations of the relationship between climate change and health, psychological behaviour or mental problems available from research in Australia. McMichael *et al.* (2003) is one of the few exceptions.

³⁶ Nevertheless, a limitation of many climate change impact assessments is that they focus on system interactions within non-human components of the climate system (IPCC 2001a).

³⁷ For better understanding see the "Transactional model of physical and psychosocial impacts" of Bentrupperbäumer / Reser (2002: 18). For another approach see the integrated regional assessment framework used by the Centre for Integrated Regional Assessment (Crimp *et al.* 2003: 57).

socio-economic changes. If no biophysical changes occur the region will not be vulnerable. If biophysical changes do occur, socio-economic ones will too. The magnitude of those socio-economic shifts will depend on a region's socio-economic structure, e.g. how many individuals and/or businesses are affected – either directly or indirectly – by biophysical changes. The transformations will also depend on the ability of the community and individuals within it to adapt (Crimp *et al.* 2003). Not all populations will be equally affected by changing climate conditions. Vulnerability and adaptation capacity are two sides of the same coin.

The response of human systems depends on factors such as wealth, income, education, housing standards, water supplies or management capabilities. In other words, communities and individuals are affected differently by environmental hazards, primarily because they differ in their capacity to anticipate, cope with or adapt to (or recover from) 'stressful' events (IPCC 2001a). In most cases, those with the least resources have the least capacity to adapt to climate variations and are, thus, most vulnerable to climate change. It is therefore important to consider the effects of climate change within a socio-economic context (Crimp 2003). The factors named above tend to be of more or less relevance depending on the particular geographical location and ethnic group (Pittock 2003: 155).

People in Far North Queensland tend to be socially and economically disadvantaged compared to other regions (QTIC 2004). "Especially Aborigines and Torres Strait Islanders are particularly vulnerable to additional stresses on health and living conditions induced by climate change" (Pittock 2003: summary). Adaptation strategies are related to the more general problems of development. "The present social circumstances of indigenous people provide a poor basis on which to build adaptation responses to climate change threats. Thus, policies that aim to improve resilience to climate change could encompass efforts to reduce relevant social liabilities such as poverty, poor education, unemployment, and incarceration, and support mechanisms that maintain cultural integrity (Pittock 2003: 156).³⁸

However, key indicators such as life expectancy, income, employment status and educational level; highlight the immense challenges faced by indigenous peoples in remote communities. "In Cape York Peninsula, one recent health check found that almost 25% of adults had signs of early kidney disease. The Kakadu Regional Social Impact Assessment in 1996 highlighted how the socio-economic well-being of the people has not been improved by money injected through either major mining investments or income from the Park. Many of the Kimberley region's Indigenous people also experience poverty, poor health, incomplete education, low participation in the labour market, and high exposure to the criminal justice system" (ACF 2003).

But not only Aborigines and Torres Strait Islanders tend to be disadvantaged. Given, for example, the current level of employment and education, certain regions will not be in a good position to adapt to potential climate change impacts. "Some shires, specifically Cardwell, Hinchinbrook and Johnstone, are within the lower 50% of all Australian local government areas

³⁸ Overall, Australia is likely to be less vulnerable to many of the threats from climate change than many neighbouring countries in the region. However, there are still groups that are susceptible to the impacts of climate change.

across all socio-economic indices. The communities in these shires may find it also difficult to adapt to any changes, economic or otherwise, and could be expected to adapt to climate change less readily than other shires, such as Cairns and Douglas” (Crimp *et al.* 2003).

In order to develop appropriate adaptation responses to climate change on a local level, a more profound understanding of the primary (e.g. extreme weather events, hot days) and secondary effects (e.g. fatalism) of climate change is required. For example, social and individual stress caused by climate change is not easily measured as it can also encompass psychological strain. In addition, “many individuals and communities are likely to lack the resources required for adequate response (under assumptions of reasonable economic growth, technology change, etc in the future) ... It would be short sighted to imagine that adaptation provides a complete answer to the problems of climate change. Nevertheless, adaptation must be part of the response” (McMichael *et al.* 2003: 111).

Awareness: In a survey by the Sustainable Energy Development Authority (SEDA), only 33% of people surveyed knew that coal is the main source of electricity production.³⁹ Another survey of Australians conducted by the International Environmental Monitor in 2000 showed that only 4% of respondents thought that the electricity industry is primarily responsible for causing any long-term changes to the world’s climate (Diesendorf / Saddler 2003). There has been numerous awareness building campaigns by NGOs and the Government alike. One programme where NGOs cooperate with the Australian Greenhouse Office is Cool Communities. On the assumption that climatic, geographical, cultural and socio-economic conditions are different across Australia, 34 communities have reached out to householders since 2002, in order to support them to find local solutions for reducing emissions. By providing information and financial support households are encouraged to save energy wherever possible. (Cf. AGO n.y.) Supported by both the Australian Greenhouse Office and the Queensland Conservation Council, Queensland houses three of the cool communities: 1) The Cairns and Far North Environment Centre (CAFNEC) organises Home Energy workshops in Cairns and surrounding areas with the aim of improving energy efficiency in the area’s households. 2) The Catholic Justice and Peace Commission – Archdiocese of Brisbane represents 600,000 parishioners and covers an area extending from Hervey Bay to the Gold Coast and out to Kingaroy. The Commission has taken part in both rounds of the Cool Communities Campaign and offers Home Energy workshops and Train-the-Trainer programmes. Furthermore, it encourages car pooling to mass. Households have been provided with retrofit sets to promote a more energy efficient home. 3) Maleny Credit Union is an institution providing socially and environmentally responsible financial solutions. The Cool Communities project offered two types of financial incentives: Cool Home Loans supported the Union’s members to retrofit their houses or build new ones in energy efficient ways and the Earth Benefits Club set up a micro-financing scheme so that members could purchase energy efficient products. (Queensland Conservation 2004)

The current Cool Communities programme draws on a 2002 analysis of the AGO’s national umbrella communication strategy guiding the Campaign. A survey has brought forward some

³⁹ Less than 35% of visitors to nine WTWHA sites surveyed were aware that they were visiting a World Heritage site (Bentrupperbäumer / Reser 2002: 11).

interesting results regarding the interactions of knowledge about climate change, behavioural change and social values: “The drivers for behaviour change that will lead to reduction in greenhouse gas emissions are complex and to a great extent based on long held Australian values.” (<http://www.greenhouse.gov.au/local/publications/strategy.html>) Three social values have emerged as central to the communication strategy: “... the good housekeeper, the loving parent and the responsible member of the community. It is PRUDENT to save money and not waste energy; it will mean PROTECTION of our future by saving the environment for our children; and it is our RESPONSIBILITY as a good member of the community that will do their bit for the common good.” (Ibid.) According to this research, aligning information about the greenhouse effect with these social values could target householders more effectively.

However, the lack of awareness regarding climate change also indicates limited opportunities for participation in decision-making processes at the national, regional and international levels. While awareness building strategies at the Federal and regional levels do not seem to be an adequate instrument to reach the local level, the Cool Communities programme has made significant progress in encouraging people to take control over household emissions.

Local Government: International, Federal and State policies also trickle down to local governments. In order to involve these in emission reductions, the International Council for Local Environmental Initiatives (ICLEI) has devised the Cities for Climate Protection (CCP) Programme which is jointly implemented with the Greenhouse Office and local governments across Australia. Currently, there are 203 local councils, representing almost 80% of Australia's population, participating in the programme. Until 2004 – after seven years of operation – CCP Australia abated almost three million tonnes of carbon dioxide equivalent. At the beginning of their commitment local governments set five strategic milestone achievements which include an inventory of main emission sources and concrete reduction targets. According to the budget, councils will then have to decide “whether [they should] ... invest[ing] in re-fits for their leisure centre, putting energy efficient specifications for their new depot, tapping the emissions from their local landfill, changing the urban planning considerations of a new suburb to try and impact on the transport emissions, all those very nitty gritty things” (Wayne Westcott cited in Local Governments Slash Greenhouse 2001).

Regarding transport emissions the CCP Programme also ties in with the TravelSmart Initiative. TravelSmart aims at reducing individual car travel by campaigning people to walk, cycle or to use public transport. In Queensland, Townsville and Chancellor Park are piloting projects on travel behaviour change in the former case and planning environmentally friendly transport options in a newly developed urban area in the latter case.

Table 5: Problems and responses of people and communities (local level)

Problems	Responses
<ul style="list-style-type: none"> - Biophysical risk caused by high weather variability and intensifying weather extremes (cyclones, droughts, heavy rainfall) - Psychological / mental problems caused by the increase in average temperatures (more hot days, higher than 35°C) - Increased incidence of disease or stress - Economical and social disadvantages caused by the impacts of climate change - Migration from rural areas and remote coast lines: higher density in cities (growing population) - Lack of awareness, social liabilities (poverty, poor education, unemployment, and incarceration) - Low (financial) capacity to anticipate, cope with or adapt to 'stressful' events or to long-term climate changes - Low (financial) capacity to recover from 'stressful' events or long-term climate changes - Different social and cultural circumstances and knowledge systems, as well as cultural behaviour - Insufficient democratic participation at national, regional and global levels 	<ul style="list-style-type: none"> - NGO-campaign "cool communities" (Queensland Conservation Council) - What has to be done: - A risk management framework; - educational campaigns; - improving the access to resources and management capabilities; - integration of different (indigenous) knowledge systems; - stakeholder approach; - greater equity in climate policy.

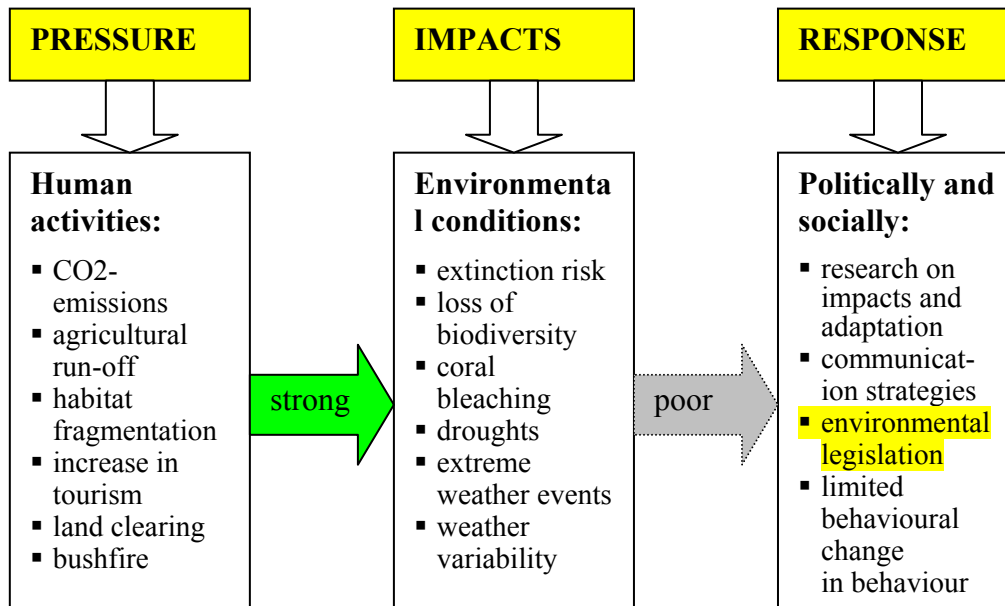
The discussion of aspects of the local level indicates that the intricate question of “equity in climate policy” is part of the climate change problem. Climate change and democracy are two sides of the same coin. Nevertheless, a risk assessment and management to buffer the impacts of climate change are necessary. From a management perspective, an adequate and better understanding of the interactive processes is crucial. Ways of monitoring and either fostering or mitigating particular effects of climate change have to be elaborated. Management of the impacts of climate change is primarily people management and therefore has to involve these in all decision-making processes. In the context of a vulnerable area this requires an informed understanding of the nature and quality of the interaction between people, culture and nature (Bentrupperbäumer / Reser 2002:).

People-centred strategies are also necessary in order to provide improved development of counter-disaster strategies. While increased accuracy in the warnings of storm or cyclonic waves has to be part of the management, the psychological impacts are also important. Society’s and individuals’ capacity to adapt to the problems caused by climate change have to be taken into account. Indigenous knowledge systems, modes of production and conceptions of technology or an understanding of people’s culture are all important considerations. The cultural and socio-economic setting differs from locality to locality around the world. Therefore, there is no single assessment and method of addressing socio-ecological and environmental issues.

4. Climate change – a multi-level playing field

Australia’s ways to deal with climate change indicate that the environmental crisis is part of a sociological, political and economical system and that it is interpreted in many different ways. But the “nature of nature” is not only a matter of discourse. The human being has already impacted on, designed and even built the environment in a way that makes it hard to define it as natural. Pressures on the environment caused by anthropogenically-induced global warming and by many other human-made threats indicate the strong relationship between society and nature, politics and the economy. They are linked in myriad ways. But it is crucial to recognise the disequilibrium of this relationship: Political and economic decisions along with individual behaviour have a strong impact on Australia’s and the world’s ecosystems. But the environmental crisis – however obvious it may be – cannot force an adequate response.

Contrary to Redclift (1995: 15), it is hence not enough to increase our knowledge about future climate changes and its impacts in order to adopt appropriate values and to emphasise long-term sustainability over short-term economic gain. Although further research is necessary, the impact of climate change on the Wet Tropics, the Great Barrier Reef, the agricultural sector, and on human health are well documented and empirically proven. The intersections between the social and the ecological systems are obvious, but so too is the lack of political and economic response. Australia’s climate change policy appears well suited to illustrate the poor economical and political awareness and even ignorance regarding the socio-ecological problem.

Figure 4: Pressure, Impacts, Response

At the **global level**, current strategies primarily rely on economic instruments to address the climate change problem: the atmosphere is being transformed from a global public good (Kaul *et al.* 1999) to a commodity whose usefulness for storing waste is to be allocated and traded among nations. In effect, under the auspices of the UN, an atmospheric commodity system is being established (Byrne/Glover 2000). The Australian Government together with the USA (and others) is reluctant not only to ratify the Kyoto Protocol, but also to implement the Kyoto mechanisms (emission trading, joint implementation and clean development mechanism). This seems paradox because the Federal Government generally supports a climate policy approach which allows industries and individual states the flexibility to implement market-style solutions. The contradiction can be explained with Australia's position in international relations which depends strongly on the foreign policy of the USA. The support of the war in Iraq and the dependency of the Australian economy on the USA are part of the strong relations between the Bush and the Howard-Governments.

At the **national level**, the Federal Government – far away from stabilisation or even reduction of greenhouse gas emissions – focuses on realising a low-cost abatement by promoting voluntary action by the industry. Based on ideas of political liberalism, the emphasis is on market-friendly policy-making and corporate governance. The latter term implies that the industry takes over more responsibility and accountability as a problem-solving partner. National environmental legislation falls short of influencing the economy or even business as usual. As one might expect, the energy market is liberalised and the fossil fuel industry has political and financial support. Australia's strong dependency on coal has a large influence on the Federal Government's attitude to the issue of global warming.

The Government offers only few incentives for renewable energies and for a much more diverse mix of sources for its electricity supply. “Despite Australia’s significant advances in economic reform, the market distortions still evident in many aspects of the energy industries are significant barriers to a low cost transition to a clean energy future” (Saddler *et al.* 2004). The study “Clean Energy Future for Australia”, prepared for WWF Australia, shows that Australia can, with appropriate policy settings, halve greenhouse gas emissions from stationary energy by 2040: “The alternative scenario – where Australia continues to increase its greenhouse gas pollution – is not economically, environmentally or ethically sustainable” (ibid). But a renewable energy future will not be achieved until the Commonwealth Government weans itself from its own short-term economic outlook.

The Government is putting into place the “Representative Areas Program” and the “Reef Water Quality Protection Plan”. But these plans are fine-tuned with the economic interests in fisheries, agriculture and tourism. On the basis of this legislation, an institutional transformation which works towards a “low greenhouse regime” is far from being realised. While the Government supports research to investigate the issues of impacts and adaptation, they have no clear strategies for reducing greenhouse gases (see the Australian Greenhouse Office, especially Pittock 2003). “In a hyper-symbolic age such as ours, providing an appearance of solving the problem is seemingly as important as actually solving it. In the case of climate change, a significant effort is being made to devise appropriate symbols and signs of a ‘solution’” (Byrne/Glover 2000). A communication strategy is an important tool for Australia’s climate change symbolism.

At the **regional (state) level**, the Queensland Government’s climate policy has intersections and contradictions with the Federal Government’s response to climate change. While the State Government does not take a leading role in international climate politics, the Federal Government is unsatisfied with its position and criticises the soft regulations elaborated nationwide to cope with the climate problem. The reasons are obvious: Queensland’s economy depends on the tourism industry and therefore on the conditions and conservation of the Great Barrier Reef and the Wet Tropics. Both are World Heritage Areas for which Queensland has a special responsibility.

However, the “Smart State” also provides few incentives to prevent greenhouse gas emissions. This is due to Queensland having an important coal industry. 88% of its energy supply is made up of fossil fuels, and in May 2004, a coal power station obtained the go ahead. This seems to be the reason for the State and the Federal Governments to share the strategy of improving communication regarding the problem of global warming.

As to legislation, the “Vegetation Management and Other Legislation Amendment Act 2004” phases out broad scale clearing of remnant vegetation in Queensland by December 31, 2006. But an industry-friendly framework on a voluntary basis and a stakeholder approach is the dominant way in which the Government of Queensland is reacting.

At the **local level**, communities and individuals are the ones who directly have to cope with global warming. But in an international world of nation states the local population is not represented. The market-based mechanisms are, furthermore, not reaching the local level. International instruments are not really designed to cope with the vast environmental and cultural differences at the local level. In other words, they focus on system interactions among non-human components. But other impacts also have to be taken into account: for example psychological and mental problems caused by the increase in average temperatures (e.g. more hot days, greater than 35 °C), biophysical risk caused by high weather variability and intensifying weather extremes (cyclones, droughts, heavy rainfalls), or increased incidence of disease or stress.

Table 6: Multi-level governance

Level	Reaction
Australia in international relations (IR)	- supporting the power shift from multi- to bilateralism - strong partnership with the United States
Federal Government of Australia	- soft regulations (no penalties)
State Government of Queensland	- communication strategy (political symbolism)
Local communities and people	- little action

To summarise: There are patterns of behaviour where the international community, the Federal and State Governments converge. Two sets of interests are mainly shaping the global, national, regional and local level: those of business and those of governments. Their interactions are jointly determining the “*multi-level regime*” which governs the whole process in a dominant way. The standard tools that (Western) nations employ to address the wide range of problems caused by climate change are market-based solutions. In other words: the economy drives reaction and the reactions depend on:

- economic growth;
- global competitiveness;
- high exporting rates of fossil fuels
- fossil fuel based energy sector
- strong coal, oil and gas lobby
- high employment in power companies, mining, aluminium production and manufacture

- low interests on the world market in renewable energies, and
- political and economical short-term interests prevail over socio-ecological long-term requirements

The reality is that the energy for Australia's economic growth will predominantly come from the development of coal, oil and gas reserves. The general political and economical view is that tax on fossil fuels or an emission trading system will threaten Australia's global competitiveness. Politicians fear a policy shock from forcing the closure of existing coal power stations and an increase in wholesale electricity prices.

5. Filling the gaps

"Yet, in this transposition of familiar approaches onto the novel problem of global environmental transformation, much is being overlooked" (Byrne/Glover 2000). There are differences between regulatory approaches at different levels of decision making and between the different regions where climate effects occur. Social, economic and ecological factors have yet to be integrated into a common solution-system. This is not to say, a "one size fits all" solution would be sufficient. Rather, a heterogeneous approach seems to be necessary for a better understanding of the socio-ecological relationship. The power struggle behind the environmental crisis is as important as the uncertainties of the eco-systems themselves. The latter are intrinsically dynamic, non-linear and chaotic, making it very difficult to accurately predict the effects of any major disturbance in such systems.⁴⁰

The multi-level approach in this case study reveals a bigger picture of the problem. Its key findings are:

- the "nature of nature" is that the human being has already influenced, designed and built the environment;
- political, social, cultural and economic processes are part of the problem;
- there is no automatism between the environmental crisis and an adequate political response;
- appearing to solve the problem seems to be as important to Governments as actually solving it;
- the international Kyoto-instruments are not really designed to cope with the vast environmental and cultural differences at the regional and local levels (they focus on system interactions among non-human components).

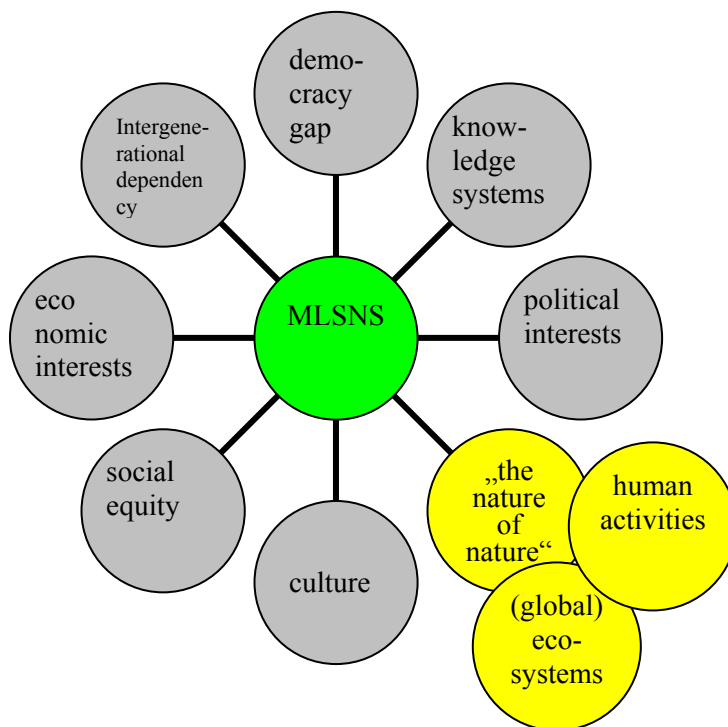
An alternative approach which relies on principles of social equity, ecological justice and ecological sustainability is required at all levels. According to Byrne/Glover (2000) this can be guided by the per capita allocation of the known global carbon sink: a per capita allowance of greenhouse gas emissions of approximately 3.3 tonnes of carbon dioxide equivalent per year

⁴⁰ This requires that assessments are conducted within a risk management framework, where risk is seen as the product of the probability of climate change and its consequences.

would constitute a sustainable and equitable emission rate. Until now Australia's per capita emissions are much higher: 27.8 tonnes.

Furthermore, we have to take the time scale into account: like the climate system and different eco-systems, the energy and tourism sectors, urban systems, human behaviour, or traffic systems have great inertia. Major exacerbating problems, including rapid infrastructure growth in vulnerable coastal areas, inappropriate use of water resources, behavioural barriers, economic disincentives and complex institutional arrangements are also part of the problem. Changes in these areas will take a long time. That means that it is insufficient to focus attention on the implementation of the Climate Convention and the Kyoto-Protocol if profound changes are to be achieved and the worst effects of climate change to be avoided. Rather, early planning is needed, and it is vital to apply the precautionary principle not only in a rhetorical way.

Figure 5: A Multi-Level-Society-Nature-System (MLSNS)



Although a regulatory apparatus of considerable complexity and size has developed within the climate change regime, NGOs, communities and individuals in Queensland feel that they are not part of the entire decision making process. Rather, the commodification of the atmosphere will merely reproduce the same self-contradictory nature-society regime that has characterised the modern era. As part of these developments, new inequalities arise because of the disparate individual possibilities to cope with the effects of climate change.

As Barrie Pittock (2003: summary) noted in his report for the Australian Greenhouse Office, "the high probability of at least some global warming, given the inertia in the climate and

socioeconomic systems, means that some adaptation will be necessary. This will be most efficient if the location- and activity-specific nature of the likely impacts is taken into account. Considerable uncertainties about location-specific impacts can be further reduced by targeted research, while case-by-case assessments of adaptation strategies will be needed for many particular sectors and locations.” This approach is also recommended by the tourism industry: “For the Great Barrier Reef and other coral reef systems to survive, it is essential for global policy-making to become much more ecologically sensitive” (Queensland Tourism Industry Council 2004). Furthermore, the development of “demonstration projects” is considered necessary (Pollard 2003: 7). Junctions on the road into the future – where reactions can develop one way or the other – must be expected, however.

Overall, there are good reasons to believe that the issues of mitigation, adaptation, adequacy of commitments, climate justice, and the different regulatory and ecosystem levels are inextricably linked. However, the interpretations of and discourse about the problems and the political responses at different levels have shown that Australia and its States and Territories are far away from a coherent climate policy and from a clear pathway towards solving the problem. In the absence of direct regulatory control, greenhouse gas emissions are largely managed by way of voluntary commitments of the private sector, which has not shown much effect. NGOs have supported alternatives like renewable energies, stronger conservation regulations or education. While their reports are full of recommendations their influence remains weak, however. The lack of incentives, financial resources and legislation is brightly reflected in Australia’s increasing greenhouse gas emissions in almost all economic sectors. Continuing this way, Australia is unlikely to fulfil its Kyoto target. Yet the incoherence of climate policies among the international, national, regional and local levels does not promise to change in the future.

6. Abbreviations

ACF	Australian Conservation Foundation
AGO	Australian Greenhouse Office
BCSE	Business Council for Sustainable Energy
BMBF	German Federal Ministry of Education and Research
CAN	Climate Action Network
CANA	Climate Action Network of Australia
CH ₄	Methane
CO ₂	Carbon dioxide
COP	Conference of the Parties
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPBC Act	Environmental Protection and Biodiversity Conservation Act
ETS	Emission Trading System
FOE	Friends of the Earth
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRR	Great Barrier Reef Region
GDP	Gross Domestic Product
GVP	Gross Value of Production
IPCC	Intergovernmental Panel on Climate Change
IR	International Relations
LNG	Liquefied natural gas
MLAA	Multi-Level-Analysis-Approach
MLPF	Multi-Level-Playing-Field
MLRS	Multi-Level-Regulation-System
MLSNS	Multi-Level-Society-Nature-System
MR	Media Release
MRET	Mandatory Renewable Energy Target
Mt	Megatonne (1,000,000 tonnes)
MW	Megawatt (1,000,000 watts)

NGOs	Non-governmental Organisations
OECD	Organisation for Economic Cooperation and Development
PM	Prime Minister
PPP	Public-private partnerships
QTIC	Queensland Tourism Industry Council
R&D	research and development
REs	Regional Ecosystems
SEDA	Sustainable Energy Development Authority
SPP	Southern Pacific Petroleum
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
WHA	World Heritage Areas
WHL	World Heritage List
WTWHA	Wet Tropics World Heritage Area
WWF	World Wide Fund for Nature (formerly World Wildlife Fund)

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- World Wildlife Fund and World Wide Fund For Nature Australia: www.wwf.org.au

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