articles

Environmental Law Challenges of Climate Change

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Introduction

As each QELA Conference has come around, the recognition of climate change as a live political issue has slowly grown. In the last 12 months, the change has been quite dramatic, with heads of both major political groupings at the federal level prepared to talk about emission targets in favourable terms, something quite unimaginable, even one year ago.

Because of these changes, it becomes realistic to speculate about the sorts of policies which may contribute to environmental law as part of an effort to deal with carbon emissions and the threat of climate change, more generally.[2] This paper seeks to sample some of the leading policy prescriptions that have emerged in recent months as a guide to what best practices might emerge in future years. If recent change is any guide, governments will be grappling with the creation of new laws, sooner rather than later. At next year's conference, we may even be debating the pros and cons of decisions made about congestion taxes; cap and trade schemes; carbon taxes and similar changes to the law.

The paper discusses three sources of policy prescription: the Stern Review;[3] the IPCC Report on Mitigation of Climate Change;[4] and the BCC report.[5] The first mentioned two reports are written from a global perspective.[6] Necessarily, their policy recommendations are generic and liable to be adopted in different ways by particular countries. The third report, having been prepared for a large urban local government is more specific in its recommendations. The paper seeks to compare the approaches of the Stern Review and the IPCC report and also explore the way in which the BCC report can be seen to be applying the approaches suggested by Stern and the IPCC.

1. The Stern Review[7]

The Stern Review ("Stern") is, perhaps, the most well known discussion of the policy responses necessitated by global warming.

Target Levels for Stabilisation

Stern addresses a number of different strands of climate change policy. However, primacy is given to the adoption of a target concentration level at which carbon dioxide equivalent gases ("CO^2e") are stabilized in the atmosphere.[8] Such a goal guides other policies including annual emissions targets over future years.[9] Such a goal is, itself, guided by both environmental and economic factors. An ultimate level that is too high will have environmental and economic consequences because of the impacts of increased climate change. An ultimate target level that is too ambitious may involve excessive economic costs without appreciable environmental benefits over a more liberal target. For example, costs may be associated with scrapping infrastructure (such as power generation facilities) long before their normal lifetime has expired. An ambitious target also involves making

1 The author is a member of the Queensland Bar. This paper presented at the Queensland Environmental Law Conference Conference 2007: *Your System or Mine?* held at Peppers Salt Resort and Spa, Kingscliff, northern New South Wales, 16-18 May 2007.

2 Previously, all one could do at conferences such as these was talk about the threat of climate change and hope that main stream politicians and policy makers might, unlikely as it was, happen to be listening.

3 Nicholas Stern, *The Economics of Climate Change The Stern Review*, Cambridge University Press, 2006.

4 Climate Change 2007: Mitigation of Climate Change: Working Group III contribution to the IPCC Fourth Assessment Report ("the IPCC report").

5 Maunsell/Aecom, *Climate Change and Energy Taskforce: A Call for Action*, Brisbane City Council, 12 March 2007 (the BCC report").

6 The paper focuses on the policy approaches applied in the domestic sphere. Both IPCC and Stern go to deal with ways of achieving international cooperation to ensure comity between national approaches and to ensure an effective global effort to limit the impacts of Climate Change. These aspects are outside the scope of this paper.

7 Nicholas Stern, *The Economics of Climate Change The Stern Review*, Cambridge University Press, 2006.

8 Stabilisation requires the reduction of annual emissions to below the annual absorption level for the same gases. Stern estimates this to be 5 Giga tonnes CO^2e ("Gt CO^2e"). See Stern, page 327 and more detailed discussion in chapter 8 (pages 218 and following).

9 Current annual emissions are over 40 Gt CO^2e, thereby, indicating a need for major reductions over time.

reductions of emissions, earlier, before new technology has been developed making savings more difficult and more expensive. Stern points out that adopting a goal involves dealing with a large number of uncertainties as to the temperature and other climate effects of particular concentrations and as to the resultant broader environmental and social impacts. The process also involves value judgments concerning both risk and equity questions including equity between generations. The range adopted by Stern is broad, in the range of 450 – 550 parts per million CO^2e ("ppm CO^2e").[10]

The ultimate stabilization goal chosen assists in choosing emissions targets, particularly emissions reduction targets. The following numbers are important to this consideration. Current annual emissions for the world are over 40 Gt CO^2e.[11] Annual absorption capacity for the planet is 5 Gt CO^2e.[12] Current atmospheric concentration is 430 ppm CO^2e, increasing at approximately 2.5 ppm per year. Stern estimates, to achieve a stabilization concentration in the range suggested, global emissions will have to be between 25% and 75% lower than current levels by 2050.[13] The implication for mitigation policies is that "even at the high end of the stabilization range, major changes in energy systems and land use are required in the next 50 years".[14] An even stronger policy implication is drawn from the fact that the agriculture sector already accounts for more than 5 Gt CO^2e per year and reducing emissions in that sector appears relatively difficult. Stern states that "stabilization is likely ultimately (well beyond 2050) to require complete decarbonisation of all other activities and some net sequestration of carbon from the atmosphere (e.g. by growing and burning biofuels, and capturing and storing the resultant carbon emissions, or by afforestation)".[15]

Stern's discussion of policy options which flow from a stabilization target is divided into policies for mitigation and policy for adaptation. Policy responses for mitigation are, themselves, divided into policies directed to pricing the cost of carbon into the cost of people's actions; technology policies directed to achieving changes needed to bring forward a range of low carbon and high efficiency technology; and policies of regulation, education and financing to break down barriers to behaviour change.[16]

Adaptation policies are necessary to cope with the policy change which will occur despite the best efforts at mitigation. Adaptation is necessary to reduce vulnerability to climate change; to cope with unavoidable impacts; and also to reap the benefits in those regions where small changes actually provide some economic benefit.[17]

Mitigation: Building in the Social Price of Carbon

The task of building in the negative externality of climate change may, theoretically, be achieved by a tax on carbon released into the atmosphere or by quantity controls on the amount of carbon dioxide which may be legally produced.[18] Whichever vehicle is used, policy and law makers should be guided by the long term stabilization goal but be prepared to exercise flexibility, in the short term, in the way in which the policy instruments are applied.[19] However, it is, also, important, for credibility in the system to be maintained, that the flexibility is exercised within a set of clear, transparent and predictable revision rules. An analogy, albeit imperfect, may be made with the way in which interest rates are adjusted within a country's monetary system.[20]

10 At time of publication of Stern, atmospheric greenhouse gas levels were 430 ppm CO^2e increasing at around 2.5 ppm CO^2e per year: Stern, page 338). One would have little difficulty agreeing with Stern that any target less than 450 ppm CO^2e is very ambitious, at least this century.

11 The latest figures from the Intergovernmental Panel on Climate Change ("IPCC") puts the figure at 49 Gt CO2e as at 2004. See IPCC Working Group III contribution to the Fourth Assessment Report, Climate Change 2007: Mitigation of Climate Change: Summary for Policy Makers, http://www.ipcc.ch/SPM040507.pdf downloaded 8 May 2007 ("The IPCC report") .

12 See Stern cited above at footnote 8. the IPCC suggests a more complex approach to absorption rates with current absorption rates being about half of what is being admitted. See Contribution of Working Group I to the Fourth Assessment Report of the International Panel on Climate Change Technical Summary, page 26 at http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_TS.pdf , downloaded 11 May 2007.

13 Stern, page 340 and see chapter 8, pages 218 and following.

14 Stern, page 340.

15 Stern, page 340.

16 Stern, page 349.

17 Stern, page 455.

18 Stern, page 354.

19 Stern, page 358-9.

20 Stern, page 360.

Both quotas and taxes have a potential to raise public finances (which may be re-invested into other climate change policies or be used to reduce other taxes). This is because tradable quotas may be auctioned rather than just being allocated to existing emitters.[21] Although taxes can be used to transfer resources to developing countries (by governments in developed countries providing assistance across borders), tradable quota systems allow such resources to flow more easily by allowing the purchase of quota allocations from developing countries or by allowing companies to have credits for emissions savings made in developing countries. If inter-country trading is built into a tradable quota system, it will help to ensure that efficiencies and reductions are made where it is most cost effective.[22]

Emission trading schemes will be more effective if they are deep and liquid (have plenty of volume of trading going on) and have well designed rules in place. The factors which contribute to the success of an emission trading scheme include broadening the scope of a scheme to include more countries, more gases and international credits; the allocation of quotas is sufficiently well handled to ensure appropriate scarcity;[23] lengthening trade periods to provide longer term confidence; designing the appropriate allocation schemes (including an appropriate use of auctioning allocations as opposed to just making free allocations); and by promoting transparency. Each of these factors involves careful planning and good decision making in the design of the schemes.[24]

Policies to Accelerate Technological Innovation

By building in the social cost of carbon, carbon pricing policies (whether they involve carbon taxes or tradable quotas) make technological innovation more likely to occur because the price in the market is higher and thereby closer to the marginal cost of energy produced by the new technology.[25] However, carbon pricing policies will, generally, be insufficient on their own to usher in new low carbon technologies. This is partly because established technologies have cost advantages of economies of scale and of learning based on experience over time which new technologies are yet to develop.[26]

The barriers to innovation applying generally in markets are accentuated in energy markets such as the power generation industry. These include low and declining levels (since 1980) of research and development. They also include market distortions in favour of existing fossil fuel technologies. World subsidies for fossil fuels in 2005 are estimated at $20-30 billion for OECD countries and $150-200 billion, worldwide.[27] The structure of electricity generation markets, often consisting of monopolies and frequently lacking full competition inhibit the rapid deployment of innovation. Road transport, although less oligopolistic, has its own barriers to innovation including a lack of network infrastructure to develop new fuels (including biofuel blends) to motorists when and where they are needed. Innovation in other areas, for example, in deploying energy conservation and efficiency technology such as new light bulbs or direct air circulation methods in buildings depend, to a considerable extent, on favourable planning and building regulations.

Against this background, Stern makes a number of recommendations as to type of technology policies which are likely to be most successful. He recommends, firstly, a portfolio approach avoiding concentration on one spectacular breakthrough.[28] Recommendations concerning research, development, and demonstration are very similar to policy prescriptions for research, generally. One should avoid volatility of funding to encourage institutions and researchers to commit themselves to projects. Peer review, arms length funding and expert panels are all recommended. Funding should address basic science and research as well as particular applications showing promise with an appropriate balance between the two. Demonstration funding should be considered in particular instances to prove viability and reduce risk. Governments should assist by providing infrastructure although demonstration projects are most suited to the private sector.[29]

21 Stern, pages 362-3.
22 Stern, pages 364-5.
23 A large drop in prices in the EU Emissions Trading Scheme ("EU ETU") occurred when it was realised that allocations were only 1% less than business as usual projections.
24 Stern, pages 375-390.
25 This is demonstrated visually by Stern in figure 16.6 at page 408.
26 See Stern, page 397, including figure 16.2.
27 See Stern, page 403 and page 313 for more detailed analysis.
28 Stern, pages 407-8.
29 Stern, pages 412-3.

While picking winners is eschewed, one area is thought particularly conducive to progress because of its broad application to a number of low carbon technologies. Energy storage, whether through photo-voltaic cells, hydrogen production or other technologies is recommended for attention because of its advantages for broader application of solar power; wind energy and even nuclear power and fossil fuel energy production (the latter in the transport sector).[30]

Stern places a lot of emphasis on deployment support. This concerns means of financial support during the period when innovative technologies are available to the market but remain more expensive than existing technologies despite the incorporation of carbon costs into energy costs. A wide range of deployment incentives[31] are available and have already been used to support low carbon technologies in a number of countries. While different policies will be applicable in different circumstances, Stern draws particular attention to the effectiveness of feed in tariffs as they have applied in a number of European countries, including Germany. A feed in tariff, often backed up by regulatory requirements that a certain proportion of energy generation be generated from low carbon technology, involves a price subsidy per unit of energy guaranteed for a certain period of time after the infrastructure has been built.[32] Stern also points out that price support mechanisms may need to discriminate between different low carbon technologies because some of the technologies which may, in the long term, prove most capable of reducing overall emissions may be less far along the deployment path and require more support. An example is the predominance of wind power in green power markets in the United States (92% of low carbon energy production) where technology neutral price support systems have been used.[33]

Stern estimates worldwide existing deployment support for renewables, biofuels and nuclear energy to be $33 billion per year. He estimates that this needs to increase by 2-5 times over the next 20 years to achieve the stabilization goals for which he advocates. This, however, is likely to be modest compared to the $20 trillion to be spent overall on energy infrastructure up to 2030 and the existing subsidies received by fossil fuel energy sources.[34]

Stern also recommends that the decline in global R&D funding on energy must be reversed, albeit, with a change in priorities away from nuclear energy, fossil fuels and synthetic oil fuels from gas and coal to carbon capture and storage, conservation, the full range of renewable energy technologies, hydrogen production and use, and fuel cells and energy storage technologies and systems

Helping Change Behaviour

Since Stern is, expressly, about the "economics of climate change", it is significant that it devotes a considerable amount of attention to policies which address the failure of markets to achieve energy efficient investment even when this appears to be cost-effective. These market failures are explained in economic terms through the existence of investment cost, lack of capital, and hidden costs and in non-economic terms through lack of clear information and lack of motivation.[35] A large variety of policy responses are discussed as available and necessary to achieve energy efficiencies through behavioural change.

Regulatory measures are seen to achieve efficiencies where markets fail because they can, inter alia, reduce complexity faced by consumers or firms through taking inefficient products out of the market; stimulate competition and innovation by signaling policy intentions, reducing uncertainty and creating scale in markets for innovative products; and cut transaction costs by simplifying regulatory requirements for new technologies, for example, by simplifying planning requirements for micro-generation technologies.[36] Performance standards, for example, for vehicle or electrical appliance efficiencies, help limit energy demand by removing inefficient products and promoting mass diffusion of more efficient alternatives. Design standards are more explicit and mandate or prohibit the use of particular technologies. The prohibition of CFCs in refrigerators, following the

30 Stern, pages 413-4.
31 See Stern, page 416, for a list of different forms of incentives.
32 In the German example, the guarantee is for 20 years.
33 Stern, pages 415-418.
34 Stern, pages 421-2. at page 418, Stern estimates existing subsidies for fossil fuels to amount to between $150 and $250 billion, annually.
35 Stern, pages 428-432.
36 Such as wind or solar generators fitted on houses and feeding into the grid.

Montreal Protocol in 1987, is such an example. Stern also emphasizes the potential of land use planning and building regulations to produce more efficient societies, either, by facilitating low carbon technologies such as wind turbines or solar panels; promoting higher density living; or encouraging public transport restricting and pricing parking spaces, creating pedestrian zones and imposing congestion charges.[37]

An alternative (or additional) policy response (to regulation) involves policies to provide information relevant to energy efficiency. Labeling requirements have led to very significant energy savings. Examples including the Energy Star program in the United States and the European Union refrigerator labeling scheme. Using modern metering technology to advise consumers of the real time cost of electricity has led to changes of behaviour reducing peak loads. The same smart technology, with an export facility, encourages the more rapid diffusion of micro generation technology with large energy savings.[38]

Public sector investment in low carbon technology and energy efficiency for its own energy needs has the potential to create viable markets; save public money; and provide an important leadership role. The public sector can help private uptake of innovative technology by facilitating the setting up of energy service contracting companies which design, manage and finance efficient energy-using processes in return for a share in the savings created by their work. This form of consultancy, already well established in the United States, Germany and Austria, "is at the heart of urban planners' strategy [in London] to deliver low carbon energy solutions".[39]

Stern also emphasizes that people are not just economic individuals responding to short term ideas of self-interest but are capable of learning and adopting new concepts of responsible behaviour. Policy options exist to develop behavioural responses in support of low carbon energy usage and energy efficiency by providing coherent information; providing good civil leadership; and by appealing to people's ideas of personal and civic responsibility including moral obligations to future generations and residents of developing countries.[40]

Policy Responses for Adaptation to Climate Change

Adaptation is defined by Stern as "any adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates their harm or exploits beneficial opportunities". It is the other response to climate change and deals with what is unavoidable notwithstanding such mitigation as is achieved. Some adaptation will be spontaneous and carried out by individuals without the need for policy input. Examples of autonomous adaptation include farmers changing the time when they plant or harvest crops in response to earlier spring weather or animals migrating to higher altitudes or latitudes to find cooler climates.

Policy driven adaptation commences where autonomous adaptation ceases and will, largely, be the responsibility of public agencies.[41]

An important starting point for adaptation policies is high quality information on climate change, including improved regional climate predictions, particularly, of rainfall and storm patterns. It is also important that this improved information is communicated to stakeholders in a way that is coherent; practical; and not over prescriptive, allowing local choice and flexibility.[42]

Land use planning and performance standards play an extremely important role in adaptation policy delivery. Planning requirements have the capacity to ensure that investors incorporate the interests of future generations when infrastructure decisions are made. Developers who are forced to explicitly consider whether to increase the long term resilience of infrastructure will make their decision more rationally. Where risks of climate change are substantial, a planned approach can allow for changes in line with natural replacement cycles and avoid expensive retro-fits. United States experience indicates that relatively cheap structural measures can avoid very large

37 Stern, pages 435-436.
38 Stern, pages 437-441.
39 Stern, pages 441-446.
40 Stern, pages 448-451.
41 Stern, pages 457-460.
42 Stern, pages 474-475.

amounts of hurricane damage. Research also indicates that, in the absence of compulsion through regulation, home owners are unlikely to undertake even inexpensive structural storm protection measures. As well as regulation, procurement policies of public agencies can encourage adaptation best practice in infrastructure decisions.[43]

Governments (including local governments) also need to establish long term policies which take account of climate change in provision of climate sensitive public goods such as natural resources protection; coastal protection; and emergency preparedness. Well thought out policies can reduce the expense associated with costly infrastructure becoming redundant or having to be reconstructed to cope with previously unplanned for conditions. An example of emergency preparedness addressing changed climatic risks is the Philadelphia Heat Health Warning System which is a multi-pronged set of responses to avoid the type of disaster experienced by France during the 2003 heat wave when 15,000 extra deaths occurred.

Particular strategies need to be developed to protect natural systems. Policies for nature protection need to be designed to allow species' movement across the landscape. Larger contiguous areas need to be provided to allow this. Existing fragmentation of the landscape and existing barriers to such movement need to be addressed.[44] Australia, with its network of sometimes isolated National Parks will require new policies to allow species' to travel and to find new habitat along with other countries.

2. Climate Change 2007: Mitigation of Climate Change: Working Group III contribution to the IPCC Fourth Assessment Report ("the IPCC report")[45]

This report is only available in its "Summary for Policymakers" version which was released on Friday, 4 May 2007. The IPCC report will be the third volume of the Fourth Assessment Report to be released.[46]

The IPCC report analyses the prospects for mitigation policies by dividing activity into seven broad industry sectors: energy supply[47], transport, buildings, industry, agriculture, forestry/forests and waste. It is trite that different opportunities and difficulties exist in achieving mitigation of greenhouse gases between the different sectors.

The IPCC report addresses these opportunities by considering, in respect of each sector, mitigation technologies and practices which are currently commercially available and also addresses mitigation technologies and practices projected to be commercialized by 2030. For example, in the energy sector, improved supply and distribution efficiency are currently available as are fuel switching from coal to gas and nuclear power, renewable heat and power (such as hydropower, solar, wind, geothermal and bioenergy). By 2030, the report projects availability of carbon capture and storage ("CCS") for gas, biomass and coal fired electricity generating facilities, advanced renewable energy; advanced renewable energy, including tidal and waves energy, concentrating solar and solar PV (photo voltaic).[48] Such an analysis provides at least a starting point for thinking about strategies to assist development and deployment of innovative technology.[49]

In addition to the analysis by industry sector, the IPCC report also addresses climate change mitigation which can be achieved by changes in lifestyle and behaviour patterns. As well as education and training programmes, generally, the report places particular emphasis on traffic demand management and the contribution that urban planning can make in reducing the demand for travel.

The continuing uncertainty with which policy makers will have to grapple can be seen in the IPCC report's estimates of the impact on global GDP for mitigation efforts to stabilize concentrations in

43 Stern, pages 476-478.

44 Stern, pages 478-481.

45 http://www.ipcc.ch/SPM040507.pdf downloaded 8 May 2007.

46 The earlier volumes, summaries of which were released earlier in 2007, are "Climate Change 2007: the physical science basis" and "Climate Change 20072007: impacts, adaptation and vulnerability". A fourth volume, a Synthesis Report is expected to be available in November, 2007.

47 Not only is energy production a large contributor to greenhouse gas emissions. It is also the fastest growing, having grown 140% between 1970 and 2004. The next fastest growing is transport which grew its contribution by 120% during the same period. See the IPCC report at page 3.

48 The IPCC report, page 14.

49 Stern also recognized the importance of addressing mitigation strategies on a sectoral basis. See his more discursive approach at pages 384-390 in the context of carbon pricing.

the range of 445-710 ppm CO^2e.[50] The report's estimate of the impact is a range of a 1% gain for global GDP as at 2050 to a 5.5% loss. The uncertainty is heightened by the further caveat that specific countries and sectors will, themselves, be affected differently.[51] The policy implication, as recommended in the report, is that decision making must involve repeated risk assessments addressing policy responses involving both mitigation and adaptation and taking into account actual and avoided climate change damages, co-benefits (for example, avoidance of other pollution production), sustainability, equity and attitudes to risk.[52] While policies can be refined up and down as politics, the state of knowledge and circumstances change, the long expected life of much infrastructure, especially, in the energy sector will mean that timid decisions made now may have high costs in the future.[53]

The IPCC report sets out a series of policy recommendations for climate change mitigation. They are generic and operate at a high level of abstraction and recognize that local circumstances will determine particular choices. The recommendations do, however, attempt to draw on the experiences which have already occurred and are able to indicate strengths and weaknesses, opportunities and constraints. The conclusions of the analysis, on the whole, reflect the conclusions of Stern.

Incentives to Stimulate Mitigation Activity

The report indicates that a wide variety of instruments are available to governments to create incentives for mitigation activity. They should be assessed against four main criteria: environmental effectiveness; cost effectiveness; distributional effects including equity; and institutional feasibility. The choice of instrument does not, in itself, determine success since all instruments may be designed well or poorly and be stringent or lax.[54]

An important observation is that it is beneficial in terms of implementation and overcoming barriers to change to integrate climate policies in broader development policies.

Regulations and standards have the advantage of providing certainty about emission levels. Where information or other barriers make response to market signals ineffective, regulations and standards are advantageous.[55]

Taxes and charges are effective in setting a price for carbon and, thereby, are efficient in internalizing the costs of greenhouse gas emissions. They are not, however, able to guarantee a particular level of emissions.[56]

Tradable permits will also establish a price for carbon. As did Stern, the IPCC report notes that the volume of allowed emissions is important to environmental effectiveness ("the importance of scarcity"); the way in which allocations are made has distributional consequences (wind fall profits to existing emitters); and fluctuations in prices can make it difficult for industry to make rational decisions.[57]

Financial incentives (subsidies and tax cuts) have economic costs but are often crucial to stimulate the development and diffusion of new technologies.[58] (Stern points out that these costs are normally borne by the consumer.)

The IPCC report makes important observations about the effectiveness of voluntary agreements between governments and industry. They tend to be politically attractive and are important in raising awareness but, generally, have not been effective in reducing emissions beyond business as usual. More recently, however, it is noted that some agreements in some countries have been effective in accelerating the uptake of best available technology and in reducing emissions.[59]

50 This is a much broader range than the 450-550 ppm CO^2e indicated as a preferable goal by Stern.
51 The IPCC report, page 27.
52 The IPCC report, page 27.
53 The IPCC report, page 28.
54 The IPCC report, page 28.
55 The IPCC report, page 28.
56 The IPCC report, page 28.
57 The IPCC report, page 29.
58 The IPCC report. Page 29.
59 The IPCC report, page 29. Stern had noted the effectiveness of the Top Runner voluntary program in Japan which he attributed to local political culture. See Stern, pages 434 (box 17.2) and 447.

Information instruments such as awareness campaigns are seen as capable of contributing to informed choices, behavioural change and, ultimately, reduced emissions. The report notes a lack of data as to their effectiveness on this last point.[60]

The IPCC report also briefly notes the importance of research, development and diffusion policies in stimulating technical advances, reducing costs and achieving progress towards stabilization.[61]

The IPCC report also examines specific policies likely to be applicable to deployment in specific sectors, indicating constraints and opportunities in each case. For example, reduction of fossil fuel subsidies and taxes or carbon charges on fossil fuels are seen as applicable to the energy supply sector but subject to the constraint of being difficult to implement because of resistance by vested interests. Feed-in tariffs for renewable energy, renewable energy obligations and producer subsidies are all seen to be appropriate to create markets for low emissions technologies.[62]

On the other hand, in the agriculture sector, financial incentives and regulations to achieve improved land management are seen as advantageous. The opportunities include synergy with achieving sustainable development, more generally, and reducing vulnerability to climate change. Similar approaches are recommended in the forestry/forests sector to increase forest area. However, international involvement is seen as likely to be necessary to provide financial incentives to overcome lack of investment capital currently presenting a constraint. There is an additional advantage seen in helping to reduce poverty.[63]

The IPCC report devotes a section to the need for government support through financial contributions, tax credits, standard setting and market creation to encourage and assist effective technology development, innovation and deployment.[64] The approach is very similar to that recommended by Stern.

The IPCC report also notes potential synergies between climate change mitigation policies and policies to promote sustainable development but also notes that they are not always consistent and careful design may be important to ensure that mitigation policies do not prove to be inimical to sustainable development. In particular, restoring loss of natural habitat and preventing deforestation can have significant biodiversity, soil and water conservation benefits and can also be implemented in ways which are socially and economically sustainable. Forestation and bioenergy plantations can lead to restoration of degraded land, manage water runoff, retain soil carbon and benefit rural economies but can compete with land for food production and may be negative for biodiversity if not properly designed.[65] There have been examples in the palm oil industry of natural rain forest being cleared to plant large expanses of palm tree monoculture in a manner that is detrimental both to biodiversity and local communities.[66] The broader problems created by the growth of plants for biofuels is discussed by the same author in *If we want to save the planet, we need a 5 year freeze on biofuels.*[67] The dangers of mitigation policies having destructive social, economic and sustainability impacts requires great care on the part of decision makers because many of those destructive impacts will occur to powerless people in the developing world whose concerns will not be, immediately, audible.

On the other hand, there is strong potential for well designed bio-sequestration projects to reduce greenhouse gases in the atmosphere while, at the same time, restoring habitat, thereby, assisting species' efforts to carry out their own adaptation.

60 The IPCC report, page 29
61 The IPCC report, page 29
62 The IPCC report, page 31
63 The IPCC report, page 32
64 The IPCC report, pages 32-33
65 The IPCC report, page 34
66 See George Monbiot, *The Most Destructive crop on earth is no solution to the energy crisis*, The Guardian , 6 December 2005
67 The Guardian, 27 March 2007 The destructive impact of clearing old growth forest to grow monoculture plantation forest is discussed by Richard Flanagan, in a Tasmanian context, in *Gunns Out of Control*, The Monthly, May 2007

Conclusions: Comparing the Policy Prescriptions of Stern and IPCC 2007

A number of things emerge from a comparison between the policy prescriptions of the two documents. There is a great deal of commonality in the analysis and the recommendations which are made. This indicates that the broad strategies to achieve a manageable and livable stabilization goal to avoid the worst excesses of climate change are clear and relatively uncontroversial in the literature.

However, what also emerges from both documents is the amount of choice available to governments and public authorities about the way in which they achieve those strategies. It is also clear that making those choices will be difficult and that each choice involves trade offs in terms of environmental effectiveness and cost to the community. Beyond unavoidable tradeoffs, the choices also involve questions of policy design. Bad decisions may achieve little by way of environmental effectiveness while, at the same time, imposing significant costs either on whole communities or particular sectors or individuals.

At least in the early stages of the process, decisions will have to be made without having all relevant information because much of that information is not yet available and will not become available for many years into the future. While Stern and the IPCC can provide criteria for good decision making, their guidance is at a very generic level.

Comparatively successful decision making will need to display political courage and political shrewdness at the same time. It will need to draw upon the best expertise available to it across a range of disciplines. It will need to provide transparency and a framework of certainty while, at the same time, showing flexibility over time. Governments will need to be information hungry factoring in new developments and new discoveries as soon as they become available.

Good political leadership in the shadow of climate change will be very valuable.

3. Local Prescriptions: Brisbane City Council Climate Change and Energy Taskforce ("the BCC report)[68]

Introduction to the BCC Report

Brisbane City Council set up a Climate Change and Energy Taskforce ("the Taskforce") in August 2006. It presented its report to Council on 12 March 2007. The report was debated on 30 April 2007 and some but not all of its recommendations were adopted.[69]

This paper is concerned with the BCC report's recommendations rather than the extent to which those recommendations have found favour at this stage. The report is significant as an analysis as to future action concerning climate change from a local perspective, contrasting with the necessarily generic approach taken by Stern and The IPCC report. Thirty-one recommendations are made. In reality, since each recommendation contains many sub-recommendations, there are many more. The result is certainly a thorough going consideration of what needs to be done.[70]

The BCC Report sets a goal for emissions rather than a stabilization goal. The goal is based on an IPCC recommendation of a reduction in world emissions by 2050. This is modified by allowing for increases in the developing world in emissions on equity grounds. Thus a 90% reduction in emissions for the City of Brisbane by 2050 is recommended with zero net emissions being achieved by an equivalent amount of bio-sequestration within the city by the same year. The target is a reduction from 1990 emissions of 9.15 million tones CO^2e[71] to no net emissions by 2050. Interim targets of 16 Mt by 2015; 9.3 Mt by 2026 and 5 Mt by 2035 are also recommended.[72] A series of sub-targets relating mineral oil consumption, and emissions targets for households and Council's operations, respectively are also recommended.[73]

68 Maunsell/Aecom, Climate Change and Energy Taskforce: A Call for Action, Brisbane City Council, 12 March 2007. The report is available at http://www.brisbane.qld.gov.au/BCC:BASE:663853654:pc=PC_2526.

69 See news report at http://www.brisbanetimes.com.au/news/queensland/council-debates-climate-change-report/2007/04/30/1177788002611.html.

70 The report uses as the focus of its concerns not just climate change but also the prospect of increasing energy costs through the phenomenon described as peak oil where the ability to produce petroleum energy products at previous levels declines with increasing scarcity resulting.

71 BCC report, page 30.

72 BCC report, page 36.

73 BCC report, page 36.

The BCC report addresses both mitigation and adaptation. It recognizes the limitations of a local government to achieve all the changes necessary to achieve its goals and recommends working with other government levels; other public institutions; commercial institutions; and individuals. It recommends a leadership role on the part of the Council and its public officials. It recommends education campaigns at a number of different levels.

Adaptation Recommendations

The BCC report recognises that there are links between adaptation strategies and mitigation. For example, a considerable amount of attention is devoted to the need to develop strategies and policies concerning air conditioning. This is because air conditioning will play a part in providing refuges for vulnerable people in times of heatwaves which can be expected to be more frequent because of climate change. However, air conditioning is a large contributor to electricity use tending to create a need for greater emissions of greenhouse gases. Thus, recommendations are made for ways in which the need for air conditioning can be reduced or avoided; but also for rules to ensure proper use is made of insulation, solar panels are used to provide low carbon power to run the air conditioner and air conditioners are made more efficient energy users through standard setting.[74] There are a number of recommendations to encourage and assist food production within the City. This has elements of adaptation to peak oil and climate change (high food prices through high freight charges and through declining fertility in food bowl areas outside the City) and mitigation (reducing greenhouse gas emissions through avoiding transport requirements).[75]

The adaptation recommendations include large scale disaster preparedness planning with a focus on climate change enhanced risks such as storm surge and storm wind damage.[76] There is specific focus on heat wave and heat stress responses in Council's own disaster planning as well as flooding and storm surge.[77] Adaptation is addressed in the recommendations relating to changes to land use planning. These include stronger safeguards against development in areas subject to flooding and storm surge and a further safety margin in the Q100 flood level;[78] and mapping and studies incorporated into City Plan identifying areas with increased risk through climate change[79]. The same recommendation suggests working with the State government to reduce the risk profile of local infrastructure including, in some cases, withdrawal of same from high risk areas.

There are many recommendations for minimising water usage and reducing dependence on centrally supplied water. The methodologies include provision of infrastructure (recycling all waste water by 2026); market mechanisms (increases in water rates for excess usage); regulation and education to achieve behaviour change ("aggressive program to remove inefficient toilets, showers and washing machines from the City and mandatory requirements for water tanks"); using land use planning rules (requiring new subdivisions of 10 or more lots to have zero net draw on mains water) and pure education (actively promoting the use of grey water).[80] The Council's role as a major user is also used in a recommendation which suggests, inter alia, that opportunities in Council buildings for water efficiency and source substitution be identified and that all Council water use be tracked though an existing Energy Information and Management System.[81]

Regulation through cooperation with other levels of government is sought as a means of promoting adaptation to adverse weather conditions by seeking changes to the Building Code of Australia and plumbing codes for all classes of buildings.[82] Stern had pointed out that consumers in a United States study had been shown to fail to adopt even low cost protection against weather hazards.[83]

It may be observed that the BCC report seeks to promote adaptation to Climate Change within the City by using most, if not all, of the policy approaches discussed by Stern and The IPCC report.

74 BCC report, page 47 (recommendation 26)
75 See, for example, recommendation 13(b) at page 41
76 See BCC report, page 45 (recommendation 22)
77 BCC report, page 46 (recommendations 23 and 24)
78 BCC report, page 41 (recommendation 13(a))
79 BCC report, page 42 (recommendation 14(a))
80 All part of recommendation 28 on page 48
81 See recommendation 7 on page 37
82 The Building Code of Australia has application (with legal force) in Queensland through the *Building Act* 1975 See, in particular, s 30
83 Stern, page 467, referring, in particular to a study by the Wharton Centre for Risk Management and Decision Processes

Mitigation Recommendations

The BCC report supports an existing proposal for a CitySmart Regional Carbon Sink[84] which is to be developed with regional mayors and the Queensland government. The report recommends that the scheme is compatible with existing and future emissions trading schemes at federal level as well as other States' schemes.[85] The idea appears to be that, to achieve zero net emissions, the City will use bio-sequestration offsets but will also be able make its tree plantings available to a broader market. Brisbane, as a local government, does not have to make the more difficult decisions as to design of such schemes (or whether to use taxation as an alternative) that face national governments but, rather, must accept and fit in with whatever national approach is taken. Emissions trading schemes are a relatively small aspect of the steps that need to be taken at a local government level.

The BCC report addresses a subject which is very important to any process of achieving institutional change. In recommendation 8, the report recommends a number of procedural changes to ensure that sustainability, Climate Change mitigation and dealing with peak oil are considered appropriately in every act and decision of the local government. These include seeking changes to relevant legislation; decision support tools for staff; including the cost of carbon emissions in financial analysis; and including performance on these issues in the expectations for all staff's performance agreements and other relevant employment documentation. In recommendation 9, the creation of a special institution is recommended, namely, an independent advisory board with a reporting responsibility to civic cabinet, its own budget and staff and a broad brief to cross boundaries and develop partnerships with the outside world.[86] These organisational mechanisms to strengthen implementation over time appear to be something not given great emphasis by either the IPCC or Stern. They are very important to achieving success, particularly, in a political environment where electoral cycles cut in every 3 or 4 years.

As with adaptation, the mitigation recommendations of the BCC report use many of the policy approaches suggested by the IPCC and by Stern.

The status of the Council as large user and procurer is utilized in recommendation 5 where solar photo-voltaics and hot water on council buildings; greater council involvement in energy from waste; partnerships with property owners and industry to install wind turbines; partnership with electricity retailers to promote green products; and setting average fuel efficiency standards for the Council vehicle fleet all receive a mention.[87]

Communication and education initiatives at a broad range of levels is recommended including use of Council officers and elected officials for leadership roles.[88]

The Council's role as a strategic and land use planning body has a key role in the report's recommendations. Part of this role has an emphasis on making the City amenable to low carbon energy transport modes but also extends to other forms of energy efficiency or low carbon energy use. The Council's role in promoting low carbon energy transport modes also extends beyond its land use planning role and extends to provision of infrastructure and a role in involving other infrastructure providers such as the Queensland government.

Recommendation 12 promotes the concept of transit oriented developments ("TODs"), a form of mixed use development (or urban village) which are well integrated with public transport, cycling and pedestrian networks. The Council is urged to engage in such developments, itself, as well as assisting their development by a favourable regulatory regime.[89] Amendments to City Plan are recommended to make rainwater tanks mandatory in all new developments; require large developments to be preceded by climate change studies; provide for solar access for roofs and

84 The concept is explained in a mayoral press release at http://newsroom.brisbane.qld.gov.au/home/news_detail.asp?ID=614 dated 11 December 2006 (downloaded 10 May 2007). The plan involves a regional tree planting plan for bio-sequestration (and habitat) purposes.

85 BCC report, page 47 (recommendation 27).

86 BCC report, pages 38-39.

87 BCC report, page 37.

88 BCC report, page 39-40 (recommendations 10-11).

89 BCC report, page 41 (recommendation 12).

encourage embedded electricity generation, especially, co-generation;[90] and require greater provision of facilities, planning and infrastructure for cycling, walking and use of public transport.[91]

The emphasis on providing and planning for low carbon transport in the BCC report is very extensive, extending across seven separate recommendations (apart from the recommendations as part of addressing land use planning issues). Recommendations include greater use of bus priority lanes; priority extension of busway infrastructure; planning for light rail services in all new bridge infrastructure; extension of light or heavy rail services in the CBD; provision of accelerated provision of bus rolling stock to provide services ahead of demand rather than lagging behind demand;[92] developing a pedestrian master plan and proceeding to implement same; improve the effectiveness and coverage of the City's bikeways;[93] explore new forms of transport system including ultra-light rail, mono-rail and cybernetic transport systems[9495] and intelligent transport systems;[96] investigate using libraries and other council centres to promote telecommuting; increase charges for travel to CBD and make public transport more economic; introduce a parking levy on employee provided spaces in the CBD; provide bus ticket packages to employees by way of salary sacrifice;[97] encourage the provision of infrastructure and networks for alternative fuels by giving rate exemptions to service stations which stock a large range of fuels including bio-fuels; use procurement policies to encourage contractors to use low carbon fuels; and move immediately to a biodiesel mix for all council diesel uses together with other fuel procurement policies favouring biofuel products.[98]

It can be seen that the BCC report, in its transport recommendations, uses a large number of the policy approaches discussed by Stern and the IPCC. These include taxation and rate exemptions to use market incentives; regulation; procurement policies; and education approaches. As well as avoiding the tough policy decisions on emissions trading, as a local government, the Council does not have responsibility for industry policy with the difficult decisions concerning the promotion of innovation and devising the best schemes to assist in commercial deployment of this technology. However, just as the Council's Carbon Sink can support a national emissions trading scheme, the willingness of local governments to support innovative technology both as procurer and with education will provide a boost to the work of State and Commonwealth governments in promoting Climate Change friendly innovations.

Conclusions Concerning the BCC Report

The BCC report provides a very recent example of planning at a local government level for mitigation of and adaptation to Climate Change. It can be seen that the more specific proposals of the BCC report apply many of the general policy approaches of the IPCC and of Stern.

Stern and the IPCC are, in some ways, more focused on policy approaches at the national level. The BCC report indicates, however, the importance of local government involvement, both in its own right and in a supportive role to the efforts of State and national governments.

The BCC report also indicates, by its own proposals for involvment with other levels of government and with corporate stakeholders and with householders, the importance of integration of efforts to mitigate and adapt to Climate Change.

The BCC report also reflects the strictures of Stern and the IPCC for far sighted planning and for goal setting but, in its substantive recommendations, makes provision for further studies and planning which will lead to further substantive policy changes.

90 This appears to be similar to Stern's emphasis on encouraging micro-generation facilities See Stern, page 420

91 See recommendation 13 on page 41

92 Recommendation 15 on page 43

93 Recommendation 16, at pages 43-44

94 Intelligent transport systems use wire and wireless connected computer technology to make transport infrastructure more efficient and safer An example comprises traffic lights regulated to operate differently according to different traffic densities See http //www its dot.gov/its_overview htm, downloaded 10 May 2007 ITS is already used in Queensland See http //www mainroads qld gov au/MRWEB/Prod/Content nsf/2911b5cc11cfec994a2569e60005f0b3/eef30e8638bf26384a256aca001c87d0?OpenDocument , downloaded 10 May 2007

95 Cybernetic transport comprise fleets of driverless vehicles operated by a supervised system See http //www robosoft fr/eng/sous_categorie php?id=1023 , downloaded 10 May 2007

96 Recommendation 17, page 44

97 Recommendation 18, page 44

98 Recommendation 19, page 44

The BCC report also emphasises the need to use a network of approaches with a particular emphasis on leadership and education backed up by market encouragement and regulatory provisions.

The bi-partisan failure of Brisbane City Council to adopt the BCC report in full indicates the political difficulty perceived for strong action to mitigate Climate Change. However, one may, reasonably, surmise that the political tide will continue to swing and that strong political leadership will, ultimately, be rewarded.

While other policies will differ in their detailed approach, the BCC report provides a very useful model of the way in which the more generic approach of the IPCC and Stern may be given a local and specific voice.