ADAPTING AUSTRALIAN CITIES TO CLIMATE CHANGE: IS THERE A GROWING RISK OF MALADAPTATION?

Mikael Granberg[1], Leigh Glover[1]
[1]*University of Orebro, Orebro, Sweden,* [2]*University of Melbourne, Melbourne, Australia*

1. INTRODUCTION

In this paper we propose that public climate change adaptation policy arises from politics and, accordingly, understanding and analysing such policy has to engage scholars with a keen interest in politics. In line with this proposition a distinguishing feature in this paper is that it seeks to consider adaptation policy for cities in a political context. This paper aims to review issues associated with the public policy response to climate change adaptation in Australian cities and consider whether the approach adopted by the federal government increases the risks of maladaptation.

As a starting point, the Intergovernmental Panel on Climate Change defines climate change adaptation (IPCC, 2007: 720):

> Adaptation to climate change takes place through adjustments to reduce vulnerability or enhance resilience in response to observed or expected changes in climate and associated extreme weather events. Adaptation occurs in physical, ecological and human systems. It involves changes in social and environmental processes, perceptions of climate risk, practices and functions to reduce potential damages or to realise new opportunities.

Similarly, Nelson et al (2007: 397) state:

> We define adaptation as the decision-making process and the set of actions undertaken to maintain the capacity to deal with future change or perturbations to a social-ecological system without undergoing significant changes in function, structural identity, or feedbacks of that system while maintaining the option to develop. At the collective level, process and action are predicated on effective governance and management structures.

Public policy interest in climate change adaptation for Australian cities is growing. This interest is marked by federal, state, and local government activity supporting an adaptation response, that have the essential role in enacting public policy to address the issue. It has been recognized in, for example, the House of Representatives 2009 Inquiry into Climate Change and Environmental Impacts on Coastal Communities, the Council of Australian Governments' capital city strategic planning systems, Infrastructure Australia's 2011 national urban policy *Our Cities, Our Future*, and the federal government's *Climate Change Adaptation Actions for Local Government* (DCCEE, 2010). Relatively few scholarly assessments or reviews of Australian adaptation policy are available (e.g., Glover, 2007; Philip and Taylor, 2011), as distinct from adaptation studies of specific phenomenon or locations.

Adaptation has proved a difficult concept, even when confined to social systems, offering wide interpretations within and between academic disciplines, and sometimes confusingly referring to both the process of adaptation and the condition when this is achieved (IPCC, 2001). Its scale can range from the local to the large, its time horizon can range from the short to the long terms, it can be tactical or strategic, it can seek

immediate, delayed, or cumulative effects, and it can encompass widely differing outcomes (such as retreat, accommodation, protection, prevention, toleration, change, and restoration) (IPCC, 2001). Further, adaptation has not been without controversy, given that it focuses on the climate change effects rather than addressing the causes of these risks or the other factors giving rise to vulnerability (such as social injustice or income distribution) (e.g., Ribot, 2011). Critics have raised the concern of whether adaptation undermines greenhouse gas (GHG) emissions mitigation; others argue that such preparation for climate change impacts is prudent. A particular concern is maladaptation, i.e., when adaptation produces negative consequences.

Formulating adaptation responses is a challenging issue for public policy for a number of reasons. Firstly, there is the large range of possible climate change impacts across social and natural systems. Secondly, there is an insufficient knowledge base to identify many of the needed adaptation responses. Thirdly, there is no social consensus about where responsibility for action should reside; even within government, climate change impacts will be the responsibility of a wide range of portfolios. Fourthly, there is the usual set of problems facing public policy of this sort, such as procuring sufficient and available public funding and resources, creating sufficient institutional capacity, training and education, and so on.

Cities in particular are complex places and the adaptation issues and potentially associated strategies are diverse (cf. Granberg & Elias, forthcoming). IPCC (2007) states that these strategies can cover effective governance, increasing resilience, changing settlement locations, changing settlement form, providing financial mechanisms, and assistance programs.

Our interest in adaptation policy in this paper concerns the public policy dimension; i.e., we are not concerned here with spontaneous social adaptations to changing climate or that undertaken independently by corporations or communities, but rather with those that are planned, purposeful, and intentional. Further, we note that not all climate change impacts need to be subject to adaptation policy; these impacts may be small or of little consequence, the changes required may be within the routine operations of society or organisations; and the changes may be minor in comparison to other agents of change. While the argument for adaptation is well developed at this time, drawing largely on planning principles of precautionary action to limit the extent of unavoidable harms and costs, the political and social dimensions of this rationalisation have been less well developed, no doubt because they must openly evoke political values. There are a number of reasons why public policy is involved in adaptation responses. Tomkins et al (2010) identify three reasons; firstly, the need to protect those least well able to cope with climate change impacts. Secondly, the provision of information and advice on climate change risks for non-state actors. And thirdly, to protect public goods.

Although this paper deals only with federal policies for climate change adaptation, there is considerable interest in adaptation at the state/ territory and local government spheres. Despite this interest, generally there has been relatively little policy activity and public expenditure at these levels. There have been some interesting public policy initiatives by the states/ territories and particularly by local government, but these are relatively few in number and the collective spending is unlikely to exceed federal expenditure. At present there is no review of activities at the sub-federal government level; nor is there one of initiatives by the Australian private and community sectors.

2. NATIONAL APPROACHES TO ADAPTATION POLICY

Adaptation may now be part of the national climate change response, but for a long time it was a marginal interest and cities have not been a priority. Australia has maintained a strong scientific effort to investigate climate change, primarily supported by the federal government, but although this has included the study of climate change impacts, it has generally not included research into adaptation up until recent times, as

described below. It appeared that adaptation was neither suitable for scientific investigation nor constituted a high priority in national climate change policy.

In Australia's first *National Greenhouse Response Strategy* (Australia, 1992), the strategies and responses are relatively general, primarily calling for research into vulnerable sectors and areas, the development of vulnerability assessment techniques, and the application of results in planning and management. In the 1998 *The National Greenhouse Strategy* (Australia, 1998) a national framework for adaptation was promised, which would, amongst other things, prepare integrated assessments for economic sectors and regions, consider mechanisms for implementation, including the barriers faced and risks involved. It also describes work underway in key sectors in general terms; coasts and marine, agriculture, biodiversity, forests, and human health.

In the national budget of 2004, a National Climate Change Adaptation Programme was announced and in the following year several key documents were produced. A *National Climate Change Adaptation Programme* (AGO, 2005a) made available AUD$14 million over four years. This program was linked to the *National Climate Change Risk and Vulnerability: Promoting an Efficient Adaptation Response in Australia* (AGO, 2005b), which sought to comparatively assess the climate change impacts risks to assist in setting adaptation priorities, and was produced by the consultants, the Allen Consulting Group. Priorities are viewed as (AGO, 2005b: ix): "Prioritising adaptation action requires the identification of vulnerable systems – human and natural – the costs if these fail, the scope to reduce this risk, and the ability to capture any potential benefits." An ambitious set of terms of reference was set for this study and the findings are reasonably broad. Additional to identified ecosystems and vulnerable agri-business units are themes particularly relevant to cities: energy (as demand is concentrated in cities), water supply (as urban demand), and settlements and emergency services. In 2006, the federal government published *Climate Change Impacts and Risk Management: A Guide for Business and Government* (AGO, 2006).

Through this period, the role of science did not include adaptation, but was directed to assist in developing an understanding of actual and potential impacts. For example, in the *Australian Climate Change Science Program 2004—2008* (AGO, 2005c), adaptation didn't rate a mention, nor did it appear in *Australian Climate Change Science Programme: Major Achievements: 1989-*2004 (AGO, 2005d).

A new national *Climate Change Policy* in 2007 described the government's AUD$44 million commitment in the 2007-08 Budget to a new National Climate Adaptation Flagship is described (Australia, 2007a). This funding supported impacts research and the development of the Australia Community Climate and Earth System Simulator. Dealing more directly with adaptation, the policy also stated that the National Adaptation Framework would guide work over the forthcoming five to seven years. It also stated that the government would provide AUD$126 million for the Australian Centre for Climate Change Adaptation. This framework (Australia, 2007b) provides strategic directions and identifies eight sectors/ regions, including 'settlements, infrastructure and planning' with five 'potential areas for action'. One of these items was to support local government by producing a toolkit, which was published in 2007 as *Climate Change Adaptation Actions for Local Government*, much of which pertains to cities as they cover infrastructure and property services, planning and development processes, and water and sewerage services. Through the period 2006—2009, the government produced around a dozen publications on adaptation.

Under the AUD$126 million Climate Change Adaptation Program, the AUD$20 million National Climate Change Adaptation Research Facility (NCCARF) was established at Griffith University. NCCARF's AUD$2.6 million research program has prepared a set of research plans for the following themes: Terrestrial Biodiversity; Human Health; Marine Biodiversity and Resources; Freshwater Biodiversity; Settlements and Infrastructure; Social, Economic and Institutional Dimensions; Primary Industries; and Indigenous Communities. Some 55 research projects have been funded to date; 13 are on

settlements and infrastructure; the latter two research themes are in the process of awarding research grants at the time of writing.

Also under this program are some small grant programs for local government; an adaptation pathways programs (AUD$2 million), skill-building programs (about AUD$2 million), and an integrated assessment of settlements that provided funding for five projects to identify issues and develop responses. Some 32 local governments were funded around $50,000 each to undertake risk assessments and action plans in round one in 2008 and a further seven groups of councils won grants valued between AUD$86,000—140,000 in round two of the LAPP.

Under the national adaptation research plan, a research strategy for settlements and infrastructure has been published (Thom, et al, 2010). Setting out research priorities for the next five to seven years, the strategy identified critical research gaps and posed research questions for the themes of urban and regional management, built environment, vulnerable coastal communities, and infrastructure. Essential questions deal with the potential severity of impacts or scale of benefits, the immediacy of action needed, and the need to alter existing interventions and the practicality of alternatives. So-called 'desirable questions' address the potential for co-benefits, cross-sectoral relevance and equity considerations.

There have also been five major national vulnerability assessments, of which, the National Coast Risk Assessment, includes consideration of settlements. A major report (DCC, 2009)—*Climate Change Risks to Australia's Coast: A First Pass National Assessment*—identifies major issues and the locations of highest risk on a state-by-state basis. Additionally, the report concludes with a set of issues for further attention (DCC, 2009: 150—151): 1). National standards and benchmarks for coastal development; 2). Regional risk assessments; 3). Demonstration strategies for areas exposed to high or extreme risk; 4). Review and update Building Codes; 5). National audit of critical infrastructure in the coastal zone; 6). Provision of information and tools essential for decision-making; 7). Research to reduce uncertainty about the magnitude of coastal risk from climate change; 8). Risk allocation and insurance; 9). Ecosystems review; 10). Community engagement; 11). Build capability of local government; and 12). Inter-jurisdictional cooperation.

In June 2011, the department released a follow-up report specifically dealing with settlements—*Climate Change Risks to Coastal Buildings and Infrastructure: A Supplement to the First Pass National Assessment* (DCCEE, 2011). It lists as a key finding that (DCCEE, 2011: 3):

> Greater than $226 billion in commercial, industrial, road and rail, and residential assets are potentially exposed to inundation and erosion hazards at a sea level rise of 1.1 metres (high end scenario for 2100)

A new national adaptation strategy was published in 2010 (DCC, 2010): *Adapting to Climate Change in Australia: An Australian Government Position Paper.* National adaptation priorities were listed as: coastal management, water, infrastructure, natural systems of national significance; prevention, preparedness, response and recovery with regard to natural disasters, and agriculture. An innovation in this policy was the commissioning of a Climate Futures report every five years to evaluate the status of adaptation activity and evaluate the effectiveness of adaptation policy; the first will be produced in 2010. In terms of major research outputs to date, national vulnerability assessments have been produced for coasts, biodiversity, world heritage sites, the national reserve system, and fire regimes.

In summary, Australia's efforts at directing an adaptation response have been modest and slow: it took some 13 years after the first national policy on climate change to produce a strategy on adaptation policy in 2005. There have been subsequent strategies in 2007 and 2010 which have both added slightly greater depth but also repeated much earlier material and have re-cast national priorities. Until the creation of

the NCCARF, actual production of federally funded research and adaptation policy development was scant; no reckoning of these outputs is available, but in all likelihood these would amount to perhaps three dozen projects over the 1992—2007 period. Cities have been a low priority theme, except to the extent that they have been part of the recent coastal program, until settlements were made a theme in the current national adaptation research grants program under the NCCARP. There would appear to be a considerable implementation gap between the identification of cities as a priority theme and the extent of federal support for adaptation policy development.

3. NEO-LIBERALISM AND CLIMATE CHANGE ADAPTATION POLICY

Public policy responses to climate change have been shaped by neo-liberal policies to an unusual degree in the realm of environmental policies, where regulatory approaches have typically dominated (cf. Granberg and Elander, 2007). By 'neo-liberalism', we mean the use of economic markets to achieve public goals, which in the case of environmental problems gives rise to 'free market environmentalism' and the role of government to promote free markets and minimise the role of government across the economy. Central to this approach has been the building of property rights around GHG emissions and creating markets in which these can be traded and the use of other market instruments, such as taxes (Azar, 2010). Other aspects of climate change policy and politics have reflected an on-going protection of the economic interests of major corporations and economic sectors linked to climate change, notably the fossil fuel producers and retailers, electricity generators, rural landowners, and motor vehicle manufacturers (Hamilton, 2001; Hotham, 2010).

This regard has been most pronounced in shaping the agenda for cutting GHG emissions, and in doing so follows the approach of the Kyoto Protocol, which establishes the global policy architecture for emissions trading. This elemental dimension to national policy has been consistent throughout the national climate strategies released under the successive national governments since 1992: Keating, Howard, Rudd, and Gillard (Australia, 1992, 1998, 2008, and 2011; DPM&C, 2007).

Neo-liberal approaches have become more open and pronounced more recently, with the federal efforts to initiate carbon pricing and emissions trading (see the strategy of 2007), currently with the recent *Securing a Clean Energy Future* initiative (Australia, 2011). This recent plan does not deal with impacts and adaptation issues. Nonetheless, there are a number of relevant policies and strategies that suggest strongly that neo-liberalism is the guiding approach for these aspects of climate change policy. There is the most recent national adaptation position paper (DCC, 2010) that describes climate change impacts as a "shared challenge and a shared responsibility" and states (2009: 7): "Adapting to the impacts of climate change is, in large measure, about managing risks. Risks will be dealt with most efficiently if they are well understood and allocated to those who are best placed to manage them." It continues (DCC, 2009: 7):

> Individuals and businesses are often best placed to manage the risks associated with their assets. The private benefits individuals and households can gain from adapting to climate change provides an incentive for them to take reasonable steps to manage their exposure to those risks, and so reduce the potential costs to them of climate change. Most of the assets and activities at risk from climate change are owned or managed by businesses and the community. It is therefore reasonable to expect that much of the national effort to adapt to the impacts of climate change will be actions taken by businesses and communities.

This approach is consistent with the advice to the government from its expert advisor, Prof. Ross Garnaut and the *Garnaut Climate Change Review* process. Garnaut lists the reasons why it is unrealistic to expect government policy to provide protection from climate change impacts (Garnaut, 2008: 364): Firstly, the number of small-scale adaptations necessary; secondly, the range and scale of impacts is beyond the

government's capacity to address comprehensively; thirdly, the uncertainty over impacts regarding their scale, timing, and location; and fourthly, governments would be more expensive and less efficient in responding to local issues than local actors.

Further reinforcing the neo-liberal orthodoxy of the national adaptation position paper is its account of the 'capacity building' areas in which government should play a role (DCC, 2010: 8):

- Providing information for businesses and communities to adapt
- Setting the right conditions for business and communities to adapt
- Government programs and assets (this title is slightly misleading, as the subject in question is the government's role in providing public goods, which are not, strictly speaking, 'assets' of the government, together with addressing market failures.)

In addressing the federal government's role specifically, there is some overlap with the capacity building role, but also recognized are its role in maintaining a "strong flexible economy" and providing a social welfare function (DCC, 2010).

Generally, we find a basic consistency in this approach to adaptation reflected in the earlier key national policy documents. For example, in the 2005 *National Climate Change Risk and Vulnerability* report, the following describes the role for government (Australia, 2005: 114—115):

> Government is generally ascribed with three important economic functions within a market-based economy, these are:
> - allocation – supporting the allocation of resources and the operation of markets and production activities in a way that maximises benefits to society as a whole;
> - distribution – distributing costs and benefits within society in a way that accords with equity objectives; and
> - stabilisation – intervening in the market economy to diminish shocks and volatility, to facilitate planning and investment, and to support ongoing improvement in wealth and living standards.

Politically, such an articulation of the role of government represents the ideal of neo-liberal views (see, e.g., Harvey, 2005).

4. ADAPTATION AND MALADAPTATION

Our interest in this paper is in the prospects and risks of maladaptation in the public policy response to climate change impacts in Australian cities. Avoiding or ameliorating climate change impacts requires adaptive actions, both responding to existing impacts or in anticipation of future circumstances (as described above). But as Scheraga and Grambsch state (1998: 92):

> Adaptive responses can also have adverse effects … an adaptive response that is made without consideration for interdependent systems may, inadvertently, increase risks to other systems that are sensitive to climate change.

Maladaptation has now become a mainstream term, recognized by such bodies as the IPCC (IPCC, 2001, 2007) and the UNDP.

Identifying the occurrence of maladaptation, however, is difficult, for there are no widely accepted criteria, suitable yardsticks are required against which to adjudge the adaptation measures, local circumstances vary considerably, the passage of time can alter the extent of success or failure, and there are the usual problems of subjective judgements. Despite these difficulties, there have been some attempts to define maladaptation in practice. Following Scheraga and Grambsch (1998), IPCC (2001), and Barnett and O'Neil (2010), maladaptation embraces those adaptation responses that increase vulnernability to climatic impacts to the feature to which they are being

applied, to other features, and worsen impacts in some other way, including causing GHG emissions to increase. IPCC (2001) lists economic resources, technology, information and skills, infrastructure, institutions, and equity as determinants of adaptive capacity.

Barnett and O'Neil (2010) describe five pathways through which maladaptation could occur; all are relevant to the case of cities:

- Increasing GHG emissions
- Disproportioning burdening the most vulnerable in society
- High opportunity costs
- Reduce incentive to adapt, and
- Path dependency.

Developments in water resource management in Melbourne, Australia are used by the authors to exemplify maladaptation, highlighting the use of such responses for addressing water supply shortfalls caused by high rainfall variability and drought through such measures as a desalination plants and cross-basin water transfers. Such adaptations, Barnett and O'Neil point out, will necessarily increase greenhouse gas emissions, impose higher water bills on consumers that will fall disproportionally on the economically disadvantaged, the expenditures constitute high opportunity costs, and increasing water supplies offer incentives to maintain high levels of demand, thereby treating the symptom rather than the causes.

5. TECHNOLOGICAL RATIONALISM AND CLIMATE CHANGE ADAPTATION POLICY

As nearly always expounded in adaptation strategies is a singular model for the production of adaptation responses, which has these as the last link in a knowledge chain that always depends on vulnerability assessments that depend on climate change impacts studies that, in turn, necessarily draw on the output of forecasts of future climate change (IPCC, 2007). To this process there is usually also an identification and evaluation of different adaptation options.

For example, the federal government's guide for local government, *Climate Change Adaptation Actions for Local Government* (DCCEE, 2010), proposes a framework for climate change risk assessment based on the *Australian and New Zealand Standard AS/NZS 4360 Risk Management.* It prescribes the following process (DCCEE, 2010):

- *Establishment of the context* – through identifying the business to be assessed, its objectives, responsibilities and stakeholders, and the relevant climate scenarios
- *Risk Identification* – by identifying how climate change will impact on each of the above
- *Risk Analysis* – by identifying existing management strategies, the likelihood of each risk, the consequence should this likelihood be realised and the level of resulting risk for each of the above climate change impacts
- *Risk Evaluation* – by ranking risks by severity and identifying those that require additional analysis
- *Risk Treatment* – through the identification and selection of the relevant risk management and/or adaptation options.

Two priority areas for action were identified in the 2007 national adaptation strategy, namely building understanding and adaptive capacity, and reducing vulnerability in key sectors and regions. These were to include such actions as improved climate change information and decision-making tools, integrated vulnerability assessments, addressing critical knowledge gaps, building sector-relevant tools for reducing vulnerability, and developing action plans for critical sectors.

When we look at the adaptation as a problem, several characteristics stand out. Vulnerability of urban systems to climate change impacts is potentially enormous, both

in the range of such impacts and the potential scale (particularly as might result from severe climate- and sea level rise-related hazards), covering such features as buildings, transport, water and wastewater systems, and communication systems. Adaptation options and potential actions are therefore of a great magnitude, differentiated by a wide range of factors, including location, stakeholders, timeframe, impact type, cost of responses, cost of potential losses, likelihood of future impacts. Yet anticipating such impacts and evaluating their likelihood and levels of risk will require forecasts of climate change at local scales and detailed studies. In isolation, adaptation responses for individual items of infrastructure or for relatively small locations are feasible and have been completed in examples from around the world; considering integrated systems, extensive settlements, and complex institutional settings is considerably more difficult.

6. MALADAPTATION AND THE LIMITS OF RATIONAL-COMPREHESIVE MODELS

Although this model of producing adaptation policies and strategies is rarely identified as such, it can be identified as being a rational-comprehensive approach. A comprehensive view is taken of the problems at hand and an effort is made to identify all the major knowledge requirements for problem resolution using scientific and technical procedures and techniques. Rarely have these processes taken social issues into account or engaged in using knowledge drawn from social sources; rather, technical approaches dominate. Specifically, the national approach to adaptation is based on a rational-comprehensive approach, based on three features. Firstly, by setting priorities that seem to cover the entire economy the model seeks to be comprehensive in its scope. Secondly, by using the aforementioned standard model for identifying impacts and response options, a rational framework is in place. Thirdly, by expressing the problem as one amenable to science, there is an expression of technological rationalism.

As a problem-solving approach, several limits to rational-comprehensive models are recognized. Typically, these include practical considerations, such as the amount of time the process takes, given the amount of information required to gather and assess. Conceptually, the rationality of the technique assumes that assessment criteria can take an ideal form and that the criteria can be used effectively. Such assumptions can rarely be achieved in practice, especially for larger real-world problems. Further, the data requirements for this approach are onerous as the data must be of sufficient quality and reflect real conditions accurately.

Why is this maladaptive as an approach? Three reasons stand out; firstly, priority setting has still left a great range of economic sectors, activities, locations, and issues that will in all likelihood never be analysed, especially at the current rate of knowledge production. As more discoveries are made of the actual and potential impacts of climate change due to the normal course of scientific research, it is likely that the gap between the knowledge of impacts and the production of adaptation responses will widen over time, rather than close. Further, it is unlikely that even the range of potential impacts within the priority themes will be sufficiently researched to allow the formulation of rational policies and strategies. Secondly, a comprehensive model usually cannot work effectively for complex, real-world problems because the data requirements are comprehensive. While the model may be suited to problems that are essentially singular and well funded, it is not one that can be practically applied to a large number of problems and where resources are necessarily modest. Part of the expense of such studies is due the costs of information collection and use and the role for trained and expert staff. Thirdly, adaptation is more complex than can be covered by narrowly cast science and in the case of cities, involve complex social and natural system interactions. To this list, one additional reason is worth considering, namely whether the rational-comprehensive approach addresses the production of scientific knowledge at the expense of considering the associated institutional factors needed to apply that knowledge. There is a risk that the approach assumes the rationality of existing institutions in using knowledge and formulating policy, so that the only barrier to action is the production of knowledge. Also added might be the need to take social

issues into account, both as a source of knowledge and to consider the social implications of various adaptation options. Neither of these social dimensions have featured in the adaptation activities to date.

An editorial by Liverman in *Global Environmental Change* reviewing the IPCC's 2007 report on impacts, adaptation, and vulnerability offered (2008:5):

> There are too many gaps in geographical and sub-sectoral coverage, too few studies that analyse observed impacts and responses or include an adequate range of scenarios, too little in the way of economic analyses, too little literature in languages other than English and too many case studies undertaken outside frameworks that permit aggregation, comparison or general insights.

This is not the fault of the IPCC authors, but reflects prevailing conditions, she continues (Liverman, 2008: 5):

> This is not the fault of the authors who must have scoured the world for relevant studies, but very likely reflects a lack of research funding and human capacity, the difficulty of designing comparative studies, the lack of reliably downscaled climate scenarios and the complexity of research on climate impacts in a world where many other things are changing.

Such comments appear appropriate to the circumstances of impacts assessments and adaptation policy production for Australian cities, as outlined above.

7. MALADAPTATION AND NEO-LIBERAL APPROACHES TO ADAPTATION POLICY

There are several ways in which neo-liberal approaches to adaptation policy have a risk of contributing to maladaptation. Of these, the risk that adaptation could contribute to GHG emissions production is of particular concern, as one dimension of public expenditure could undermine another. Our concern arises from the ways in which the adaptation problem is framed. As Philp and Taylor noted of the national adaptation strategy (2011: 1):

> The key purpose for this precedence is to ensure that the owners and operators of nationally significant infrastructure, such as transportation infrastructure, provide continued and uninterrupted functioning of these assets, which are critical in supporting the national economy (CoA 2010a).

Much of the large urban infrastructure and that associated with cities, such as the electricity sector, forms part of the carbon-intensive economy. Ensuring that the most valuable assets are protected against climate change impacts in effect ensures the continued functioning of those systems most responsible for high GHG emissions. An implication of Phil and Taylor's observation is that the emphasis is on protecting the national economy as it is currently constituted. Such an outcome is reinforced by the difficulty and expense of preparing adaptation responses based on scientific research, as only larger corporations and those responsible for expensive public infrastructure and urban assets will be able to formulate suitable adaptation responses.

8. CONCLUSIONS

Notwithstanding the preceding identification of the political values underpinning Australian climate change adaptation policy, the view of the government agencies and political leaders is that adaptation policy is apolitical and a matter of technical and scientific knowledge informing planning decisions. In reality public policy arises from politics, so that understanding and analysing public policy necessarily engages those with an interest in political science in aspects of politics (Giddens, 2009). Therefore adaptation policy must be considered in a political context. A reading of the

aforementioned national (and also of the state and territorial) policies and strategies on climate change in general and on adaptation in particular, shows that these are devoid of political language, political concepts, and political references and citations. Accordingly, underpinning political values and ideology is hidden in a technological rational language.

In the urban setting, using neo-liberal values to determine adaptation priorities places a high value on assets with high market values and a low value on that with low market values or which is subject to market failure. As a consequence, the interests of those at the lower end of the socio-economic spectrum subject to the costs of climate change impacts will not receive the same degree of public investment in adaptation as those who are wealthier. This group also suffers from a general lesser capacity to undertake adaptation, for reasons that include less access to capital, information, and so on. Furthermore, a number of urban locations have historically attracted lower land values because of higher exposure to natural hazards, a market feature that can expose the less wealthy to higher vulnerabilities to selected climate-related hazards.

On the surface, Australia's public policy response to the climate change threats to cities through adaptation policy is logical and straightforward, albeit that it has taken a considerable length of time to establish a specific research program. However, there would appear to be considerable risks that this program will foster maladaptive responses. In this paper we have focused on dimensions of the national adaptation response that may give rise to maladaptation. As argued above, we identify the problem that adapting cities to climate change and climate change risks has been approached as essentially a technical matter, amenable to resolution through a rational-comprehensive methods, a position broadly consistent with that advocated by international scientific leadership under the UN's IPCC. As the research on cities has shown, the problems are large and varied, and beyond the scope of any organised research program. To this problem must be added the very low level of adaptation research.

Despite the national strategies and frameworks' identification of priorities, those that pertain to cities are broad. It appears that neo-liberal logic underpins this effort. Governments appear to largely withdrawn from conducting adaptation studies of cities, preferring to produce relatively basic tools and guides for use by communities, corporations, and households to prepare their own adaptations to climate change. Essentially, this approach leaves adaptation to be decided by market forces, which will result in adaptation efforts being shaped by market values. An immediate consequence of this approach is that this is likely to support those components of the economy associated with the production of GHG emissions increasing the risk of system lock-ins in terms of path dependency. However, there are few signs that the current approach to adaptation policy has taken into account the risks of maladaptation and that alone increases the risk of its occurrence.

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Acknowledgements

We thank the reviewers for their comments.