# RESPONDING TO A TRANSFORMATIVE STRESSOR: CLIMATE CHANGE AND THE INSTITUTIONAL GOVERNANCE OF AUSTRALIAN CITIES.

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## INTRODUCTION

Climate change is likely to exert escalating stresses on urban environments over the coming decades (Garnaut, 2008; IPCC, 2007; Stern, 2006). Urban settlements in Australia will be subject to significant vulnerability (Hennessy et al, 2007). This will prompt responses from institutional governance frameworks in Australian cities and metropolitan areas. Efforts to manage climate change effects in urban environments will require institutional change, where new rules of governance are developed and imposed by institutions in an effort to more adequately manage social stresses associated with climate change and its impacts. Operationalsing climate adaptation as a central issue of planning governance will represent a significant step in addressing climate change stresses in urban environments. Operationalisation in this instance refers to climate adaptation becoming incorporated, codified and implemented as central tenet of planning governance.

This paper has three key purposes. First, it examines social scientific understandings of institutional change processes and how change occurs in response to trigger events and associated stresses. It argues that existing understandings of institutional change do not adequately reflect the fact that certain stressors have the capacity to compel institutional change, irrespective of the influence of institutional actors and institutional capacity. A new typology of stressors is presented, referred to as 'transformative stressors.' It is argued that when transformative stressors occur, they possess capacity to make institutional change an imperative. Second, this paper establishes a conceptual approach that understands climate change as a transformative stressor requiring institutional change within the planning frameworks of Australia's cities and metropolitan regions. An examination of the role of planning regimes in responding to climate change as a transformative stressor through climate adaptation in urban environments follows. Third, it reports early findings from an on-going enquiry into the manner in which the metro-regional planning regime of Southeast Queensland (SEQ) has responded to climate change as a transformative stressor in an urban context.

## THE ROLE OF TRANSFORMATIVE STRESSORS IN COMPELLING INSTITUTIONAL CHANGE

Social science has long considered the roles institutions play in guiding and managing social engagement. Scholarship offers a diversity of thinking and critique focused on definitively characterising institutions as social scientific objects. Institutions are broadly understood as social entities that structure and co-ordinate social interactions across a variety of settings (Alexander, 2005; Connor and Dovers, 2004; March and Olsen, 1989; North, 1990; Peters, 2005). As Connor and Dovers (2002, p. 7) note, social institutions provide the 'generalised regulatory framework for socially acceptable behaviour.' Within this context, they shape human behaviour and social interaction by creating and imposing rules of governance. These may be formal or informal (Connor and Dovers, 2002, 2004; North, 1990; Young, 2010). Formal rules include constitutions, law, rules and regulatory provisions; informal rules include social conventions and commonly recognised behavioural norms. In addition to imposing rules of governance, institutions are also characterised by their enforcement functions (March and Olsen, 1989; North 1990; Young, 2010). Institutions assume a dual role, imposing rules on one hand and ensuring compliance on another. These rules of governance can be expressed individually or as part of a hierarchy, where compliance is required at each stage of social engagement in order to advance to subsequent stages. Institutions exist in various forms and co-ordinate social interaction and behaviour in a variety of settings, from ensuring that drivers are licensed and tested to guiding and managing urban environments through planning regimes and their associated functions.

A key characteristic of social institutions is their ability to undergo institutional change. Change occurs when an institution amends or reorientates its rule set in order to deliver improved social outcomes (Alexander, 2005; Kingston and Caballero, 2009). An institution can undergo change when confronted with particular events or phenomena that are not easily managed through existing rules of governance. When an

institution is confronted with a particular social issue that cannot be effectively addressed through existing rules of governance, it is faced with two choices. In the first instance, the institution can conceptualise the nature, impact and extent of the change dynamic and respond to it through a process of change and the operationalisation of new or improved rules. In the second instance, the change dynamic can be resisted or ignored, which in turn risks the institution becoming irrelevant or unfit for purpose (Cortell and Peterson, 1999; Young, 2010). The capacity of any institution to undergo a change process is subject to the nature and character of both the institution and the change dynamic, as well as the influence internal and external institutional actors (Cortell and Peterson, 1999; Hogan, 2006; Young, 1999, 2002). Institutional capacity to react to a change dynamic varies greatly, with some institutions ready to change quickly and freely, while others resist change or change slowly. In the latter case, institutions confronted with demanding change dynamics can be resistant due to institutional arthritis, a condition where institutions become entrenched and unable to adapt to new imperatives (Olsen, 1982; Young, 2010). This is also referred to as institutional inertia (Dovers and Hezri, 2010). I submit that the term 'institutional sclerosis' is equally apt in describing institutional resistance to change dynamics.

Institutional change is often prompted by an external crisis or series of crisis moments (Cortell and Peterson, 1999; Hogan, 2006; Schmidt, 2010; Young, 1999, 2002, 2010). Crisis events act as triggers by creating and escalating social stresses, in turn prompting institutional change as relevant institutions try to manage the impacts of the change dynamic and associate stresses through the implementation of new or amended rules of governance. Examples of crisis events might include significant demographic change, a resource shock, a public health emergency or an unanticipated fall or rise in economic activity. Institutions that respond adequately through change can maintain their relevance, whilst those unwilling or unable to change face becoming irrelevant (Olsen, 1982; Young, 1999; 2010). Institutional change events can be broadly divided into two categories: episodic change, which is swift and dramatic and incremental change, which is slow and gradual (Krasner, 1984; North 1990, 1993). In some cases, stresses may initially be minor, prompting incremental change, before increasing in scope and impact and ultimately converting incremental change into episodic change (Young, 2010).

Social stresses created by trigger events alone are not usually sufficient to compel institutional change. Whilst trigger events do create social stress, institutional responses to change dynamics are also strongly conditioned by change-orientated preferences and institutional capacity (Cortell and Peterson, 1999; Hajer, 1993, 1995; March and Olsen, 1989; North 1990; Young, 2010). Change-orientated preferences describe how the reactions of institutional actors can shape whether or not institutional change follows the trigger event. These actors may be internal or external institutional actors, including appointed or elected state and policy officials, as well as public stakeholders. Change responses may be problematic in situations where actors are presented with change dynamics that require institutions to confront problems that are substantively different in scale and character to those previously encountered (David, 1985; Low and Astle, 2009; Moser and Ekstrom, 2010). In such cases, difficulties can arise as actors fail to understand or ignore the gravity of a change dynamic and consequently hinder or block institutional change processes. Institutional capacity refers to the manner in which an actor's ability to take advantage of an opportunity for change depends on their institutional position. In other words, some institutional actors may recognise a crisis event and associated window of opportunity and may seek to respond through institutional change, only to be over-ruled by the preferences of other actors. In such cases, institutional change is unlikely to occur. Whether this is an appropriate and suitable outcome depends on the nature and severity of the crisis event and the extent and magnitude of the social pressure it creates.

The influence of actors on institutional decision making is significant, particularly when related to institutional change processes (Hajer, 1993, 1995; March and Olsen, 1989; North 1990; Young, 2010). The nature and character of institutional change results from the ways in which actors respond to broader changes in their domestic and international environments (Cortell and Peterson, 1999). As McFaul (1995, p. 216) notes, institutions 'do not change of their own accord; they are changed.' The perspectives of actors may be shaped by factors including levels of understanding relating to new or emerging social phenomena (Fünfgeld, 2010; Moser and Ekstrom, 2010), the influence of lobby groups (Liebcap, 1989), political objectives (Ostrom, 2005) and collective bargaining (Alston, 1996). Institutional storylines may also be highly influential (Hajer, 1993, 1995). Hajer characterises storylines as 'narratives on social reality through which elements from many different domains are combined and that provide actors with a set of symbolic references that suggest a common understanding' (1995, p. 62). Storylines fulfil an essential role in clustering knowledge, positioning social actors and forming coalitions made up of actors who collectively subscribe to particular storylines. Dominant storylines shared by internal and external institutional actors have significant capacity to shape decision-making around institutional change. A dominant storyline may have no empirical basis, but still hinder or derail institutional change processes necessary to address a proven and recognised problem. This can be especially evident in cases where large sections of the voting public subscribe to a particular storyline. Path dependency may also present a significant barrier to

institutional change. This occurs when institutions resist a process of institutional change because of an embedded focus on a particular set of issues (Cortell and Peterson, 1999; David, 1985; Low and Astle, 2009). In other words, institutions and their associated actors become used to dealing with particular perspectives. This creates a form of myopia, which can undermine institutional capacity for confronting new or emerging challenges. Path dependency therefore leads to situations where 'institutions that have grown up around one sort of problem may be unable to respond adequately when confronted by a quite different sort of problem' (Low and Astle, 2009, p. 48).

I argue that whilst these perspectives of institutional change correctly identify crises as central in creating a rationale for institutional change, they are undermined by the contention that institutional actors matter more in directing institutional change than wider impacts of social stresses. I assert that a new conceptualisation of institutional change is needed to account for this deficiency in scholarship. This is based on the proposition that certain stressors possess sufficient capacity to compel institutional change, due to the severity of their social consequences. I argue that under certain circumstances the social impacts of particular stressors can be severe enough to compel institutional change, irrespective of the preferences of institutional actors. In such cases, I contend that embedded path dependencies and dominant institutional storylines can also be swept aside by the severity of the change dynamic and its associated social stresses. I refer to them as 'transformative stressors.' Though uncommon, I submit that transformative stressors currently exist and in some cases, their impacts are already evident and leading to escalating social stresses. I contend that when faced with transformative stressors, institutions will be compelled to either change or become irrelevant and that actors and their personal preferences will assume less importance when institutions are faced with certain serious, pervasive and cumulative social stresses. In short, when they occur, transformative stressors possess the capacity to make institutional change an institutional and social imperative.

## CLIMATE CHANGE AS A TRANSFORMATIVE STRESSOR

I characterise a transformative stressor as a chronic large-scale phenomenon which triggers a process of institutional change whereby institutions seek to reorientate their activities in order to better manage the social, economic and environmental impacts created by the transformative dynamic. As distinct from other social scientific conceptualisations of institutional change, the transformative stressors model is premised upon the argument that certain stressors have potential to become severe enough to compel institutional change, leading to large-scale structural modifications in an institutional context. In such cases, the transformative stressor and its impacts act as trigger events, which open windows of opportunity for institutional change. A transformative stressor, as distinct from other types of crisis event, demands institutional responses because its social impact is so pervasive and severe that institutions must either respond with new rules of governance or face becoming irrelevant. Under this model, the preferences of institutional actors remain valid in shaping institutional responses through change processes, but the capacity of actors to block change is significantly diminished by the level of social stress created by the transformative stressor.

This paper identifies climate change as one example of a transformative stressor. It is profoundly different from almost all social stress events previously faced by institutions. The phenomenon is large-scale, with the potential to create negative social impacts on national, regional and local levels. Climate change and its effects are predicted to negatively affect societies in many ways, including but not limited to, physical impacts on man-made and natural environments, economic costs, biodiversity losses and resource reductions (Garnaut, 2008; IPCC, 2007; Stern, 2006). Faced with severe environmental stresses, institutional governance frameworks are and will be required to change and reorientate in order to deliver improved social outcomes (Connor and Dovers, 2002; Wilson and Piper, 2010). As the social consequences of climate change impacts increase, many different types of institutions will be forced to react by conceptualising the character, impact and extent of the phenomenon as it applies to their sphere of governance. Negative social consequences will intensify and escalate in tandem with climate change impacts. Institutions will have no choice but to respond, or risk becoming obsolete. Institutional capacity and the preferences of institutional actors will remain important in conditioning responses to the change dynamic, though it is likely that institutions which display sclerosis will either need to undergo significant levels of reorientation or risk being replaced by alternative institutional arrangements better equipped to recognise and respond to climate change as a transformative stressor.

Urban governance frameworks are especially crucial in responding to climate change as a transformative stressor in Australia. More than 75% of the Australian population is urbanised, with the vast majority of urban dwellers living in low-rise, dispersed suburban settlements near the coast line (Major Cities Unit, 2010). The spatial character of this type of urbanisation means that it has contributed significantly to climate change through form and structure, land-use patterns, energy demand and car dependence (Condon,

Cavens and Miller, 2008). The impact of climate change on many Australian urban environments is likely to be severe (Hennessy et al, 2007). I argue that climate change effects are already emerging as a cumulative change dynamic and institutions charged with developing, implemented and maintaining urban governance frameworks will be compelled to respond to climate change as a transformative stressor. Institutional change will be necessary if social institutions are to adequately confront and manage the social stresses created by climate change impacts in Australian urban environments. Efforts to advance climate change mitigation may still limit the severity and incidence of climate change effects, but are unlikely to eliminate all impacts (Garnaut, 2008; Stern, 2006). Consequently, I argue that a strong focus on operationalising climate change adaptation strategies through urban governance frameworks must become a central tenet of institutional responses to this transformative stressor in Australian urban environments. A capacity for successful institutional change will therefore be vital in managing transformative stresses created by climate change.

## RESPONDING TO A TRANSFORMATIVE STRESSOR IN URBAN ENVIRONMENTS THROUGH PLANNING

Institutions are central in managing and co-ordinating urban environments (Fünfgeld, 2010; Ruth and Coelho, 2007). This is achieved through the institutional imposition of governance frameworks designed to guide appropriate forms of social behaviour, as well as through the use of various mechanisms to ensure compliance within an urban context. Planning regimes, operating across urban scales, are important institutions in this wider urban context. Planning regimes are social institutions that develop and implement governance frameworks to direct development activities within a set of rules and expectations (Alexander, 2005). As a cluster of institutional processes, planning is characterised as a 'set of governance practices for developing and implementing strategies, plans, policies and projects, and for regulating the location, timing and form of development' (Healey et al, 1999, p. 31). A key aim of planning governance is therefore the regulation of strategic, spatial and land-use development and the provision of regulatory frameworks and compliance mechanisms to ensure socially acceptable behaviour in urban and other environments. As part of this aim, planning regimes try to balance the particular needs of individuals and groups with broader social needs, including environmental management, the provision of infrastructure and preservation of amenity (Faludi, 2000). Institutional change is required when existing rules of planning governance become inadequate in addressing changing circumstances created by social stresses (Alden, Albrechts and da Rosa Pires, 2001; Alexander, 2005; Forrester, 1989). I argue that climate change, as a transformative stressor, will require planning regimes to undergo institutional change if they are to successfully contribute to wider efforts towards comprehensive urban responses to the phenomenon in Australian cities. Specifically, I suggest that planning regimes must undergo institutional change in order to deliver an improved operationalisation of climate adaptation as a means of managing wider social stresses created by climate change impacts in Australian urban environments. In this context, the operationalisation of climate adaptation refers to adaptation becoming incorporated, codified and implemented as a central principal of planning governance.

The operationalisation of climate adaptation represents a new institutional challenge for planning regimes. Many scholars argue that the integration of climate adaptation into planning governance represents one of the most serious and demanding tasks currently facing the planning profession (Gleeson, 2008; Newman, Beatley and Boyer, 2009; Smith et al, 2010 and Wilson and Piper, 2010). I argue that addressing this task will require institutional change. This need will become more acute as transformative stresses created by climate change begin to increase in severity and frequency in urban environments. Whilst efforts to respond to change dynamics may initially be resisted by institutional actors, it is posited that climate change impacts, unlike many other stressors, will continue to escalate and will eventually reach a point where their wide-ranging social consequences and costs can no longer be ignored by actors. Planning regimes can respond through institutional change, where the goal of the change process is to regulate the location, form and timing of development so that it is more resilient to climate change effects. In tandem with this, new regulations can be established to improve the resilience of existing urban built environments. In both cases, delivering locally appropriate action is key, as climate adaptation strategies work best when developed and implemented according to local needs (Matthews, 2011a, 2011b; Measham et al, 2011; Wilson, 2006). Some useful strategies that planning regimes may employ in urban contexts include integrating adaptation strategies directly into development plans, along with specified implementation and monitoring strategies, codifying adaptive design standards for existing and new development through plan-making and building community capacity (Matthews, 2011a, 2011b; Wilson and Piper, 2010).

## EMERGENT FINDINGS FROM SOUTHEAST QUEENSLAND (SEQ)

The remainder of this paper reports early findings from an inquiry into the manner in which the metro-regional planning regime of Southeast Queensland (SEQ) has responded to climate change as a

transformative stressor within an urban context. The SEQ metro-regional planning regime is a key urban institution, charged with implementing governance frameworks to direct development activities throughout the SEQ metropolitan region. As such, it is necessary for the planning regime to respond to climate change as a transformative stressor. A major part of this task is the operationalisation of climate adaptation as a central principal of metro-regional planning governance. I argue that meeting this obligation requires the SEQ metro-regional regime to undergo a process of institutional change in order to deliver an improved operationalisation of climate adaptation within planning processes. In doing so, the regime can improve its effectiveness in managing wider social stresses created by climate change impacts in the SEQ urban environment. The performance of the SEQ regime meeting this challenge between 2005 and 2010 is tested in this section and emergent findings are presented.

My analysis of the nature and adequacy of the SEQ metro-regional planning regime's responses to climate change as a transformative stressor focuses on the time period from 2005 to 2010. This paper identifies 2005 as the point at which climate change became a transformative stressor for the SEQ planning regime. I argue that the events of Hurricane Katrina in 2005, the widespread awareness-raising of Al Gore's 'Inconvenient Truth' documentary and the publication of both the Stern Review in 2006 and the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report in 2007 created a significant institutional and public awareness of climate change as an issue for SEQ. The near decade-long drought experienced in the region, along with major flooding events in rural Queensland of 2008, 2009 and 2010 created significant social stress, which in turn added to this emerging awareness of climate change as a significant emerging challenge. The timeframe examined in this paper corresponds to the establishment and evolution of the current regional planning framework in SEQ. This began with the development and implementation of the *Southeast Queensland Regional Plan (SEQRP) 2005-2026*. This paper covers the full lifetime of that plan and runs to the end of 2010 and so includes the period when the SEQRP 2005 was replaced with the *Southeast Queensland Regional Plan (SEQRP) 2009-2031*.

Southeast Queensland (SEQ) is a heavily urbanised metropolitan region on Australia's east coast. It contains two of Australia's major cities, Brisbane and Gold Coast, which are respectively third and sixth largest nationally. The SEQ metropolitan region forms a long coastal conurbation, running from Noosa in the north to Coolangatta in the south. This has been referred to as the 200-kilometre city (Spearitt, 2010). Another major conurbation in SEQ runs west from the coast, via Brisbane, to the city of Toowoomba. SEQ is the fastest growing metropolitan region in Australia and has a current population of approximately 2.7 million people. This figure is anticipated to increase to around 4.4 million by 2031 (DIP, 2009a, p. 8). Consequently, demand for housing, infrastructure, energy, employment and amenity is increasing steadily and creates on-going development pressures in the region. Whilst these development pressures are significant planning challenges in their own right, they are likely to be greatly exacerbated by predicted climate change impacts (DIP, 2009b).

The Intergovernmental Panel on Climate Change (IPCC) identifies SEQ as highly vulnerable to climate change impacts and ranks the region amongst the six most vulnerable areas in Australia (Hennessy et al, 2007, p. 525). Predicted impacts during the current century include increased coastal and inland inundation; inland storm surges; reductions in water availability; sea level rises of up to 0.79m over current levels and an increase in the number of days with temperatures in excess of 35°C (DIP, 2009b; Hennessy et al, 2007). SEQ is already vulnerable to severe weather events and natural hazards such as bushfires, inland flooding and coastal storm surges. The urban environments of SEQ, already challenged by development pressures and existing natural hazards, now also face nascent climate change stresses. The SEQ metro-regional planning regime is a central institution in managing these pressures through metropolitan governance frameworks. Accordingly, I argue that the operationalisation of climate adaptation represents a vital institutional challenge for the SEQ metro-regional planning regime in managing climate change as a transformative stressor.

The SEQ metro-regional planning regime has operated on a regional scale since 2005. Regional planning regulations and provisions in SEQ have statutory force and all planning activity in the region must correspond to policies and objectives expressed through the *Southeast Queensland Regional Plan (SEQRP) 2009-2031*. The SEQRP 2009 replaced the *Southeast Queensland Regional Plan (SEQRP) 2005-2026*. That plan also had statutory force. All planning activities, regulations, strategies and interventions implemented by the region's 11 local councils since 2005 must correspond with the spatial objectives expressed in the SEQ Regional Plan (DIP, 2009a; DIP, 2005; Searle and Bunker, 2010). This ensures that the SEQ metro-regional planning regime has significant institutional importance and is responsible for providing governance frameworks to 'manage regional growth and change in the most sustainable way to protect and enhance quality of life in the region' (DIP, 2009a, p. 4). The current SEQRP has a supplementary climate change plan, the *Draft Southeast Queensland Climate Change Management Plan (DCCMP) 2009-2031,* which addresses both climate change mitigation and adaptation. It is still awaiting

statutory enactment at the time of writing (2011). The plan states that planning in SEQ has 'a key role' in building resilience to climate change impacts on human settlements across the region (DIP, 2009b, p. 4). Taken together, the current and past SEQ regional plans document the institutional preferences of the SEQ metro-regional planning regime towards many planning issues since 2005, including climate change and climate adaptation.

The *Southeast Queensland Regional Plan (SEQRP) 2005-2026* demonstrated some institutional acknowledgement of climate change through its policies and objectives. Part F08 of the plan focused on urban development. Planning policies in that section did not directly address climate change as a planning issue but the focus of some policies did indicate a degree of institutional awareness of climate change. However, an institutional preference for climate change mitigation rather than adaptation was evident. Policies 8.2.1, 8.2.3, 8.2.4, 8.2.5, 8.7.3, 8.7.4 and 8.7.6 illustrated an institutional preference for densification, urban consolidation, transit orientated development and the promotion of regional activity centres in order to minimise car dependence, energy demand and to decentralised employment (DLGPSR, 2005, pp. 65-75). Policy 8.2.1 required that all new development incorporate subtropical design principles to reduce energy consumption (DLGPSR, 2005, p. 67). Overall, this section of the SEQRP 2005 demonstrated that climate change mitigation was a vague institutional concern for the SEQ metro-regional planning regime between 2005 and 2009. Climate change adaptation, however, appears not to have been an institutional issue at all. This is likely explained by the fact that the SEQRP 2005 was prepared before 2005, during a time when climate change had not yet manifested as a transformative stressor in SEQ. The lack of attention directed towards climate adaptation in the plan was reflective of this. The severe drought in SEQ that lasted until 2010 was at early stage at the time and major flood events did not frequently occur until later in the decade. Accordingly, there were limited trigger events when the SEQRP 2005 was being prepared. I argue that institutional change did not occur and the development of rules of governance designed to operationalise climate change adaptation would have appeared unnecessary to institutional actors at that time.

The *Southeast Queensland Regional Plan (SEQRP) 2005-2026* was in effect from 2005 to 2009. As demonstrated, the plan did not demonstrate an institutional preference for responding to climate change as a transformative stressor through the operationalisation of climate adaptation because there were few trigger events present when the plan was being prepared. However, in tandem with climate change becoming a transformative stressor in SEQ, trigger events became common during the lifetime of the plan. These included wider triggers like Hurricane Katrina, as well as region-specific triggers including the Queensland drought that ran from 2003 to 2009/10 and the severe flooding in rural Queensland in 2008 and 2009. Policies and objectives in the SEQRP 2005, though in force during this time, were not helpful in directing planning strategies for managing these stresses in SEQ. Additionally, the SEQRP 2005 did not have a supplementary climate change plan. In short, there was no institutional elaboration of climate adaptation as a central issue for planning and urban governance in the region during the period from 2005 to 2009. I argue that this demonstrates a lack of institutional recognition of climate change as a transformative stressor during that time.

The SEQRP 2005 was replaced in 2009 with the current regional plan, the *Southeast Queensland Regional Plan (SEQRP) 2009-2031*, which is accompanied by the *Draft Southeast Queensland Climate Change Management Plan (DCCMP) 2009*. The SEQRP 2009 demonstrated some institutional recognition of climate change as a transformative stressor. This suggests that both wider and region-specific trigger events were institutionally recognised during the lifetime of the SEQRP 2005 and that institutional actors considered some degree of response necessary when preparing the SEQRP 2009. Institutional responses were expressed through policies in both the SEQRP 2009 and the DCCMP 2009. For example, Policies 1.3.1 – 1.3.6 expressed institutional preferences for reducing greenhouse gas emissions, improving energy efficiency, promoting carbon storage and increasing take-up of renewable energy technologies (DIP, 2009a, p. 42). The DCCMP 2009 reiterated these policies and expressed 'climate change aspirations for SEQ' including compact urban forms, increased provision of public transport, potable water management and a move towards more localised food provision (DIP, 2009b, p. 13-14). The general climate change policies in the SEQRP 2009 and the DCCMP 2009 did not significantly advance those seen in the SEQRP 2005, suggesting that institutional preferences remained primarily focused on climate change mitigation while the plans were being prepared.

Whilst similar to the SEQRP 2005 in their institutional expression of climate change mitigation, the SEQRP 2009 and DCCMP 2009 both addressed climate adaptation to a limited extent. Applied to the transformative stressors framework, this suggests that some incremental institutional change did occur within the SEQ metro-regional planning regime resulting in the operationalisation of climate adaptation becoming part of urban governance through the SEQ metro-regional planning regime. However, the question remains as to whether this incremental change was sufficient to respond to climate change as a transformative stressor by operationalising climate adaptation as a central principal of metro-regional planning governance. I argue that

the evidence suggests that the level of incremental change was not extensive enough. Despite its inclusion in the relevant plans, the institutional elaboration of climate adaptation as a central issue for planning and thus urban governance in SEQ was weak.

The institutional elaboration of climate adaptation through policies and objectives in the SEQRP 2009 and DCCMP 2009 was narrow during the timeframe examined in this paper. For example, the SEQRP 2009 stated that the planning process in SEQ can reduce risks from projected climate change effects by avoiding development in hazardous areas, improving the design of developments and infrastructure and improving community preparedness. Policies 1.4.1 – 1.4.3 also expressed these broad aims and called for the establishment of adaptation strategies to minimise vulnerability to riverine flooding, sea level rise, storm surges, heatwaves and other severe weather events wrought by climate change (DIP, 2009a, p. 44). The DCCMP 2009 also expressed the necessity of climate adaptation in the region and proposed thirteen draft actions to increase adaptive capacity across the region (DIP, 2009b, p. 14, 30-35). Four were acknowledged by the plan as being underway in 2009. These included preparing a new coastal plan (Draft Action 20); implementing the policies of the coastal plan across the region (Draft Action 22); acquiring digital elevation data for coastal areas (Draft Action 23) and developing a regional summary of projected climate change impacts for SEQ (Draft Action 27).

Whilst these aims are limited, they at least acknowledged an institutional recognition of the need for climate adaptation to be part of governance structures in SEQ up to 2010. The fact that climate adaptation featured in the regional planning framework indicated that incremental institutional change took place in the SEQ metro-regional planning regime since 2005. This is positive, even if the extent of change was limited. I make the following observations when applying this to the transformative stressors model. First, trigger events, which occurred during the lifetime of the SEQRP 2005, appear to have focused institutional attention on climate change as a transformative stressor. These included Hurricane Katrina, Al Gore's documentary, the publication of the Stern Review and IPCC 4$^{th}$ Assessment Report, as well as the droughts and floods experienced in SEQ and the wider state of Queensland. Second, these triggers created windows of opportunity for institutional change and these were exploited to some degree. For this to happen, institutional actors must have expressed preferences for change. Third, institutional capacity was sufficient to allow change but the extent of institutional change was incremental and limited. Finally, irrespective of institutional change having occurred, there remained a lack of specific guidance addressing how planning authorities in SEQ could deliver climate adaptation through planning processes. This was because the policies and objectives towards adaptation in the regional planning framework were not sufficiently prescriptive or directive and so lacked the capacity to properly orientate local planning activities towards climate adaptation. This, I argue, was because climate adaptation was just one institutional concern amongst many and so was not fully institutionalised and operationalised as a central tenet of planning and urban governance in SEQ.

The SEQRP 2009 continues to function as the primary planning document in SEQ and its policies and objectives in respect of climate change and climate adaptation remain in place at the present time (2011). Institutional responses to climate change as a transformative stressor through governance frameworks currently remain unchanged from those highlighted and discussed in this paper. In spite of the limited institutional expression of climate adaptation as part of a comprehensive response to climate change as a transformative stressor, there remains scope for an improved urban response through planning governance in SEQ. The consequences of the major flooding in Southeast Queensland in early 2011 may represent a set of triggers strong enough to compel institutional recognition of climate change as a transformative stressor. This may in turn prompt more substantial institutional change within the SEQ metro-regional planning regime. The SEQ planning regime has demonstrated a capacity for incremental change in respect of climate adaptation, but I argue that episodic change is needed if climate adaptation is to be fully operationalised in urban governance frameworks. Increased incidences and severity of flooding are part of the predicted impacts of climate change in SEQ. In this regard, the floods of 2011 offer a vivid example of the capacity of climate change to intensify as a transformative stressor in SEQ. Losses of lives, livelihoods and assets were experienced across the region. Impacts were especially heavy in urban areas, most notably in Brisbane and Toowoomba. These may prove to be the triggers that will compel episodic institutional change within the SEQ metro-regional planning regime. I submit that the social stresses created by the 2011 floods will ensure that institutional actors will likely find it difficult to resist significant institutional change. However, whether episodic institutional change actually follows these trigger events remains to be seen.

As a final consideration, it must be acknowledged that institutional change, especially episodic change, is often facilitated or blocked by political and government actors and preferences. Whether politicians and government officials in SEQ recognise climate change as a transformative stressor and understand the necessity of operationalising climate adaptation in urban settings through planning governance frameworks

remains an unresolved question. I argue that the limited focus on climate adaptation in the SEQRP 2009 and DCCMP 2009 offers some hope for more significant institutional expression in the future. These plans were the products of a Labour state government and indicate awareness within that party of climate change as a transformative stressor requiring responses from institutional governance frameworks. There will be a state election in Queensland by March 2012, and should Labour lose office, it appears that the Liberal National Party (LNP) will not ignore the necessity of climate adaptation. Current LNP policy on climate adaptation illustrates the party's support for research into adaptation strategies, as well as support for the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Adaptation Flagship (LNP, 2010). In addition, the impacts of the 2011 SEQ floods also forced politicians and officials to confront the devastating impacts of extreme weather events. Political management and strategy making in respect of such events has come under significant media and public scrutiny in SEQ, suggesting that the political sphere cannot ignore these issues in the future.

## CONCLUSION

Institutions are understood in a social scientific context as social entities that structure and co-ordinate social interactions across a number of settings. This is achieved through the imposition of rules of governance. Institutions are capable of undergoing institutional change when faced with trigger events and associated stressors that require new rules of governance in order to better manage their impact. This paper developed a new conceptual framework that proposed a typology of stressors significant enough to compel institutional change even in situations where resistance from institutional actors is present or where institutional capacity may be limited. These stressors are referred to as 'transformative stressors' and climate change is identified as one such example. This paper has argued that the improved operationalisation of climate adaptation is a central tenet of a comprehensive urban response to the transformative stresses climate change and its effects are predicted to create in Australian cities. The role of planning regimes as social institutions responsible for establishing and maintaining governance frameworks was examined, along with the capacity of planning to respond to climate change as a transformative stressor in urban environments.

This paper identified 2005 as the time when climate change became a transformative stressor for the metro-regional planning regime in Southeast Queensland (SEQ). The metro-regional planning regime is a key urban institution, charged with implementing governance frameworks to guide development activities across the metropolitan region. This paper argued that the current and past SEQ regional plans document the institutional preferences of the SEQ metro-regional planning regime towards many planning issues since 2005, including climate change and climate adaptation. It was argued that operationalising climate adaptation through institutional change is essential in responding to climate change as a transformative stressor in SEQ. As demonstrated from an analysis of SEQ regional plans, the metro-regional planning regime underwent incremental, though not episodic, institutional change in response to transformative stresses wrought by climate change between 2005 and 2010. It was argued that the inclusion of policies and objectives relating to climate change adaptation in the *Southeast Queensland Regional Plan 2009-2031* and *Draft Southeast Queensland Climate Change Management 2009* showed some institutional awareness of climate change as a transformative stressor. It was further argued that episodic institutional change in response to climate change stresses might occur in the future, particularly in respect of the social stresses created by the 2011 floods in SEQ. The widespread, costly and damaging impacts of these events could yet prove to be triggers for episodic institutional change within the SEQ metro-regional planning regime. Episodic change in such a case would clearly demonstrate the nature of climate change as a transformative stressor that demands responses from institutional urban governance frameworks in SEQ, as well as other Australian cities and metropolitan areas.

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