

Climate change adaptation through land use planning and disaster management: Local government perspectives from Queensland

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Abstract

Climate change will manifest in altered regimes of natural hazard occurrence, and therefore can be conceptualised as a disaster management issue. Strategic land use planning is a critical tool to mitigate and adapt to hazardous events. Local governments in Queensland have the responsibility for aspects of disaster management and land use planning as core functions of the council. Together they form part of the Prevention Preparedness, Response and Recovery (PPRR) framework for disaster management. In many local governments, however, there seems to be divergence between land use planning and disaster management due to the lack of integration between different functions of council. Given the growing concerns about impacts of climate change, there are new imperatives for linking land use planning, disaster management and climate change as part of an integrated package to address disaster management issues in a holistic manner.

The objective of this paper is to examine how local government perspectives on disaster management are linked to climate change and land use planning. Do Councils see land use planning, disaster management and climate change as separate? What are the key issues that local councils are grappling with in terms of disaster management? The paper will address some of these questions based on data from an on-line survey of local governments in Queensland and in-depth focus group discussions with six Queensland local governments. The paper will develop a framework for linking climate change with disaster management and land use planning to build community resilience.

Introduction

There is growing societal concern about climate change, given the potential impacts of associated sea level rises, flooding, and altered risks of other natural hazards (Gurran et al, 2008; Burton, 2006; Bryne et al, 2009; Hastings and Childs, 2009; Newman et.al, 2009). Risk management at national, state and local government levels for natural hazards such as flooding, bushfire and storms has, nevertheless, developed before the emergence of climate change as a major political issue. With the Disaster Management Act 1993, local councils were made responsible for developing disaster management plans for local government areas. Likewise with planning legislation (Integrated Planning Act 1997 and more recently the Sustainable Planning Act 2009), local councils have been charged with the responsibility for developing strategic land use plans as a part of their planning schemes. There is no strong link, however, between land use planning and disaster management (DM) in council organisational structure. While the recent debate on climate change has given greater focus to mitigation measures for reducing greenhouse gas emissions, there is still little discussion on linking impacts of climate change, which includes predicted changes to natural hazard occurrence and intensity patterns (i.e. risk) in many areas (CSIRO and BoM, 2007), with disaster management and land use planning. The current focus on climate change is an excellent opportunity to develop such links. This paper uses a recent study on the role of disaster management in local councils in Queensland as a basis to argue the case for greater linkages between adaptation to climate change, disaster management and land use planning.

The paper is organised around three key sections. First, the paper briefly reviews the key planning principles to deal with climate change and develops an integrated framework for linking climate change with land use planning and disaster management. The paper then reviews the emerging policy frameworks for climate change, disaster management and land use planning in Queensland. This provides a useful context for discussion of local government perspectives on climate change, disaster management and land use planning and for identification of key planning challenges facing them.

1. Linking climate change with land use planning and disaster management

Climate change

Dealing with climate change not only involves managing greenhouse gas emissions, but also minimising the risks from natural hazards through mitigation and adaptation. Gurrán et al, (2008) in their recent report *Planning for climate change: Leading Practice Principles and Models for Sea Change Communities in Coastal Australia* highlight the need for mitigation as well as adaptation strategies in a land use planning context to deal with climate change. Mitigation measures aim to reduce greenhouse gas emissions thus minimising future impacts of climate change beyond what is already projected. These measures include stricter environmental standards, energy and water efficiency, modified building codes and changes in urban form to reduce dependencies on motor vehicles through land use planning. Adaptation measures to climate change impacts will involve increasing our ability to cope with a changing climate and building community resilience based on analysis of risk assessment and vulnerability. Some of the adaptation measures to coastal hazards could include preventing new permanent developments within areas of risk, reinforcing barrier devices to protect property, and re-establishing foreshore vegetation.

There have already been a number of local mitigation responses to climate change in different parts of Australia. Examples include construction of energy efficient buildings, designating areas specifically for habitat conservation, harvesting storm water to irrigate parks and green spaces, grey water recycling. Adaptation measures include placing a moratorium on development, buy-back fund for properties potentially damageable by sea level rising sea-levels, determining legal liability for past approvals for coastal front development, refusing coastal developments on the basis of anticipatory sea level rises (Bryne et al, 2009).

Disaster management

Beatley (2009) in his book *Planning for Coastal Resilience: Best Practices for Calamitous Times* points out that planning for natural hazards comprises four stages - also Emergency Management Australia (EMA) (EMA, 2004). This is also known as the PPRR framework for disaster management:

- Prevention/mitigation,
- Preparedness,
- Response and
- Recovery.

While prevention/mitigation focuses on long term proactive steps (such as prohibiting buildings in flood prone areas or adopting building codes), preparedness and response actions

are focused on dealing with immediate concerns for health and safety (Beatley, 2009). Preparedness entails actions immediately before an imminent natural disaster (such as evacuation in the face of cyclones) while response activities deal with actions in the immediate aftermath of event (such as search and rescue). Prevention and mitigation could include proactive land use planning and stronger building codes. Inherent in effective hazard management is building community resilience which involves developing community support systems, to prepare for and respond to disaster events. In this context, Walker and Salt (2006) discuss the need for new “resilience thinking” while dealing with issues of climate change and natural hazards management.

Australia’s *comprehensive* approach to emergency management adopts this framework of PPRR (prevention/mitigation, preparedness, response and recovery) to minimise or eliminate hazards and to increase the resilience to hazards of a community or environment: (EMA, 2004).

Land use planning

Land use planning can play a key part in reducing current and future community risks associated with climate change, notably by enhancing prevention and preparedness and/or facilitating response and recovery in a community). Responsible management of the environment and its resources, and flexible and responsive development can prevent or mitigate negative impacts (EMA, 2002). Gurran et. al (2009) suggest that in planning for climate change, there is an important role for land use planning which reduces the future carbon impact of new developments as well as for improving resilience against natural hazards associated with climate change.

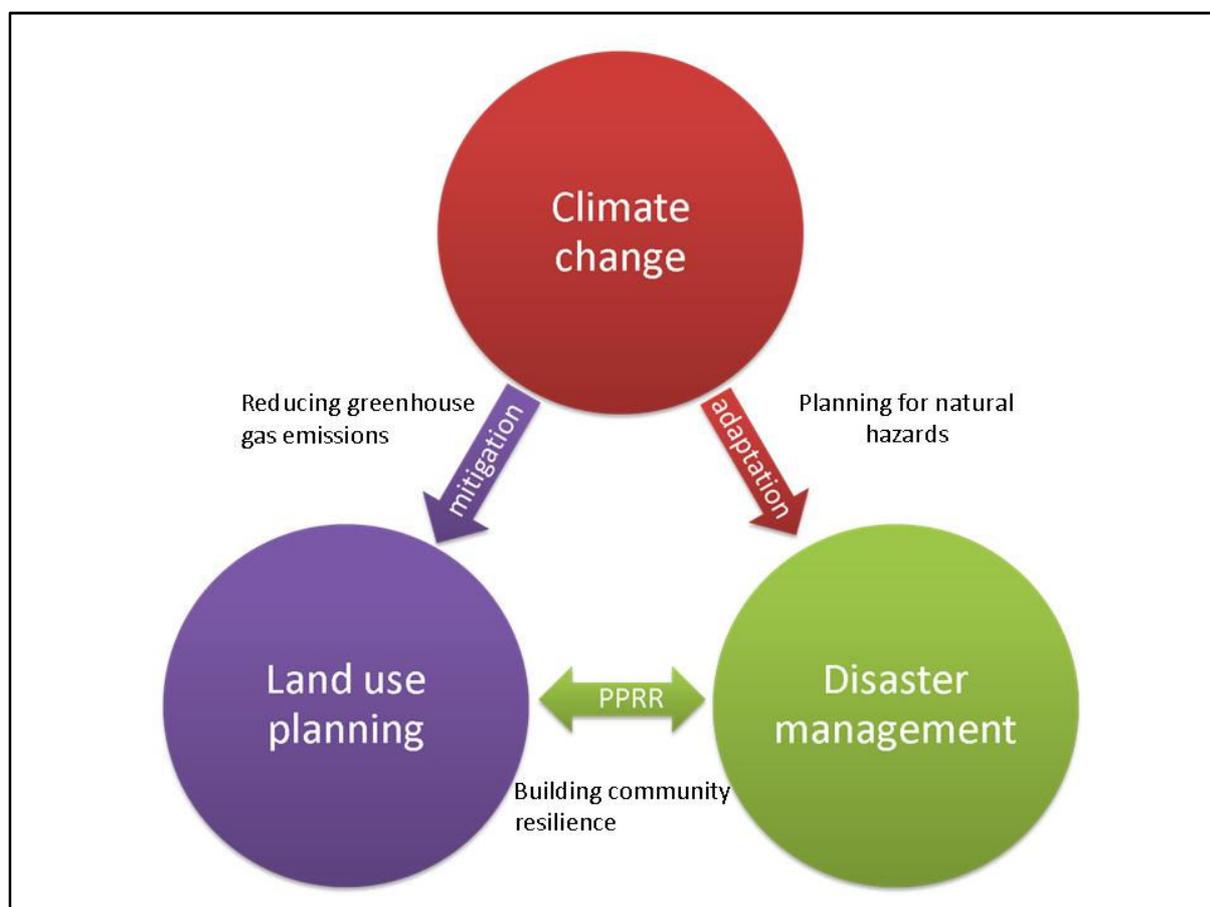
Land use planning can influence mitigation of disasters through the development of strategic land use plan as well as assessment of development applications on the basis of the adopted plan. EMA (2002) suggests that land use planning can minimize risk in a number of ways such as:

- prohibiting development in high-risk areas through zoning and overlay controls;
- limiting the types of development in high to moderate risk areas for recreation or other forms of public use reducing the potential impacts of natural hazard events; and
- applying appropriate development controls in moderate and lower risk areas such as minimum elevations, setbacks and lot sizes, as well as maximum densities and site coverage.

Figure 1 below summarises the posited links between climate change, land use planning and disaster management.

The framework proposes that the primary link between climate change and land use planning is mitigation while the link between climate change and disaster management is adaptation. Likewise, the link between land use planning and disaster management is seen as a continuum of PPRR (prevention, preparedness, response and recovery).

Figure 1: Framework for linking climate change with land use planning and disaster management



Having developed an analytical framework for linking climate change with disaster management and land use planning, the paper briefly reviews the emerging policy frameworks for these three important themes in the context of Queensland.

2. Emerging policy frameworks for climate change, land use and disaster management in Queensland

Climate change

In Australia, the three levels of government, federal, state and local, have specific and different responsibilities in managing land use and the environment (Hastings and Childs, 2009). Local councils have mandatory responsibilities for land use planning schemes that duly consider the environment, settlement patterns and economic activities within their communities. Thus, in this context, local government is the vehicle via which practical policy and planning adaptation to climate change occurs at the community level. This local government responsibility poses a range of challenges for decisions concerning land use and land use planning. The fundamental question is whether local councils are effectively

responding to the evolving science and policy frameworks relating to climate change to benefit their constituents.

International and national cooperation and guidance on the issue became more concerted with the advent of the IPCC and its publications in the early 1990s, and the *National Greenhouse Response Strategy for Australia* in 1992 (Commonwealth of Australia, 1992). The latter was followed up in Queensland by the *Queensland Government Response Strategy* (Queensland Government, 1995).

By the late 1990s, the development of substantive federal and state policies gained momentum. In 1998, the National Greenhouse Strategy specifically advocated the adoption of planning strategies that take into account potential sea-level rise (Commonwealth of Australia, 1998). State governments, including Queensland, responded with their own policy framework and implementation plans (e.g. Queensland Government, 2001; 2004). These documents established the basis for the most recent iteration of state policy, *ClimateSmart 2050* (Queensland Government 2007a, 2007b). ClimateSmart strategy established adoption measures such as incentives for energy efficiency and reduction in water consumption to households as well as ban on native vegetation clearing (Bryne et al, 2009). Some of the land use planning responses include the South East Queensland Regional Plan, state planning policies for natural disasters, state coastal management plan, coastal vulnerability assessment and review of disaster management plan (Bryne et al, 2009).

Related documents supporting Queensland's policy synthesise the science and potential impacts of climate change (e.g. Queensland Government, 2008) with an emphasis on managing carbon emissions. Nevertheless, regional plans (i.e. the *Southeast Queensland Regional Plan 2009-2036*), the State Coastal Management Policy and *draft Queensland Coastal Plan* do encourage consideration of sea-level rise (applicable to storm surge risk) in planning schemes (Queensland Government, 2009a, 2009b).

The documents *Climate Change Adaptation Actions for Local Government* (Commonwealth of Australia, 2007) and the Local Government Association of Queensland's (LGAQ) *Adapting to Climate Change, A Queensland Local Government Guide* (LGAQ, 2007) more specifically aim to provide guidance to local governments dealing with impacts of climate change, including potential sea-level rise. The greater practicality and specificity of these documents for local government appears to address the policy gap identified by the earlier studies.

ClimateQ: toward a Greener Queensland is Queensland's climate change response, and includes policies to further reduce the State's greenhouse gas emissions, and support community and industry prepare for, and adapt to, a changing climate (Queensland Government, 2009c). As part of this strategy, the government has developed initiative on disaster preparedness in vulnerable communities for developing the capacity of individuals, families and businesses to contribute towards their own safety and well-being in the event of a natural disaster.

Disaster management

The Queensland *Disaster Management Act 2003* (the Act) forms the legislative basis for disaster management activities within all levels of Government and the Queensland Disaster Management System. One of the objectives is to establishing disaster management groups for the State, disaster districts and local government areas; the other is to prepare disaster management plans and guidelines (Queensland Government, 2005).

Local governments have a key role in identifying and understanding the credible hazards and risks that could impact on the safety and sustainability of their communities. Their role is to establish mitigation, preparation, response and recovery strategies and arrangements, within the ambit of their resources and responsibility. This is achieved through Local Disaster Management Groups and the development of local disaster management plans that enhance their community's preparedness to manage the consequences of a disaster and provide a vital link to individuals, voluntary organisations and community organisations that are integral to the execution of disaster management strategies.

Land use planning

Sustainable Planning Act 2009 (Queensland Government, 2010) is a key tool for implementing the broad land planning and development reform in Queensland. The Act is outcomes-focused and significantly improves and streamlines land use planning and development framework and systems.

State Planning Policy 1/03: Mitigating the adverse impacts of flood, bushfire and landslide (SPP 1/03) (Queensland Government, 2003) sets out the State's interest in ensuring that the natural hazards of flood, bushfire, and landslide are adequately considered when making land use decisions about development. This policy guides planning schemes and development decisions to reduce community vulnerability and the financial impacts of natural hazards. The SPP requires the identification of *natural hazard management areas* within which minimising risks to the community should be a key consideration. Local councils are obliged to take this into consideration while preparing planning schemes and assessing new developments. This policy came into effect in 2003.

The other relevant state government policy is state coastal management plan. Storm tide inundation hazard is addressed under the *State Coastal Management Plan – Queensland's Coastal Policy 2001* (State Coastal Plan), and is excluded from SPP 1/03 except to the extent that cumulative impacts (e.g. flooding can be exacerbated under storm tide conditions) may need to be considered in determining the extent and severity of hazard under SPP (note the new draft Queensland Coastal Plan is presently available, as indicated above).

The above discussion on emerging policy frameworks for climate change, disaster management and land use planning provides a useful context for discussion on a recent study *Policy into Practice: Adoption of Hazard Mitigation Measures by Local Governments in Queensland* conducted by the authors for Emergency Management Queensland to examine the role of local government in disaster management in Queensland. While the study did not have a specific focus on climate change, there are aspects from the study which are relevant for understanding issues relating to links between disaster management, which is argued here to be relevant to managing climate change impacts, and land use planning.

3. Local government perspectives on climate change, disaster management and disaster management: Research findings

For the purpose of this study, information and data collection was achieved using a survey tool comprising two components:

- An online questionnaire survey for all local councils in Queensland
- A series of focus groups with selected six Queensland local Councils.

The online survey was conducted between August and November, 2009. A Council response rate of 66% was achieved with at least one representation from 48 of the 72 local Councils in Queensland completing the survey. No specific questions on climate change were asked in the online-survey (due to the scope of the research project), however some questions on this topic were raised in the focus group meetings with six councils.

The Online Survey Findings

This paper reports on only a small number of survey items that specifically reflect overall incorporation of disaster management into council corporate planning and land use planning. Readers are referred to the research report, Childs et al, (2010), for the full results across a range of themes, the full questionnaire, and rationales of questions included in the survey.

Incorporation of DM Requirements by local councils

Participants were asked to rate the degree to which DM requirements were incorporated into Council plans/planning more generally. This follows published guidance on why and how to do so from, for example, the Local Government Association of Queensland (2008).

Table 1. How well are DM requirements incorporated into the following?

	Very well incorporated	Satisfactorily incorporated	Limited incorporation	Very limited/not specifically acknowledged	Total responding*
Council Corporate Plan	13	30	2	3	48
Community/ Local Plan	8	12	12	16	48
Council Operational Plan	12	30	2	4	48
Planning Scheme (land use planning)	8	24	10	6	48
Master Plans	3	20	9	12	44
Annual Budget Process	7	31	5	5	48

* one-response-per-Council database

Table 1 reflects that a substantial majority of Councils consider that they have either “satisfactorily” or “very well” incorporated DM requirements into their Council corporate plan, Council operational plan or the annual budget process. Achieving this in sum is viewed as a key mechanism of diffusing awareness and consideration of DM issues and implications across all Council departments and functions (e.g. Local Government Association of Queensland, 2008). The study of Childs et al, (2010) reveals that the ability of individual Councils to promote DM in this way is dependent on a range of factors ranging from the prioritisation of DM by key Council personnel through to staffing and resourcing levels.

According to the respondents from councils across Queensland, 32 of the 48 councils have incorporated disaster management in land use planning. A number of councils (16 of 48) have limited or very limited incorporation of DM in their land use planning documents indicating scope for improvement in integration between the disaster management and land use planning in these councils.

Land use planning

The on-line survey had specific questions to find the extent to which DM has been genuinely integrated into the processes of land use planning. Again, this follows published guidance on why and how to do so from, for example Queensland Government (2003) and EMA (2002). Table 2 presents the results of a closed-format question addressing this aspect.

Table 2. What types of land use planning controls are in place in your Council to reduce community vulnerability to hazards?

	Yes	No	Total responding*
Buffer zones (e.g. for bushfires)	34	11	45
Restrictions on building in hazardous areas	40	5	45
Land-use zoning appropriate to hazards risk (e.g. sports fields on floodplains)	41	3	44
Raising floor levels of buildings and/or rezoning following a significant event	33	12	45
Strategic location of critical infrastructure (e.g. hospitals, schools, emergency services, evacuation routes)	31	14	45
Adaption/enforcement of building design codes for other hazards (e.g. wind, slope, fire)	34	11	45
Buy-back/acquisition policy for high risk properties	7	38	45

* one-response-per-Council database

The vast majority of Councils reported that they had restrictions on building in hazardous areas and/or land-use zoning appropriate to hazard risk. Other more specific controls were less evident. Nevertheless, for each of these measures/controls, well over half of the

responding Councils had them in place. The one exception to this related to having an acquisition policy for at-risk properties.

A further, notable theme emerged from the additional comments of several Councils. This alluded to their control (lack of) over the location of State infrastructure and the resulting inconsistencies with local planning schemes and/or subsequent exposure of this infrastructure to risks that are locally acknowledged.

The Focus Groups Findings

Four coastal and two inland Councils were selected for the purpose of conducting in-depth focus group meetings with Council-based DM stakeholders. These Councils were selected in consultation with Emergency Management Queensland and the Local Government Association of Queensland, Disaster Management Alliance within the resourcing framework of the project. The councils selected were Gold Coast, Cairns, Rockhampton, Mackay (coastal), Murweh (Charleville) and Central Highlands (Emerald) (inland). Each of these are known to be taking an active interest in disaster management issues (facilitating research participation), being localities either at significant risk from hazards and/or having experienced major events in recent history. In the case of the chosen coastal councils, population growth and development pressures are presently weighing on strategies for managing hazard risks and disasters.

The researchers aimed to negotiate attendance in the focus groups (where applicable) by DM staff, land use planners, corporate administrators/managers and elected representatives (councilor). This was generally achieved. The focus group meetings were conducted with the six (6) Councils between October and December 2009, with open discussion facilitated on themes including: the issues of adopting policy/ guidance documents (i.e. related to the Queensland DM Act, Queensland State Planning Policy 1/03 and the Queensland coastal plans/policies) and climate change issues as they relate to disaster management. Discussions were analysed via thematically-based collation techniques following confirmation of transcripts by group participants. Again, readers are referred to Childs et al, (2010) for greater detail.

Climate Change

Many coastal councils which participated in the focus group were vulnerable to climate change through exposure to potential sea-level rise and storm/ storm surge risk. Councils along the coasts expressed more concerns about the climate change than the inland councils. Councils such as Gold Coast and Cairns have taken steps to prepare strategic policy documents relating to climate change (Gold Coast City Council, 2009, 2010; AECOM, 2009). The Gold Coast's Climate Change Strategy 2009-14 examines the risks of climate change and its likely consequences for the Council and the community in both short and long term. It identifies a number of targeted actions focused on climate change mitigation and adaptation.

Focus group interviews with Cairns city council found that the IPCC has listed Cairns as one of world's 6 most vulnerable sites. A private consulting firm AECOM produced a document assessing the climate change risks and opportunities (AECOM, 2009). With respect to land use planning in Cairns, the report recommended assessing and mapping the areas within the jurisdiction of the Cairns Regional Council that are vulnerable to climate change impacts. In addition it recommended reviewing the materials and information that guide Cairns Regional

Council's land use planning and development assessment activities to determine where amendments are necessary to incorporate the consideration of climate change impacts. With respect to natural disaster planning and response, it suggested that there was a need to enhance the Council's natural disaster coordination capacities, including establishing a new flood immune disaster coordination centre. It was suggested that council's natural disaster response capacity needed to cater for potentially more frequent and more extreme natural disasters associated with climate change.

The members of focus groups pointed out the priority given to climate changes issues by moving climate change from a separate document to being embedded into a range of land use planning and corporate documents. They also saw the transition from *Integrated Planning Act 1997* to *Sustainable Planning Act 2009* as providing an opportunity to effect changes relating to DM / climate change in planning schemes. Climate change issues will now be required to be addressed in the strategic planning schemes under the new act. Respondents suggested that the new Sustainable Planning Act, 2009, makes possible prohibition of development in some zones which have a high risk for development.

Disaster management

Adoption of disaster management policy guidelines

Some council indicated that there were too many policy guidelines regarding disaster management coming from the State government which the local government found it hard to meet with limited resources available to councils. There were also apparently conflicting guidelines - e.g. storm tide mapping was not "fit for purpose" – and could not be translated easily into public information that effectively communicated risk. The approach to policy guidelines was viewed as very much top-down process. It was suggested that more consultation was needed with the councils prior to developing these guidelines.

Other councils considered that the SPP & other policies were vague – but this at least meant that they could do what they needed to do within the policies. The intent of policy was good, but that they needed to be customised to give more direction for Local Government use. The view was expressed that policies were "sketchy" in character and scope and needed greater clarity and focus.

One focus group reflected that the SPP1/03 was generally too broad to adapt to local government planning schemes. Translating the SPP1/03 into practical measures at local government was a problem. Thus, there seemed to be an emerging view that there was a disconnect between disaster management staff and planning staff in preparing and implementing the planning scheme.

Inconsistencies in application of state planning policies

Some Councils noted that the State planning policy allowed for a variety of solutions that again, could lead to inconsistencies in risk treatment. One Council pointed out those inconsistencies cannot only apply between localities/developments, but also occurred through time. It was suggested that under current State policy, once any necessary hazard management plans were accepted under development application requirements, there was no auditing to make sure that these plans were passed on to subsequent property owners.

Lack of cooperation between state and local governments in provision of infrastructure

An issue was also raised concerning cooperation between the State and Local Governments in relation to siting State-controlled infrastructure and facilities. At worst, it was suggested that facilities key to disaster response were placed at vulnerable locations by State authorities, against the advice of locals.

One Council proposed a simple criterion to assist the integration of DM and land use planning – that new developments should not place any extra burden on local DM resources. In this regard, a major concern was the need to ensure that access during emergencies was not problematical.

Land Use Planning

Integration between disaster management and land use planning

There were varying degrees of integration between DM and land use planning in Councils. All responding councils in the focus groups were attempting to address the risk mitigation requirements of State planning policy (e.g. SPP1/03; coastal management policies) in their urban and regional planning processes. Nevertheless, in most cases, land use planning and DM operations of Councils were clearly differentiated and often did not seem to collaborate on a systematic, routine basis. The interaction that did occur was commonly facilitated by risk studies/projects through which planning scheme risk standards were recommended.

Although Table 2 above does suggest that many planning controls are in place to mitigate hazard risk, the focus group interviews revealed scope for improvement in terms of governance structures to integrate land use planning and disaster management. Some council has begun integrating land use and disaster management issues although they are run under different departments within the council. With the climate change agenda, there is now greater potential to link land use planning and disaster management.

Another point raised in focus groups was that in the council policies for disaster management, there is too much emphasis on RR (response and recovery) and not enough on PP (prevention and preparedness). The suggestion was made that there should be a review of local disaster management plan to have greater focus on prevention and preparedness as part of the overall PPRR framework for disaster management. It was also emphasised that the disaster management legislation requires local government to have a focus on *recovery* therefore proactive land use planning has not been articulated well with disaster management plans in the councils.

Lack of up-to-date land use and other maps

Natural hazards risk modelling at local scales was either not available or rudimentary across many areas, making it difficult to develop robust standards for planning. Land use maps and other relevant risk information (e.g. contour and hydrology maps) were not up-to-date for DM planning in many Councils. Some Councils were reluctant, at least partly due to this, to release information to the public so that they could assess their own risk exposure and manage it accordingly.

Compensation issues

The use of planning schemes under the Integrated Planning Act, 1997 and the new Sustainable Planning Act, 2009 as a tool for DM – for example the introduction of new standards to respond to risks – was deemed problematical by some Councils. The issue of perceived liability of Councils and potential compensation issues to landholders if landholder rights were changed (for example by changing risk standards applied to land use planning) was raised. Councils were therefore wary of being proactive in introducing amended standards, and preferred to wait for someone else to “take the first step”.

Changing risk standards

Where risk standards are reviewed and changed, differential standards (old and new) can be apparent in the built environment – for example varying floor heights that are visible in local areas. One Council alluded to the need to consider applying standards in conjunction with desired urban design outcomes e.g. street-level (i.e. ground storey of buildings) car parking may be an appropriate ground-level land use in higher flood-risk areas, but this may be an undesirable use from the perspective of an urban design imperative to develop an active and attractive street culture.

Conclusion

Climate change is an important issue facing local councils in Queensland. Focus on mitigation to reduce greenhouse gas emissions alone, however, is not enough. There has to be greater focus on building community resilience and minimizing vulnerability through adaptation measures for climate change impacts as well – including those from changing patterns of natural hazard occurrence and intensity. Policies on climate change, disaster management and land use planning need to be linked together more strongly by local councils to deal with both mitigation and adaptation measures.

This paper proposed a framework for linking the climate change, disaster management and land use planning. The framework proposes that the primary links between climate change and land use planning are mitigation measures while the links between climate change and disaster management are adaptation measures. Likewise, the link between land use planning and disaster management is seen as a continuum of PPRR (prevention, preparedness, response and recovery).

The study of local councils in Queensland found that at present the link between disaster management and land use planning is weak. The study identified a number of other issues of concern to Councils such as inconsistencies in application of State Planning Policies, lack of cooperation between State and local governments in provision of infrastructure, lack of up-to-date land use and other maps, compensation issues, changing risk standards. Each of these issues is important and needs to be dealt with in planning for climate change in Queensland.

Beatley (2009) has recently identified three key themes for addressing planning issues in coastal communities facing climate change. They include sustainability (e.g. protecting natural capital of community, reducing ecological footprint, enhancing quality of life), hazard mitigation (e.g., steps for reduce exposure and vulnerability) and community resilience (ability of community to adapt and respond to events) which are interactive and reinforcing. The relevance of some of these ideas for the local context is worth considering for dealing with climate change in Queensland.

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