Climate change adaptation in Queensland, Australia – increasing resilience in the face of flooding and sea level rise

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Climate change is projected to cause rising sea levels, and an increase in the frequency and severity of extreme weather events. This is especially problematic in Australia, with 80% of the Australian population living in the coastal zone, and 711,000 residential addresses located within 3km of the coast and less than 6m above sea level. Extreme weather events are already having a catastrophic impact on Australian regions, especially in coastal areas. During the 2010-2011 Australian summer, flooding in Queensland and Cyclone Yasi resulted in 75% of the State being declared a disaster zone, and generated an estimated $3.6 billion in insurance claims.

The recent spate of natural disasters, as well as long-term projections for the future, have motivated the Queensland government to enact laws designed to minimise the impacts of future sea level rise and extreme weather events. These laws are closely linked to maps of at-risk areas, and seek to either restrict development, or ensure that development is constructed to withstand the impacts of future extreme weather events.

This paper provides a case study and critical analysis of the Queensland approach for adaptation to flooding and sea level rise in land use planning, and provides some recommendations based on the region's recent experience with extreme weather events.

INTRODUCTION

Queensland is highly susceptible to the impacts of climate change, including sea-level rise, storm tide inundation, flooding and cyclones. In the summer of 2010-2011, Queensland experienced its most severe flood since 1974, which caused 35 deaths,

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and approximately $5 billion worth of property damage.[1] After the floodwaters receded and the initial clean-up was completed, focus moved to the adequacy of the State's planning schemes, waterway management, emergency management, and insurance coverage. The resulted in the establishment of a Commission of Inquiry, which conducted extensive public hearings, and is expected to release a final report in February 2012.[2] There have also been at least 3 different government inquiries into current arrangements for flood insurance in Australia,[3] as the Queensland floods exposed a widespread problem of un- and under-insurance.

2011 was also a watershed year for coastal planning, with the Queensland state government approving a new Coastal Plan.[4] This plan is yet to commence, but will deliver an improved approach to management of development in areas vulnerable to the impacts of sea-level rise, erosion and storm-tide inundation.

This paper will examine these recent developments in Queensland, focusing on the differences between the planning scheme for riverine flooding and the planning scheme for sea level rise. Whilst the new Coastal Plan represents a pro-active, forward-looking approach to planning, the scheme governing areas vulnerable to riverine flooding has been largely reactive in nature. This paper will conclude by making some recommendations as to how planning for the impacts of climate change and extreme weather events can most effectively be managed in Queensland and beyond.

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1 Queensland Floods Commission of Inquiry, *Interim Report* (August 2011) 20 <http://www.floodcommission.qld.gov.au/__data/assets/pdf_file/0006/8781/QFCI-Interim-Report-August-2011.pdf>.

2 Queensland Floods Commission of Inquiry, *Final Report* (2011) < http://www.floodcommission.qld.gov.au/publications/final-report>.

3 Commonwealth of Australia, *Reforming flood insurance: clearing the waters* (April 2011) Treasury Department < http://www.treasury.gov.au/documents/1995/PDF/clearing_the_waters_april2011.pdf>; Commonwealth of Australia, *Inquiry into flood insurance and related matters* (June 2011) National Disaster Insurance Review < http://www.ndir.gov.au/content/issuespapers/NDIRIssuesPaper.pdf >; Commonwealth of Australia, *Reforming flood insurance: a proposal to improve availability and transparency* (November 2011) Treasury Department < http://www.treasury.gov.au/documents/2221/PDF/transparency_november2011.pdf>.

4 Queensland Department of Environment and Resource Management, *Queensland Coastal Plan* (28 October 2011) < http://derm.qld.gov.au/coastalplan/index.html>.

EXTREME WEATHER, FLOODING, AND SEA-LEVEL RISE IN QUEENSLAND

Queensland is the 3rd largest state in Australia by population, with approximately 4.5 million residents.[5] The overwhelming majority of this population are settled along the coast,[6] with an estimated 80% of Queensland residents living on the coast.[7]

Queensland has a long history of extreme weather events, with floods and cyclones being relatively commonplace. The potential and the real impacts of weather related extreme weather events and sea-level rise have been at the forefront of politics, law and media in Queensland in the past few years. Coastal planning in Queensland has recently undergone an extensive review, with a new plan expected to commence in late 2011. This plan comprehensively deals with risks posed to development by extreme weather and sea-level rise.

The Queensland floods in December 2010 and January 2011 also brought extreme weather events to the fore. The state was subject to widespread and devastating flooding, with the Queensland government releasing the following statistics:

- Thirty-five people died in the floods, and three remain missing;
- More than 78 per cent of the state was declared a disaster zone, with over 2.5 million people affected;
- 29 000 homes and businesses were subject to inundation; and
- It is estimated that repairs to property will cost more than $5 billion.[8]

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5 Queensland Government Office of Economic and Statistical Research, *Estimated resident population and components of change by number, Queensland, 1999–00 to 2009–10* (17 October 2011) <http://www.oesr.qld.gov.au/subjects/demography/population-estimates/tables/erp-components-change-no/index.php>.

6 Queensland Government Office of Economic and Statistical Research, *Queensland Thematic Maps* (2012) <http://statistics.oesr.qld.gov.au/qld-thematic-maps?sub=1&ser=60885>.

7 Queensland Government Department of Environment and Resource Management, *State Coastal Management Plan 2002* (12 April 2011) iii <http://www.derm.qld.gov.au/environmental_management/coast_and_oceans/coastal_management/state_coastal_management_plan/index.html>.

8 Queensland Floods Commission of Inquiry, *Interim Report* (August 2011) 20 <http://www.floodcommission.qld.gov.au/__data/assets/pdf_file/0006/8781/QFCI-Interim-Report-August-2011.pdf>.

For Queensland, 2011 has been a year of rebuilding and reflection. In the aftermath of the floods, a Commission of Inquiry was established to consider, amongst other things:

- the preparation and planning by governments, emergency services and the community;
- the performance of private insurers in meeting their claims responsibilities;
- the flood response, including information provided to the community;
- adequacy of forecasts; and
- all aspects of land use planning.[9]

The Commission delivered an interim report on 1 August 2011, but the report relating to insurance and land-use planning is not scheduled for release until 24 February 2012.[10] Despite this delay, there has been significant activity undertaken by government, with several reviews conducted to examine the operation of private insurance in Australia,[11] and amendments to land-use planning schemes.

Given both the real and potential impacts of extreme weather and sea-level rise on Queensland, it is timely to analyse and evaluate the legal frameworks for planning in at-risk areas.

LEGISLATIVE RESPONSES TO SEA-LEVEL RISE AND FLOODING IN QUEENSLAND

Governance in Australia

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9 Queensland Floods Commission of Inquiry, *Order in Council containing Terms of Reference* (2011) < http://www.floodcommission.qld.gov.au/terms-of-reference>.

10 Queensland Floods Commission of Inquiry, *Final Report* (2011) < http://www.floodcommission.qld.gov.au/publications/final-report>.

11 Commonwealth of Australia, *Reforming flood insurance: clearing the waters* (April 2011) Treasury Department < http://www.treasury.gov.au/documents/1995/PDF/clearing_the_waters_april2011.pdf>; Commonwealth of Australia, *Inquiry into flood insurance and related matters* (June 2011) National Disaster Insurance Review < http://www.ndir.gov.au/content/issuespapers/NDIRIssuesPaper.pdf >; Commonwealth of Australia, *Reforming flood insurance: a proposal to improve availability and transparency* (November 2011) Treasury Department < http://www.treasury.gov.au/documents/2221/PDF/transparency_november2011.pdf>.

Before discussing the content of planning laws in Queensland, it is useful to briefly outline the system of governance in Australia. Law in Australia is made at three distinct levels:

- Federal government level;
- State government level; and
- Local government level.

In this area of law, the majority of laws are made at the state and local government level. Historically, state government planning laws have been relatively general in nature, with detailed planning regulations being delegated to the local government level. Currently, state planning laws are contained in the *Sustainable Planning Act 2009* (Qld) ("SPA"). One of the major purposes of SPA is to manage the process by which development takes place,[12] and consequently, SPA focuses more on the process of assessing development applications rather than on the content. Some of the key functions of SPA include:

- Provision for state planning instruments, including regional plans and State Planning Policies ("SPPs");[13]
- Provision for local planning schemes;[14] and
- Establishment of the Integrated Development Assessment System ("IDAS"),[15] which is a system for integrating state and local government approval processes for development.[16]

Development applications are generally assessed against local planning schemes. However, relevant state laws must be taken into account. If there is an inconsistency between a SPP and a local planning scheme, the SPP will prevail.[17] To cater for this, often SPPs will contain a clause requiring local governments to consider the SPP when creating or updating their planning scheme, or when making development decisions.

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12 *Sustainable Planning Act 2009* (Qld) s 3.
13 *Sustainable Planning Act 2009* (Qld) Chapter 2.
14 *Sustainable Planning Act 2009* (Qld) Chapter 3.
15 *Sustainable Planning Act 2009* (Qld) Chapter 6.
16 *Sustainable Planning Act 2009* (Qld) s 230.
17 *Sustainable Planning Act 2009* (Qld) s 43.

This paper will consider the detailed planning rules for development in Queensland in both riverine flood-prone areas, and coastal areas.

Building resilience in new developments

Development in riverine flood-prone areas

At the State level, there is a State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide ("flood policy"),[18] and an associated guideline ("flood guideline").[19] As development in Queensland is usually assessed under local government planning schemes, the flood policy has to be appropriately reflected in a local government planning scheme, and this will be satisfied where the planning scheme seeks to achieve the same outcomes as the flood policy, and all aspects are consistent.[20] Where a planning scheme does not adequately address the flood policy, then it must be assessed under the flood policy.[21] This has the effect of consistency; theoretically, the same considerations will be applied regardless of whether the development is assessed under a local government planning scheme or the flood policy. However, requiring local governments to integrate the flood policy into planning schemes streamlines the process.

Generally, the flood policy applies to development proposals for land located in 'natural hazard management areas'.[22] The flood policy does not prescribe the extent of these areas, instead leaving this task to local governments. The flood policy does state that this will generally be based on the 1% Annual Exceedance Probability ("AEP") flood (commonly referred to as the 'one in 100 years' flood), but this may be

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18 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

19 Queensland Government Department of Local Government and Planning, *State Planning Policy Guideline for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) < http://www.emergency.qld.gov.au/publications/spp/pdf/spp_guidelines.pdf>.

20 Queensland Government Department of Local Government and Planning, *State Planning Policy Guideline for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 2 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp_guidelines.pdf>.

21 Queensland Government Department of Local Government and Planning, *State Planning Policy Guideline for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 2 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp_guidelines.pdf>.

22 Defined as 'an area that has been defined for the management of a natural hazard': Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 12 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

altered to suit local conditions.[23] The flood event adopted by the local government is to be referred to as the 'defined flood event' ("DFE").[24]

Not all development proposed in a natural hazard management area will be assessed under the policy. The policy will apply where the proposed work involves a material change of use or reconfiguration of a lot[25] that would increase the number of people living or working in the hazard area, or involves institutional uses where evacuation may be difficult (eg. hospitals, nursing homes).[26] Therefore, a single dwelling in a developed area will generally not be assessed under the flood policy.

If proposed development falls into this category, as a general rule, development must be compatible with the nature of the natural hazard.[27] However, if there is already a development commitment in place, or there is an overriding need for the development in the public interest, and no other site is suitable and reasonably available for the proposal, then development must minimise as far as practicable the adverse impacts from natural hazards, and ensure it does not result in an unacceptable risk to people or property.[28] Additionally, wherever practicable, community infrastructure must be

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23 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 16 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

24 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 32 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

25 A 'material change of use' means the start or re-establishment of a new use of premises, or a material increase in the intensity or scale of the use of the premises, and a 'reconfiguration of a lot' means sub-dividing or amalgamating lots: *Sustainable Planning Act 2009* (Qld) s 10(1).

26 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 13 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>. It also applies to a material change of use or reconfiguration of a lot involving the manufacture or storage of hazardous materials in bulk, and work that involves physical alteration to a watercourse or floodway.

27 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 6 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>. This applies unless there is a development commitment, or there is an overriding need for the development in the public interest, and no other site is suitable and reasonably available for the proposal.

28 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 7 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>. The development commitment exception applies because 'there have been past planning decisions that should be respected in order to maintain confidence and certainty in the planning process, even though they may not be consistent with current planning requirements': http://www.emergency.qld.gov.au/publications/spp/pdf/spp_faq_dev_commit.pdf.

located and designed to function effectively during and immediately after natural hazard events.[29]

To achieve compatibility with the nature of a natural hazard, proposed development which is subject to the policy must meet the following specific outcomes:

- Development maintains the safety of people on the development site from all floods up to and including the DFE;
- Development does not result in adverse impacts on people's safety or the capacity to use land within the floodplain;
- Development minimises the potential damage from flooding to property on the development site;
- Public safety and the environment are not adversely affected by the detrimental impacts of floodwater on hazardous materials manufactured or stored in bulk; and
- Essential services infrastructure (e.g. on-site electricity, gas, water supply, sewerage and telecommunications) maintains its function during a DFE.[30]

As noted above, the flood policy must be incorporated into local government planning schemes, subject to the following requirements:

- Natural hazard management areas are identified in the planning scheme;[31]
- The planning scheme contains strategies to ensure that development is compatible with the nature of the hazard, to minimise the impacts on existing developed areas, and to prevent development from materially increasing the extent or the severity of natural hazards;[32] and

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29 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 8 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

30 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 18 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

31 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 8 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

32 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 9 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

- The planning scheme includes a code designed to achieve the development outcomes listed above, and ensures that development mentioned in the flood policy is subject to assessment.[33]

Whilst state government direction on flood policy is desirable, there are several problems with the existing flood policy. First, it does not place any clear restrictions on development, but rather seeks to 'minimise' flood-related damage. This is a vague and uncertain term, and does not provide local government with clear direction as to how this can be achieved. Second, it is not supported by comprehensive mapping of flood-prone areas. As a result, the policy requires often under-resourced local governments to undertake mapping. It also means different standards may be applied across the state, leading to inconsistent results. Because the SPP does not provide strong protection against development in flood-prone areas, there is a high risk that there will be continuing development in at-risk areas. The SPP is however currently under review,[34] and ideally these issues will be addressed in future amendments.

Applying the flood policy in Brisbane – a case study

As discussed above, the SPP is an overarching policy document, and the substantive planning provisions are found in local government planning instruments. The Brisbane City Plan 2000 is the planning scheme for the Brisbane City Council area. Chapter 5 of the Plan contains a series of development assessment codes, which set out performance criteria, and acceptable solutions. Generally, construction of a house will be self-assessable, provided the proposed development complies with any acceptable solutions listed,[35] which include a requirement that houses are not constructed more than 8.5m above ground level.[36] Where development is self-assessable a development permit is not required,[37] resulting in cost and time savings for the developer. It also means that the proposal is not subject to public consultation.

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33 Queensland Government Department of Local Government and Planning, *State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (June 2003) 9 < http://www.emergency.qld.gov.au/publications/spp/pdf/spp.pdf>.

34 Queensland Department of Local Government and Planning, *State Planning Instruments Program 2010–2011* (2010) <http://www.dlgp.qld.gov.au/resources/spi-interest-instrument-reviews-2010-11.pdf>.

35 Brisbane City Council, *Brisbane City Plan: Chapter 3* (6 January 2012) 30 < http://www.brisbane.qld.gov.au/bccwr/lib181/Chapter3_Full.pdf>.

36 Brisbane City Council, *Brisbane City Plan: Chapter 5 (House Code)* (1 January 2007) 100 (A2) < http://www.brisbane.qld.gov.au/bccwr/lib181/chapter5_house_code.pdf>.

37 *Sustainable Planning Act 2009* (Qld) s 236(1).

If a proposed house will be constructed more than 8.5m above ground level, then it is considered code assessable-notifiable development.[38] This means that a development permit is not required, but the proposal is subject to public notification and comment.[39] This gives neighbouring landholders an opportunity to object to the development on the basis of loss of amenity, thereby making it difficult to achieve flood immunity through this technique.[40]

The provisions related to development on flood-prone land are contained in the house code, and are as follows:

Performance criteria	Acceptable solution
House must be protected from adverse flooding and must not significantly interfere with the passage, storage or quality of stormwater or the natural functions of a waterway	• House and ancillary structures are not within a waterway corridor (as shown on the Planning Scheme Maps) • Design and construction of the house complies with Council's Erosion and Sediment Control Standard

Habitable rooms, non–habitable areas (e.g. utility areas, garage, laundry and storage room) have acceptable levels of flood immunity	• The minimum habitable floor levels comply with table 1. For flooding caused by the Brisbane River, creek or waterway, or storm surge, these levels are:
	  • House pad – 100 year ARI+300mm;
	  • Habitable areas – 100 year ARI+500mm; and
	  • Non-habitable areas – 100 year ARI+300mm (except for Brisbane River flooding – 50 year ARI+300mm).[41]

[38] Brisbane City Council, *Brisbane City Plan: Chapter 3* (6 January 2012) 30 < http://www.brisbane.qld.gov.au/bccwr/lib181/Chapter3_Full.pdf>.

[39] Brisbane City Council, *Public Notification and Making Submissions on Applications* (1 January 2010) 3 <http://www.brisbane.qld.gov.au/2010%20Library/2009%20PDF%20and%20Docs/2.%20Planning%20and%20Building/2.10%20Tools%20and%20forms/tools_and_forms_public_notification_and_making_submissions_on_applications.pdf >.

[40] See for example http://floodrecoverybrisbane.wordpress.com/2011/10/17/post-flood-solution-is-houses-on-stilts/, which refers to the McGirl property on Graceville Ave, Graceville, which the owners raised to 10.6m above ground level to achieve flood immunity. This was subject to public objections, and occurred prior to Council introducing the 8.5m limit. Interestingly, the McGirls only suffered $60,000 of damage during the 2011 floods, and this was all to external parts of the house, such as the pool, water pumps, and an electric gate.

[41] Brisbane City Council, *Brisbane City Plan: Chapter 5 (House Code)* (1 January 2007) 101 (A2) < http://www.brisbane.qld.gov.au/bccwr/lib181/chapter5_house_code.pdf>.

Following the flood disaster in early 2011, the Brisbane City Council released a Temporary Local Planning Instrument ("TLPI") to regulate the rebuilding of houses damaged or destroyed by floodwaters. This was released as a TLPI rather than a permanent amendment to the planning scheme, as changes to the Brisbane City Plan can take up to 18 months to implement, and it was viewed as important to provide certainty to residents who were undertaking repairs or rebuilding their homes.[42] The Brisbane Temporary Local Planning Instrument 01/11 was introduced on 16 May 2011 and will have effect for a one year period.[43] It applies to properties susceptible to Brisbane River flooding, as well as other creek or waterway flooding.

The TLPI makes several important changes, including:

- Introduction of a new Interim Residential Flood Level ("IRFL") based on the 2011 floods. The Level will be the highest of either the estimated level of the January 2011 floods, or the existing levels used (based on a 100 ARI event and 3.7m AHD at the Brisbane City Gauge);[44]
- Self-assessment of houses is permitted where the house will be up to 9.5m above ground level, and it is affected by riverine or waterway flooding.[45] This overrides the Brisbane City Plan which only allows for self-assessment of houses up to 8.5m above ground level. This allows owners to raise their houses more easily to achieve greater flood immunity;
- Flooding is to be taken into account when assessing maximum height of houses, multi-unit and single-unit dwellings.[46] This means that houses may be

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42 Brisbane City Council, *Interim Flood Levels – TLPI* (10 August 2011) < http://www.brisbane.qld.gov.au/planning-building/tools-forms/TLPI/index.htm>.

43 Brisbane City Council, *Temporary Local Planning Instrument 01/11 – Brisbane Interim Flood Response* (16 May 2011) 2 < http://www.brisbane.qld.gov.au/2010%20Library/2009%20PDF%20and%20Docs/2.%20Planning%20and%20Building/2.10%20Tools%20and%20forms/Temporary_Local_Planning_Instrument_01_11_Brisbane_Interim_Flood_Response.pdf>.

44 Brisbane City Council, *Temporary Local Planning Instrument 01/11 – Brisbane Interim Flood Response* (16 May 2011) 2 < http://www.brisbane.qld.gov.au/2010%20Library/2009%20PDF%20and%20Docs/2.%20Planning%20and%20Building/2.10%20Tools%20and%20forms/Temporary_Local_Planning_Instrument_01_11_Brisbane_Interim_Flood_Response.pdf>.

45 However, if a house is on a small lot this changes to code notifiable.

46 Brisbane City Council, *Temporary Local Planning Instrument 01/11 – Brisbane Interim Flood Response* (16 May 2011) 1 < http://www.brisbane.qld.gov.au/2010%20Library/2009%20PDF%20and%20Docs/2.%20Planning%20and%20Building/2.10%20Tools%20and%20forms/Temporary_Local_Planning_Instrument_01_11_Brisbane_Interim_Flood_Response.pdf>.

permitted to be constructed even higher than the 9.5m height where it is necessary to achieve flood immunity; and

- Houses may be raised or extended with habitable floor levels below the interim residential flood level with requirements for resilient building design and materials. For this type of development to be allowed, floor levels must be elevated above ground level, new building work must use water resistant materials, essential services must be located above flood levels with electrical services easily disconnected, and building work below flood levels must be constructed from corrosion free components such as galvanised steel or aluminium.[47] This requirement offers some flexibility to homeowners, and allows them to retain lower floor levels with measures put in place to minimise damage if a flood event occurs.

The changes introduced in the TPLI provide some important benefits. Easing the restriction on building heights allows for houses to be raised higher to provide some immunity from floodwaters. The requirement to also use water-resistant materials in construction below flood levels is also an important amendment. However, the main problem with the TLPI is its coverage. It only applies to properties affected by flood levels, and does not provide opportunities for owners of nearby properties to increase or build resilience. Theoretically, if a more severe flood event occurs, these properties may be damaged. Owners of these properties could potentially construct higher than the 8.5m level specified in the City Plan, but any proposal would be subject to public scrutiny (and possibly opposition). Perhaps the scope of the TPLI could be broadened to apply to these properties.

Importantly, the TLPI only applies where a homeowner wants to change the design of the property, and it does not apply to like-for-like repairs or rebuilds.[48] Consequently, the owner of a house severely damaged in the floods can rebuild their house to exactly

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47 Brisbane City Council, *Temporary Local Planning Instrument 01/11 – Brisbane Interim Flood Response* (16 May 2011) table 1, 1 < http://www.brisbane.qld.gov.au/2010%20Library/2009%20PDF%20and%20Docs/2.%20Planning%20and%20Building/2.10%20Tools%20and%20forms/Temporary_Local_Planning_Instrument_01_11_Brisbane_Interim_Flood_Response.pdf>.

48 Brisbane City Council, *Temporary Local Planning Instrument – 01/11 Brisbane Interim Flood Response: Frequently Asked Questions* (16 May 2011) 3 < http://www.brisbane.qld.gov.au/2010%20Library/2009%20PDF%20and%20Docs/2.%20Planning%20and%20Building/2.10%20Tools%20and%20forms/TLPI_FAQ_Fact_Sheet.pdf >.

the same standards as it was constructed pre-floods. When another flood event occurs, it is therefore almost certain that the homeowner will suffer the same degree of damage once again. Repairing and rebuilding houses after the 2011 flood event was a prime opportunity for the local government to force residents to increase their resilience to flood events, and it is unfortunate that this has not occurred.

Whilst the TLPI has not been entirely successful in promoting resilience in flood-affected communities, it has given motivated homeowners the opportunity to take proactive measures to increase their immunity with less difficulty than prior to introduction of the TPLI. However, it would be more effective if future amendments to the planning scheme require all repairs and rebuilds to increase the resilience of homes to the impacts of future flood events.

Following the floods, the Commission of Inquiry was directed to consider, amongst other things, 'all aspects of land use planning through local and regional planning systems to minimise infrastructure and property impacts from floods'.[49] The final report is due to be delivered on 24 February 2012, and will ideally make recommendations to increase the resilience of properties to flood damage. As the TLPI is due to expire in the middle of 2012, the local government will need to make permanent amendments to retain the provisions of the TPLI and to give effect to the recommendations of the Commission of Inquiry, and it is hoped that these amendments will go further than the TPLI.

Development in coastal areas likely to be affected by sea-level rise or extreme weather events

The structure of the planning regime for coastal areas in Queensland is similar to the planning regime for riverine flood-prone areas, consisting of a State Planning Policy, which is integrated into local planning schemes.

Prior to 2011, coastal management was regulated under the *Coastal Protection and Management Act 1995* (Qld) and the *State Coastal Management Plan 2002* ("2002

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[49] Queensland Floods Commission of Inquiry, *Order in Council containing Terms of Reference* (2011) < http://www.floodcommission.qld.gov.au/terms-of-reference>.

plan"). The overall goal of the 2002 plan was to ensure that 'the coast is managed to allow for natural fluctuations to occur, including any that occur as a result of climate change and sea level rise, and provide protection for life and property'.[50] The 2002 plan contained a set of guiding principles, including the following:

- Trends in climate change including sea level rise, more extensive storm tide flooding and associated potential impacts are to be taken into account in planning processes;
- Erosion prone areas which exist on open coasts and along tidal waterways are to be secured and maintained largely free from development;
- The consequences of physical coastal processes are to be recognised and such processes generally are allowed to occur naturally;
- Risks associated with all relevant hazards including storm tide inundation and cyclone effects are to be minimized; and
- The natural topography and physical features of coastal dune systems, which provide adjacent areas with protection from inland erosion, are to be protected and managed on an ecologically sustainable basis.[51]

Although these principles required decision-makers to take sea-level rise and other coastal risks into account, the language is quite vague and leaves a high degree of discretion to decision-makers.[52]

To address these inadequacies, the Queensland government developed a new legislative regime for coastal protection and management, which was scheduled commence in late 2011.[53] The new Queensland Coastal Plan ("2011 plan") consists of

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50 Queensland Government Department of Environment and Resource Management, *State Coastal Management Plan 2002* (12 April 2011) 27 <http://www.derm.qld.gov.au/environmental_management/coast_and_oceans/coastal_management/state_coastal_management_plan/index.html>.

51 Queensland Government Department of Environment and Resource Management, *State Coastal Management Plan 2002* (12 April 2011) 27 <http://www.derm.qld.gov.au/environmental_management/coast_and_oceans/coastal_management/state_coastal_management_plan/index.html>.

52 See for example Justine Bell, 'Planning for climate change and sea level rise - Queensland's new Coastal plan' (2012) *Environmental and Planning Law Journal* (forthcoming).

53 Queensland Department of Environment and Resource Management, *Queensland Coastal Plan* (28 October 2011) <http://derm.qld.gov.au/coastalplan/index.html>. However, at the time of writing, the plan had not yet been proclaimed into force.

a State Policy for Coastal Management, and a State Policy for Coastal Protection,[54] with the Protection Policy applying to assessable development under the *Sustainable Planning Act 2009* (Qld).

The 2011 plan is accompanied by maps of 'coastal hazard areas', which are areas subject to erosion, storm tide inundation, or permanent inundation due to sea level rise.[55] There are two types of coastal hazard areas:

- High hazard areas - areas projected to be permanently inundated by rising sea levels, or temporarily inundated to a depth of one metre or more during a storm; and
- Medium hazard areas – areas projected to be temporarily inundated to a depth of less than one metre inundation during a storm.[56]

The maps of coastal hazard areas are essential to the decision-making process. The overall aim of the Protection Policy is to regulate development in coastal hazard areas. As a general rule, performance outcome one ("PO1") of the development assessment code states that development in a coastal hazard area is permitted if it is:

- A coastal dependent development, such as a port;
- Temporary or readily relocatable;
- Essential community service infrastructure that cannot feasibly be relocated elsewhere; or
- Redevelopment that does not increase the risk to people and property from exposure to adverse coastal hazard impacts.[57]

Development outside the scope of PO1 is more heavily regulated, and whether it will be allowed will depend upon whether it is proposed in an urban or greenfield area, and in a high or medium hazard area. The following table depicts the types of development permitted under the development assessment code:

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54 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

55 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) 99 <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

56 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) 100-101 <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

57 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) 75 <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

	Urban	**Greenfield**
High hazard area	• Development in PO1; or • Does not increase intensity of development; or • A risk assessment shows adverse impacts from a storm can be mitigated through location of structures.	• Development in PO1
Medium hazard area	• Development in PO1; or • Does not increase intensity of development; or • A risk assessment shows adverse impacts from a storm can be mitigated through location of structures.	• Development in PO1; or • Development for non-residential purposes AND Risk assessment shows adverse impacts from a storm can be mitigated through location of structures

These rules reflect one of the key aims of the Protection Policy, which is consolidation of urban development, and restriction of greenfield development in coastal hazard areas.[58] Importantly, the Protection Policy does not apply to all development; it focuses on development that increases the population on the coast, such as subdivisions, rezoning, and large developments of more than 1000sqm.[59] Consequently, the plan accepts that developed communities are already vulnerable to the impacts of sea-level rise, and allows for smaller re-development to occur without attracting the provisions of the Coastal Plan.

Like the regime for regulating riverine flood-prone areas, the regime for coastal management also involves regulation at the local level. Under the Plan, the Protection

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58 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) 40 <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

59 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) 38 <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

Policy must be taken into account by authorities when assessing development applications, and making or amending planning schemes.[60]

The new Coastal Plan provides some important benefits. One of the best features of the Coastal Plan is its link to comprehensive maps of coastal hazard areas. By clearly defining areas which are considered at risk, the government has provided homeowners with some measure of certainty as to whether future development will be permitted. The Coastal Plan also contains a code which places very specific obligations on decision-makers, thereby reducing the potential for discretion. Although decisions will still be made at the local government level, the prescriptive nature of the Coastal Plan means that decision-making will be heavily regulated. Combined with the effective prohibition on new developments in greenfield areas, this regime should deliver good outcomes for Queensland.

However, the main difficulty faced by governments in this area is how to address threats posed to previously developed areas (ie. Urban areas). The Plan recognises that this problem cannot be easily addressed, and instead delegates in-depth consideration of these issues to local government. The Protection Policy requires local governments to implement a coastal hazard adaptation strategy for urban localities which are projected to be located within a high coastal hazard area before 2100. These strategies are required to be integrated into the relevant planning instrument. The adaptation strategy will be based upon an assessment of the mitigation options, including retreat, avoidance and defence, and a cost-benefit analysis of these options.[61] Given that the Coastal Plan has not yet commenced, these strategies have not yet been prepared, and it will be interesting to see their development.

Conclusions

The governmental approaches to development in riverine flood-prone areas and in coastal areas are very different. Whilst planning for development in riverine flood-prone areas has largely been reactive to extreme weather events, the new regime for coastal planning represents a lengthy period of strategic planning for the coast.

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60 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) 62 <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

61 Queensland Government Department of Environment and Resource Management, *Queensland Coastal Plan* (2011) 40 <http://www.derm.qld.gov.au/coastalplan/pdf/qcp-web.pdf>.

Additionally, the Coastal Plan is supplemented by detailed mapping conducted by the State government, whereas the regime for riverine flooding requires often under-resourced local governments to undertake their own mapping. Another positive feature of the Coastal Plan is its prescriptive nature. Because the Plan is highly prescriptive, local governments have little discretion in making planning decisions.

The State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide is currently under review, which is due to be completed by December 2013.[62] By this time, the findings of the Commission of Inquiry will have been released, and will hopefully offer some guidance to law-makers. Ideally, the new SPP for floods will follow the model of the Coastal Plan, and provide a very prescriptive set of rules for local governments to follow. This could take the form of a development code, similar to the code contained in the Coastal Plan. Furthermore, this code would ideally be more onerous than the Brisbane TLPI and require any repairs, re-building, or new developments to ensure the building is, as far as possible, resilient to the impacts of flood events.

Increasing resilience in existing developments

The discussion above has outlined the Queensland government's approach to permitting new developments in areas at-risk of riverine flooding, sea-level rise, and extreme weather events. A far more vexed issue is how to deal with already developed properties which face these same risks. Whilst prohibiting new developments is comparatively easy, it is far more difficult for governments to address the risks posed to existing properties.

At present, insurance is the primary tool used to protect existing properties. In Australia, insurance for buildings and contents operates through a private insurance scheme, with many different products available on the market. Of these products, approximately half cover damage caused by flood, and only a very small number cover damage caused by storm surge and action of the sea.[63] One of the major

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62 Queensland Department of Local Government and Planning, *State Planning Instruments Program 2010–2011* (2010) <http://www.dlgp.qld.gov.au/resources/spi-interest-instrument-reviews-2010-11.pdf>.

63 See Justine Bell, 'Insurance for extreme weather events in Australia – current policy trends, and future directions' (2011) 8 *Macquarie Journal of Business Law* 339.

vulnerabilities exposed by the 2010-2011 Queensland flood disaster was the extend of under- and un-insurance in Queensland.

However, even where property is covered by insurance, insurance is a reactive tool, in the sense that it compensates for damage which has already occurred. Whether insurance can be used as a proactive tool to promote adaptation has not been explored in any detail in Australia. Theoretically, insurance can be used as a proactive tool, by providing customers with incentives to increase the resilience of their properties to climate change-induced extreme weather events and flooding. Insurance companies encourage this proactive behaviour in other areas of home insurance. For example, customers can receive premium discounts where they have taken measures to decrease their vulnerability to theft, such as by installing alarms and security grilles.

The measures necessary to decrease vulnerability to climate change-related impacts depend upon the context. In areas prone to flooding and storm surge, properties could be retrofitted to withstand flooding. Similarly, in cyclone-prone areas, properties could be retrofitted to withstand strong winds. Standards have already been developed for application to new buildings, and these could be applied to existing buildings.[64]

These type of measures have not been considered in any detail by Australian governments. Following the flood disaster, there have been a number of government reviews into the operation of private flood insurance. These reviews have focused on developing a common definition of flood, and exploring the potential for mandatory flood insurance.[65] The most recent proposal put forward by the Commonwealth government requires all insurers to offer flood cover, with an option for consumers to

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64 See for example David Henderson and John Ginger, 'Role of building codes and construction standards in windstorm disaster mitigation' (2008) 23(2) *Australian Journal of Emergency Management* 40. The Brisbane City Council Temporary Local Planning Instrument 01/11 also addresses measures which can be implemented to reduce vulnerability to flood impacts.

65 Commonwealth of Australia, *Reforming flood insurance: clearing the waters* (April 2011) Treasury Department < http://www.treasury.gov.au/documents/1995/PDF/clearing_the_waters_april2011.pdf>; Commonwealth of Australia, *Inquiry into flood insurance and related matters* (June 2011) National Disaster Insurance Review < http://www.ndir.gov.au/content/issuespapers/NDIRIssuesPaper.pdf >; Commonwealth of Australia, *Reforming flood insurance: a proposal to improve availability and transparency* (November 2011) Treasury Department < http://www.treasury.gov.au/documents/2221/PDF/transparency_november2011.pdf>.

'opt out' of cover.[66] Where a consumer chooses to opt out, and their property is subject to a flood risk, the insurer is required to notify them of this.[67]

To implement the proposal put forward by the Commonwealth government, insurance companies not currently offering flood insurance will need to invest significant resources into developing this product. This will involve not only rewriting policies, but also engaging underwriters to ensure that flood insurance is appropriately priced based on the degree of risk posed to a property. This would also involve insurers having to obtain flood risk data for all properties. Theoretically, this could lead to an enormous increase in insurance premiums.

Furthermore, if government funding is instead focused on retrofitting homes to increase resistance to extreme weather events, ideally this will only need to occur once, whereas if there is a succession of extreme weather events, damage may occur and subsequently be repaired multiple times.

Managing risks posed to existing properties is a difficult issue for Australian governments, but the potential of insurance to assist with this is currently under-explored.

This paper will not discuss other options in detail, but these include compulsory acquisition and mandatory buybacks, as well as tools such as rolling easements.

CONCLUSION

Queensland has a long history of exposure to extreme weather events, with scientists predicting that the frequency and intensity of these events may increase into the

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66 Commonwealth of Australia, *Reforming flood insurance: a proposal to improve availability and transparency* (November 2011) Treasury Department, 3 < http://www.treasury.gov.au/documents/2221/PDF/transparency_november2011.pdf>.

67 Commonwealth of Australia, *Reforming flood insurance: a proposal to improve availability and transparency* (November 2011) Treasury Department, 3 < http://www.treasury.gov.au/documents/2221/PDF/transparency_november2011.pdf>.

future.[68] Coupled with threat of future sea-level rise, it is imperative that planning for future development in Queensland is appropriate to the weather conditions.

As demonstrated by the case studies of planning for riverine flooding and coastal hazards, government approaches to planning differ considerably in different areas. Whilst the new scheme for coastal planning will hopefully prevent inappropriate future development, the scheme for planning in areas susceptible to riverine flooding needs to be much more robust. With the upcoming release of the Commission of Inquiry report, as well as the revised State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide, the next few years will be crucial to safe-guard Queensland against the impacts of climate change and future extreme weather events. However, it is difficult to build resilience in existing developments, and Australian governments need to further explore how to achieve this.

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[68] Ross Garnaut, *The Garnaut Review 2011: Australia in the Global Response to Climate Change* (Cambridge University Press, 2011) 6-7.