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ADAPTING TO CLIMATE CHANGE THROUGH DEVELOPMENT PLANS

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ABSTRACT

Adapting to climate change may be one of the greatest challenges we face in the 21st Century. Rising sea levels, greater severity of storm surge events, changes to rainfall patterns, increased risk of bushfire and landslide, and the greater incidence of hot days are likely to challenge current development and settlement patterns, and the balance of considerations and risks in planning and development decisions. Whilst urban planning cannot address climate change adaptation alone, it has an important role to play in providing for safer, more robust and sustainable urban environments. This paper provides a practical introduction to the range of matters to be considered in addressing climate change adaptation through local government development plans, with particular emphasis on the South East Queensland policy context and experience.

INTRODUCTION

The climate is changing and we need to respond. Planning has an important role to play because it can help mitigate the effects of climate change and adapt to its inevitable effects. This paper focuses on climate change 'adaptation'; it does not address climate change 'mitigation'. Climate change mitigation focuses on reducing carbon emissions to reduce global warming; it is about preventing the unmanageable. Climate change adaptation focuses on adapting to changes to the climate that inevitably will occur; it is about managing the unpreventable.

Science indicates the climate is changing. Further, it now appears the law, in some jurisdictions at least, also suggests that adaptation to climate change is a matter that decision makers should take account of in exercising their powers[1]. In Queensland, the *Sustainable Planning Act 2009* (the Act), which is the foundation of the Queensland planning and development system, provides that climate change is a matter to be taken into account in advancing the Act's purpose. The purpose of the Act is to seek to achieve ecological sustainability; all entities that exercise a power under the Act are to do so in a way that advances this purpose. Arguably, in Queensland at least, authorities that create development plans, in their various forms, may be under an obligation to take account of climate change in preparing these plans. Further, the recent South East Queensland Regional Plan 2009-2031, which is the pre-eminent plan for South East Queensland, provides clear policies for climate change mitigation and adaptation.

This paper focuses on the range of considerations that might reasonably be taken into account in seeking to adapt to climate change through local government development plans. It will consider the anticipated extent and nature of climate change, the way in which these matters might be addressed in development plans, and consider the range of challenges in doing so, in particular, with regard to uncertainty, managing information and risk, and accommodating change.

ELEMENTS OF CLIMATE CHANGE

The climate will change in a number of ways. CSIRO predict that Australian surface temperatures will rise significantly[2] over the next 60 years. This will lead to a range of

[1] An authoritative account of the law in this area is a matter for others.
[2] Depending on emissions scenario, predictions range from 1 ºC to 2.5 ºC for a low emissions scenario, to 2.2 ºC to 5 ºC for a high emissions scenario.

significant changes to the climate and weather patterns. The implication of these changes for government, policy makers, and the development industry, is the need to plan for:

- sea level rise;
- storm surge increase;
- increased flooding and inundation;
- increased strong winds, rain and hail;
- increased heatwaves and high temperatures;
- greater frequency and severity of bushfire and landslide;
- increased coastal erosion; and,
- changes to rainfall patterns.

PLANNING FOR CLIMATE CHANGE

To know what we are planning for, we need to have some idea of how conditions are going to change, and over what timeframe. Some of the challenges for development plan makers will be how to determine the extent and nature of change, and how to effectively address it through a statutory planning process. Development plans generally deal with the above matters in various ways and to varying degrees. The following provides an indication of the nature of the anticipated change and the relevant science. It also provides general guidance on how these matters might be addressed through development plans.

Sea level rise

As the ice caps melt, sea levels will rise. Globally seas are predicted to rise by anywhere from 0.19 m to around 0.81 m by 2100, depending on emissions scenarios adopted and data confidence levels. Due to other locally specific factors such as the strengthening of the East Australia Current, climate change in eastern Australia may be more pronounced and tend towards the upper end of the projected levels. The Draft Queensland Coastal Plan 2009 provides for a sea level rise of 0.8m by 2100. In contrast the NSW Government has adopted a sea level rise benchmark of 0.9m by 2100. To determine the effects of sea level rise on the landform and inundated areas, extensive modelling would be required based on adopted assumptions for predicted change. Some of the preliminary mapping for this is presently underway.

Development generally would need to be avoided in areas to be subject to permanent inundation. Existing uses and infrastructure may need to be removed, abandoned, or protected though engineered solutions such as protection structures. Such solutions need to be considered in the context of other natural processes that they may interfere with, and impacts resulting from the disruption of these processes. Infrastructure including roads, services, and community uses not protected may need to be relocated. Further, asset life would need to be considered to determine the retreat of infrastructure/uses over time. Alternatively, land use designations may be integrated with the provision of protective structures. If this were the case, development might be required to contribute to the cost of protective structures through infrastructure charges/agreements.

Storm tide increase

A storm tide is a relatively short term change in sea level produced by a meteorological disturbance such as a cyclone. A storm tide is caused by: reduced atmospheric pressures associated with meteorological events such as cyclones causing the surface water to rise in a mound; and/or wind driven sheer stresses that cause the water to pile up against the land. Sea level rise and an increased likelihood of cyclone events are likely to exacerbate existing impacts and increase their frequency. Storm tide events will need to be calculated in accordance with an accepted standard[3] and will need to take into account climate change factors to understand the potential storm surge impacts with the added spectre of climate change.

[3] In Queensland storm tide is to be calculated on the basis of the approach in the State Coastal Management Plan Guideline Mitigating the Adverse Impacts of Storm Tide Inundation, and the emerging draft State Planning Policy Coastal Protection

Sensitive uses, such as residential, generally should be avoided in storm tide inundation areas. Where there is an existing development commitment, development should be consolidated to minimise its footprint and should be designed appropriately; for example providing habitable rooms above the defined storm tide event level. Appropriate emergency access and refuge would need to be provided for development within the storm tide inundation area. Critical infrastructure within the storm tide inundation area may need to either be designed to be able to operate during inundation or be relocated.

Coastal erosion

With rising sea levels and the increased frequency and severity of storm tide events, it is likely that much greater coastal erosion will occur. Governments have previously accounted for coastal erosion in 'coastal erosion zone setbacks', which exclude development within a certain distance of an agreed coastline. The setbacks account for the natural variability of coastlines over time. These setbacks will need to be reconsidered with regard to climate change.

Development should be avoided within vulnerable erosion prone areas. Appropriate set backs should be provided to ensure development does not interfere with coastal process and to provide that development is not as risk from coastal erosion. Erosion prone area management processes are beyond the scope of development plan control.

Flooding and inundation

Flooding and inundation is likely to increase in severity with increased rainfall and changing weather patterns resulting from climate change. It is anticipated that rainfall may increase in intensity dramatically in some locations. This will place significant pressure on existing stormwater infrastructure to cope with increased rates of runoff. Increased runoff rates combined with increased water levels within estuaries may result in significant additional inundation in low lying lands. Extensive hydrologic and hydraulic modelling will be required to take account of these effects.

Development should be compatible with an area subject to flooding or inundation. Where there is an existing development commitment, development should be consolidated and designed appropriately; for example, habitable rooms may be provided above the defined flood event. Appropriate emergency access and refuge needs to be provided for development within flood areas. Further, critical infrastructure within flood areas should either be designed to be able to operate during flood events or be relocated.

Strong winds, rain and hail

Climate change has the potential to result in stronger and more prevalent winds, rain and hail. While it is not clear whether cyclones will increase in frequency, there is a scientific consensus that cyclones are likely to become more intense.

The design and construction standards of buildings to withstand strong winds, rain and hail are matters that generally are controlled by building standards; generally it is not appropriate these matters be addressed through development plans. However, development plans can influence the overall design and orientation of buildings, and the incorporation of detailed design features such as appropriate awnings and shelter for pedestrians. Street planting and public realm treatment can assist in mitigating the effects of strong winds, rain and hail. The form of infrastructure, such as overhead power lines, can also influence the vulnerability of urban areas to strong winds, rain and hail. Further, sustainable urban drainage systems can assist in appropriately managing stormwater and minimising localised flooding and the effects of stormwater runoff.

Heatwaves and high temperatures

As the earth warms there is likely to be a greater incidence of heatwaves and high temperatures. Within Australia temperatures are expected to increase, depending on emissions scenario adopted, from 1 ºC to 2.5 ºC for a low emissions scenario, to 2.2 ºC to 5 ºC for a high emissions scenario. Depending on the location within Australia there is

predicted to be change in the daily temperature ranges, including: decreasing temperature ranges in the north; increasing temperature ranges in the south; an increase in the number of hot days and warm nights; and, associated changes in the number of frosts.

The design of buildings and public spaces can influence natural energy efficiency and the performance of buildings and urban areas. Buildings can also be orientated for solar efficiency, capture natural breezes, provide sun shading, and incorporate cross ventilation, green roofs and walls, and other natural cooling measures. Streets and public spaces can assist in moderating temperatures to avoid or lessen heat island effects in urban areas through appropriate shading, sun protection, vegetation, and materials.

Bushfire

With increased temperatures, increased hot days, and changes to rainfall patterns, it is likely that that the occurrence of hot and dry conditions conducive to bushfire will increase. Bushfire risk analysis mapping analysis may need to be reconsidered.

Sensitive uses should be avoided in areas of bushfire hazard. In particular community/institution uses, such as hospitals and aged care facilities, where evacuating people may be particularly difficult, should not be located in these areas. Where avoiding these areas is not practicable, development should be designed and sited to minimise the risk to people and property. Adequate access for emergency vehicles and services should be provided. Further, development should be designed to incorporate an adequate and accessible water supply for fire fighting purposes and should provide adequate setbacks and buffers to vegetation.

Landslide

With increased rainfall, storms, cyclones, and strong winds, it is likely that the wet and unstable conditions conducive to landslide will increase. Landslide risk analysis and the default thresholds for slope vulnerable to landslide may need to be reconsidered.

Sensitive uses should be avoided in areas subject to landslide. Where this is not practicable, measures should be taken to ensure that development provides for the long term stability of the site and development is not vulnerable to landslide activity originating from above.

Changes to rainfall patterns

Changes to rainfall patterns are likely to affect the availability of water for urban use and agricultural production. It is likely there will be increased periods of drought. Further, a greater proportion of the water that is received will come through heavy rain and storms.

Standards might provide that development efficiently manages and captures water, and that water storage capacity is provided within development. The allocation and availability of productive agricultural land might also need to be reconsidered with regard to available water supply.

CHALLENGES

There numerous challenges in effectively providing for climate change adaptation through development plans. In particular, there are significant challenges regarding: how to acquire and manage information; how to address uncertainty and risk; how to communicate risk and uncertainty in a non-alarmist fashion; how to provide sufficient flexibility; and how to collaborate and integrate with other tools and initiatives to provide for effective action.

Information

One of the greatest challenges will be obtaining and updating relevant climate change information effectively. The science is still uncertain but will develop over time. It is likely that information will be updated regularly as further data and improved assessment techniques come into play, requiring the update of previously understood benchmarks and approaches. To effectively provide for the range of matters indicated above, new studies and data sets will

be required. Extensive new modelling and mapping information will need to be carried out to understand these matters and effectively provide for them through development plans. Further, we will need to be able to communicate this information in a responsible way so that the public is informed of what is going on, but is not induced to become unnecessarily fearful or reactionary.

Uncertainty

Aligned with the need for information is current and future uncertainty. We have an idea of what generally might happen, but there is no certainty of what will happen. We will not have all the information to make fully informed decisions. We will need tools to be able to make reasonable decisions in a highly uncertain environment. Further, we will need to be able to manage processes so that we can take appropriate action when new information comes to light and when we have greater certainty.

Risk

Much of dealing with climate change adaptation will revolve around risk. This is related to information and uncertainty. We will need to be able to make informed and practical decisions on what level of risk we are prepared to tolerate. For example, the information regarding sea level rise is uncertain. There may be a best case and a worst case scenario. Relevant questions will be, should we adopt the best case (high risk), worst case (low risk), or medium case (medium risk) scenario for the purpose of planning, and what are the resource implications of each? Developing tools to understand, assess, and make informed decisions regarding risk will be a key element in planning for climate change.

Flexibility

Planning strategies and implementation tools will need to incorporate a degree of flexibility to deal with a lack of information, uncertainty and risk. For example, providing regulatory flood levels in a development plan might fetter the ability of the relevant authority to amend the plan expeditiously when better information becomes available. An outcome focussed approach to creating development plans may be beneficial, where statements of principle are provided in the plan, and other factually based information is provided in a form that can more easily be updated when new information is available.

Cooperation and Integration

More than any other issue, climate change will require governments to work together to pool resources, integrate information, and agree on regional approaches to address climate change matters. Further, development plans are only a small part of the overall suite of tools and actions required to effectively adapt to climate change. Working within and between government and other professionals, agencies, and programs will be essential to provide for integrated, workable, practical, and effective action to adapt to climate change.

SUMMARY

Adapting to climate change will be a key challenge in the next generation of development plans. There are a range of practical means of addressing these matters. However, tackling these issues will require new skills in dealing with information, uncertainty, risk, and greater than ever require cooperation between and within government programs at all levels.

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