

# 'Towards a Resilient Sydney' - climate change adaptation planning for Sydney

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**Abstract:** The New South Wales (NSW) Office of Environment and Heritage is working in partnership with NSW Department of Planning and Infrastructure to assess Sydney's vulnerability to climate change and identify opportunities to improve resilience. The project *Towards a Resilient Sydney* provides an opportunity to identify key impacts and vulnerabilities in Sydney and highlight responses and opportunities to minimise these impacts and improve Sydney's resilience. Having researched leading cities around the world that are preparing for and responding to the possible impacts of climate change, the *Towards a Resilient Sydney* project recognises that effective strategic responses require a regional or metropolitan approach to achieve outcomes at wider scales. The project highlights the strengths of local and state governments working collaboratively to build capacity and endorsement for best practice adaptation. Finally, the paper will investigate the relationship between long term strategic land use planning and the future climate, specifically why strategic planning can contribute to the city's climate change resilience. It will discuss the opportunities for metropolitan strategic planning to consider to Sydney's vulnerability to climate change.

## Introduction

In recent years governments nationally and internationally have become increasingly aware of the huge risks that climate change poses to our cities. More than half the world's population currently live in cities and the proportion is set to rise in future years (UN Habitat 2012). Cities are centres of political and economic power, have highly concentrated populations and complex infrastructure systems and are often in coastal locations. As the impact of Hurricane Sandy on New York or the floods in Brisbane show, cities are vulnerable to the impacts of extreme weather events which have widespread and lasting impacts on buildings, neighbourhoods, infrastructure and communities. Cities are not only vulnerable to the impacts of extreme weather events, they are also vulnerable to impacts of gradual climate change (Matthews, 2011; WRI, 2011; IPCC, 2007 & IPCC, 2012).

Sydney is Australia's largest city, with a population of over 4.3 million people. The city's population is forecast to grow to 5.8 million by 2031, while at the same time, the challenges of climate change are likely to become more apparent. Heatwaves, sea level rise, more intense and frequent bushfires, and more variable rainfall are among the key challenges Sydney will face.

The New South Wales (NSW) Office of Environment and Heritage (OEH) is working in partnership with NSW Department of Planning and Infrastructure to assess Sydney's vulnerability to climate change and identify opportunities to improve resilience in the *Towards a Resilient Sydney* project. The project aims to assess cross sectoral vulnerability to climate change risks and identify responses and opportunities that assist local communities to improve resilience and minimise impacts. These aims are identified in *NSW2021 Regional Action Plans* for Northern Beaches, Western Sydney and Blue Mountains, and South Western Sydney (NSW Government 2012a, 2012b, 2012c). In partnership with local government stakeholders, the project will build on existing efforts to respond to climate change by state and local government in the Sydney Metropolitan Area, by recognising local actions to assess and address climate risks and develop adaptation strategies.

The *Towards a Resilient Sydney* project provides a strategic, regional approach to achieve adaptation outcomes at wider scales. This approach has been outlined in the *Draft Metropolitan Strategy for Sydney 2031* (NSW Government 2013), where the outcomes of the *Towards a Resilient Sydney* project will be reviewed so we can improve our strategic planning to position the city to rise to the challenge of its climate future.

This paper will provide an overview of the *Towards a Resilient Sydney* project and the city's future climatic and growth challenges. It will detail the project's regional approach to vulnerability assessment and highlight the strengths of local and state governments working collaboratively to build capacity and endorsement for best practice adaptation, the paper also examines avenues to address climate

change in metropolitan land use planning. The *Towards a Resilient Sydney* project is currently underway, and its goal is to outline effective strategic responses and outcomes.

### **Towards a Resilient Sydney**

The development of a regional approach to climate change for Sydney is consistent with a key target of the NSW Government's ten year plan, *NSW 2021*, to "minimise impacts of climate change in local communities" (NSW Government 2011). The overall aim of the *Towards a Resilient Sydney* project is to provide an integrated regional response to the key exposures and vulnerabilities for Sydney. The project involves a staged process:

1. Develop improved information of climate risks for Sydney. NSW Office of Environment and Heritage worked with the University of New South Wales (UNSW) Climate Change Research Centre to develop high resolution climate projections for Sydney. The results of this are detailed below.
2. Assessing the cross sectoral vulnerability to these climate risks. This includes understanding the vulnerabilities for land uses, buildings and infrastructure in Sydney. This will assist in building capacity and endorsement across government, private sector, and community to deliver best practice adaptation. The paper will discuss the methodology of this assessment.
3. Identify responses and opportunities that assist local communities to improve resilience and minimise impacts. Future adaptation planning will be undertaken with stakeholders and will build on existing processes that ensure integration of actions.

The key stakeholders for the project are service providers within state and local governments. Many of the impacts of climate change will affect services and infrastructure for which state and local governments have primary responsibility including public health, land use planning, infrastructure, open space and national parks, human and emergency services. The project engages with stakeholders on a sectoral basis to develop endorsed outcomes, prioritise key strategies and mechanisms for implementation.

A Project Partners Group has been established comprising NSW Department of Planning and Infrastructure, Environmental Protection Authority and two local government bodies - Sydney Coastal Councils Group and Western Sydney Regional Organisation of Councils. The Group provides valuable input to the design of the project, assists with communication with stakeholders and participates in the implementation of the project. The project is currently underway with stage 1 (improved climate projections) complete and OEH embarking on the delivery of stage 2 (assessment of vulnerability).

### **Future climate change and growth challenges for Sydney**

#### ***Sydney's Future Climate***

OEH, in partnership with the Climate Change Research Centre at UNSW have completed a pilot study to develop climate change projections for the Sydney Metropolitan Area to 2050.

The climate projections have been analysed to determine the impacts of climate change on a range of biophysical parameters including coastal systems, water, fire and heat and air quality. The Sydney Climate Storyline was developed to assist participants of the Sydney Integrated Regional Vulnerability Assessment (IRVA) workshops to identify direct and indirect impacts on their sector and capacity to adapt to these impacts. These projections sit within a larger project to deliver fine scale projections across NSW, to be publically released in 2014.

Some of the key climate change projections for 2050 from the Sydney Climate Storyline are detailed below:

- It is projected that Sydney will become wetter, with higher annual rainfall across much of Sydney. dominated by increases in Autumn;
- Increases in surface flows and recharge are forecast to occur during Autumn months. Changes in surface flow are projected to be larger than changes in recharge;
- Sydney is projected to become hotter, with higher maximum and minimum temperatures projected across the region in all seasons. The greatest increases in minimum temperatures are projected to occur in the west and southwest of the city;
- The number of warm days is projected to increase over all of Sydney and the number of heat waves expected to increase;

- Increases in mean daily Forest Fire Danger Index (FFDI) are projected during Spring particularly east of the Blue Mountains; and
- Exposure to coastal hazards is expected to increase under future climate change scenarios, due to the increased landward reach of beach erosion and oceanic inundation associated with a projected rise in mean sea levels. This has the potential to cause impacts in Sydney due to the concentration of population, buildings and infrastructure in close proximity to dynamic coastal environments.

These results from the Sydney Climate Storyline are consistent with previously released climate information for Sydney, as detailed in the NSW Climate Impact Profile (DECCW 2010).

### **Sydney's Growth Challenges**

Sydney is Australia's largest city, comprising 4.3 million people inhabiting over 10,000 square kilometres. It sits within a coastal basin and is bordered by the Pacific coast to the east, the Blue Mountains to the west, Hawkesbury River in the north, and Royal National Park to the south. *[map 1]*

The city is of global importance to Australia, accounting for almost one-fifth of the national total annual output of goods and services and represents over two-thirds of the estimated Gross State Product (GSP) of NSW (NSW Government 2013).

The Sydney Metropolitan Area's population is growing. The population has grown from 3.4 million in 1991 to 4.3 million in 2011. This growth represents an annual increase of 42,600 people or 1% growth per year. The historic patterns of Sydney's growth are projected to continue into the future. The Sydney Metropolitan Area's population is projected to reach 5.8 million by 2031 (Department Planning and Infrastructure NSW 2013).

Sydney's future age profile is projected to show the same patterns of growth at all ages, with the biggest cohorts still being early adults. However one of the biggest projected changes into the future is population ageing. The projected number of people aged 65 years and over will nearly double in the next 20 years, from 500,000 in 2010 to 900,000 by 2031 and the proportion of the population at the older ages will increase, from 12 to 16 per cent by 2031 (Department Planning and Infrastructure NSW 2013).

Another major challenge for accommodating Sydney's growing population is household size. The number of people per Sydney household is expected to fall from 2.58 in 2011 to 2.51 in 2031, despite appearing to be stable for the time being, this means that Sydney will need a greater number of smaller houses such as units and townhouses to meet the changing demographics (Department Planning and Infrastructure NSW 2011).

The draft *Metropolitan Strategy for Sydney to 2031* (NSW Government 2013) was prepared by the NSW Department of Planning and Infrastructure and sets the frameworks for Sydney's growth to 2031. The draft Strategy anticipates that Sydney's additional population will require 545,000 more homes and 625,000 more jobs. One of the key aims of the draft Strategy is to give people a choice of housing that is more appropriate to their needs, more affordable and enables them to live closer to where they work. In particular, the draft strategy identifies a number of key places to focus new housing and jobs alongside good transport connections. The draft Strategy outlines that Greater Western Sydney will be home to more than half of Sydneysiders in 2031.

The draft Strategy recognises that this growth will occur in the face of climate change by containing two clear objectives to build resilience to natural hazards and to minimise impacts of climate change in local communities. An Action of the draft Strategy is to review the actions of the *Towards a Resilient Sydney* project to identify opportunities for strategic planning to assist local government and communities plan for climate change.

### **Strategic Planning and Climate Change**

As Sydney continues to grow, it is important to plan now so that future land uses are capable of fostering communities that are resilient to change. Our current land use patterns were based on historic climate and weather patterns, and its appropriateness into the future must be questioned as the climate changes. Planning for a resilient Sydney recognises that decisions that are made now have long term, lasting impacts on our cities, communities and natural environments.

While there needs to be a local action on climate change, work at the regional or metropolitan scale is needed to address the interconnections and interdependencies between systems and sectors across broad geographic and time scales. OEH's experience with IRVA processes in two regions shows that developing regional scale responses to climate change is practicable and delivers appropriate actions at a broad scale.

The NSW Government has recently introduced a new Planning Bill into parliament. The intent of the new planning system (see White Paper and Draft Exposure Bills) is to emphasise the preparation of evidence based, whole of government strategic planning in the development of land use plans. Community and stakeholder engagement will be central to the development of strategic plans to help set where infrastructure and growth will occur.

Strategic land use planning can play an essential role to reduce the impact of climate change on communities. Matthews (2011) argues that strategic planning is well suited to embedding adaptation responses for a number of reasons:

- planning tends to function at a local or regional level, and adaptation actions work effectively at this level;
- planning is multi-disciplinary, collaborative and forward thinking, consistent with adaptation planning processes; and
- it provides a clear strategic framework for an area which sets out clear visions and agendas and offer support and guidance for local plans as they are developed.

The International Panel on Climate Change (IPCC 2007) asserts that proper plan making can increase adaptive capacities in urban systems by including adaptation measures in land use planning and infrastructure design and by including other measures for reducing vulnerability. Strategic plans can also influence development decision making which may assist in avoiding impacts from extreme events and gradual changes in climate. This approach is not new to strategic planning in NSW, with current regional strategies and local environmental plans considering issues in relation to bushfires, flooding and coastal protection.

As the *Towards a Resilient Sydney* project progresses, opportunities are already beginning to emerge as to how land use planning at a metropolitan scale may respond. This section of the paper we explore a few opportunities for climate change information and tools to guide and assist with integration of adaptation responses into future metropolitan strategies.

### ***Climate change projections***

The development of climate change information is critical to support and inform adaptation responses in strategic land use planning. The Draft Metropolitan Strategy provides a long term vision for Sydney's function and structure based on the best available data, such as population projections and economic forecasts. The proposed new Planning Act commits to developing evidence based regional plans, which make climate change projections a key consideration in strategic land use planning into the future.

OEH (in partnership with the Climate Change Research Centre – UNSW) is developing fine scale climate change projections to deliver by 2014 to local councils and the public. The project is producing 10km resolution projections using a regional climate model across NSW and the ACT. The projections will form the basis of improved biophysical impacts of climate change - including projected changes in fire weather, flooding, erosion, coastal impacts, heat waves, storms and biodiversity. These impacts will be highly relevant to strategic land use planning.

### ***Creating an evidence base***

There is an opportunity for climate change information to be considered in the evidence base and analysis undertaken during the development of the strategic plan. Hunt *et al* (2010) argue that city scale research in relation to climate impacts can assist in informing early priorities and actions. It can also assist in determining if actions and priorities contained in long term plans are economically rational, address current climate variability and focus on no-regrets measures. For example, climate impacts can be incorporated in cost benefit analysis, economic assessments, or design analyses. Also research products can be developed to support adaptation responses in different levels of strategic plans.

An example of how new types information can be incorporated into evidence based studies is the Cost Benefits of Alternative Growth Scenarios for Sydney (CIE *et al* 2012) commissioned by the NSW

Department of Planning and Infrastructure as a key assessment report in developing the Draft Metropolitan Strategy. As part of the assessment, greenhouse gas emissions were considered in each of the urban growth scenarios as it was recognised that this would influence the amount of emissions due to transport and in-dwelling use and construction. An opportunity exists in the future to incorporate climate information in growth scenario assessments to support metropolitan planning to fully weigh up future land use settings in the face of climate impacts.

Specific research projects can assist in articulating and strengthening the case for adaptation responses in different levels of plans. Table 1 details an example of how scientific research in relation to heat impacts may assist planners and decision makers to incorporate adaptation measures in strategic plans.

**Table 1: Evidence base to support adaptation responses to heat in various levels of strategic plans**

Strategic Plan - Scale	Evidence base (e.g.)	Adaptation measures (e.g.)
Metropolitan planning	<ul style="list-style-type: none"> <li>• Research quantifying the impact of land use types on temperature.</li> <li>• Quantify the impact of vegetation on cooling.</li> </ul>	Increasing regional vegetation connectivity, biodiversity conservation, conservation of parks and waterways.
Subregional planning	<ul style="list-style-type: none"> <li>• Identify and quantify the positive impacts of specific regional parklands and waterways on cooling the built environment.</li> </ul>	Promote connectivity, conservation and enhancement of existing regional vegetation and waterways.
Local Plans	<ul style="list-style-type: none"> <li>• Thermal imaging across LGA to understand contributors to heat and cooling.</li> <li>• Cost benefit analysis of cooling strategies for buildings.</li> <li>• Calculating the economic benefits of street trees.</li> </ul>	Development controls in relation to green wall and roofs, building materials and colours, water sensitive urban design and greening strategies for public domain.
Precinct planning	<ul style="list-style-type: none"> <li>• Material and colour of buildings that best reflect heat</li> <li>• The impact of building material, orientation and height on radiant temperatures</li> <li>• Plant species best to ameliorate the impacts of heat.</li> </ul>	Urban design principles in relation to water sensitive urban design, increasing vegetation in the public domain and building design. Set targets to achieve cooling outcomes.

**Scenario based planning**

The creation of future scenarios for a regional or local area can be an effective tool to consider adaptation in the strategic planning process. It can assist with engagement of the community and stakeholders around considering a range of climate and non-climate drivers across sectors, impacts and responses, time and place and institutions. This can assist with educating the community about climate change adaptation as well as potentially developing endorsed adaptation responses.

In recent years adaptation researchers have used scenario based planning as a tool to integrate with other policy and management strategies. The Coastal Urban Climate Futures in South East Australia from Wollongong to Lakes Entrance project (Norman *et al*, 2013) highlights the effectiveness of developing scenarios for land use planning.

The project’s objective was to identify what a climate-adapted Australian settlement would look like from the perspective of future climate-adapted coastal small town communities to 2030. It engaged with state and local government decision makers to develop scenarios that integrated and considered

climate, water, ecosystems, coastal landscapes, urban planning, emergency management and health and wellbeing, with a focus on coastal adaptation.

The project highlights that the creation of integrated scenarios provides an opportunity to rise above individual sector or location specific perspectives and address significant synergies and trade-offs between outcomes. It can also address effective governance and decision-making, including strategies that might enhance organisational adaptive capacity and resilience. Scenarios can also identify significant interdependencies between adaptation responses in order to take advantage of synergies or avoid maladaptation and provide an opportunity to provide an ongoing, adaptive and iterative process through effective governance, engagement and collaboration (Norman *et al*, 2013).

### **A Regional Approach to Vulnerability Assessment**

Identification of regional responses is key to the *Towards a Resilient Sydney* project. The Sydney Metropolitan Area is made up of 41 local government areas whose Councils are responsible for a range services such as roads, waste, biodiversity, community services, land use planning and development. The majority of Metropolitan Councils have undertaken climate change risk assessments, with some progressing these to adaptation plans. The NSW Government agencies are also responsible for delivering a range of services including health, education, emergency management and major infrastructure. Similarly, state agencies are at varying stages of considering climate change in their service delivery.

Hunt *et al* (2011) describe how analysis of climate change at a city scale is “likely to coincide more closely with local administrative boundaries and so facilitate decisions related to adaptation at an appropriate level of governance”. It is common to look at adaptation at a regional scale, as many of the impacts will affect services and interconnected infrastructure which are delivered at a metropolitan scale. It can also coordinate the efforts of a varying range of stakeholders, and in Sydney’s case, it enables local and state governments to coordinate efforts and devise appropriate and cost effective responses.

### **Integrated Regional Vulnerability Assessment**

This section details the approach taken by OEH in undertaking a regional vulnerability assessment for a large and complex city like Sydney with numerous government stakeholders. The outcomes of this integrated vulnerability assessment will play a critical part in identifying adaptation responses and providing ongoing engagement with local and state government stakeholders in relation to adaptation planning for Sydney.

Vulnerability has been described as a bridge that connects the physical impacts of climate to adaptations in social-ecological systems (Malone and Engle 2011). The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as the degree to which a system is susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes (IPCC 2008). Vulnerability is generally conceptualised as a combination of the geographical and temporal proximity to a hazard (exposure) and the propensity for exposure to result in harm (sensitivity); exposure and or sensitivity can be moderated through system adaptation (Pelling 2011).

Governments have a number of roles to play in responding to the threat posed by climate change. These roles encompass the need to adapt its own programs and activities, to regulate to reduce community vulnerability and to build the adaptive capacity of the community to facilitate adaptive responses (Brooks *et al* 2009). Frankhauser *et al* (1999) suggested that because of the long time horizon and prevailing uncertainties about climate change, the best strategy would be to increase the flexibility of systems to function under a wider range of climatic conditions. The difficulty for government, in the first instance, is in developing and implementing processes that are able to inform policy by identifying systemic vulnerabilities and potential actions to address them.

The challenge therefore lies in taking the identified regional vulnerabilities and developing regional adaptation strategies that can translate into on-the-ground action and be owned by regional participants. Identifying and understanding regional vulnerabilities at a local level can help government service providers prepare for a changing climate. OEH has developed a process that uses local knowledge to identify potential threats and possible options for responding to a changing climate across multiple sectors. This cross-agency initiative is called an Integrated Regional Vulnerability Assessment or IRVA (developed with support from the Fenner School ANU see also Li 2010)

The IRVA examines the potential impacts of climate change on human services, built environment, industries, infrastructure, natural and cultural assets and emergency services, and determines the region's vulnerability to these impacts by considering socio-economic factors and environmental resilience. The process aims to provide a sound basis for local climate change adaptation planning (NSW OEH, 2013).

OEH undertook a pilot IRVA process in the South East in 2010 and have subsequently completed IRVA in the Riverina Murray Region. The IRVA is carried out at a regional scale as this is the scale appropriate for climate modeling and impact information and allows stakeholders to identify the likely affects of these changes on local socio-economic and biophysical systems. In addition, because the IRVA uses a consistent approach, findings from individual sector- or place-based workshops can be integrated across scales. This allows regional vulnerabilities and capacity constraints to emerge (NSW OEH, 2013).

It is important to recognise that regions are not closed systems, their boundaries are 'fuzzy' and subject to external influences. Through the IRVA process external influences that might distort vulnerability assessment or change capacity to adapt can also be identified (NSW OEH, 2013). For example, Sydney's transport system supports a daily commuter flow from surrounding areas such as the Illawarra and Central Coast, as well as international and national movements of persons and goods. These systems may make populations and businesses outside of Sydney vulnerable to transport disruptions due to climate change.

### **Stakeholder Engagement**

A key step in the IRVA process is identifying stakeholders and engaging them in a series of Sector Workshops. Stakeholder engagement is critical to the development of any strategy. As adaptation responses are highly contextual, input by relevant decision makers and experts are vital. Key stakeholders have the experience, knowledge and ideas applicable to developing options. In addition, the project may result in changes to practices and processes. Potential changes have a better chance of being broadly accepted and implemented if they originate in a process that involves the decision makers. As outlined above, the IRVA process has concentrated principally on local and state government stakeholders (NSW OEH, 2013).

OEH will be hosting six sector workshops between October and December 2013, with two integration workshops in early 2014. Table 2 indicates the scope of each workshop and likely participants. At the workshops, local and state government decision-makers will be engaged to understand the dynamic interactions that are going on within their sector and where the sector may have (unanticipated) impacts on other sectors. It also allows participants to identify areas where there are common risks or vulnerabilities between sectors so that they can address these issues in a coordinated way.

**Table 2: Sydney's Sector Workshops**

<b>Sector Workshop</b>	<b>Scope Includes</b>	<b>Stakeholders, e.g.</b>
Emergency Management	Transport (rail, light rail, road, freight, port, ferry, buses) water (stormwater, sewer, water), energy, telecommunications, community infrastructure	Emergency Management Officers
Human Services	Regional, subregional and local strategic planning, state significant and local development, urban renewal and greenfield development, neighbourhood and building design, peri-urban area	Community Development Directors (child care, senior and youth services)
Built Environment	Emergency management (fire, flood, heat, bushfire), infrastructure and utilities, public health / disaster management	Strategic Planning and Development Assessment Managers
Infrastructure	Education, health, senior, youth and child services, aged care, disability services, community services, health and education asset management and planning	Infrastructure / Asset Managers (traffic, stormwater, waste etc), Transport Planners
Cultural and Natural Assets	Natural resource management, biodiversity, conservation, Aboriginal and historic heritage.	Heritage Officers, Environment Managers, Biodiversity Officers, Catchment Managers
Economy and Industry	Business development, tourism, legal, professional, education	Economic Development, Tourism Officers, Risk and Finance Managers
Integration workshops	All participants in sector workshops	All participants in sector w/shops

All participants of the sector based workshops will be invited to come together at the integration workshops where Sydney's regional vulnerabilities across all sectors will be presented. Stakeholders will be asked to review and validate their individual sector issues, then to consider these cross-sectoral impacts and ways in which they could be collectively addressed. It is at this point that regional vulnerability can start to be articulated and discussed, and collectively, adaptation actions will emerge.

### **Likely outcomes and next steps**

The vulnerability assessment process generates a large complex qualitative information set which both assists in the development of actions on climate change and provides an opportunity for organisational learning by government service providers. Key regional vulnerabilities emerge from thematic analysis of sectoral workshop outputs which provide a method for identifying, analysing and reporting patterns or recurring themes across sector data to develop a regional story which is rich in detail. In the pilot project for the South East for example, these techniques were used to identify six themes of cross-sectoral regional vulnerability. These were competition for water, regional economic sustainability; land use change; ecosystem function and services; regional infrastructure; and regional community (OEH 2012 & Jacobs *et al* 2013).

In addition to identifying key regional vulnerabilities, it serves as a capacity building exercise for participants by encouraging social learning and networking among participants from all tiers of government and across a range of sectors. It elicits tacit knowledge about local conditions and shadow systems that would not have been discovered otherwise, and generates enthusiasm among local participants for the future development of a regional adaptation responses. To build on this enthusiasm the key is the development of techniques to prioritise adaptation options and the engagement of a broader group of stakeholders utilising the learnings outlined from international experience. ( see also Pelling 2011)

The challenge lies in taking the identified regional vulnerabilities and developing regional adaptation strategies that can translate into on-the-ground action and be owned by regional participants. Formal planning for climate change adaptation is emerging rapidly at a range of scales from local government adaption planning responses, to state and national level adaptation planning strategies. Many leading cities—including New York, London, Singapore, Boston, Portland, Adelaide, Melbourne, Copenhagen—have committed to adaptation planning, to ensure that their city is prepared for and able to respond to the possible impacts of climate change. These first generation of plans provide useful information for the *Towards a Resilient Sydney* project in terms of how institutions are framing the issue of adaptation and the suite of responses that are being evaluated as solutions to climate change.

As Dovers (2009) outlines normalisation of adaptation issues into day to day to decision making in areas like conservation planning, emergency management, regional development, and strategic planning can link current imperatives and existing challenges with future climate change challenges.

### **Conclusion**

This paper presents an overview of the *Towards a Resilient Sydney* project, in particular the benefits of taking a regional approach to assessing Sydney's vulnerability to climate change. By focusing on Sydney as a region, it assists with identifying common and integrated impacts and vulnerabilities and capacity constraints, coordinates efforts and highlights cost effective responses. OEH experience in regional integrated vulnerability assessments in two regions in NSW shows that developing regional scale responses to climate change is achievable and that participatory approaches are able to garner regionally specific information. Bringing together government service providers at the state and local level is more likely to result in identified responses being accepted and implemented. The paper also indicates why strategic planning at a metropolitan scale is well suited to addressing the impacts of climate change. The *Towards a Resilient Sydney* project provides an important opportunity to move forward and integrate adaptation responses in Sydney's metropolitan planning.

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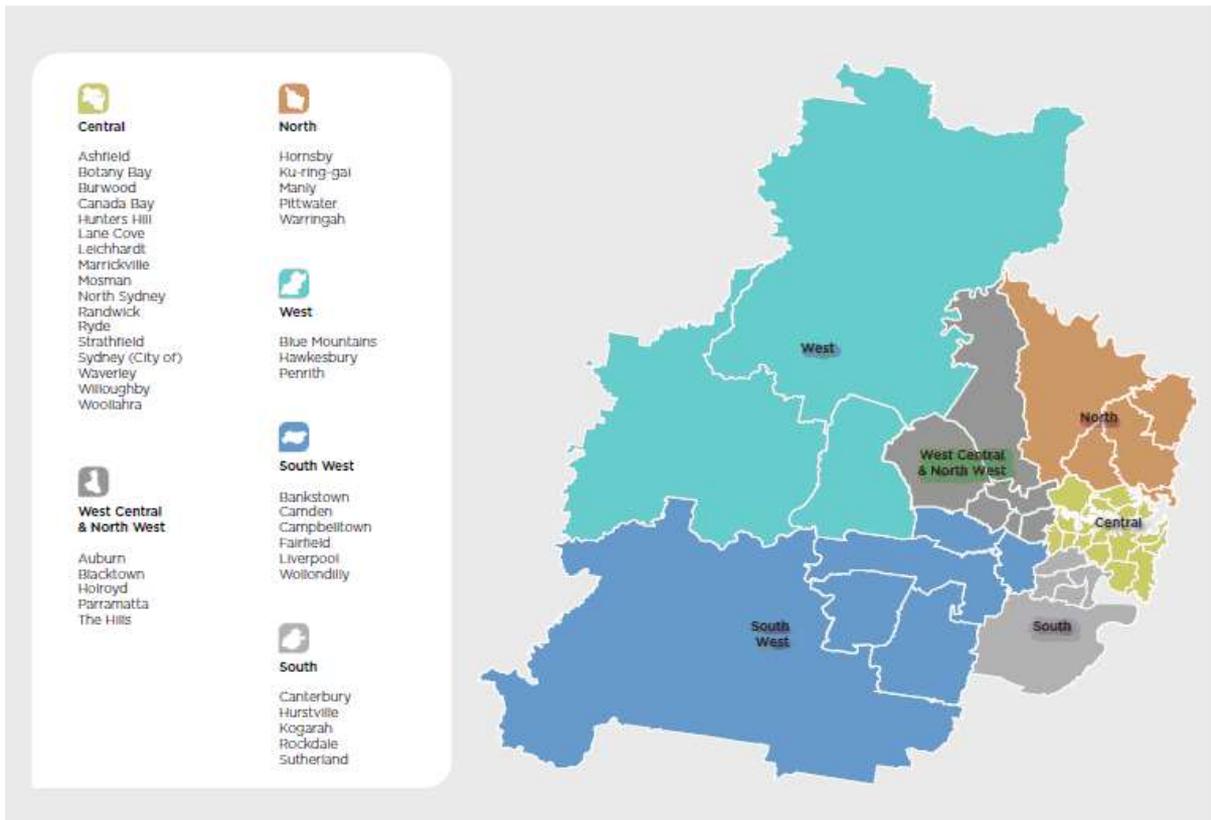
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Map of the Sydney Metropolitan Area (*Draft Metropolitan Strategy for Sydney*)