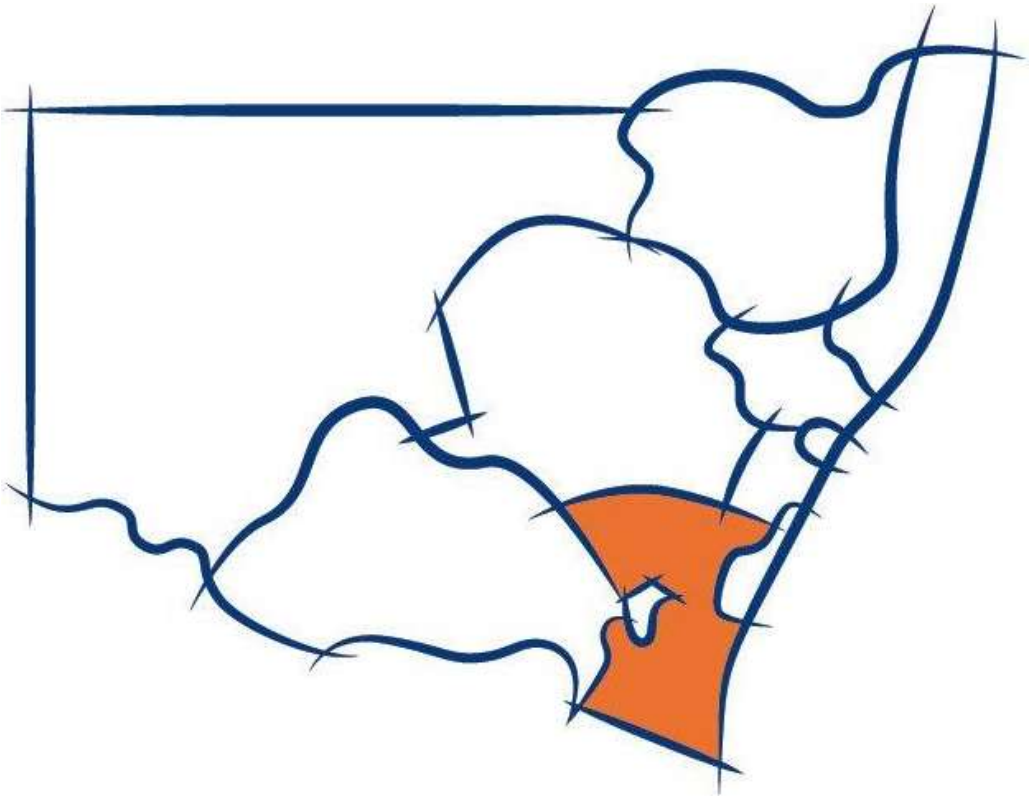
NSW GOVERNMENT Office of Environment & Heritage

AdaptNSW

Enabling Adaptation in the South East (EASE)



Acknowledgement:

We acknowledge the significant contribution and analysis provided by Dr Brent Jacobs and the research team at the Institute for Sustainable Futures, University of Technology Sydney in the development of this report.

Cover image:

An adaptation time line developed during the Alpine sub-region workshop that links sub-regional socio-economic change, the incidence of extreme climate events with policy windows that offer opportunities for change.

Published by:

Office of Environment and Heritage
59 Goulburn Street, Sydney NSW 2000
PO Box A290, Sydney South NSW 1232
Phone: +61 2 9995 5000 (switchboard)
Phone: 131 555 (environment information and publications requests)
Phone: 1300 361 967 (national parks, general environmental enquiries, and publications requests)
Fax: +61 2 9995 5999
TTY users: phone 133 677, then ask for 131 555
Speak and listen users: phone 1300 555 727, then ask for 131 555
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

Report pollution and environmental incidents
Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au
See also www.environment.nsw.gov.au

ISBN 978-1-74359-972-3
OEH 2015/0247
November 2017

Find out more about your environment at:

www.environment.nsw.gov.au

Enabling Adaptation – Minimising the impact of climate change in local communities

Climate Change Pressures

Seasonal shift in rainfall to summer and autumn, greatest rainfall increase on the Far South Coast.

Extreme fire weather days to increase in summer and spring.

Fewer cold nights (<2°C) in the Alpine area.

Hot days (>35°C) to increase.

Average maximum temperatures to increase by 0.5 - 1.0°C (by 2030)

Adaptation Pathways

Emergency management surge capacity for more extreme weather events

Teleworking employment options between major centres and smaller towns

All season tourism packages showcasing regional landscapes, food and culture

Tourist trails draw visitors from regional centres to coastal retreats

Innovative farming systems capitalising on new cross-sector partnerships

Climate smart coastal development allowing space for 'uphill drift' and ecosystem re-establishment

Biodiversity corridors for enhanced ecosystem resilience

Food production and value-added processing matched to climate

Cooma

Canberra

Young

Goulburn

Bega

Batemans Bay

Sea level rise will pose an increased risk to property and infrastructure in coastal areas.

Population Projections

2011	2016	2021	2026	2031
Total pop*: 175,650	Total pop: 182,950	Total pop: 188,800	Total pop: 195,850	Total pop: 200,750
>65yrs: 19.07%	>65yrs: 22.24%	>65yrs: 25.05%	>65yrs: 27.59%	>65yrs: 29.78%
<15yrs: 18.78%	<15yrs: 17.82%	<15yrs: 17.39%	<15yrs: 16.87%	<15yrs: 16.32%

*LGAs: Bega Valley, Bombala, Boorowa, Cooma-Monaro, Eurobodalla, Goulburn-Mulwaree, Harden, Palerang, Queanbeyan City, Snowy River, Upper Lachlan, Yass Valley,

Contents

List of figures

List of tables

1 Introduction

The climate of NSW is changing and there is international scientific consensus that further change is now 'locked in' to our global climate system (IPCC 2014). As a result there is a growing risk of climate related impacts on our state's natural, social and economic systems. Regional administrators, businesses and communities need to identify their strengths and weaknesses in the face of climate impacts – deciding how they will act together to minimise the impact and realise the opportunities of climate change on their local economy, environment and society.

Enabling Adaptation in the South East (EASE) aims to use tacit local knowledge to identify regional climate vulnerabilities and develop workable and agreed pathways and projects that minimise the impacts of climate change on local communities and build resilience to future extreme events and hazards. Using the NSW South East region as a pilot, EASE builds on the findings from the South East Integrated Regional Vulnerability Assessment (SE IRVA) (OEH 2012), to provide a collective evidence base for state and local governments to incorporate climate change considerations into long-term planning.

The EASE project was initiated by the NSW Office of Environment and Heritage (OEH) with the Institute for Sustainable Futures, UTS as a research partner. It is a process that begins by identifying potential transitions for key regional systems and putting them into the context of the vulnerabilities identified by the SE IRVA, projected population change, recent employment trends within industries for the region, and the influence of the neighbouring ACT (Chapter 3). It surveys the current state of adaptation planning in the region (Chapter 4) and concludes by describing some possible first steps projects and providing baseline benchmarking data by which progress in adaptation can be tracked (Chapter 5).

This report synthesizes the data gathered during EASE participatory workshops conducted in June 2014 (three sub-regional workshops) and August 2014 (two implementation workshops), with over 130 representatives drawn primarily from the local governments and NSW Government agencies of the South East and Tablelands region (see list in Appendix A).

Working together, these local decision-makers identified those aspects of existing (business-as-usual) regional systems which are *resilient* to climate change, and those which will need *transition* pathways to reach an ultimately *transformed* system in the future. They assessed adaptation action at a sub-regional scale, as climate change vulnerabilities differ considerably among three regional landscapes: alpine, tablelands and coast.

A total of 12 South East and Tablelands pathways models were developed including:

- large regional towns
- agricultural service centres
- coastal development
- potable water supply
- emergency management
- alpine tourism
- coastal tourism
- public land management
- coastal ecosystem management
- off-reserve conservation
- extensive grazing
- irrigated dairying.

The models show how adaptation can emerge along a series of planned strategic transition pathways that arise from the need to move away from business-as-usual vulnerabilities towards system transformation. The final step in this process was for participants to come up with at least one 'first-steps' project, to activate pathways linked to each regional model.

Defining climate change adaptation

Vulnerability is…

'*the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is the function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity*' (IPCC 2007, p.883).

Adaptation is…

'*the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities*' (IPCC 2007, p.869).

Some definitions of *adaptation* assembled by Hansen et al. (2013):

- '*Human efforts to reduce the negative effects of, or respond to climate change – not to be confused with evolutionary or biological adaptation*' (Hansen & Hoffman 2010) [emphasis added]
- '*changes in socio-ecological systems in response to actual and expected impacts of climate change, in the context of interacting non-climatic changes. Adaptation strategies and actions can range from short-term coping to longer-term, deeper transformations, aim to meet more than climate change goals alone, and may or may not succeed in moderating harm or exploiting beneficial opportunities*' (Moser & Ekstrom 2010) [emphasis added]
- '*Insurance, given a non-zero probability that climate change will have an adverse effect on your investment. Here "insurance" is any action you take to protect your investment, and an "investment" is anything you care about*' (Hansen et al. 2013) [emphasis added].

And from Hallegatte (2009):

'*Adaptation for extremes should prioritise flexible and "non-regret" options with long-term perspective, using soft strategies (not only technical), reducing decision time horizons and introducing safety-margins in new investments*'.

Pelling (2011) provides the following definitions:

- **Resilience** – '*stability and maintaining the status quo*'
- **Transition** – '*incremental social change and exercising of existing rights*'
- **Transformation** – '*new rights claims and changes in political regimes*'.

A note about the process

It is important to note that the nature of the questioning used in the process deliberately seeks to identify the factors that are perceived by the participants to contribute to the sectoral and regional vulnerability. Because of this focus on vulnerability, and the absence of the balancing context of what makes the region resilient, the content may appear to be overly critical. The process also seeks to draw on the tacit knowledge of staff in the region, so some of the views and perceptions of individual participants may be contestable on a purely factual basis. It is important that these views not be discounted however, for their influence either for or against action in the region remains.

2 What needs to change in South East NSW?

2.1 Adaptive pathways – from business-as-usual to system transformation

Adaptation is the process by which vulnerability to climate hazards is minimised (Figure 13); however, adaptation responses can vary greatly depending on the type and severity of the hazard and the capacity of the community to adapt. These responses can range from:

- resilience (changes or coping strategies to maintain business-as-usual)
- transition (incremental system changes)
- transformation (fundamental system change).

In practice there is considerable overlap and sub-components of systems may transform in order to maintain wider system resilience. For example, in agricultural systems, fundamental changes to production techniques may be required to maintain the livelihoods of farmers and the resilience of Australia's food production system.

If the more extreme predictions of climate change are realised, it is likely that adaptation responses will need to go well beyond the available coping strategies; however, abrupt transformation is a highly unpredictable process, often with unknown outcomes (National Research Council 2013).

An incremental approach to adaptation achieved through an understanding of community behaviour and careful long-term planning and consultation by government carries less risk of disruption to society; however, such an approach requires foresight to be incorporated into strategic planning processes to ensure that the alternative transition pathways lead to an agreed, desirable future.

By collaboratively identifying and developing potential incremental actions in strategic planning processes with regional decision-makers, policy interventions create a degree of 'stickiness' and 'soft' path-dependency (Levin et al. 2012) toward regional systems transformation to address climate change pressures. Such action can influence future policy requirements and behaviour, and in doing so entrench support for change over time and expand its reach to cover broader populations (Levin et al. 2012).

Given the uncertainty around the timing, severity and scale of climate impacts and the inherent difficulty of attempting to predict the future, a pathways approach to adaptation allows the best available knowledge to be used for progressive, staged decision-making.

A pathways approach facilitates planning that is responsive and flexible under changing circumstances over time and it allows consideration of interactions between major adaptation actions with overlapping timeframes (Bosomworth et al. 2015).

2.2 Key regional systems in South East NSW

A total of 12 regional pathways models were developed during the three sub-regional workshops and were finalised during the two regional implementation workshops. Together, they are a representation of the major systems that operate in the NSW South East region and shape government service delivery.

Some models cover all sub-regions (such as potable water supply, emergency management and public land management), others are limited to activities specific to a particular sub-region (such as coastal development and coastal tourism for the coastal sub-regions, and extensive grazing for the alpine and tablelands sub-regions).

These regional system pathways provide state agencies, local government, industry and the community with a bottom-up identification of potential future transitions for the region. Strategic planning for the region at a range of levels of government can draw on these models to realise more climate resilient systems in a thriving NSW South East region.

Chapter 5 outlines suggested projects from the South East EASE process which may provide a basis for local government and state agencies to achieve the regional transformation envisioned by EASE workshop participants.

Large regional towns

Business-as-usual

Examples of large regional towns in the South East region include, among others, Goulburn, Cooma, Young and Batemans Bay. Business-as-usual practices in large regional towns in the NSW South East include efforts to attract new residents to address imbalances in population age structures (e.g. promoting availability of childcare facilities for commuters in Goulburn); planning for natural disasters (bushfire, flood, drought); acting as service provision hubs for the surrounding region (such as in business support, agricultural processing and financial services, tertiary education, regional health and hospitals, and corrective services) and acting as gateway towns for seasonal tourism (Figure 1).

Current challenges facing the region include coping with changing population demographics (through ageing, rural residential development, retirees), and the growth of welfare dependent communities in some South East locations.

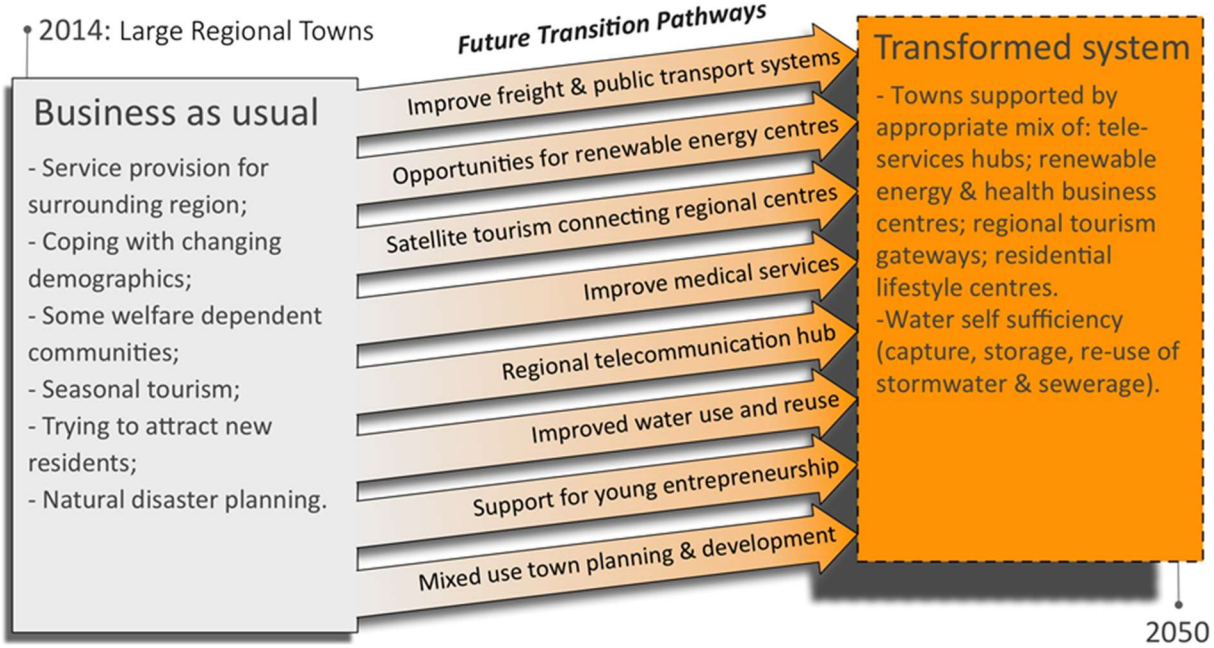


Figure 1: Transformation of large regional towns in the NSW South East

The transition

The priority adaptive pathways identified by participants to transform large regional towns in the South East are focused largely on the development of business opportunities through the provision of enhanced infrastructure, and may include the following:

Business opportunities – satellite tourism connecting regional centres of the South East; opportunities for renewable energy centres; improved medical services and the development of regional telecommunication hubs supporting issues such as telehealth and satellite workplaces, satellite business offices and distance education; support for young entrepreneurship in the region, to take advantage of innovative technology as it becomes available.

Infrastructure and planning – improved freight and public transport systems; opportunities for renewable energy centres; fast broadband applications; measures to promote transition to improved water use and reuse, recognising the likely changes in frequency and intensity of drought; and mixed use town planning and development to facilitate new types of businesses.

The transformed system

EASE workshop participants determined that transformed large regional towns could consist of an appropriate mix of:

- teleservices hubs
- residential lifestyle centres matched to local advantage, e.g. increased retiree care facilities in sea/tree-change retirement areas; hobby-farm/airfield developments, etc.; increased childcare facilities in burgeoning commuter centres
- renewable energy business centres
- regional tourism gateways
- increased water self-sufficiency through capture, storage and reuse of stormwater and sewage to reduce the impact of drought
- health business centres.

Table 1 collates the key constraining and enabling factors associated with transformational change in transport systems in large regional towns.

Table 1: Constraining and enabling factors associated with transformational change for transport systems in large regional towns

Sphere	Constraints	Enablers
Social	• Culture and behaviour – private vehicle reliance dominates because of convenience and comfort • Families need the flexibility associated with private vehicles	• Carpooling – improved technology to connect people, e.g. apps • Creating stronger relationships and connections – increasing community resilience • The region has the skills and knowledge to foster integrated transport solutions • Strategic planning for local and regional solutions and connections • Regional towns become more attractive, therefore more people, more business and rates revenue

Sphere	Constraints	Enablers
Policy	• Need a study of different transport durability modes/routes/services to maintain community transport services if another mode is disabled • Early stage of Australian market for non-internal combustion engine vehicles, and need for supportive infrastructure	• Undertake research and implement policies and processes to build the resilience of transport systems. • Commuter 'matching' services • Gradual growth of non-internal combustion engine vehicles, e.g. electric vehicles and potential to install supportive infrastructure, e.g. staged charging station facilities • Potential to couple growth of electric vehicles and infrastructure with business/tourism opportunities for sustainability, e.g. CENTROC's 'Recharge the Region' program • Link in with smart hubs/telecommuting hubs to build regional town identity and encourage investment
Economic	• Cost of transport infrastructure construction and maintenance to withstand climate change or ongoing rebuilding/replacement costs • Cost of durable materials • Infrastructure costs • Reduction of transport services/options for public and freight in small rural townships with a declining population	• Funds for implementation • Potential for combined passenger and freight modes • Business diversification, e.g. Toll becomes a public transport service? • Improved freight routes increase business opportunities

Agricultural service centres

Business-as-usual

Agricultural service centres of the South East region include towns such as Bombala, Braidwood and Crookwell. At present, agricultural service centres (also considered as smaller rural centres) in the South East are maintaining resilience through exploitation of available natural and cultural resources, improvements in road transport to major centres (creating commuting and goods transport opportunities), increasing reliance on transit tourism for business, and availability of relatively affordable housing and lifestyle choices within commuting distance of employment centres. As with other areas, the NSW BASIX legislation is the major driver of building sustainability (Figure 2).

Current challenges facing these smaller centres in the South East region include: water supply and security imposing limits on development, also a challenge for larger towns, the decline and consolidation of retail and service businesses (which usually results in the loss of independents), and the evolution of some towns into dormitory-commuter or welfare-dependent villages.

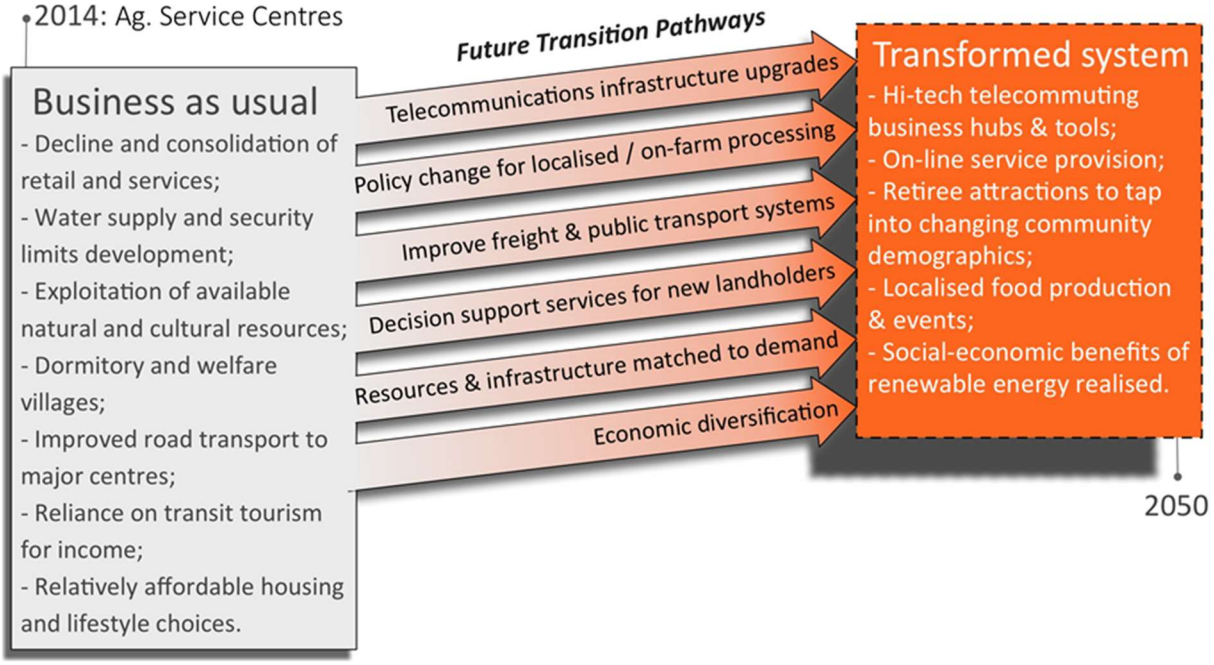


Figure 2: Transformation of agricultural service centres in the NSW South East

The transition

The priority adaptive pathways identified by participants to transform agricultural service centres in the South East encompass policy and infrastructure enhancement opportunities, and may include the following:

Policy opportunities – decision support services for new landholders to assist them in adjusting to rural regional lifestyles; agricultural/food policy changes to encourage localised or on-farm processing of agricultural produce; and local economic diversification, in particular, to combat boom and bust economic cycles associated with drought.

Infrastructure enhancement opportunities – telecommunications infrastructure upgrades; improved freight and public transport systems (particularly where some community members may be isolated from essential services in larger towns); and improved matching of resources and infrastructure to demands of local communities (such as an ageing population and their support services).

The transformed system

EASE workshop participants determined that transformed agricultural service centres would support:

- hi-tech telecommuting business hubs and tools
- attractions/facilities for retirees to tap into changing community demographics
- localised food production and events
- online service provision through fast broadband services
- the realisation of the socioeconomic benefits of adoption of local renewable energy generation.

Table 2 collates the key constraining and enabling factors associated with transformational change in localised food production in agricultural service centres.

Table 2: Constraining and enabling factors associated with transformational change in local food production in small agricultural service centres

Sphere	Constraints	Enablers
Social	• Image – produce may not be 'perfect' • Most supermarket chains have fresh fruit/vegetable produce appearance standards • Convenience of supermarket shopping • Regular, consistent supply of produce may be difficult • Consumers slow to recognise low carbon footprint as a choice determinant	• Regular local markets to connect sellers and buyers • Emerging campaigns to sell 'imperfect' fresh fruit/vegetable produce • Growth of a local produce identity and brand • Link in with sustainability programs, schools, Landcare, etc. • Potential development of food co-op to share costs, etc. • Rise in popularity of community gardens • Communications to producers regarding potential financial savings achieved through low carbon production processes • Promotion of low carbon producers
Policy	• Current health, safety policies and approvals processes are challenging • Communications regarding food safety certification for localised/on-farm production are difficult to find • Small-scale operations are water hungry therefore need for smart water policy to ensure water security for small-scale producers and local community	• Policy changes to enable small-scale production, processing and selling • Local government and community building an identity for local produce for both local and broader market • Local government supporting production for local use, i.e. space for markets, reduced market fees for local producers • Linking in with local supermarkets (e.g. IGA), cafes, etc. to have a local food section • Reduced local government licensing fees for businesses promoting local produce or hosting regular local produce only days • Use of private land (and community gardens) to match small-scale production • Food co-ops/socialised food production
Economic	• Regular supply and quality • Potentially higher costs for localised production • Perceived higher costs for making changes to low carbon production processes	• Tourism attraction for smaller towns – foodie/gourmet tourism • Lower produce transport costs and less emissions – incentive for producers in terms of carbon footprint • Producers having a lower carbon footprint becomes a marketing advantage • Local government agreement with local supermarkets, cafes and restaurants for use of local produce • Identity/name for local production and marketing

Sphere	Constraints	Enablers
		• Promote the services/ business model for small-scale producers

Coastal development

Business-as-usual

At present, coastal development in the South East region is characterised by in-fill development and green-field development, both of which are limited by local infrastructure. For water in particular, infrastructure is being augmented to exploit alternative water sources (such as groundwater) and secure water supplies. In addition, planning controls are being adjusted and building designs modified, often triggered by climate events. Flooding is a primary concern for coastal settlements and state purchase of flood prone land has been used in the past to reduce risk to some settlements; however, this strategy was not considered to remain viable into the future because of the likely scale of the hazard. Existing protection works, such as sea walls and breakwaters are being augmented to provide enhanced coastal protection (Figure 3).

Current challenges for coastal settlements in the South East region include the need to raise the height above sea level of critical infrastructure such as roads and gravity-feed sewage systems in response to sea level rise, coastal storms and more intense rainfall events.

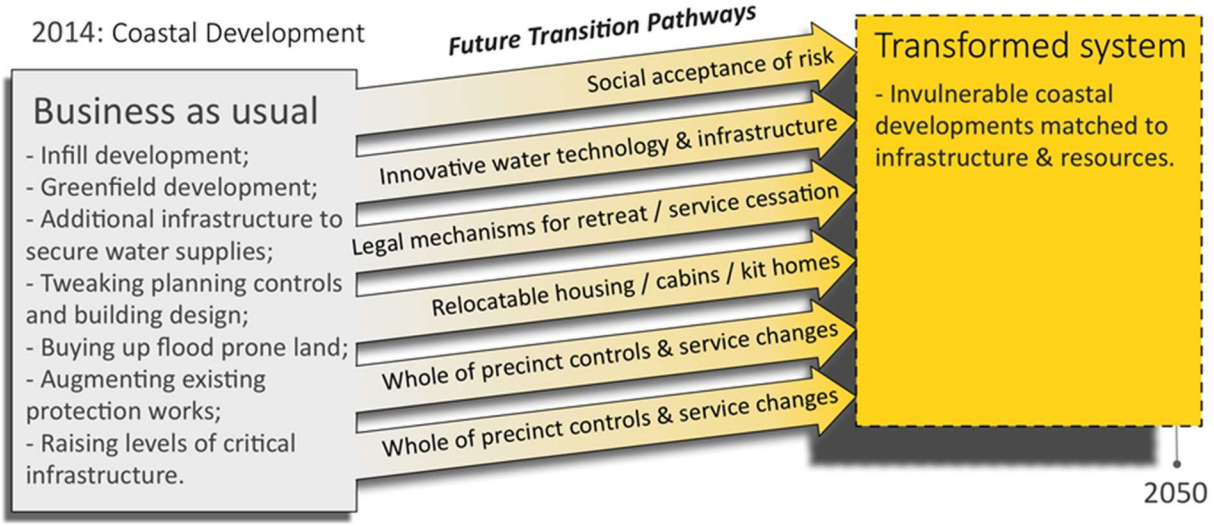


Figure 3: Transformation of the coastal development sector in the NSW South East

The transition

The priority adaptive pathways identified by participants to transform the coastal development sector in the South East region encompass changes to infrastructure, planning provisions and local government servicing, and could include the following:

Infrastructure and planning – changes to planning mechanisms that enable whole-of-precinct controls; development of settlements based on less permanent styles of housing in high hazard areas such as relocatable housing, cabins and kit homes; facilitation of uphill drift of coastal development to keep pace with rising sea levels and coastal erosion; adoption of innovative water technology and infrastructure.

Government servicing – examination of the potential policy implications and legal mechanisms for retreat/cessation of local government services to settlements frequently affected by flooding and sea level rise; changes to planning mechanisms to enable whole-of-precinct local government servicing; and awareness and education of coastal communities to increase social acceptance of risk.

The transformed system

EASE workshop participants determined that transformation in coastal development systems could result in 'invulnerable' coastal developments that allow population size and service requirements to be closely matched to infrastructure needs and available resources.

Table 3 collates the key constraining and enabling factors associated with transformational change in coastal development.

Table 3: Constraining and enabling factors associated with transformational change in coastal development – legal mechanisms for retreat and service cessation

Sphere	Constraints	Enablers
Social	• People have an idea of property value and associated expectation of compensation irrespective of the influence of environmental change on the market • Perception that government action could influence property values • Payment of rates gives an expectation of provision of services by local government • Short-termism of views & money/value • General community unaware of what will be lost with sea level rise/coastal erosion, even with technical and engineering solutions	• Education and communications regarding the potential solutions and outcomes, e.g. engineering solutions may seem good, but also need to communicate possible maladaptation outcomes • If development consent is given for hazardous areas, clear communications should be given relating to what assistance and/or services will be provided
Policy	• Local government doesn't have resources to enforce compliance • Legacy issues on older properties, i.e. local government cannot put conditions of consent on existing properties – harder to retrofit • Public buy-back of houses in flood prone areas in past – has set expectation of similar future actions • The standard instrument local environment plan (LEP) is restrictive for local solutions by removing local clauses/ Also flooding only has clauses 'to consider' not enforce	• LEP zonings for hazard areas, e.g. for temporary uses such as tourism • Local government could place conditions on services, e.g. levy for services on precincts at risk • Local government can place conditions of consent on new developments • Potential for policy/legislation to get conveyancers to assess insurability of property • Planning legislation currently doesn't support retreat • Short-term leases from public owned land, e.g. peppercorn leases
Economic	• Local government can't afford mitigation works and many engineering works can be maladaptive • High cost of current engineering solutions, e.g. opening Intermittently Closed and Open Lakes and Lagoons (ICOLLs) (e.g. Shoalhaven local government area – opening of multiple lakes to alleviate flooding is extremely costly and dangerous)	• Get banks involved – when buyers seek loans, potential for banks to require an assessment of property insurability in relation to climate hazards for risk management of their loan • Un-insurability of properties in hazardous areas having associated impact on property values and therefore development opportunities

Potable water supply

Business-as-usual

Delivery of potable water in the South East region is enacted through a range of actions (Figure 4) including: drought planning and proofing (such as reviews of water infrastructure); stormwater diversion and harvesting; augmentation of current supply systems (to secure town water supplies, pumping from rivers); introduction of water trading and pricing; and the development of water sharing plans (10-year plans already place limits on development in some locations).

Institutional changes such as water trading and formal sharing plans drive adoption of water use efficiency measures; the development of alternative water sources (groundwater and aquifers, tanks at household and town scales, recycling plants); implementation of use restrictions (such as embargoes on new licences); and education campaigns (community awareness raising).

The NSW South East region's natural environment is supported through the adoption of environmental flows and monitoring (including water quality, flow monitoring, catchment condition monitoring).

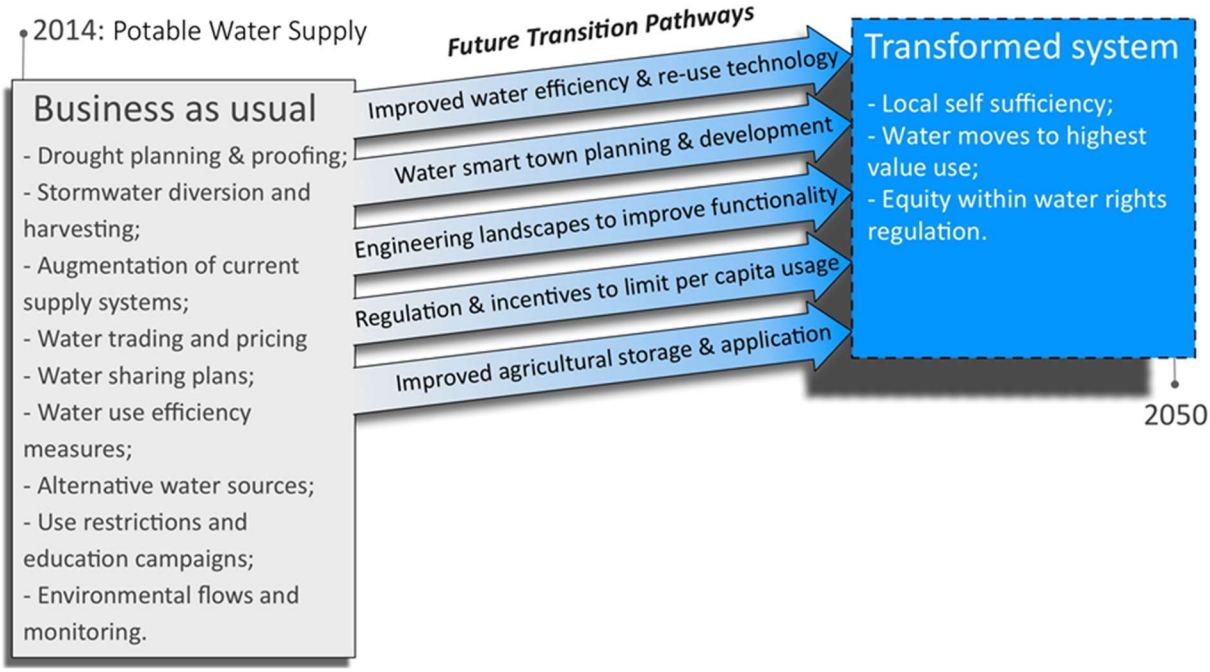


Figure 4: Transformation of the potable water supply in the NSW South East

The transition

The priority adaptive pathways identified by participants for transition in the potable water supply sector in the South East region focused on enhanced technology and infrastructure, landscape-scale planning, and regulatory changes, and may encompass:

Technology and infrastructure – rapid adoption of improved water efficiency and reuse technology; and improvements to storage and application of water by agriculture.

Landscape-scale planning – water smart town planning and development, and engineering of landscapes to improve functionality.

Regulatory – regulation and incentives to limit per capita water usage.

The transformed system

EASE workshop participants determined that the transformed NSW South East water sector could consist of:

- settlements that have local water self-sufficiency
- increased equity within water rights regulation
- market mechanisms to manage the volume of usage closest to its highest value use.

Table 4 collates the key constraining and enabling factors associated with transformational change in water efficiency in regional and rural towns through improved technologies that allow for greater reuse, recycling and water efficiency.

Table 4: Constraining and enabling factors associated with transformational change in water efficiency in regional and rural towns through adoption of improved technologies

Sphere	Constraints	Enablers
Social	• The need to improve the clarity of the technical water guidelines • The need to improve accessibility to information	• Potential for establishment of an advisory body, or greater role for local/ state government to provide consistent, up-to-date dissemination of information and advice
Policy	• The need for consistency in regulations between urban and rural areas • Regulation hasn't kept up with technology (too rigid) which is preventing innovation	• Set development standards at local and regional scales • BASIX strengthened to better encourage water efficiency, especially in rural areas
Economic		• Infrastructure to capture stormwater in urban areas for reuse

Emergency management

Business-as-usual

Current adaptive measures aim to improve health information systems, community engagement and involvement, information accessibility for planning, and expanding surge capacity beyond regional boundaries (Figure 5).

Current challenges facing the emergency management sector in the South East region include emerging community health issues such as an ageing population and the rise of associated chronic illnesses; emergency management infrastructure gaps such as a shortage of emergency operations centres (which is currently being addressed in Bega for example); adaptive management limited to combat agencies rather than a whole-of-government approach; lower levels of community preparedness in areas where engagement has been difficult; and lead times to access out-of-region resources that limit surge capacity.

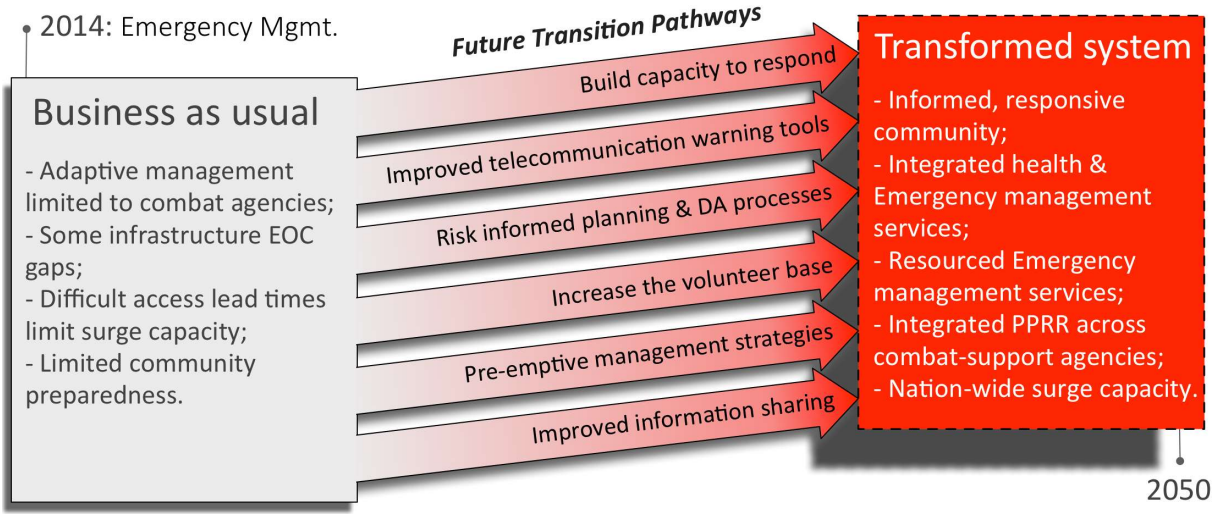


Figure 5: Transformation of the emergency management sector in the NSW South East

The transition

The priority adaptive pathways identified by participants to transform emergency management in the South East region encompassed capacity building, enhanced technology and planning processes and may include the following:

Capacity building – building capacity to respond to critical incidents (e.g. community preparedness, fauna rescue and treatment); increasing the volunteer base.

Enhanced technology – improving telecommunication warning tools; improving information sharing at a whole-of-government scale.

Planning processes – upholding risk-informed planning and development approval processes; and enhancing pre-emptive management strategies (e.g. improving the capacity of waste management systems to cope with emergencies, and shifting hazard reduction burn regimes to align with changing seasonal safe-condition windows).

Transformed system

EASE workshop participants determined that the transformed South East region emergency management sector would consist of:

- emergency services provision characterised by well-integrated health and emergency management services
- integration of prevention, preparedness, response and recovery (PPRR) models across combat-support agencies in the NSW South East
- an informed and responsive community
- support by effective community engagement approaches and telecommunication warning tools in the lead-up to critical incidents
- expanded, coordinated, surge-capacity response plans that support the region during emergencies.

Table 5 collates the key constraining and enabling factors associated with achieving the change to a transformed emergency management system in the NSW South East.

Table 5: Constraining and enabling factors associated with transformational change in emergency management agencies in the NSW South East

Sphere	Constraints	Enablers
Social	• Social apathy • Not everyone uses or acts on the information provided • Response driven culture of emergency response can discourage self-help • Public perception that emergency management is only about responding • Ageing volunteers • Less community cohesion resulting in fewer volunteers, and less resilience • Consultation fatigue – the same information is sought and provided from different agencies • Emergency information is not location- and time-specific enough for people to make response decisions • Computer literacy of young/old to access emergency information • How to reach and service disadvantaged and minority community groups	• Improved emergency management agency websites and communications • Community understanding that fire/ flood/storms are normal and the necessary steps to prepare and manage for these events • Integration of emergency management preparation, planning and response – 'all hazards' approach to communications and coordinated emergency response agency for public liaison/communications
Policy	• Establish government as single source of trusted information • Current federal policy is fuelling climate scepticism • Politics is affecting community short and long-term vision • Health-based emergencies not considered currently in emergency PPRR and response plans	• Coordinated emergency response agency for public liaison and communications • Greater flexibility in volunteer position opportunities, e.g. GIS, communications, reserve list, etc. • Non-discrimination clause in Acts/Regs for emergency volunteers as is in existence for voluntary military service • Tax breaks for volunteers • Targeted education – seasonal and location specific • Requirements to show flood/fire, etc. plans with Development Applications

Alpine tourism

Business-as-usual

Business-as-usual for alpine tourism in the NSW South East is characterised by the predominance of winter-based activities (Figure 6), primarily drawing visitors from Canberra and Sydney to two key alpine resorts (Thredbo and Perisher) and two sub-areas (Selwyn Snowfields and Charlottes Pass Ski Resort). The NSW ski season runs from the June long weekend to the October long weekend, with a peak during late July and August.

In an effort to provide resilience for winter-based tourism, adaptive measures such as snow-making and cloud-seeding are now selectively undertaken. These relatively expensive

measures have an uncertain feasibility beyond 2075, in the context of a changing climate. Ongoing resort upgrades aim to maximise visitor capacity during the peak season.

Summer visitation is minor in comparison to winter and early spring tourism, although there are tourism activities indicating this is beginning to broaden. Summer attractions include mountain biking, camping, fishing, boating and festivals. Existing infrastructure is repurposed where possible to support summer tourism, such as the Kosciuszko Express Chairlift at Thredbo which is used for mountain bike riders and bushwalkers.

As the Thredbo resort falls within the boundaries of Kosciuszko National Park, the growing popularity of mountain biking creates management tensions when riders fail to adhere to the dedicated managed trails. Event coordination occurs through collaborations between the tourism resorts and the NSW National Parks and Wildlife Service. It was proposed that perceptions of fire risk may also reduce visitor numbers during the summer.

Notable employment characteristics of the region include a seasonal workforce associated with gateway towns such as Jindabyne, where populations swell during the peak snow season through ski and hospitality positions. There is also a fixed workforce associated with electricity generation and retailing company Snowy Hydro Limited, which also drives cloud seeding operations for enhanced snowfall and runoff.

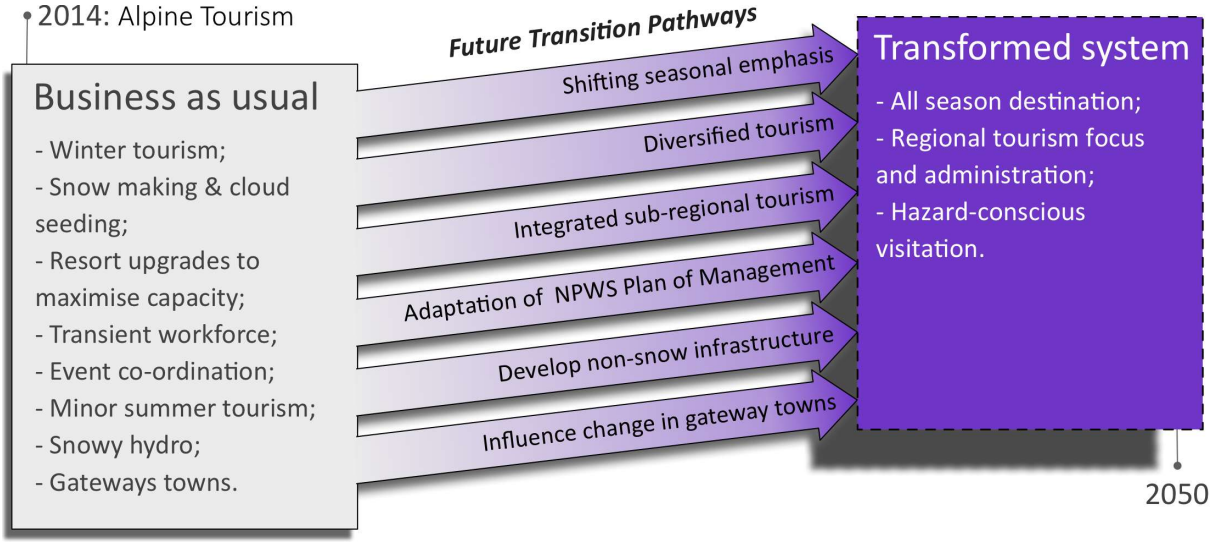


Figure 6: Transformation of the alpine tourism sector in the NSW South East

The transition

The priority adaptation pathways identified by participants to transform alpine tourism in NSW focused on broadening the area's tourism opportunities, business opportunities and investigating synergies between national park management and regional prospects. Approaches may include:

Broadened tourism opportunities – a shifting seasonal emphasis (that may require an identity change for the alpine area over time), development of non-snow infrastructure (e.g. glamour camping 'glamping', 'great walks', adventure tourism facilities such as zip-lines), and diversified tourism options such as ecotourism and low-impact tourism activities, agricultural and food-based tourism, integrated sub-regional tourism strategies both within NSW (e.g. coastal–alpine campaigns) and across the border with Victoria, packages with international operators and enhanced event-based tourism.

Business opportunities – fostering change within gateway towns to create new employment opportunities and ensure support for the transition.

Park management – adapting the plan of management for Kosciuszko National Park to align with the transition pathways.

The transformed system

EASE workshop participants determined that transformation of the NSW alpine tourism sector would involve:

- the alpine sub-region established as an all season (snow-independent) destination
- tourism by 2050 characterised by hazard-conscious visitation
- tourism options administered, promoted and integrated at a regional scale
- the unique features of the region, such as the sensitive endemic species of the alpine zone, are duly conserved and protected from human-use impacts.

Table 6 collates the key constraining and enabling factors associated with transformational change in alpine tourism associated with ecotourism rebranding.

Table 6: Constraining and enabling factors associated with transformational change for ecotourism rebranding in the NSW alpine area

Sphere	Constraints	Enablers
Social	• No World Heritage status in the NSW alpine region • Limited transport links as the region is difficult to access without private transport • Currently very narrow tourism brand (i.e. skiing only) • Pre-conceived negative ideas around 'eco' = greenie, rough or basic	• Grow the local and global profile of the region • Iconic landscape walks • Apply for World Heritage status • Eco-assets map identifying key natural tourism wonders • Brand as 'pristine' not 'green' or 'eco' to overcome negative stereotype • Social media to target younger populations, so that in 20 years this demographic is returning and do not have snow tourism expectations
Policy	• Civil liability laws limit adventure activities	• Improve transport infrastructure • Regional tourism plan • Improved coordination between state agencies (e.g. NPWS, Tourism NSW) and interstate (e.g. Vic) and Commonwealth • Work with key decision makers to improve the support and understanding of tourism in the region • Premier's regional coordination forum • Experiential decision-making – take decision-makers out to show what the area has to offer
Economic	• Existing infrastructure – reluctance to invest • Limited data that's not snow-based	• SEROC Regional Infrastructure Strategy – social and economic • Regional tourism and events

Sphere	Constraints	Enablers
		• Seasonal tourism data collection and analysis

Coastal tourism

Business-as-usual

At present, coastal tourism in the NSW South East region can be described as seasonal, with a summer dominance (Figure 7). The natural coastline, beach culture and recreational fishing opportunities attract visitors primarily during the warmer months. Visitor numbers also fluctuate within seasons according to the weather, with warm, clear forecasts drawing people from inland regions and urban centres to coastal retreats.

Ongoing challenges facing the NSW South Coast include: infrastructure constraints, especially transport as the region is highly car dependent; poor mobile phone coverage; and under-utilised housing stock, attributed to a high proportion of holiday rental properties.

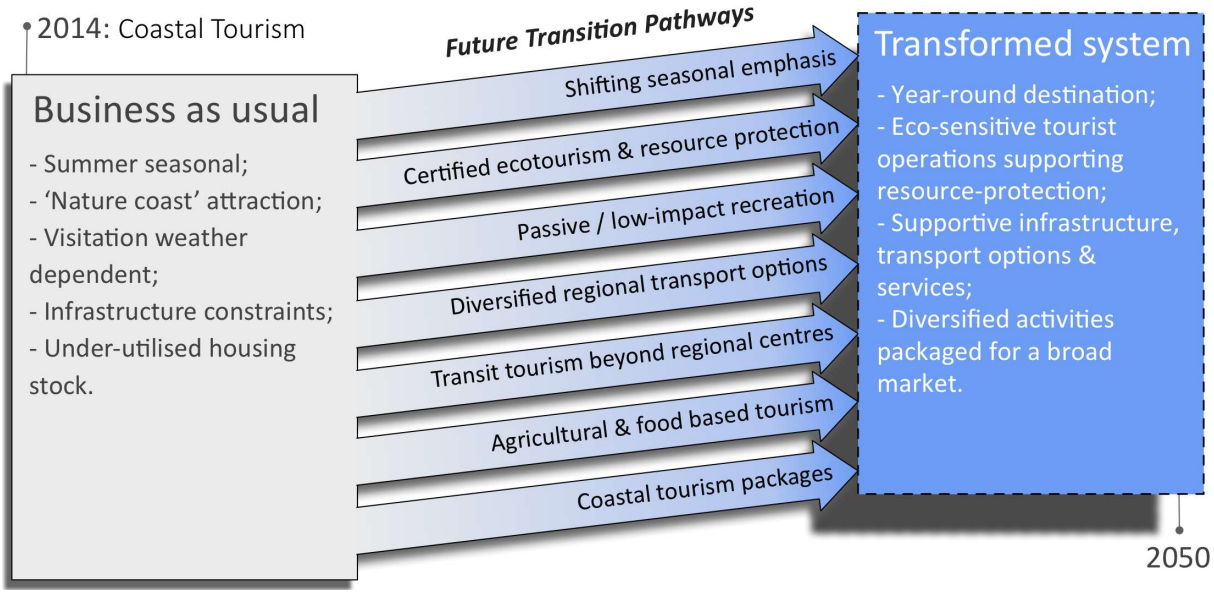


Figure 7: Transformation of the coastal tourism sector in the NSW South East

The transition

The priority pathways identified by participants to transform coastal tourism in the NSW South East focused on broadening the area's tourism opportunities and diversifying transport options, and may include:

Broadened tourism opportunities – a shifting seasonal emphasis (diversifying into event-based tourism during cooler months); certified ecotourism ventures that align with regional conservation priorities (e.g. koala surveys); passive tourism destinations (e.g. Tanja Lagoon Camp and Myer House) and low impact recreation opportunities (e.g. walking trails) that are available to both visitors and local residents; and tourism packages with add-ons such as whale-watching, day trips to national parks, Indigenous cultural awareness, regional accommodation, agritourism food trails; integrated sub-regional tourism strategies (e.g. coastal–alpine campaigns) and promoting transit tourism destinations outside of regional centres.

Diversified transport options – increasing regional transport options to broaden market access, e.g. rejuvenating Eden as a port town and having regular coastal ferry services for increased tourism and business opportunities.

The transformed system

EASE workshop participants determined that transformation of NSW South Coast tourism would involve:

- the NSW South East coast established as a year-round, all-season destination
- diversified tourism packages promoting eco-sensitive tourism and planned events that preserve the unique characteristics of the area, such as the natural coastline and culture
- improved transportation options
- broadly communicated and marketed tourism activities
- diversified accommodation options
- improved telecommunication infrastructure.

Table 7 collates the key constraining and enabling factors for transformational change in coastal tourism associated with ecotourism development and accreditation.

Table 7: Constraining and enabling factors associated with transformational change for NSW South East coastal ecotourism development and accreditation

Sphere	Constraints	Enablers
Social	• The need for standardised and recognised ecotourism accreditation • Competing industries, e.g. fishing, agriculture	• Research to establish and develop accreditation aspects/requirements for ecotourism • Education and awareness – Tourism Inter Industry Forum
Policy	• Limited recognition of accreditation by land managers	• Approach of Kakadu, Tasmania, New Zealand that allow commercial operators and gain international status and recognition
Economic	• Marketing agencies/accreditors – accreditation costs money • Obstacles to accreditation	• Coordinated government commitment to accreditation standard may overcome financial constraints • Invite and incentivise commercial operators

Public land management

Business-as-usual

Public land management in the South East region is managed through regular review and revision of active management objectives (Figure 8).

Current objectives encompass threatened species protection (e.g. enclosures and breeding programs); ecological monitoring and evaluation; regulatory instruments (e.g. LEPs); risk management and threat abatement activities (e.g. environmental assessments, hazard reduction burns and pest control). Community education and capacity building activities are also crucial, in an effort to reduce human induced pressures on public lands and work with external landholders to address regional priorities, such as the spread of weeds. As government resourcing arrangements determine the extent of public land management activities, alternative sources of funding and partnerships are needed to augment conservation capabilities.

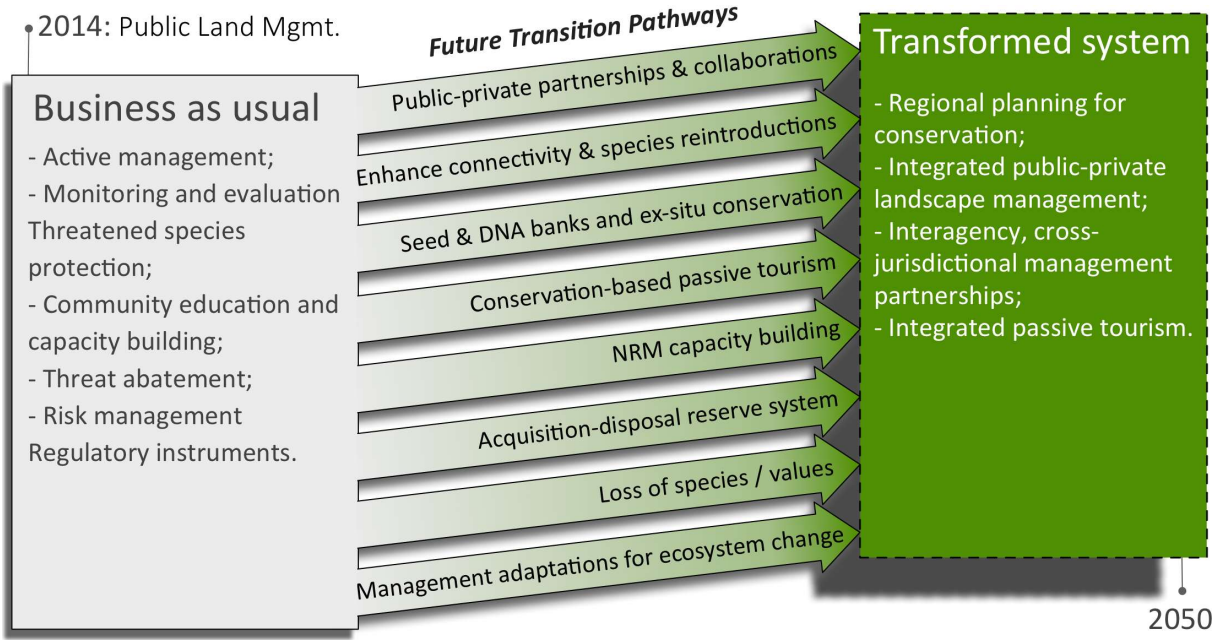


Figure 8: Transformation of public land management in the NSW South East

The transition

The priority pathways identified by participants for adapting public land management to a changed climate out to 2050 focused on changed resourcing and management structures, enhanced ecosystem management arrangements, and community capacity building, and may include:

Resourcing and management structures – enhanced public–private partnerships and collaborations; alternative funding sources; and accepting that change is likely to occur within some ecosystems over time and consequently adapting management accordingly through 'acquisition-disposal' reserve systems.

Enhanced ecosystem management arrangements – a strategic focus on enhancing connectivity and reintroducing species; DNA, seed banks and ex-situ conservation programs that support species reintroductions.

Community capacity building – targeted NRM capacity building for private land managers; and conservation-based or passive tourism that can promote ecological knowledge and support land management.

The transformed system

EASE workshop participants determined that as regional NRM concerns extend across land tenure boundaries, integrated public and private land management plans will better support tenure-blind landscape management to 2050. Approaches to support transformation may include:

- integrated public–private land management plans
- improved interagency, cross-jurisdictional, Aboriginal and public–private partnerships and collaborations
- enhanced habitat where possible through suitably restored public lands
- certified ecotourism promoting ecological awareness and supporting land management
- integration of conservation strategies into regional planning and development
- working together to maintain connectivity at a regional scale
- certified ecotourism operations will be operating across the South East by 2050.

Table 8 below collates the key constraining and enabling factors for transformational change in public land management to improve landscape connectivity across land tenure types.

Table 8: Constraining and enabling factors associated with transformational change for public land management in the NSW South East to improve landscape connectivity between public and private lands

Sphere	Constraints	Enablers
Social	• Differing priorities for land use • Less media coverage of conservation issues and therefore less community awareness • Perception that conservation limits private land use – means it is a polarising issue	• Better general communication for the relevance of connectivity and make it clear why we need to conserve • Good news and case studies to bring the community along • Community champions leading the way • Rewards and recognition for landholders • Greater communication regarding conservation approaches that are complementary to private land uses such as agriculture • Communication of the value of ecosystem services, e.g. for agriculture
Policy	• Regulations for clearing around properties to decrease bushfire risk have consequent effects on connectivity • Inability to fully enforce environmental protections • LEPs – connectivity not currently recorded and recognised in LEPs	• Landscape approach to mapping vegetation through LEPs to link landscape conservation with planning decisions • Quantify the value of ecosystem services to agriculture, e.g. pollination ($ value) • Water quality improvements from protection of vegetation and riparian zones cheaper than mechanised water filtration
Economic	• Loss of agricultural lands due to semi-urban spread • Land costs limiting public lands acquisition and leading to reduced connectivity in coastal areas • Who pays for the connectivity – private or public funds?	• Improved biodiversity and landscape outcomes from greater connectivity, is more cost effective than in-situ/ex-situ conservation for threatened species • Landscapes adjacent to protected areas may be more productive, potentially leading to increased private landholder support, e.g. high soil fertility, cleaner water sources

Coastal ecosystem management

Business-as-usual

Coastal ecosystem management in the NSW South East is currently being enacted through a range of measures that encompass: managing protected areas (national parks and marine parks); threat abatement activities (e.g. weed, bushfire, and ICOLLS); the rehabilitation of selected landscapes (e.g. dunes); wildlife refuges; species reintroductions (e.g. endemic revegetation works to re-establish habitat); and the enforcement of managed resource use (e.g. aquaculture) (Figure 9).

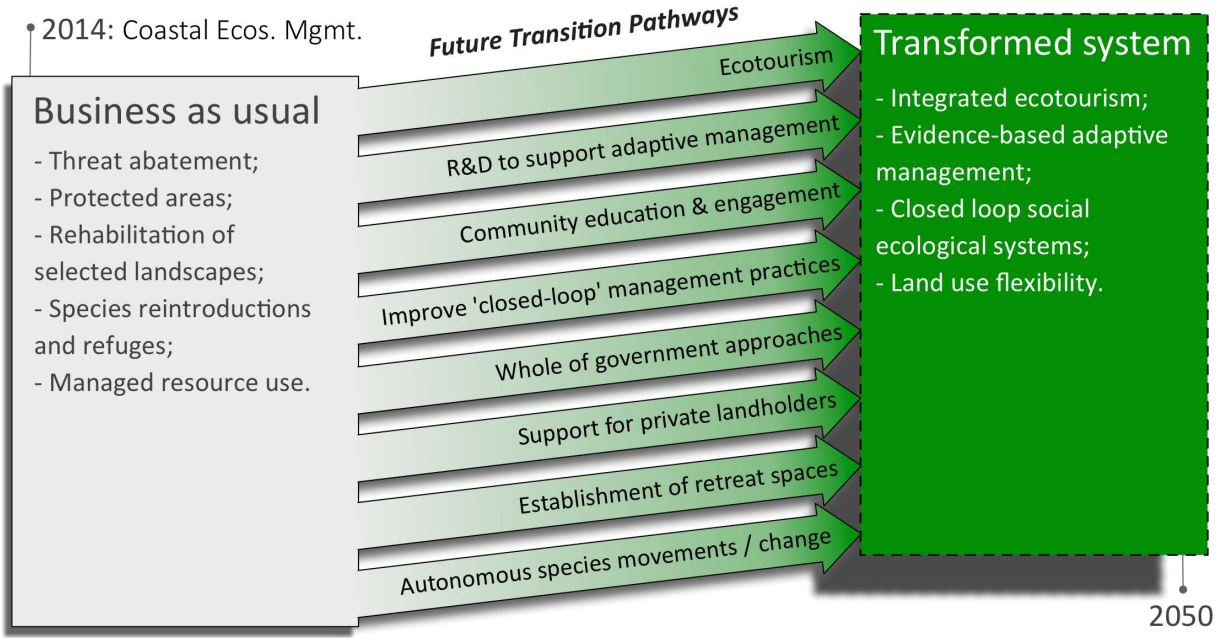


Figure 9: Transformation of coastal ecosystem management in the NSW South East

The transition

In the context of a changing climate, autonomous species movements (e.g. abalone, fish) and wider ecosystem changes are expected to occur over time. Coastal ecosystem management will need to adapt as a consequence.

The priority pathways identified by workshop participants to adapt coastal ecosystem management in the future focused on enhanced research and development (R&D), policy changes and community capacity building, and may include:

Enhanced R&D – sustained research and development that supports adaptive management.

Policy change – improving 'closed-loop' resource management practices; whole-of-government approaches to ecosystem management (e.g. Rural Fire Service and Parks and Wildlife Group collaborations); and developing ecotourism certification.

Community capacity building – enhanced community education and engagement activities; and strategic NRM capacity building for private landholders.

The transformed system

EASE workshop participants determined that transformed coastal ecosystem management could consist of:

- long-term monitoring, at multiple scales, to better support evidence-based adaptive management
- facilitation of certified ecotourism markets and integration with regional ecosystem management strategies to enhance community awareness/ engagement/education
- closed-loop nutrient and material recycling processes in local social-ecological systems to decrease input costs and diminish local or external waste impacts
- land-use flexibility to accommodate the movement of habitats to manage instances of coastal inundation and sea level rise
- support of passive tourism options such as diving and whale-watching to engage the community in environmental appreciation and understanding of conservation needs.

Table 9 collates the key constraining and enabling factors associated with transformational change for coastal ecosystem management leading to implementation of a holistic approach to land-use planning and risk management.

Table 9: Constraining and enabling factors associated with transformational change for coastal ecosystem management – holistic land-use planning and risk management for coastal ecosystem management

Sphere	Constraints	Enablers
Social	• What a land owner is entitled to do on private land is not always well understood • Community ownership, and joint understanding of what's important for natural asset management could be improved • Conflict in land use, understanding of environmental change and generational culture • Resistance to changing laws/policies/zonings that are perceived to 'restrict' use	• Stewardship payments to support ecosystem services management as an alternative to private landholders' previous source of income • Clear guidance and leadership about what you can/cannot do with your property rights from the beginning and why – advice provision at point of sale • Promote a production–conservation management mixed use of properties – farming and conservation
Policy	• Vested interests • Rural residential subdivision can create environmental and agricultural economic blockages • Currently planning for the lowest common denominator – enable this with legislation flexibility – design better communities without assuming the worst	• Clearly promote landscape ecosystem services' value to current and future potential owners • Rural residential – there is potential to implement positive land management practices/requirements on larger blocks to maintain them as productive/conservation lands • Land-use planning legislation that is more responsive to changing environmental and social conditions
Economic	• Differing perceptions of land use and associated value • Increasing input costs and lower profits can lead to more intensive grazing practices, which can have adverse effects on the environment	• Farmers getting appropriate payment for their produce permitting good land management practices

Off-reserve conservation

Business-as-usual

Off-reserve conservation efforts to maintain business-as-usual in the NSW South East include legislation; community engagement, education and capacity building initiatives (e.g. incentives, covenanting, Landcare, Waterwatch and Local Land Services extension programs); biosecurity (e.g. the control of biological pests); water sharing rules and plans (e.g. aquatic ecology, recreational fishing licences, harvest limits); development planning (e.g. strategic, connectivity); and species breeding and translocation programs (Figure 10).

At present, many hazard reduction burn regimes and intensive farming systems do not optimally align with regional biodiversity conservation objectives to enhance habitat connectivity.

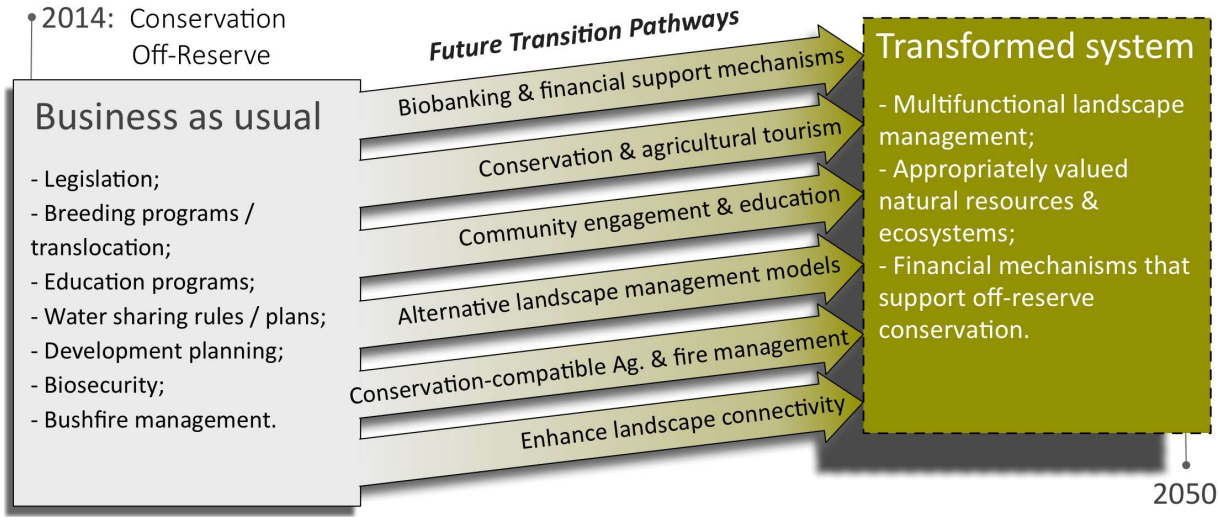


Figure 10: Transformation of off-reserve conservation in the NSW South East

The transition

The priority pathways identified by participants for transition of off-reserve conservation in response to changed climate out to 2050 focused on market mechanisms, landscape-scale management approaches, R&D extension, and community capacity building, and may include the following:

Market mechanisms – establishing functional and well regulated biobanking markets or novel financial mechanisms (e.g. philanthropy, crowd sourcing, stewardship, government funding partnerships, rebates and tax benefits) that enable private landholders to take on conservation responsibilities; promotion and entrepreneurial support for conservation and agricultural tourism.

Landscape-scale management – developing alternative landscape management models.

R&D extension – to develop innovative management regimes, ongoing research and extension is needed to establish evidence that can effectively support adaptive management in the context of the precautionary principle; and promoting the uptake of conservation-compatible agriculture and fire management regimes, which help to maintain landscape connectivity.

Community capacity building – community engagement, education and capacity building programs which involve landholders in regionally significant NRM/conservation projects (e.g. Greening Australia projects, Aboriginal Land Council land rehabilitation programs, voluntary conservation agreements, land property vegetation plans).

The transformed system

EASE workshop participants identified transformed off-reserve conservation management approaches as supporting:

- 'multifunctional landscape management' where productive rural livelihoods and habitat connectivity are jointly supported through effective NRM partnerships
- stewardship payments for off-reserve species conservation
- novel financial support mechanisms that appropriately value natural resources and ecosystem services.

Table 10 collates the key constraining and enabling factors associated with transformational change in off-reserve conservation.

Table 10: Constraining and enabling factors associated with transformational change for off-reserve conservation in the NSW South East

Sphere	Constraints	Enablers
Social	• Slow movement away from European cultural farming styles not suited to the Australian landscape • Need for reward/incentive for private landholder best practice • Community doesn't always value the environment because it is not easily monetised	• Financial incentives to increase viability of off-reserve conservation landholdings and actions will promote social change • Community engagement to enable people to understand • Education – identify opportunities to contribute to the school curriculum and/or programs • More localism encouraging pride and care of local environment • Work with landholders to build a consensus about 'duty of care' and benefits of stewardship.
Policy	• Absence of bi-partisan political support can lead to changes decisions and policy directions • Barriers to reaching the 'right' targets for off-reserve conservation implementation, e.g. which land is in more 'need'? • Long-term requirements for effective conservation and funding • Uncertainty about species shifting range with changing climate conditions, potentially out of stewardship areas	• Encourage more localism • Prioritisation of strategic implementation of off-reserve conservation • Clear separation of incentives – implementers and regulators • Having a strong lead agency to take carriage and push forward – an NGO may be more effective at running program because of organisational flexibility and reach
Economic	• Will the costs/stewardship payments be equivalent to a salary, making it a viable alternative for private landholders? Will it be worthwhile for people to participate?	• Fund to create interest that can be used, e.g. similar to biobanking total fund deposit

Extensive grazing

Business-as-usual

Existing adaptive practices, such as fine-tuning production systems to be more resilient to drought cycles, managing stocking rates and capitalising on variable market prices, and farm business diversification are likely to remain dominant for farm businesses in the South East region's extensive grazing sector over the next 20–30 years (Figure 11).

Ongoing issues facing the extensive grazing sector in the NSW South East also include rural population/demographic change, declining investment in R&D over the past 20 years and natural resource management challenges associated with a shift towards multi-location, corporate grazing enterprises; peri-urban spread and absentee landholders.

At present, system resilience within the sector is maintained through improving grazing management practices (e.g. stocking rates, pasture improvement, product diversification, and production targets); enhancing economies of scale (e.g. consolidating grazing lands and reducing labour costs to achieve higher investment returns); or diversifying incomes through integration of mixed farming (e.g. mixed grazing, fattening, trading, and cropping).

Further adaptive practices include fodder conservation, rationalising inputs (e.g. fertiliser, drenching); maximising farm-water harvesting (within the legislative constraints of the Farm Dam Policy, which results in fewer but bigger dams); diversifying incomes through complementary on-farm ventures (e.g. renewable energy production); and off-farm employment opportunities (e.g. on and off-farm employment roles within family units).

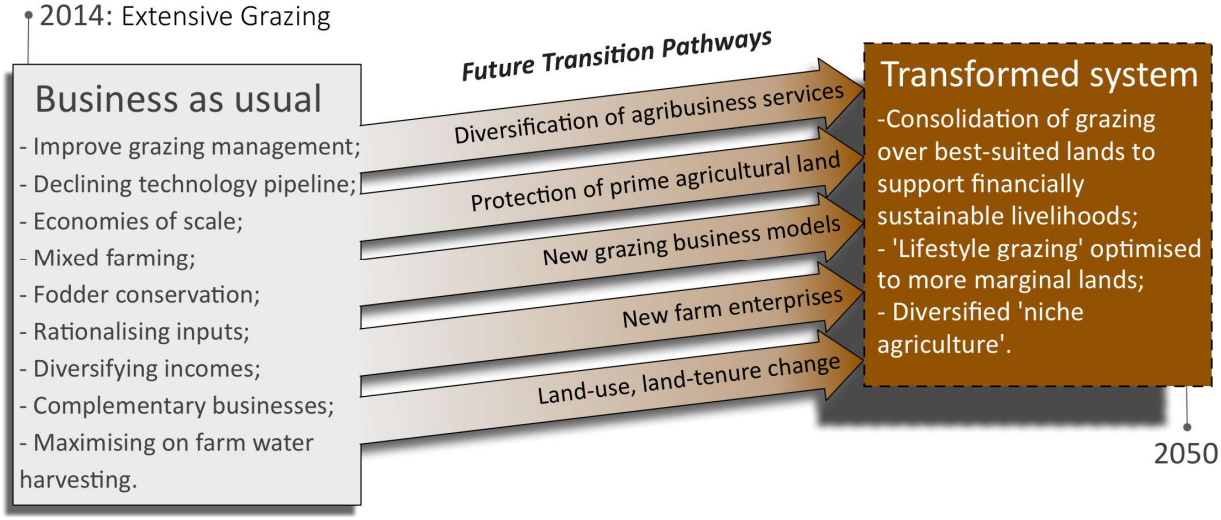


Figure 11: Transformation of the extensive grazing sector in the NSW South East

The transition

The priority pathways identified by participants to adapt the South East region's extensive grazing sector focused on business diversification and strategic land management, and may include the following:

Business diversification – diversification of agribusiness services (e.g. abattoirs capable of processing a range of carcass types and different scales – community use through to commercial); implementation of new grazing business models (e.g. finishing, trading, and opportunistic grazing); 'niche agriculture' ventures such as the small-scale nut industry in the NSW–ACT Capital region, horticulture and local food production; agritourism, boutique escapes and farm stays; horse riding schools; educational and school group visits; hunting lodges (potentially high value but limited opportunities), and integration with packaged tourism events.

Strategic agricultural land preservation – protection of prime agricultural lands through NSW Government regional plans as change in regional land use and land tenure will continue through rural residential development and subdivisions (close to regional centres); amalgamation and consolidated ownership of productive land; multi-region/multi-location enterprises, corporate ownership and non-resident landholders; fragmentation; and nature conservation.

The transformed system

To support financially sustainable livelihoods for NSW South East graziers to 2050, EASE workshop participants identified that transformed extensive grazing systems could:

- consolidate commercial-scale extensive grazing over the best-suited lands
- tap into agritourism opportunities
- integrate 'niche agriculture' to diversify farm income streams (diversified production outputs, localised food production, agritourism).

Table 11 collates the key constraining and enabling factors associated with transformational change in regional agriculture through diversification of farm income streams.

Table 11: Constraining and enabling factors associated with transformational change for diversification of on-farm income streams

Sphere	Constraints	Enablers
Social	• Social acceptance of using some species for food • Divide between 'haves' and 'have nots' with wind farms	• The extent and strength of existing farmer-based networks in the South East region • Wind farms providing secure annual alternative income to landholders
Policy	• Limits to LEPs and regional environment plans to strategically protect agricultural land • All wind development is considered state significant • Regulation – kangaroos and other native wildlife – restricted take • Biosecurity – animal movement restrictions for disease control • State National Electricity Market rules inhibit use of renewables • Intensification and water impacts	• Licensing for quota-based native animal takes and on-sale for production • Expansion of supportive policy frameworks for renewable energy
Economic	• Inappropriate processing facilities, e.g. no micro abattoir – limited transport • Fencing requirements • Infrastructure – cattle only suitable for some locations • Energy supply mainly from fossil fuels • Some decline in farm asset maintenance,	• Wind farm development is providing financial leeway to some landholders, enabling potential diversification • Support services and advice regarding short-term outlays vs long-term gains

Irrigated dairying

Business-as-usual

At present, business-as-usual within the NSW South East region's irrigation-dependent dairy industry encompasses resource use efficiency gains (such as energy benchmarking, increased soil testing, water sharing plans, nutrient budgeting, effluent reuse, whole farm planning, and alternative fertilisers); technology adaption (such as milk plate coolers and water use efficiency tools); alternative energy production (e.g. biogas); and environmental management planning, which specifically targets water quality protection through the uptake of effluent management guidelines for dairy processing (Figure 12).

Further adaptive measures include value added processing (e.g. on-farm boutique milk, cheese, and yoghurt making, such as Tilba Milk); financial incentives for increased production; off-farm grazing, agistment, and fodder imports.

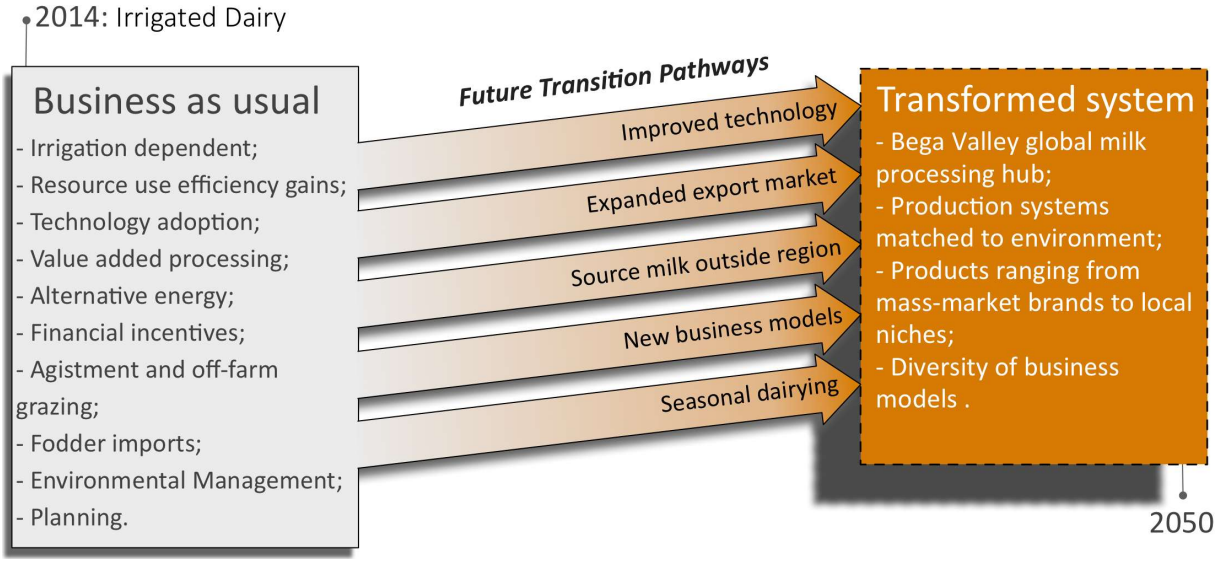


Figure 12: Transformation of the irrigated dairy sector in the NSW South East

The transition

The priority pathways to adapt the NSW South East's irrigated dairy sector out to 2050 focused on new business models, technology and markets and improved transportation, and may include:

New business models – higher intensity production through feedlots, incorporate or switching to beef production, carbon storage, corporate farm models, franchising and seasonal dairying, sourcing milk from outside the region (to expand dairy processing operations at Bega).

New technology – increasing the uptake of improved on-farm technologies (e.g. water use efficiency tools, effluent screw press).

Improved transportation and new markets – reducing transportation limitations (e.g. no rail access) and expanding export markets (e.g. enhanced use of the Eden port facilities).

The transformed system

EASE workshop participants determined that transformation of the irrigated dairy sector in the NSW South East would:

- support the Bega Valley to become a global milk-processing hub
- produce products ranging from mass-market brands to local niche and boutique products
- require improved transportation options (rail, sea)
- be based on sustainable production systems matched to environmental conditions
- involve a range of business models to support business diversity
- capitalise on its remote location as a marketing tool, e.g. the New Zealand '100% Pure' campaign.

3 Why these pathways?

This chapter documents the data presented at the EASE workshops which informed the development of the pathways models in Chapter 2. It summarises the vulnerabilities identified by the South East Integrated Regional Vulnerability Assessment, which the workshop participants validated and then built the adaptation pathways upon. It documents the projected population and climate change data for the region, along with recent employment trends within industries, which were presented to the workshops, and finally it puts all of this in the context of the influence of the neighbouring ACT.

3.1 Vulnerabilities in the South East

The SE IRVA identified six key areas of vulnerability to climate change for the NSW South East:

- economic sustainability
- community
- land-use change
- regional infrastructure
- competition for water resources
- ecosystem function and services.

These vulnerabilities were determined by employing a systems approach to consider the region's exposure and sensitivity to climate impacts (Table 12), and the adaptive capacity of its communities and government service providers to respond to these impacts. Where a sector, and ultimately the region, had a high exposure and sensitivity to a particular climate impact and limited adaptive capacity, it was considered to be more vulnerable (Figure 13). For further information or to download the SE IRVA report see www.climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Regional-vulnerability-and-assessment/South-East.

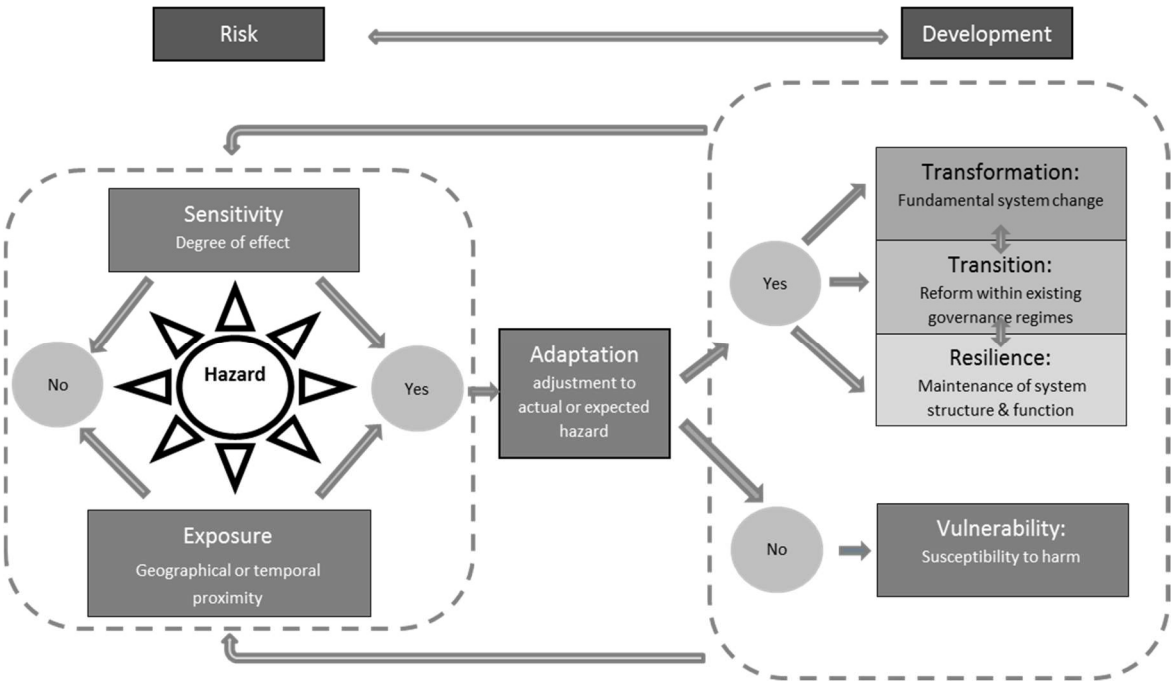


Figure 13: Adaptation pathways to reduced vulnerability in response to climate hazards (Adapted from Pelling 2011)

3.2 Expected changes to climate in the South East

Table 12: Summary of expected changes to climate in the NSW South East region

Projected temperature changes	
Maximum temperatures are projected to increase in the near future by 0.5–1.0°C	Maximum temperatures are projected to increase in the far future by 1.8–2.5°C
Minimum temperatures are projected to increase in the near future by 0.4–0.7°C	Minimum temperatures are projected to increase in the far future by 1.4–2.3°C
The number of hot days will increase	The number of cold nights will decrease
Projected rainfall changes	
Rainfall is projected to decrease in spring and winter	Rainfall is projected to increase in summer and autumn
Projected Forest Fire Danger Index (FFDI) changes	
Average fire weather is projected to increase in summer and spring	Number of days with severe fire weather is projected to increase in summer and spring

By 2050, the climate of the South East region:

- is virtually certain to be hotter, with a likely rainfall increase in summer and decrease in winter (Table 12). Snowfall is likely to decrease; however, changes in weather patterns that cannot be resolved by the climate models mean that rainfall in coastal parts of the region is difficult to simulate.
- Cold nights are expected to decrease on average across the region. The Snowy Mountains and Cooma–Monaro, in particular, are likely to experience large declines in the incidence of cold nights with 10–20 fewer per year by 2030 and in excess of 40 fewer cold nights by 2070.
- The region as a whole is expected to experience an increase in average and severe fire weather in the near and far future. The greatest increase in fire weather is most likely in spring and summer, with a decrease in autumn
- Runoff and stream flow are likely to decrease in spring and winter, particularly in the west, and increase during summer.
- Sea level is virtually certain to continue to rise.
- The rate of erosion is likely to increase on some soils. Coastal agricultural soils are likely to be inundated and acidification is likely to increase.
- Sea level rise coupled with increased flooding is virtually certain to pose an increased risk to property and infrastructure in coastal areas. Developments near coastal lakes and estuary entrances and on coastal floodplains are vulnerable.
- Widespread changes to some natural ecosystems are very likely. Those most at risk are alpine ecosystems, low-lying coastal ecosystems and those sensitive to fire.

(Source: DECCW 2010, p.115 and OEH 2014)

3.3 Expected changes to population in the South East

Population is projected to increase across all sub-regions of the South East of NSW in the next twenty years (Figure 14).

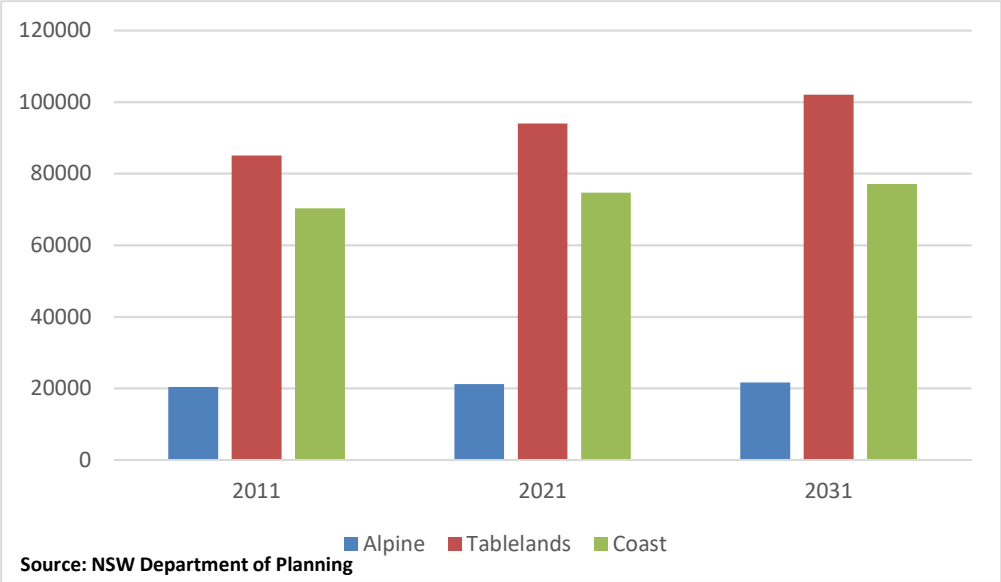


Figure 14: Expected changes to population by sub-region in the South east as presented to workshop participants

The population across the South East is also ageing. The sub-regional population age profiles show similar patterns for the three sub-regions of South East NSW (ABS 2007, ABS 2012) (Figure 15) between 2006 and 2011. In all sub-regions, 20–29 year olds make up the smallest proportion of the population due to migration to larger cities for higher education and career opportunities, breaking a regional link for careers to be built in the region (OEH 2012).

The largest proportions are in the 40–49 years age segment in the Alpine and Tablelands sub-regions (about 15% of the population) and in the 50–59 years segment for the Coast sub-region (about 17% of the population).

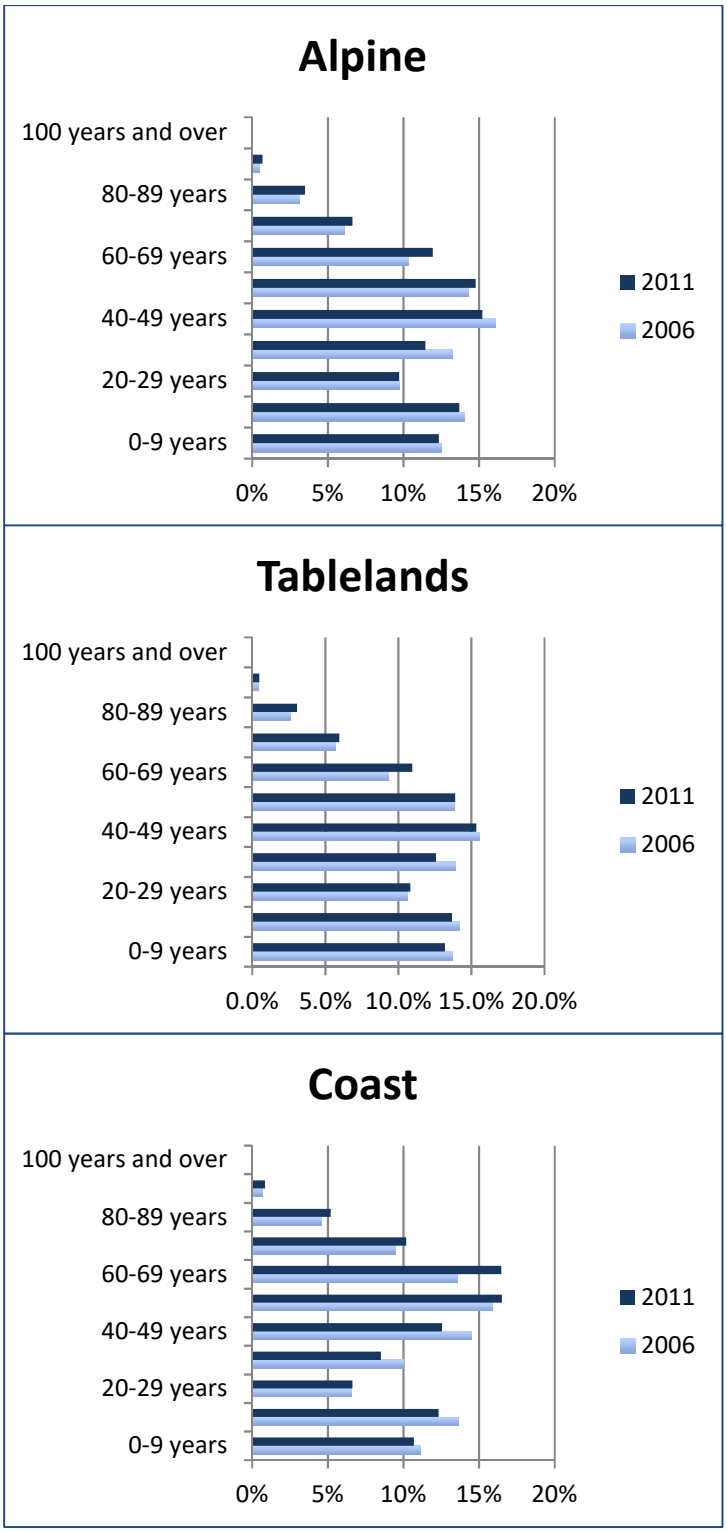


Figure 15: Population age profiles of the sub-regions of South East NSW in 2006 and 2011 (Sources: ABS 2007, ABS 2012)

3.4 Recent trends in industry of employment in the South East 2006 to 2011

Alpine

For the Alpine sub-region the industries employing the greatest numbers of people include agriculture, high street activity (such as food and beverage services, and food and other retailing), public sector employment and pre-school and school education, electricity supply (presumably through Snowy Hydro), ski and sports industries (because of the sub-region's proximity to the Snowy Mountains ski fields), and construction and technical services.

In the Alpine sub-region, 12 industry sectors accounted for over 400 new jobs between 2006 and 2011, counteracting job losses in other sectors. The sectors that grew most include ski and sport related activities, public sector employment (social, health and education services), business services (such as building cleaning and other services), food product manufacturing and basic wholesaling activities.

Tablelands

For the Tablelands industries employing the greatest numbers of people include the public sector, high street activity, agriculture, and construction services. Public administration is the single largest employment sector, but other public sector employment including defence, education, and public order and safety (attributable to the Goulburn Police Training Academy) features prominently. Social services and professional and technical services are also within the 10 highest employing industry sectors.

Between 2006 and 2011, 11 industry sectors accounted for over 60% of the employment growth. Employment growth was greatest in the public sector (including public administration, defence, social services, public order and safety, education and residential care), but growth was also attributable to building construction and construction services, as well as services related to professional, scientific, technical and computer systems. More detailed analysis is required to understand the factors underpinning the Tablelands' employment growth; however, the reasons for some of the bigger changes in employment are evident from activity known to occur in the sub-region. For example, public sector employment growth is undoubtedly related to proximity to Canberra, but also through the location of key public facilities in the region, e.g. Australian Defence Force facility near Bungendore, and the Police Academy at Goulburn.

Coast

For the Coast sub-region, top employment sectors include high street/tourism activity (food and beverage services, food retailing and other store-based retailing), accommodation, public sector employment, professional and technical services, and social and residential care services (reflecting the age profile of the sub-region).

There was overall positive job growth for the Coast sub-region. Ten industry sectors accounted for 1248 new jobs between 2006 and 2011, although this growth is offset by declines in other industries. The major growth sectors include residential care and social services, services related to professional, scientific, technical and computer systems, food product manufacturing, public sector activities (including education, administration, medical and health services), construction and food and beverage services.

3.5 Regional context

The EASE process is informing strategic planning at the regional scale for state agencies, the South East Regional Organisation of Councils and for collaborative actions between local governments. It is also a resource at a local scale for individual local governments. EASE is supported by strategic planning at both a state level, and at a regional level through the South East and Tablelands Regional Plan.

An understanding of the future of the South East region of NSW must also take into account the dominant role in the region of the neighbouring ACT. Services offered in the ACT to the South East region are accessed by NSW residents. In turn the ACT is reliant on NSW for a portion of its labour force, natural resource supply and food security.

A parallel project, *Enabling Adaptation in the ACT* (EnAACT), has undertaken a similar process with decision-makers in the major service delivery areas of the ACT Government (Jacobs et al. 2014). Additionally the ACT is considered under the NSW Government's regional planning for adaptation, and public sector managers from the ACT were included in information gathering for EASE.

The emergency management models from both projects are presented to illustrate the interconnections across jurisdictions (Table 13). While there are some differences in scale between the two emergency management models and a greater focus on the urban environment in EnAACT, there are also similarities. For example, in transition both regions seek to improve surge capacity and increase involvement, engagement and responsibility for emergency management from the community.

Common features of a transformed emergency management system for the ACT and NSW South East include:

- establishment of responsive and responsible communities
- normalisation of surge capacity that extends beyond current administrative boundaries
- a fully resourced emergency management service.

Table 13: Alignment across EASE and EnAACT in the transition pathways and transformed systems developed for emergency management service delivery

EASE emergency management model	EnAACT emergency management model
Transition	
Ex-region surge capacity	Regional (cross-border) surge capacity
Community engagement/involvement	Shared responsibility for community safety Decentralised triage and community-based care
Health information systems Pre-emptive emergency management	Adoption of innovative technology
Accessible information across agencies for planning	Inter-operability of services Lower risk built environments
Transformation	
Informed, responsive community	Collaborative co-management of risk
Fully resourced EM service	Equitable and socially inclusive services
Nation-wide surge capacity	Inter-operability and delivery of regional emergency management services
Integrated PPRR across combat-support agencies	Less vulnerable urban form
Integrated health–EM service	

4 Where are we now?

This report synthesises the process and outcomes of each of the activities conducted during the EASE integration workshops and is intended to provide an information base to identify responses and opportunities that assist decision-makers to enhance resilience and realise transformations by which the impacts of climate risks for the NSW South East region are minimised. Figure 16 provides an overview of the EASE project.

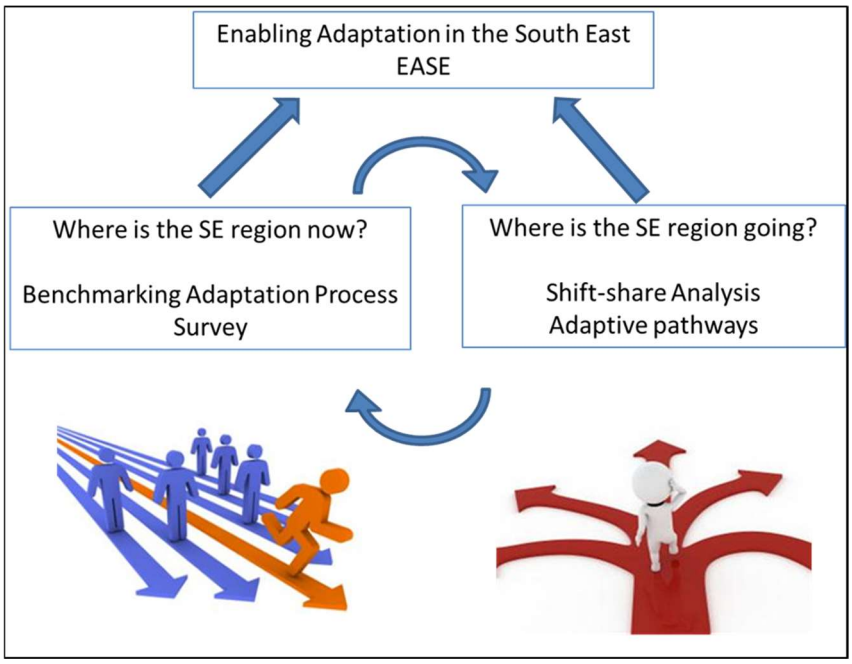


Figure 16: Overview of the EASE project

This chapter presents a summary of information on the current state of government adaptation to climate impacts obtained from a survey of people on the stakeholder list for the EASE workshops in the South East, and from a benchmarking exercise undertaken at the workshops.

4.1 Key findings of the stakeholder survey

Perceived key climate change risks

Despite the majority (77%) of respondents stating that climate change adaptation is important to them personally and in their professional roles, only half (52%) noted that climate change adaptation was a moderate to strong priority for their organisation.

Location of adaptation actions

Adaptation actions such as assessing climate risks and vulnerability are generally conducted at a local or regional scale, which provides the necessary evidence to inform climate adaptation planning. Building social capital is also important at the regional scale through building trust, expanding networks and nurturing partnerships. Research and funding to provide evidence for changes to climate policies and strategy was reported as most often occurring at a state level.

Key knowledge gaps

Knowledge of the resilience of natural resources and ecosystems to cope with climate variability and extremes, the impacts of climate change on communities and businesses, and an understanding of the costs and benefits of adaptation actions were reported as key knowledge gaps for adaptation.

Summary

The survey results suggest that the development of realistic, practical and equitable policy responses to address climate adaptation to achieve sustainable outcomes is yet to be achieved. The survey found that there is a need to:

- translate '*adaptation concepts to reasonable, time-based, implementation programs and projects*' for government
- engage the broader public on climate change and acceptance by finding ways to '*translate adaptation into the everyday workings of people's lives and jobs*'
- create a sense of ownership, and a role for regional delivery and cooperation should be fostered.

4.2 Baseline benchmarking results for the South East

Benchmarking consists of coordination through goal-setting, linking the performance of cooperating parties via monitoring, to discussions of how to improve operations in light of this performance (learning), i.e. an adaptive management approach.

Best practice benchmarking is a technique commonly used in local government in Australia for a range of purposes from community engagement to financial performance (e.g. www.pc.gov.au/inquiries/completed/regulation-benchmarking-local-government/report).

During the EASE workshops, a single region benchmarking process was trialled to compare aggregate levels of activity undertaken by local government and NSW Government agencies in the sequence of processes involved in climate change adaptation for the sub-regions of South East NSW.

Figure 17 shows the activity index for each sub-region of the South East. There were large variations in activity among adaptation processes. In general, the scores declined with progression around the adaptation process cycle. Earlier processes (such as impact assessment, vulnerability assessment and planning) in most sub-regions tended to show higher levels of activity than later processes (in particular monitoring and evaluation). The patterns of activity were most similar for the Tablelands and Coast sub-regions. There was also variation in the level of activity among the four focus areas. In general, activity was focused more often on people (society) and environment, with less focus on governance and the economy. The exception to this pattern was again the Alpine sub-region, where considerably more processes were reported as targeting governance than the other regions, particularly for vulnerability assessment and implementation.

The EASE process collated a body of evidence cited by participants to support the activity index for each sub-region. Evidence spanned all levels of government from Australian to NSW agencies and local government, and encompassed a range of scales from local to regional activities (such as the SE IRVA).

The evidence included:

- reports on extreme events from state authorities such as the State Emergency Service and Rural Fire Service
- local government commissioned research such as the Climate Change Impacts Report for Cooma

- planning documents pertaining to water sharing, sea level rise and flood and fire risk
- corporate planning documents for climate risk
- community consultation and capacity building activities such as South East Local Land Services' extreme event workshops and Regional Development Australia's regional food economy consultations with local government
- websites where information could be sourced were also listed including the Australian Alps National Parks Program and OEH websites
- water infrastructure development via Public Works improvements such as the Moruya to Deep Creek Dam pipeline, the Eurobodalla Northern Water Treatment Plant and the Bega to Yellow Pinch Dam pipeline
- limited evidence of the involvement of the private sector in adaptation processes with the exception of Bega Cheese's environmental management system, which is used to drive change in energy efficiency, heat stress on cows, succession planning and water use efficiency for the local industry.

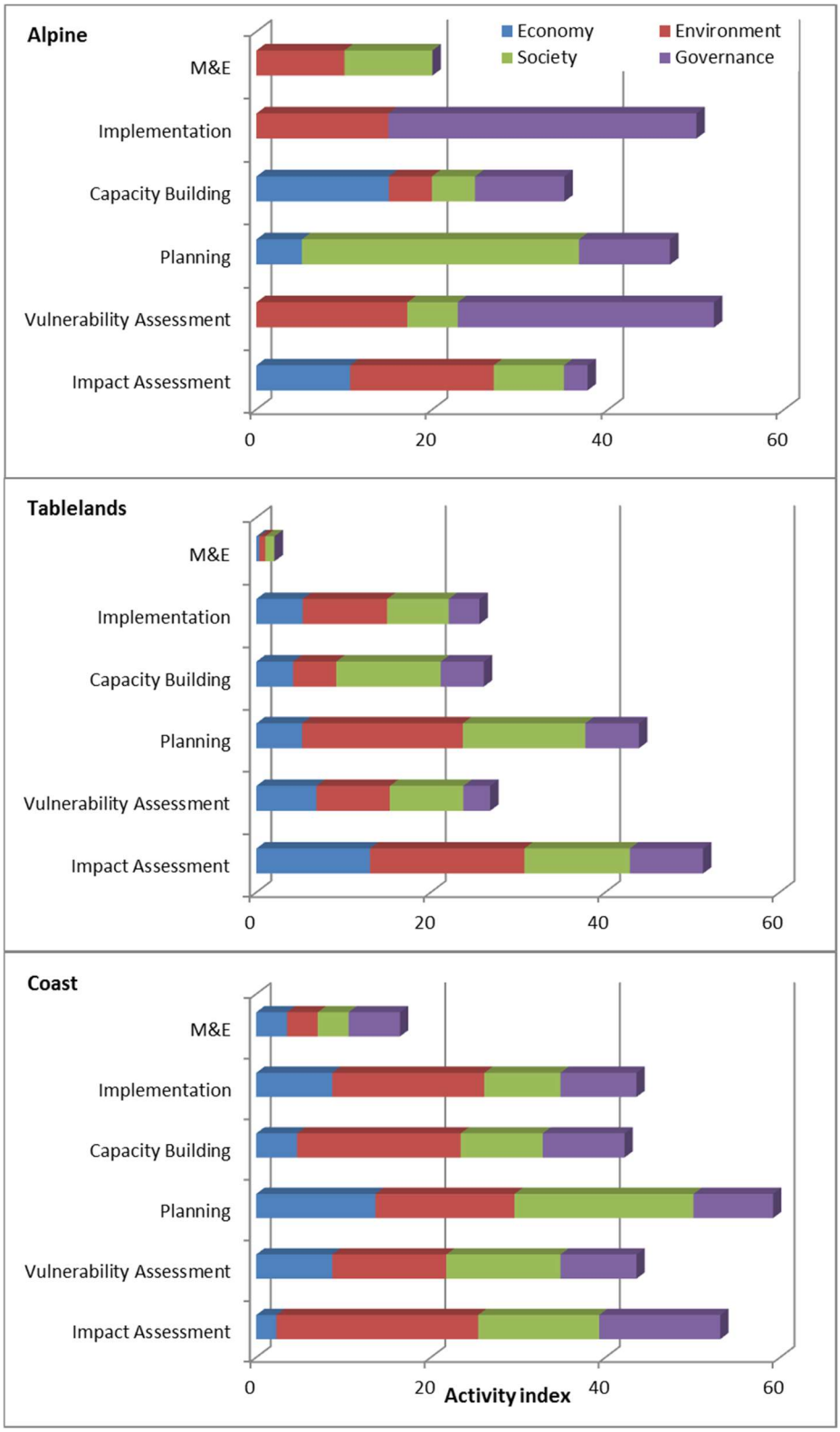


Figure 17: Level of activity in adaptation processes for each of the sub-regions of South East NSW

Stacked bars represent the focus of the adaptation process.

5 Where to next?

5.1 Projects to activate pathways

Workshop participants voted on the various pathways for each of the seven regional systems to determine the key priorities for government from the range of transition pathways. The participants then worked together in cross-sectoral groups to identify transition projects to progress toward regional transformations to address climate vulnerabilities. Descriptions of these projects are outlined in Table 14. A more extensive list of proposed actions can be found in the SE IRVA (OEH 2012).

Table 14: Pilot projects to activate pathways

Transformed system	Project description
Large regional towns	Development of regional 'smart' tele-community hubs
Coastal development	Integrated shade tree project for heat management in the central business district of coastal inland towns
Emergency management	Development of a comprehensive all-hazards communication plan at a localized and regional scale that is nuanced to local conditions to enable a localised PPRR framework
	A 'Youth Emergency Management Taster' program
Coastal tourism	Develop and support tourism alternatives and activities in South East NSW to sustain a long-term and adaptable tourism sector
Public land management	Tablelands to Coast landscape mapping to determine high conservation areas for wildlife corridors and to develop a regional strategy around biodiversity corridors
Off-reserve conservation	Stewardship payments to landholders to improve conservation of flora and fauna to build landscape resilience
Extensive grazing	Investigate and demonstrate a range of mixed enterprise options – grazing, cropping, horticulture, tourism, etc. to inform farmers and infrastructure planning

5.2 Actions underway

Since the inception of the EASE project in the South East, a number of actions to enhance regional adaptation planning have commenced, including:

- Shoalhaven City Council was awarded $80,000 in 2014 from the Building Resilience to Climate Change (BRCC) program. 'Cooling the Nowra CBD' took advantage of an urban revitalisation project at Egan's Lane Park to introduce an evaporative cooling solution and other infrastructure to alleviate heat stress on high temperature days, while also providing better civic space, shade, water and seating to meet articulated community needs.
- Queanbeyan City Council received $19,000 in 2015 from the BRCC program for the project 'Gross pollutant traps effectiveness'. This project is designed to increase local capacity to treat stormwater runoff arising from increased rain intensity and storm events, to improve water quality and ecological health in local and neighbouring waterways.

- Eurobodalla Shire Council, with CSIRO and Murrang Earth Sciences were funded $80,000 from the BRCC in 2016 for 'Building adaptive capacity against rising coastal groundwater'. The project will assess potential risks that groundwater infiltration and salinity present to infrastructure in the Eurobodalla Shire now and under projected climate change scenarios, as well as identifying potential mitigation and adaptation measures.
- Shoalhaven City Council received $60,000 in 2013–14 from the Community Resilience Innovation Program administered by Emergency NSW for a 'Strategic Action Plan for the Sussex Inlet Community'. This project engaged the local community of Sussex Inlet to develop a Strategic Action Plan to maximise their capacity to be better adapted and develop resilience to natural hazards and a changing climate. It was driven by a community-led process in a high flood and fire prone community with an ageing population for whole of community disaster preparedness and management, alongside action research conducted by Griffith University.
- Two regional scholarships were conferred in 2016 for participants from the South East to attend the Learning to Adapt accreditation course supported by the Environment Institute of Australia and New Zealand.
- The Regional Leaders' Executive (RLE), a meeting of agency leaders in the South East and Tablelands facilitated by the Department of Premier and Cabinet, made the decision to make climate change adaptation a 'priority project' reporting to the RLE.
- A Memorandum of Understanding for Regional Collaboration between the ACT and NSW includes *Adaptation* as a key reporting section, and has been identified as a potential vehicle to promote regional adaptation.
- References to the EASE process and its findings were included and helped to inform the Department of Planning and Environment's South East and Tablelands Regional Plan.

5.3 Supporting processes

Climate Change Fund

In November 2016, the NSW Government announced an Environmental Future Funding package, which includes a Climate Change Policy Framework outlining the Government's ongoing commitment to action on climate change. It also included a Draft Climate Change Fund Strategic Plan, with priority investment areas and potential actions for up to $500 million of new funding from the Climate Change Fund over the next five years. The draft strategic plan proposes three priority investment areas that will form the basis of future action plans for:

- accelerating advanced energy
- national leadership in energy efficiency
- preparing for a changing climate.

Building Resilience to Climate Change program

The Building Resilience to Climate Change (BRCC) program is a partnership between Local Government NSW and OEH to address identified climate change risks and vulnerabilities facing NSW councils.

The program was established to encourage:

- enhanced consideration of climate change impacts in local and regional decision-making
- delivery of projects that minimise climate change impacts for local and regional decision-makers

- implementation of climate change adaptation beyond current projects and programs
- fostering of adaptive capacity in local government through a community of practitioners across professional disciplines with direct experience in implementing adaptation responses across NSW.

Community Resilience Innovation Program

The Community Resilience Innovation Program (CRIP) supports a broad range of community-led projects designed to increase all-hazard disaster preparedness and build community capacity and resilience. CRIP projects are based on collaboration and partnership between local community organisations and emergency services agencies. CRIP aims to:

- encourage local communities to engage in creative, community-focused activities that will enhance disaster resilience
- develop effective partnerships and build networks between local community organisations, councils, businesses and emergency services agencies
- foster ways to effectively engage the local community in emergency management and resilience building
- share knowledge and lessons learnt about new approaches and models through project evaluation
- support initiatives that can be integrated into current business and maintained in the longer term.

CRIP is a scheme under the Natural Disaster Resilience Program, funded by the NSW and Commonwealth governments through the *National Partnership Agreement on Natural Disaster Resilience*.

Appendix A: List of EASE workshop participants

Participants in the Alpine sub-regional workshop

Organisation	Position
Bombala Council	Planning Manager
Cooma–Monaro Shire Council	Manager, Infrastructure Planning and Local Emergency Management Officer
Cooma–Monaro Shire Council	Manager, Public Health and Environment
Cooma–Monaro Shire Council	Planning Manager
CSIRO	Sustainability Economist
Department of Premier and Cabinet	Senior Regional Coordination Officer South East NSW
Department of Primary Industries	Regional Director, South East Business, Partnerships & Natural Resources Division
National Parks & Wildlife Service	Alpine–Queanbeyan Area Operations Coordinator
National Parks & Wildlife Service	Snowy River Area Manager
NSW Forestry Corporation	Regional Ecologist
NSW Office of Water	Senior Water Planner
NSW Planning and Environment	Regional Planning Officer, Southern Region
NSW Public Works	Project Manager
NSW Public Works	Regional Manager, South Coast
Office of Environment and Heritage	Conservation Planning Officer, South East
Office of Environment and Heritage	Senior Natural Resource Officer, Floodplain Management, South
Office of Regional Development	Business Development Manager, South East
Snowy River Shire Council	Manager, Community and Strategic Planning
Snowy River Shire Council	Manager, Water and Sewer
South East Local Land Services	Senior Land Services Officer, Pastures
South East Local Land Services	Land Services Officer
Southern NSW Local Health District	Director, Corporate Services

Participants in the Tablelands sub-regional workshop

Organisation	Position
ACT Environment & Sustainability Directorate	Senior Policy Officer, Climate Change Policy
Australian Department of Environment	Climate Adaptation Branch Officer
Boorowa Council	Economic Development and Tourism Officer
Boorowa Council	Planning Manager
Department of Education and Communities	Regional Coordinator Communities Policy & Programs, Southern Region
Department of Premier and Cabinet	Regional Coordinator
Department of Primary Industries	Regional Director, South East Business, Partnerships & Natural Resources Division
Department of Primary Industries	Rural Support Program Officer
Department of Primary Industries	Technical Specialist, Grazing Systems
Family & Community Services	Project Officer, Sector Performance
Goulburn Mulwaree Council	Economic Development Officer
Goulburn Mulwaree Council	Planning Officer
Goulburn Mulwaree Council	Strategic Planner
Harden Shire Council	Director Environmental Services
NSW Fisheries	Regional Manager, South
NSW Office of Water	Senior Water Planner
NSW Planning & Environment	Regional Planning Officer, Southern Region
NSW Police	Regional Emergency Management Officer, South East – Tablelands
NSW Public Works	Project Manager, South Coast Region
NSW Public Works	Senior Project Manager Engineering, South Coast
Office of Environment and Heritage	Biodiversity Conservation Officer, Planning Unit South East
Office of Environment and Heritage	Conservation Planning Officer, South East
Office of Environment and Heritage	Senior Natural Resource Officer, Floodplain Management, South
Office of Environment and Heritage	Senior Threatened Species Officer, South East
Office of Regional Development	Business Development Manager, South East
Palerang Council	Environmental Services Coordinator
Queanbeyan City Council	Planning Officer
Queanbeyan City Council	Sustainability Officer
Rural Fire Service	Manager Lake George Zone
South East Local Land Services	Senior Strategic Land Services Officer, Climate Change Planning
South East Local Land Services	Team Leader, Goulburn office

Organisation	Position
South East Local Land Services	Team Leader, Tablelands and Native Vegetation
Southern Inland Regional Development Australia	Executive Officer
Southern NSW Local Health District	Energy Manager
State Emergency Service	Deputy Region Controller
Upper Lachlan Shire Council	Economic Development Officer
Upper Lachlan Shire Council	Planning Manager
Yass Valley Council	Senior Strategic Planner
Young Shire Council	Director Planning, Environment and Strategic Services

Participants in the Coast sub-regional workshop

Organisation	Position
Bega Valley Shire Council	Coastal & Floodplain Management Planner
Bega Valley Shire Council	Executive Officer
Bega Valley Shire Council	Planning Officer
Department of Primary Industries	Regional Director, South East Business, Partnerships & Natural Resources Division
Eurobodalla Shire Council	Coastal & Floodplain Management Planner
NSW Fisheries	Aquatic Ecosystems Manager, South Coast
NSW Planning and Environment	Regional Planning Officer, Southern Region
NSW Police	Regional Emergency Management Officer, South East, Coastal
NSW Public Works	Senior Project Manager, South Coast Region
Office of Environment and Heritage	Conservation Planning Officer, South East
Office of Environment and Heritage	Senior Natural Resource Officer, Coast and Estuaries, South East
Office of Environment and Heritage	Senior Threatened Species Officer, South East
Rural Fire Service	Community Safety Officer
Rural Fire Service	Team Leader Development Assessment & Planning
Shoalhaven City Council	Team Leader, Environmental Planning and Assessment
South East Local Land Services	General Manager
South East Local Land Services	Team Leader Land Services, Far South Coast
Southern NSW Local Health District	Nurse Manager Initiatives & Projects and Disaster Manager

Participants in the region-wide integration workshop 1 – Queanbeyan

Organisation	Position
ACT Planning and Environment Directorate	Senior Policy Officer, Climate Change Policy
Australian Department of Environment	Climate Adaptation Branch Officer
Boorowa Council	Infrastructure Planning Manager
Department of Education and Communities	Regional Coordinator Communities Policy & Programs, Southern Region
Department of Premier and Cabinet	Regional Coordinator South East
Department of Primary Industries	Rural Support Officer
Family and Community Services	Project Officer, Sector Performance
Harden Shire Council	Director Environmental Services
NSW Office of Water	Senior Water Planner
NSW Planning and Environment	Regional Planning Officer, Southern Region
Office of Environment and Heritage	Biodiversity Conservation Officer Planning Unit, South East
Office of Environment and Heritage	Conservation Planning Officer, South East
Office of Environment and Heritage	Conservation Planning Officer, South East
Office of Environment and Heritage	Regional Clean Energy Coordinator, South East
Office of Environment and Heritage	Regional Clean Energy Coordinator, South West
Office of Environment and Heritage	Senior Natural Resource Officer, Floodplain Management, South
Office of Environment and Heritage	Senior Threatened Species Officer, South East
Office of Regional Development	Business Development Manager, South East
Palerang Council	Environmental Services Coordinator
Queanbeyan City Council	Sustainability Officer
Southern Inland Regional Development Australia	Executive Officer
South East Local Land Services	Senior Land Services Officer, Pastures
South East Local Land Services	Senior Strategic Land Services Officer, Climate Change Planning
South East Local Land Services	Team Leader, Goulburn office
South East Local Land Services	Team Leader, Tablelands and Native Vegetation
South East Regional Organisation of Councils	Executive Officer
South East Regional Organisation of Councils	Waste Manager
Southern NSW Local Health District	Energy Manager
Snowy River Shire Council	Manager, Community and Strategic Planning
Snowy River Shire Council	Manager, Water and Sewer

Organisation	Position
Upper Lachlan Shire Council	Economic Development Officer
Upper Lachlan Shire Council	Planning Manager
Yass Valley Council	Senior Strategic Planner
Young Shire Council	Director Planning, Environment and Strategic Services

Participants in the region-wide integration workshop 2 – Narooma

Organisation	Position
Bega Valley Shire Council	Executive Officer
Cooma–Monaro Shire Council	Planning Manager
Eurobodalla Shire Council	Coastal & Floodplain Management Planner
NSW Public Works	Senior Project Manager Engineering, South Coast
Office of Environment and Heritage	Regional Clean Energy Coordinator South East
Shoalhaven City Council	Team Leader, Environmental Planning and Assessment

References

ABS 2007, *2006 Census QuickStats: People — demographics*, for all local government areas in the South East NSW region, Australian Bureau of Statistics, Canberra, viewed April 2015, www.abs.gov.au/websitedbs/censushome.nsf/home/quickstats?opendocument&navpos=220.

ABS 2012, *2011 Census QuickStats: People — demographics & education*, for all local government areas in the South East NSW region, Australian Bureau of Statistics, Canberra, viewed April 2015, www.abs.gov.au/websitedbs/censushome.nsf/home/quickstats?opendocument&navpos=220.

Bosomworth K, Harwood A, Leith P and Wallis P 2015, *Adaptation pathways: a playbook for developing options for climate change adaptation in natural resource management*, Southern Slopes Climate Change Adaptation Research Partnership (SCARP), RMIT University, University of Tasmania, and Monash University.

DECCW 2010, *NSW Climate Impact Profile: The impacts of climate change on the biophysical environment of New South Wales*, Department of Environment, Climate Change and Water, Sydney, viewed April 2015, available at climatechange.environment.nsw.gov.au/~/media/E9B51B22CAEE42EFA45F9B13F98158F7.ashx.

Hallegatte S 2009, 'Strategies to adapt to an uncertain climate change', *Global Environmental Change*, 19(2), 240–247.

Hansen L, Gregg RM, Arroyo V, Ellsworth S, Jackson L and Snover A 2013, *The State of Adaptation in the United States: An Overview*, a report for the John D and Catherine T MacArthur Foundation, EcoAdapt, Washington, USA.

Hansen LJ and Hoffman JR 2010, *Climate Savvy: Adapting Conservation and Resource Management to a Changing World*, Island Press, Washington DC.

IPCC 2007, *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ML Parry, OF Canziani, JP Palutikof, PJ van der Linden and CE Hanson (eds), Cambridge University Press, Cambridge, United Kingdom, Glossary viewed April 2015, available at ipcc.ch/pdf/glossary/ar4-wg2.pdf.

IPCC 2014, 'Summary for policymakers', in *Climate Change 2014: Impacts, Adaptation, and Vulnerability, Part A: Global and Sectoral Aspects, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, CB Field, VR Barros, DJ Dokken, KJ Mach, MD Mastrandrea, TE Bilir, M Chatterjee, KL Ebi, YO Estrada, RC Genova, B Girma, ES Kissel, AN Levy, S MacCracken, PR Mastrandrea and LL White (eds), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Jacobs B, Boronyak-Vasco L and Mikhailovich N 2014, *Enabling adaptation in the Australian Capital Territory*, UTS-ISF, viewed April 2015, at www.environment.act.gov.au/cc/what-government-is-doing/climate-change-adaptation-and-resilience.

Levin K, Cashore B, Bernstein S and Auld G 2012, 'Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change', *Policy Sciences*, 45(2), 123–152.

Moser SC and Ekstrom J 2010, 'A Framework to diagnose barriers to climate change adaptation', *PNAS* 107 (51), 22026–22031, DOI:10.1007887107.

National Research Council 2013, *Abrupt impacts of climate change: anticipating surprises*, National Academies Press, Washington DC, USA.

OEH 2012, *Integrated Regional Vulnerability Assessment: South East New South Wales Pilot Study*, *Volume 1: Regional vulnerabilities*, Office of Environment and Heritage, Sydney, available at: climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Regional-vulnerability-and-assessment/South-East.

OEH 2014, *South East and Tablelands Climate change snapshot*, Office of Environment and Heritage, Sydney, available at: climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/South-East-and-Tablelands-Climate-Change-Downloads.

Pelling M 2011, *Adaptation to Climate Change: From Resilience to Transformation*, Routledge, London, viewed April 2015, available at talos.unicauca.edu.co/gea/sites/default/files/Adaptation%20to%20Climate%20Change%20From%20Resilience%20to%20Transformation.pdf.