Integrated Regional Vulnerability Assessment:

Metropolitan Sydney

Volume 2: Priority Sector Workshops – Summary Findings

Towards a Resilient Sydney

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ISBN 9781 74359 860 3
OEH 2015/0002
December 2014

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1 Introduction

This report (Volume 2) presents the findings from five sector-based workshops held with participants as part of the Metropolitan Sydney Integrated Regional Vulnerability Assessment (IRVA) project initiated by the NSW Office and Environment and Heritage (OEH).

The aim of the Metropolitan Sydney IRVA is to build a shared understanding of the Sydney Metropolitan region's vulnerability to climate change and to catalyse adaptation through responses that are sensitive to the reality of regional systems. A series of workshops was conducted in late 2013 with representatives from government service providers from five key sectors: human services, economy and industry, emergency management, built environment and infrastructure, and natural and cultural assets. The sector workshops provided an in-depth regional understanding of the vulnerability of the Sydney Metropolitan Area to climate change impacts. An integration workshop was held in March 2014 to assess cross-sectoral vulnerability to climate risks across Sydney and prioritise adaptation actions to address these vulnerabilities (see Volume 1).

The sector workshops allowed for intensive stakeholder engagement with local and state government representatives within the five key sectors. The aim of engaging sectorally within government was to build capacity and understanding of climate change issues and potential impacts within these sectors and also draw on adaptation examples. The process also acknowledges that the current vulnerability of government operations in Sydney is not codified or written in official documents, but rather it exists in the collective store of experience and knowledge of public sector managers. This report synthesises the process and outcomes of each of the sector workshops and is intended to provide an information base to identify responses and opportunities that assist government, private sector, non-government agencies and local communities to improve resilience and minimise impacts of climate risks for Sydney.

A total of 271 participants took part in the Metropolitan Sydney IRVA, representing 80 organisations. Participants were drawn from a wide variety of positions across three levels of government, state-owned corporations, and agencies involved in government service delivery in the Metropolitan Sydney region (see Appendix A).

Table 1: Sydney IRVA workshop sectors

Sector	Coverage
Human services	Employment, health, aged care, disability services, community services and education.
Economy and industry	Key industries: agriculture, manufacturing, wholesale and retail trade, tourism, business, financial and insurances services.
Natural and cultural assets	Natural resource management, biodiversity conservation, natural and cultural heritage.
Emergency management	Preparation, response and recovery to fire, flood, storm, drought and other emergencies.
Built environment and infrastructure	Roads and transport, energy, water and communications infrastructure, buildings and residential developments, as well as strategic, land use and statutory planning.

2 Workshop activities

The workshops used a participatory learning approach to assess the impacts of climate change on Sydney's social, economic and biophysical systems, and their capacity to adapt.

The day commenced with a presentation on the likely climate changes and socioeconomic and demographic trends for the region. Splitting into small groups, the participants were then asked to map out various impact pathways (or chains of events caused by the respective climate impact) of two climate change events that are likely to affect the Metropolitan Sydney region across a range of scales – from household in the centre, then outwards to the community, local government area, state, federal and global scales. Figure 1 shows an example of an influence diagram drawn in the built environment and infrastructure workshop, relating to the impact of sea level rise.

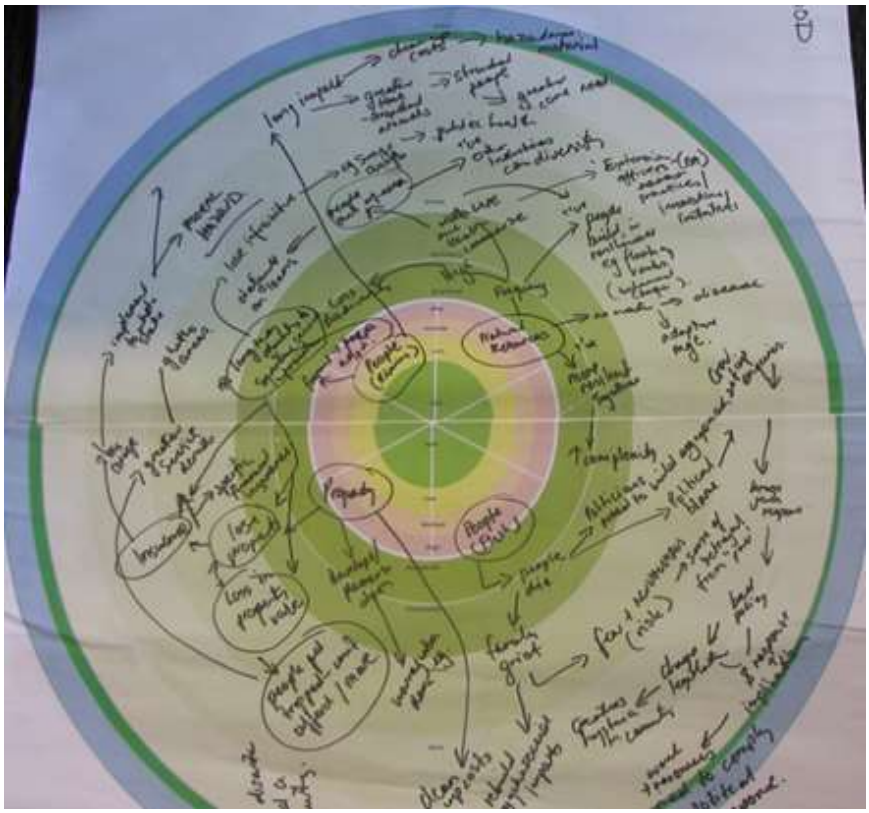

Figure 1: Example of an influence diagram, as drawn by workshop participants

This process explored the dynamic interactions that occur between sectors and exposed often unanticipated impacts on government services. Participants were asked to consider potential linkages with or dependencies on other sectors/service providers by identifying areas of common risk or vulnerability, so they could be address in a coordinated way.

Following an introduction to the concepts of adaptive capacity and the five capitals framework, all the participants use electronic polling technology to vote on indicators that either support or constrain the capacity of their communities and organisations to adapt to the impacts of climate change and variability. In a series of rounds, the indicators were grouped under the five capitals and the priority and importance of the indicators was recorded. In smaller groups, the participants discussed the meaning of each indicator,

potential constraints to adaptation, where and how these constraints could be overcome and who could play a role in actions to build adaptive capacity.

In the following sections, the key findings from the sector workshops are presented as:

- a brief discussion of the overall findings of the sector workshop
- an impact pathways diagram which records the impact pathways exercise, showing the flow-on effects of different climate change pressures across scales
- a diagram that captures snap shot of each sector (showing the interrelationship between climate drivers, impacts - direct and indirect, external drivers, cross sectoral vulnerably and adaptive capacity), and
- tables recording the detailed discussions around adaptive capacity indicators produced in each of the sector workshops.

3 Human services

3.1 Findings

The climate change impacts, including declining air quality, increased incidence of bushfires, flooding and rainfall and extreme heat waves, produce both direct and indirect impacts on the human services sector. Many of the direct impacts were identified by participants as affecting human health; for example, health-related illnesses such as increasing respiratory illnesses and water borne diseases. Examples of indirect impacts include those on human resources for health and rising insurance costs. However, it was noted that the most marginalised groups (homeless) and those with existing vulnerabilities will be most severely impacted. These impacts were exacerbated by existing drivers of social vulnerability such as increased costs of health services, population growth, poor land-use planning (e.g. loss of agricultural lands) and current health trends such as an ageing population and increase of lifestyle diseases. The interrelationships between the sectors mean that various pressures shaping these sectors also have flow-on impacts on the human services sector. Such impacts include NSW budgetary constraints, increasing demand for emergency management services and loss of connection to culture and place.

A range of strategies were identified during the workshop to build the capacity of the human services sector to deal with the impacts of climate change and existing stresses. These include developing skills for improved collaboration (e.g. multi-agency approaches) and strategic planning across the three tiers of government. This also involved developing improved mechanisms for working together and facilitating co-learning between health and community services. The provision of alternative funding models that mainstream support for adaptation activities, through the exploration of various novel funding sources not limited to government, was also considered. Discussions also focused on the need to reprioritise health and community services budgets to address climate change impacts on the most vulnerable communities, as well as widening health inequalities. A significant area where such investments are needed related to an improved understanding of climate change impacts on mental health and the associated strategies required to build the resilience of those suffering from mental illnesses.

Greater understanding of heat island effects, particularly in the Western Sydney region, was also highlighted as a key strategy in building adaptive capacity. Linked to this was the need to invest in green spaces, protecting existing green corridors outlined in Local Environment Plans (LEPs), as well as integrating targets for green spaces within strategic government policies. Such investments were also seen to enhance adaptive capacity through socially activating urban spaces (e.g. new places for communities to meet and exercise), thereby improving the wellbeing and social capital of communities. Civil society organisations (e.g. NGOs, volunteer networks) were also observed to have a key role to play in building the adaptive capacity of communities experiencing health related impacts from climate change; however, it was noted that human service organisations also require the strengthening of their own organisational capacities if they are to provide improved support and service delivery.

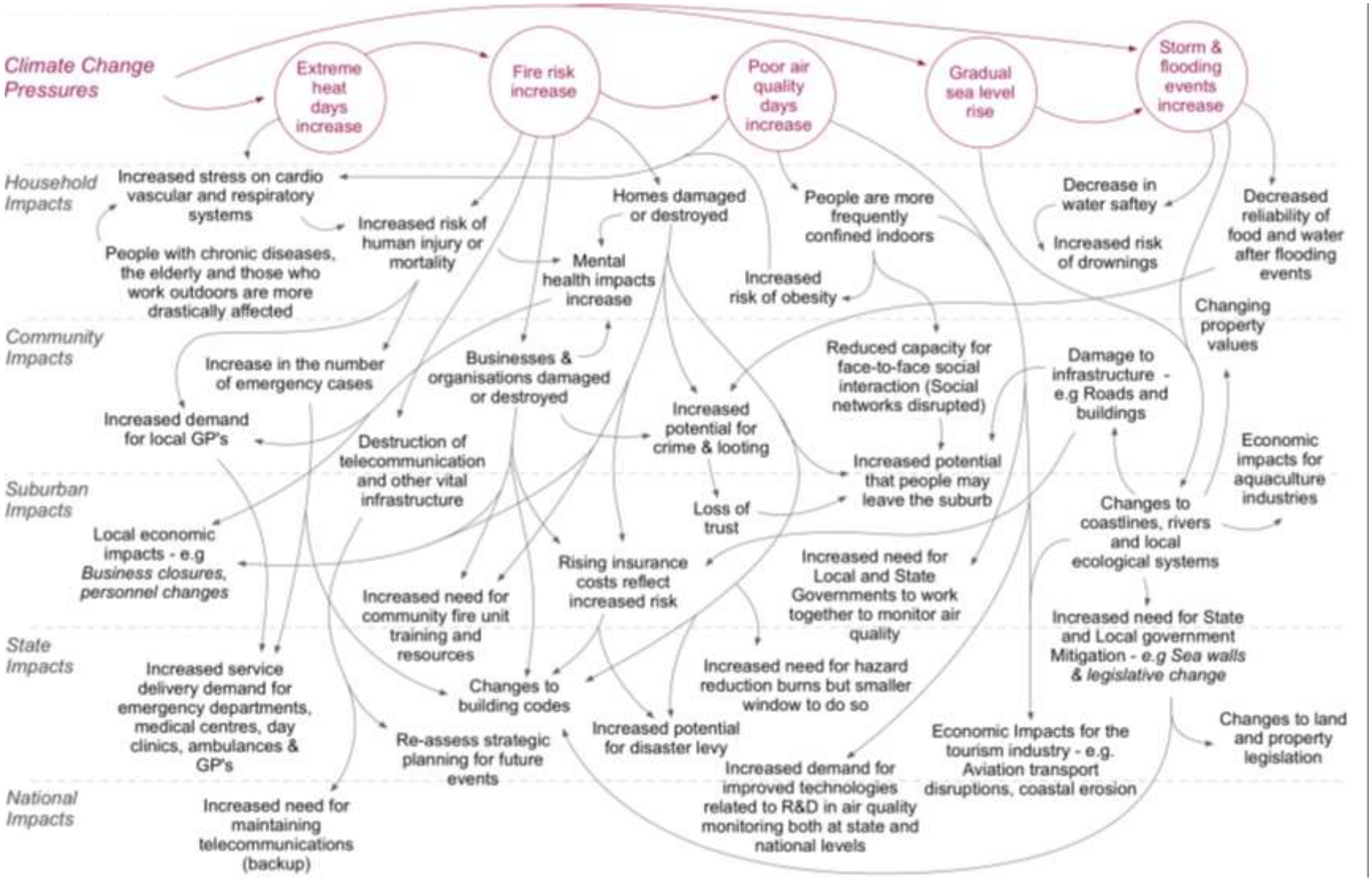

Figure 2: Impact pathways diagram – Human services

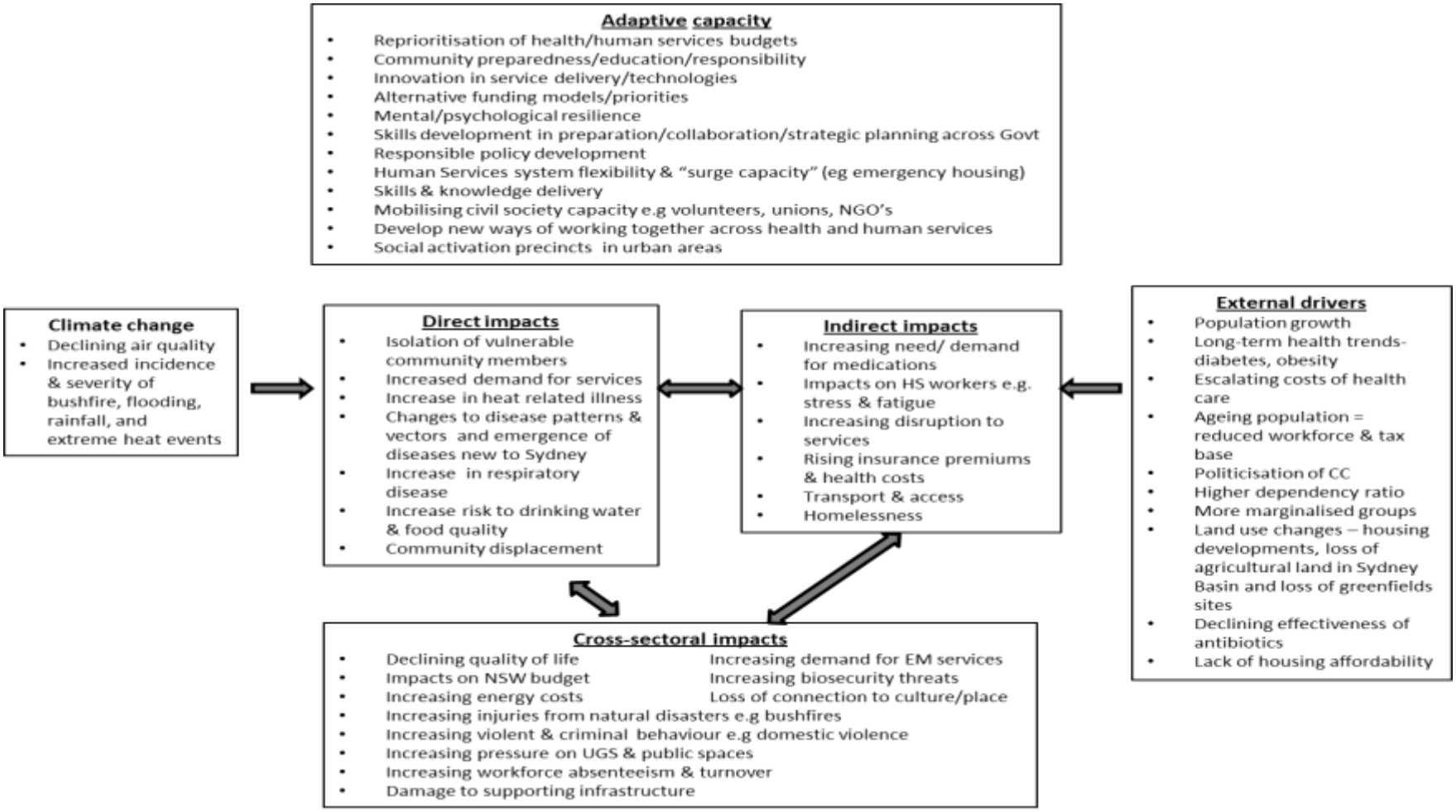

Figure 3: Human services sector vulnerability to climate change in the Sydney region

3.2 Workshop outputs

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Financial capital				
Changing priorities	• Changes in political set up/agenda/will	**Constraints:** • Democratic system that promotes short termism • Political culture pandering to cost of living concerns • Funding for incentives • Decrease in incentives (solar tariff) • People don't think it's necessary (here and now) • People don't feel impacted	**Change needed most:** • Global change (would influence Australia) • Change needed at every level	• Regulations planning • Influence gross costs to mobilise/advocate for change/give information needed
Moral hazard	• People/organizations with assets not taking responsibility and expecting others (community/government) to bail them out	**Constraints:** • Political fear about discussion of issues unpopular in the community such as rebuilding and relocation of exposed community members • Wanting things to stay the same – want to rebuild in the same location in the same way • Attachment to place: 'How dare you tell us not to rebuild' • People want the 'right to do as we please' – disregarding cost to community	**Change needed most:** • Insurance companies • Local government • State government regulations	• Education/communication of risk to community • Regulation – better definition of rules around risk and assistance • Transparency (in particular about changes in flooding risk)

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Competing priorities	• Things which government prioritises today (not prioritising climate adaptation) • climate adaptation is abstract/long-term so other more easily defined issues get priority • At community level building codes prohibitive to adaption	**Constraints:** • Short termism/bloody minded ignorance • Lack of political will to prioritise adaption • Insurance/private sector drive change • Households not having sufficient information or finance to adapt	**Change needed most:** • Transparency of decision making/puts pressure on decision-maker • More communication (information) • Media	• Councils to provide information on climate adaptation to their communities
Sources of funding/funding models	• Range of funding models – not all explored – target different sectors to encourage climate adaptation outcomes • Funding sources and models determine availability for communities and sectors	**Constraints:** • Funding sources and models reflect lack of priority given to climate change by government • Who's responsible for climate adaptation? Within agencies/Government/ funding streams (no governance of climate adaptation) • The term 'climate change' – politically unsavoury terminology • Funding in general (sustainability) reduced • Over-reliance of community on government – no 'rainy day' fund	**Change needed most:** • Need to think more broadly about funding models • Less red tape attached to funding • Leadership outside government • Funding sources tied to outcome so no clear geographical focus	• OEH could offer a research grant to investigate funding models • Involve lobby groups in advocacy for funding at political level (especially directly lobbying government ministers) • Crowd source funding

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Human capital				
Health (mental/ physical/ spiritual)	• In the short term, hazards will increase injuries. In the longer term, many of the effects of chronic diseases, such as diabetes, will be amplified in the community by climate change • Making vulnerable communities and institutions more vulnerable • Adverse impacts are expected to be greater in communities where people are more isolated with fewer community connections – this affects support for people with poor physical and mental health • Climate change will result in differential health impacts that will affect disadvantaged communities most, causing an increase in health inequality across the community • Mental health of the community, in particular, will need consideration as a result of an increase in extreme weather events • Impacts are not only confined to individuals with compromised health, the health of the community is reflected in the health of human service sector workers	**Enablers:** • International groups proactive in human health impacts (e.g. WHO) • National and international coalitions focused on chronic diseases • Overwhelming threat to life as we know it – provides a stimulus for action **Constraints:** • Complexity of the issue and the scope of response required • Lack of awareness of climate change impacts on mental health • Not currently a priority for human service agencies	**Change needed most:** • Vulnerable populations require greatest support but one size doesn't fit all • Health Authority IES need to actively plan for climate change impacts in their regions • Gender is an important factor; men need to be more proactive in caring for their health • People with mental illness in particular need increased recognition and community support	• Disaster planning needs to be remodelled to cope with climate change events. Disaster response needs to be able to develop resilience as well as respond to disaster events • Health professionals need to be more willing to speak out about climate change impacts in collaboration with science and engineering groups • Needs champions for action – people recognised by the community as 'moral beacons', e.g. retired judges, religious leaders • Civil society needs to form coalitions of the concerned and pressure for action • Give higher priority in health budgets to support people with mental illness • Agency leadership groups, such as regional clusters, should be more active in acting on climate change • A Productivity Commission-style review into cost of inaction on adaptation to climate change in the human services sector • Improved housing options for homeless/boarding house residents

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Skills and knowledge/ training	• Lack of skills and knowledge among health staff to help community prepare for climate change • Communicating likely impacts without causing panic in the community • Skills in engaging community to develop and implement climate change strategies in collaboration with other agencies • Agency management need to recognise climate change as a community issue Sharing of knowledge about climate change through engagement with local families • Knowledge and skills to develop resilience in children and young people • Community with resources needed for climate adaptation • Recognise communities as knowledge holders • Health service staff generally lack skills/knowledge to plan and prepare for climate change • Human services sector clients are not aware of the problem and are not responding	**Enablers:** • Lack of resources forces collaboration across NGOs, governments and private sector • climate change problem focuses on local community development approaches **Constraints:** • Silo mentalities among government agencies – 'not my/our problem' mentality • Lack of interest among senior health service staff • Lack of trust in communities • Not recognising the inherent knowledge and strength in communities • Government aversion to debt • Culture of blaming others • Conservatism of governments • Short-term focus • Lack of resources (money, human, educational) • Political ideologies • Obsession with economic growth	**Change needed most:** • A sense of urgency in the community but change should primarily come from government • Vested interest in some sections of the community limits action and needs to be addressed • Inspiring political leadership that encourages action at senior levels of government	• Service integration • Place-based multi-agency approaches • Governments need to direct power, decision-making and trust • Strong political leadership • Clear messages that are authoritative and believable

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Risk perception	• A lack of urgency of what impacts may mean within the human services sector • Political risk of action among elected officials often over-rides the future threat of climate change • Insufficient pressure from community for government and public service preparation and action • Current lack of impacts of climate change on individuals' daily lives encourages lack of risk perception	**Constraints:** • 'Tragedy of the commons' – everybody's problem so nobody takes responsibility • Political persuasion/ideology of Federal Government leadership • Climate variability is engrained within the mindset of Australians means they become tolerant and accepting of climate risk • Lack of sense of urgency of seriousness of climate change impacts • Lack of societal engagement with effects of climate change • Media reporting approach to disaster is often de-personalised and sensationalised in the media	**Change needed most:** • Media – need trusted sources of clear information • Business needs to see climate change action as being in its own interests to take climate change seriously • Government leadership • Community engagement with climate change information/issues	• Community champions to explain risks • Bipartisan endorsement of climate change action • Communication strategy campaigns • Religious leaders need to take action

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Social capital				
Engagement/ consultation	• Full circle communication – agencies actively seek feedback • Get people on board – to change behaviour • Community education • Who should be engaged (TAFE): Staff, students, employers of students • Two way process • Transparent communication • Consistent messages	**Enablers:** • Self – interest – clearly describe to people how climate change will affect them **Constraints:** • Diversity of views • Confused messages – need consistent message that climate change is real • Denial of the problem • Absence of policy within human services agencies • Short termism in politics • 'Artificial consultation' – to be seen to consult but not really	**Change needed most:** • Clear frameworks • For government currently diverse views, short-term focus, climate change needs to be above politics • Requires leadership on moral rather than political grounds **Change needed least:** • Natural disaster management: community tuned into message whether they are impacted or not – providing feedback on consultation	• Political messages should be recast to acknowledge that climate is changing regardless, without the focus on human induced changes • Government: must set guidelines and information on when consultation is occurring and ensure that it happens • Government agencies need to 'practice what we teach' on sustainability • Government needs to demonstrate best practice in consultation and engagement • Need more resources allocated • Working in political environmental – public service can't do what is not politically accepted. Change needs to begin at highest levels of government • Focus messages on positive messages 'what is possible' rather than fear/scaring people

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Legislation/policy	• Legislation provides both rules and guidance • Includes both 'carrot and stick' to be effective • Set of values to enforce • Create values in community – change public opinion, e.g. anti-discrimination, smoking • Protect rights • Control society	**Constraints:** • Long lead time for change to be implemented • Political will to frame effective climate change policy is lacking in government • Community values currently constraining policy development – general loss of interest in climate change – but can be a source of change, e.g. community currently placing greater value on farming over mining (Lock the Gate), but support can vary among communities • Shift of responsibility among levels of government – Fed, state, local • Implementation is important – if legislation is not enforced nothing will change vested interests • Current political ideology • Cost – government doesn't want to increase cost of living (fear of voter backlash)	**Change needed most:** • Change social norms • Leadership in government • Vision – bipartisan political support • Community – communicate what will happen to the things people value	• OEH – look at other areas that have been successful in creating social change, e.g. anti-discrimination • Planning – not build in hazard prone areas, take climate adaptation into government decision-making

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Networks	• Formal and informal fabric that binds particular groups together and includes: online networks, schools, workplaces, community groups, families and clubs • How people integrate in society • Communities of practice • Connections between different departments and levels of government	**Constraints:** • No core network in the sector– if not a strong network, limited changes • Lack of information • Resistance to change • Time and resources poor to participate in networks • Bureaucracy not supportive • *Towards Resilient Sydney* – promoting change through events • Limited knowledge of existing networks	**Change needed most:** • Inter-agency networking • Cross stakeholder • Foster trust and confidence to strengthen networks • Need champions	• Local Government NSW networks • Linkages between plans – councils' integrated planning and reporting linked to State Plan • Create a network map – what networks already exist
Planning	• If you have an effective plan in place you can anticipate outcomes; assists communication of effects and preparation • A range of plan and planning processes are important for the sector including: land-use planning, strategic planning, demographic profiling and population planning, place making, services planning, corporate planning • State Plan important in integrating planning	**Constraints:** • Ineffective consultation • Competing objectives • Political environment and will • Lack of direction and knowledge • No shared vision – knowing where we want to be • Lack of finance • Short-term view – absent long-term objectives. Short term doesn't lead to long-term goals	**Change needed most:** • Political will to change • Co-ordination between council/state/Fed • Long-term vision • Bipartisan agreement • Quadruple bottom line considerations	• Community – demand political will • More interaction between government and community • Consultation panels • Regulatory requirement for climate change planning

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Physical capital				
Power	• Physical infrastructure that provides generation capacity (upstream) and service provision (downstream) • The way power is delivered impacts on human services, i.e. power lines cause fires which impact on emergency management and human services sectors • Diversity in stock/type and public/private power is important • Green power – market diversification leads to greater choice for people, which requires incentives to change • Decentralised systems at different scales – energy society • Population density and changing demographics affecting supply and demand • Connection to neighbourhood • Standards	**Constraints:** • Legacy systems – gold plating (power lines; IT) increases cost of transition to new forms • Need more research to promote more reliable alternate sources – Federal Government policy and incentives? • Community behaviour in relation to consumption • Privatisation of public services • Cost benefit analysis and financial inability > financial/economic focus, therefore is it the best/most resilient • Distributed power generation makes grid management more difficult for electricity	**Change needed most:** • Community behaviour • Balance in energy usage/expenditure, e.g. city celebrations use increased electricity contrasted with behaviour change messaging • Power security – needs to be included in long-term planning • New developments – opportunity for energy efficiency development • Locations – Western Sydney higher electricity demand because hotter and a growth centre; most new developments rely on air conditioning, therefore higher power draw	• Incentives for behaviour change – state and local government, individuals • Electricity providers – long-term planning – need more competition • TAFE/universities and industry – more research and innovations and lead by example
Services – health/education	• Service availability is dependent on access, location, service reliability, capacity, flexibility, design aspects	**Constraints:** • Individual and community scepticism about climate change • Decision-making too heavily influenced by costs of action	**Change needed most:** • Building design and management (education to ensure changes are	• State and federal government – provide incentives to drive triple-bottom line outcomes • Provide evidence to infrastructure developers that

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
	• Power source for health services	• Legacy systems and large investments in existing modes of service provision • Lack of available land to accommodate expanded services • Perceived affordability • Economic driven perception/society, e.g. costs of standard building vs green building models +multiple and benefits • Technological redundancy (constrains and promotes) **Enablers:** • Exposure to major climate event • New technology and knowledge • Education of next generation for decision-making • New 'greener' materials, buildings • Legislation such as 'green stars' • Public–private investment/donations for infrastructure • New markets, i.e. overseas students • Research and development	implemented in new infrastructure) • Life-cycle costing – long-term benefits – future investments, therefore design needs to incorporate climate change • Socioeconomic, environmental, civil leadership, cultural change • Recognition that long-term recurrent savings will/or may out-weigh the additional upfront infrastructure costs • People who commission buildings most need to change • Lack of incentives to drive triple-bottom line outcomes • Government (state and federal) has a role for incentives for assisting sustainability in building/infrastructure	long-term recurrent savings of sustainable building is economical despite the additional upfront infrastructure costs • Raise awareness of industry of the long-term economic benefits of sustainability – architects, designers, developers, engineers, private (universities and healthcare)

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Infrastructure	• Roads important for emergency access and evacuation • Electricity/power – back-up systems in hospitals, shut down in service (e.g. education) • Transport – private/public • Social infrastructure • Telecommunications, no information share, no education, no warning of disruption • Water infrastructure (in particular stormwater management to reduce potential flooding) • High speed internet will drive changes in the sector	**Constraints:** • Local government funds for roads – urgency of funding to roads can be to detriment of other services/infrastructure • Lack of knowledge re standards for future planning, i.e. road/drains/bridges • Legacy effects – electrical wiring is partly underground now, but funds to transition entire system difficult to access, i.e. safer in storm events/fires • Uncertainty of future impact • Local government boundaries – inconsistency between state/regional/LG planning	**Change needed most:** • Political will • Long-term planning and accountability • Long lead times for impacts to appear, i.e. water security planning in flood, etc. • Funding and resources for councils to prioritise service infrastructure	• State – infrastructure funding models need to account for long-term impacts and ensure local government has resources to undertake necessary measures • Greater use of multi-level partnerships between federal, state and local governments
Housing (homes)	• Growth areas should be a focus of effort for innovation in affordable design and housing choices that reflect community identity and distinctiveness • Adaptability in housing is important to cope with future climate change • Provision of social infrastructure, services, and employment needs to match housing development in new areas	**Constraints:** • Stigma > house vs home (public/social) • Focus on greenfield development for new housing • Lack of affordability of housing options in Sydney • Difficulty of retrofitting adaptation • NSW Government reliance on housing for revenue through stamp duty • Developer monopolies – leads to construction of 'McMansions' with little diversity in housing styles/models	**Change needed most:** • Lack of social/public housing means increased vulnerability of disadvantaged in the community • Urban design and building design resilience • Increased green space needed	• Local government to increase green space and incorporate provision for green space in development designs • State needs to improve the provision of social housing

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Natural capital				
Multiple events	• Increase the risk of mental health impacts in the community and among human services staff and social disorder (e.g. looting) • Could be caused by climate impacts coupled with other types of natural disasters, e.g. drought, fire, flood, hail, East Coast lows, cyclone, tsunami, earthquake • Rental shortage after bushfires in Blue Mountains • Strained emergency services • Surge capacity needed to cope (hospitals, combat agencies, welfare agencies, ambulances) • Our ability to respond may be compromised • Emergency housing, food, shelter for domestic pets and animals	**Constraints:** • Limited resources – lack of strategic planning at government level • 'It won't happen to me, hasn't happened before, and won't happen now' • Political will • Lack of volunteers • Strains the community • Lack of agency collaboration and communication • Agencies' 'wants' take precedence over 'our' solution **Enablers:** • RFS/SES good at engaging communities to prepare	**Change needed most:** • Community preparedness • Strategic planning at a state level • Protection of vulnerable populations and community members • Understanding impact on mental health	• Better land-use planning (particularly in areas currently considered out-of-hazard) • Community cohesion – building social capital where needed and recognition of existing connected communities • Rehearsal/exercises (drill) of simulated multiple events • Education around cause and effect. Overseas examples, e.g. Cyclone Sandy in US • Need 'terrorist tweet' style readiness (central agency coordination)

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Food supply and security	• Local food/food miles/food safety. Reliance on imports (from other domestic regions and overseas) risky • Concerns about animal welfare may change future societal food preferences • Food for growing population in Sydney • Foreign ownership of Australian land to supply food for overseas consumption • Over-consumption of some foods impacts on human health (obesity, diabetes) and increases food waste • Seasonal food – production of some foods impacted more by changed climate • Consumer demand is a big determinant of food requirements for Sydney	**Constraints:** • Current consumer attitudes limit change • Changing lifestyles – time poor, more take out • Government policy re tariffs on imports mean some Australian food producers not viable • Availability of alternative food sources • Legislation not supporting local food production • Ability of the natural environment to support food production already under stress • Cost of production vs returns mean many farmers in Sydney area grow turf not food	**Change needed most:** • Supports for local food production through 'Free Trade' rather than global industrial production • Consumer attitudes – lifestyle choices, cost of living – politicised. 'We're doing it tough so buy cheap food' • Protecting market gardens – providing space for agriculture in Sydney • Duopoly of big supermarkets ensures only the cheapest options, to the detriment of Australian farmers • Management of the environmental constraints on food production • Consumer preference – 'cheap food in one location'	• Australian Competition and Consumer Commission legislation needs to be changed to support local food producers • Community needs to be more active to lobby for change • Consumer preferences need to change to ensure 'buy local' support • Government needs to ensure local agriculture land is preserved in planning for population growth in Sydney • Restaurants driving local food ideas should be promoted and supported, e.g. promote benefits of veggie patch over swimming pool in Sydney's backyards, Hawkesbury Harvest supporting Sydney's local food producers • Increased consumer support for local produce – buying Australian owned locally, free trade internationally

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Water security and quality	• Ensuring efficient, adequate and continuous security of supply • Disease prevention by ensuring potability of water • Future service availability could be compromised • Securing a supply of water for agriculture • Water for the environment – to ensure ecosystem resilience • Engagement with water providers	**Constraints:** • Current government water policy/licensing • Communities' attitudes – 'who shouts the loudest', cultural use, ethnic diversity • Water efficiency linked to drought (scarcity), e.g. recycled water • Price of water is too low to promote resource efficiency • Community preferences for bottled water vs tap water • Climate variability leads to a 'stop–start' policy environment	**Change needed most:** • Urban users and the peri-urban farm community • Community attitude to water (linked to government priority) • Community consultation in relation to government policy, engagement and ownership of water issues • Disadvantaged people – particularly hospitals need assistance to reduce vulnerability • Strategic vision to manage future change • Water efficiency of infrastructure	• Government – needs to be transparent and strategic, needs to communicate effectively around water's importance, the need for efficiency, etc. • Engagement with lobby groups • Consider rate reduction for efficient water users • Encourage community to implement 'best practice in your own household'

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Green space/ urban heat islands	• Non- reflective surfaces (black roofs/road) • Reducing heat build-up in city • Pressure on existing infrastructure: air conditioning on trains/buses not working • Recreation spaces with vegetation • Community gardens, parks, backyards • Green infrastructure – green walls • Green spaces can improve community health (especially mental), help reduce chronic disease and promote exercise	**Constraints:** • Current preference for trading-off green space for increased floor space in residential dwellings • Cultural changes (inside living) expectation of comfort. Bigger houses result from higher standard of living • Lack of incentives for green space • High cost of new technologies such as enabling harvesting stormwater from industrial areas to water golf courses • Planning regulations such as BASIX, SEPP 65	**Change needed most:** • Western Sydney (recognised urban heat island) • Protection of existing green space (through Local Environment Plans or Regional Growth Plans) • Dept of Housing greater green space provision for disadvantaged communities	• Improved urban designs to incorporate green space at precinct scale • Provision of trees and urban green space in key strategic policies

4 Economy and industry

4.1 Findings

Climate change impacts such as extreme heat, storms and flooding, fires and air quality, extreme events and gradual sea level rise produce both direct and indirect impacts on the economy and industry sector. Direct impacts include those related to reduced workforce mobility, reduced access to business premises, declining health of workforce and damage to business premises and associated infrastructure. Examples of indirect impacts include those relating to declining business viability and productivity, increased costs of work cover insurance, loss of access to finance to prepare and recover, and changing consumption patterns. Both direct and indirect impacts combine to produce cross-sectoral impacts such as rising demand for and cost of power, declines in the Sydney stock market and impacts on financial markets, rising cost of primary production in competition with other industries, loss of property values and cost shifting to consumers. External drivers that were considered to be exacerbating social vulnerability to climate change impacts include political and policy processes, scepticism in the business sector about climate change impacts and costs, infrastructure spending, dependency on imports, poor coordination between the various tiers of government and short-term economic focus.

A range of strategies were identified to enhance the adaptive capacity of the economy and industry sector to climate change impacts and existing stresses. These include targeted assistance and incentives programs for businesses related to disaster prevention, preparation, response and recovery. It was noted that businesses also need to be proactive and engage with climate risk assessments and formulate continuity plans. Greater opportunities and mechanisms that support innovation such as developing the skills/knowledge of the sector or changes to institutions were also identified. Innovation through improved information technology and telecommunication systems were identified as critical to providing access to new data and emerging technology required by businesses. The need for resource sharing and coordination across various sectors (e.g. between small businesses and larger organisations) was also identified as a key strategy for cross-fertilization of knowledge related to climate risks and the various types of innovations that may be required to overcome such risks. Linked to this was a need for businesses to engage more with local communities through various local events such as workshops. The creation of greater opportunities related to flexible work arrangements that can support a mobile workforce, and provisions for businesses to operate from home were also seen as a key strategy to address climate risks.

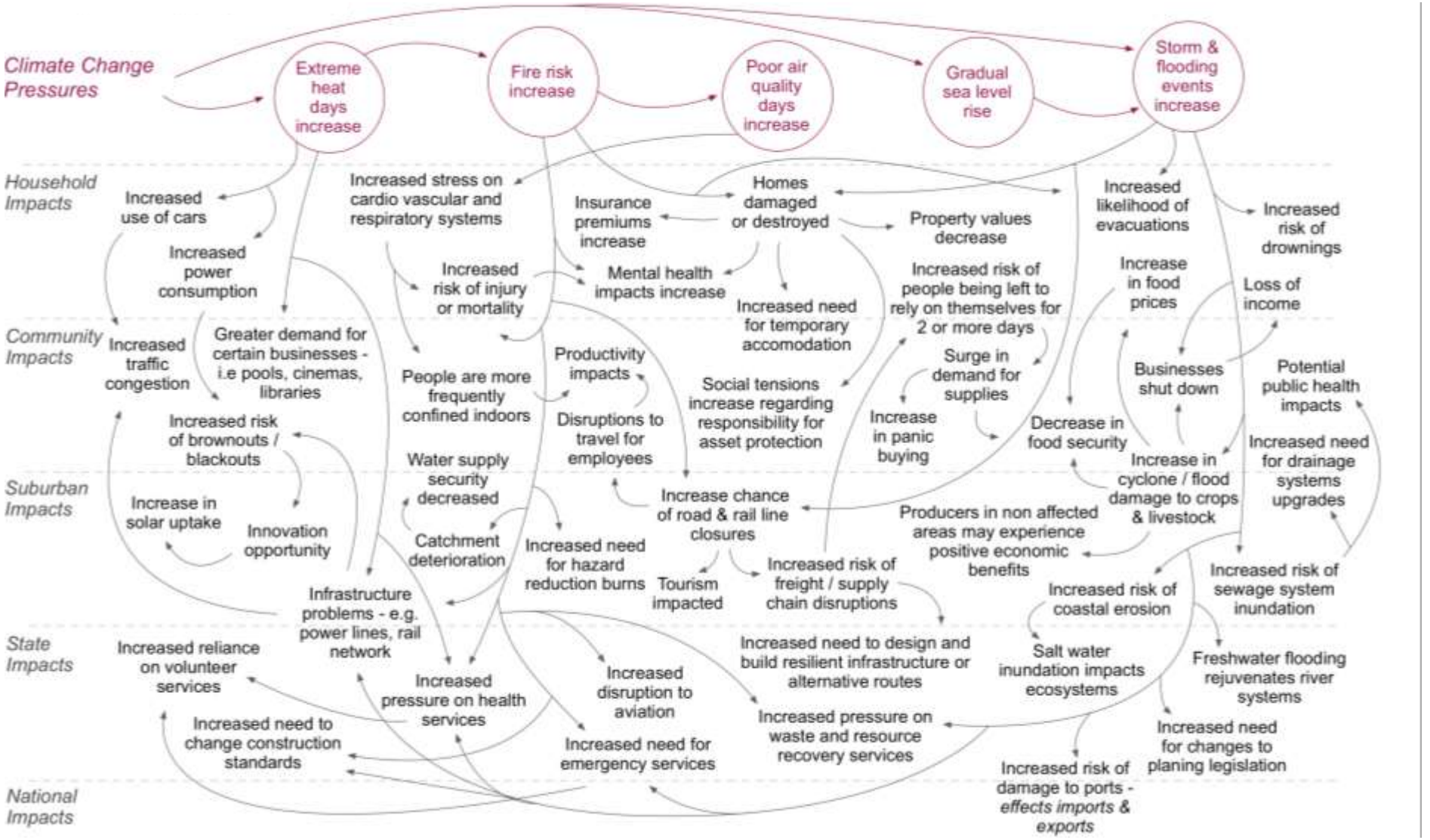

Figure 4: Impact pathways diagram – Economy and industry

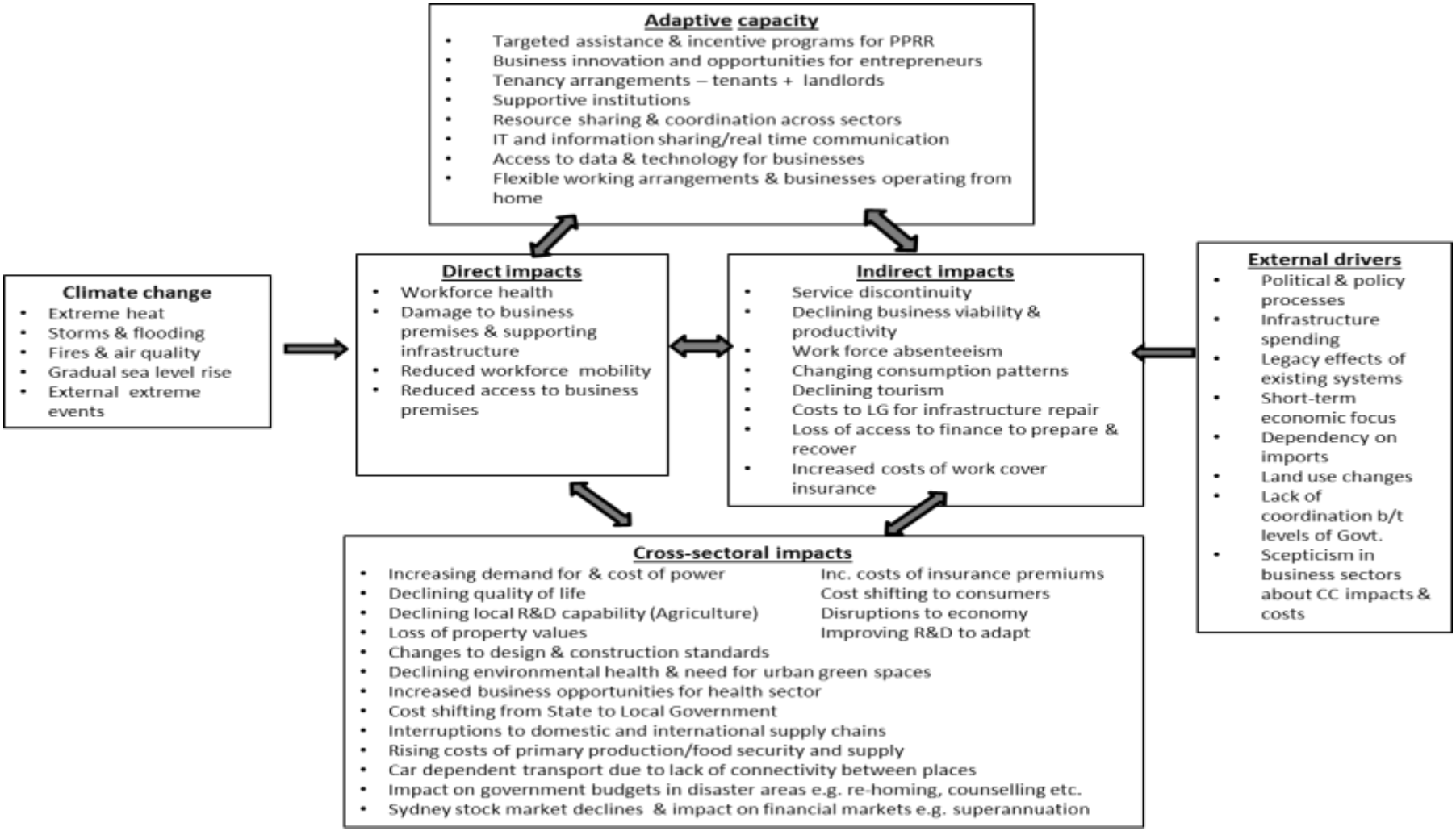

Figure 5: Economy and industry sector vulnerability to climate change in Sydney

4.2 Workshop outputs

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Financial capital				
Funding and budget priorities	• Access to funding for commercial activities • Funding needed to support community adaptation and resilience to climate change • Each community needs to inform priorities	**Constraints:** • Reactive funding • Prioritised short-term planning • Residents do not want to fund non-priorities (commercial activity = nuisance) • Prevention methods • Multiple funding sources – means division of priorities **Enablers:** • Construction sector encourages infrastructure funding	**Change needed most:** • Blue Mountains • Investment/creation of different financial arguments to promote reprioritisation • Infrastructure sector • 'Transition', e.g. business strategies need to account for long-term planning and seek innovative solutions • Funding priorities – long-term • Business tax concessions for climate adaptation • Planning and leadership needs to come from both government and the private sector	• State and Federal governments need to allocate funding for infrastructure improvements – recognising that investments may be heterogeneous across areas • Community needs to take more responsibility in lobbying for specific priorities • Insurance industry pressure • Superannuation funds could be invested in climate adaptation • Government procurements requirement should specify climate adaptation
Incentives/ disincentives (e.g. capital + trade)	• Way of changing behaviours and investments • Tool (blunt or sharp) to achieve policy objective • Education and support programs too, or zoning, e.g. Conservation Agreement	**Constraints:** • Lack of awareness of incentives that are available • Government out of step with what businesses need • Ideology or policy **Enablers:** • Immediacy of climate risks/threat	**Change needed most:** • Appropriate application for business/sector • Incentives for community climate adaptation action • Energy sector regulation	• R+D to address climate risks • Essential services need to be encouraged to be more flexible, more adaptive and less carbon intensive • Example, get co-generation or renewable energy viable

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Sources of funding/ funding models	• Business ability to access funds to change operations/infrastructure to be more environmentally friendly • Providing funding to write legislation/policy • Consultation process • Support/subsidy programs for industry to implement initiatives • Debt funding/venture capital/angel investors for small business as funding models	**Constraints:** • Competing funding priorities • Inability to demonstrate return on investment to funding body • Ability for government to commit funding • Funding timing/horizons (3 years is too short) • Cost of technology • Cost of and access capital • Solar panel programs at federal level and clean tech (only a few companies knew about it) • SMEs not aware of different funding models • SMEs have limited access to funding, are not aware of various funding programs of government	**Change needed most:** • Clear guidelines on funding requirement • Clear priorities for funding mix • Facilitating access to funders and different models • Business differing priorities (landlord versus tenant). 3-year payback but tenant only has 3-year lease	
Investment	• Continued investment in renewable energy devices by residents, business and government with ongoing research and product development coupled with education for the end user about what is all means • Funding, incentives, knowledge, assistance needed • Tax rebates or state grants Education from schools, business chambers, local council Banks offer reduced interest rates	**Constraints:** • Uncertainty re impacts of climate change to different markets – reluctance/ scepticism • Lack of willingness to invest because of lack of supporting infrastructure (transport, work-force mobility • Reluctance of banks to lend • Lack of clear government policy/regulations/standards reducing incentive to innovate • Lack of competition driving adaption **Enablers:**	**Change needed most:** • Legislation – impacts everything – state, fed • Incentives for green investments – Fed. Government and financial sector • Supportive infrastructure (transport lines, etc.) • Discounted interest rates for 'green'/sustainable development • Preferential access for development that is sustainable	• Government • Finance industry • Business owners responsible for knowledge investment

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
	• Investment into knowledge of climate adaptation methods for non-English speaking background (NESB) businesses, as resources at local government level are lacking in NESB concentrated business areas, e.g. South West Sydney • NESB business owners need to be willing to learn and invest in improving their business by understanding climate change risks • Federal, state and local governments have a role in education of the NESB business community. Need to work together to develop their knowledge. Young NESB people can encourage their parents • Invest into agricultural infrastructure, e.g. cooling/heating systems; irrigation barrier • Investment in new plant equipment to take advantage of new market conditions • Ports – resilience of port to continue to function, i.e. infrastructure of ports – wharfs, shipping, channels. Ports built to future climate change conditions, i.e. SLR will continue and impact current states	• Low interest rates, cheap capital • International context sees example of innovation for ports (boats) in West Coast America (California) and Europe because of local air quality requiring lower sulphur fuels		

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
	• Infrastructure systems – roads, all industries' infrastructure • Social/human capital investment			
Human capital				
Innovation	• Having access to the right type of technology (e.g. energy), means that it will eventually be cheaper (long-term vision) • Demonstration projects changing ways of doing things • Commitment to change prerequisite to innovation	**Constraints:** • Acceptance needed (overcoming scepticism) • Information overload **Enablers:** • Cost of inaction and effective messages about set-up cost and long-term benefits of innovation	**Change needed most:** • Skills (knowledge and training) • Mindsets • Process changes (e.g. Local Environmental Plans) • Communication on viability of adapting • Cultural change and focused messages on incentives and economic benefits of innovation	• Government (households already doing it) • All levels of education and educators to improve innovation by households, community, business, etc., i.e. everyone including local and state government)
Knowledge	• No acknowledgement of problem • Knowledge = information and synthesis • Lack of knowledge in community of expectations of climate change	**Constraints:** • Focus on economic returns particularly in property rentals • Political obstacles • Lobbying of government from vested interest in the mining and industrial sectors • Lack of consensus of information/science exploited in politics • Scope of interdependence of climate change effects	**Change needed most:** • Funding • Policy development in financial incentives/ assistance • Use of non-climate change messaging applied broadly • Incorporation of climate adaptation in core government processes • Greater emphasis on participatory processes • Ability to see alternatives	• Councils – information for business on general sustainability (not focused on climate change) • State government promote green agenda • Emphasis on all government levels • Civil society – NGOs, educational institutions that have credibility with wide spectrum of organisations

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Risk perception	• Businesses being aware of disaster PPRR (Prevention, Preparation, Response, Recovery) • Corporate/management level needs to buy into climate change risk as a business risk • Senior management/ councillors reluctant to believe in climate change – need to repackage it around disaster recovery • Relating climate change risks to more accessible risks • Make climate change 'real' for all communities/groups – give positive solution/action to group	**Constraints:** • Low rates of knowledge amongst business. Business has responsibility to plan for PPRR and continuity • Government has role to educate business in language businesses understand • Policy within industry is driven by senior management and what they believe. By expanding stakeholders this can be overcome (+) **Enablers:** • Action being taken by some Government enterprises, e.g. RTA's climate change Risk Assessment Business Plan – now entrenched as part of business plan • Some executive buy-in /recognition leading to incorporation of climate change in business planning	**Change needed most:** • Need for education • Need for local case studies/stories that are easily understood, using case studies, e.g. Ipswich	• University/business partnerships • Business needs to get engaged and understand risks themselves • Industry needs to formalise climate risks and develop plans/actions • Industry bodies informing/distributing industry specific information for implementation by individual businesses – business/sector 'template' • State plan re risk perception with implementable actions at different levels: individual, household, community, industry, councils, state agencies
Workforce	• Adaptable and mobile workplace • Local employment opportunities • To shifting tourism and related industries (e.g. aviation fuel) • Educational and training • Regulation of overseas qualifications • Internet shopping impact on retail and demand on warehousing and logistics	**Constraints:** • Lack of access to capital venture, incentives • Difficulty in identifying what growth industries will be • Skills shortage • Poor tax incentives for Research and Development • Competitiveness of Australian workspace • Globalised economy	**Change needed most:** • Put the environment back on agenda (incentives for green collar work) • Infrastructure needs to promote job growth in Western Sydney	• NSW Trade and Investment to shift focus to Western Sydney marketing • Prioritise and align training, education and industry policies • Government needs to map out the workforce needs of climate change future

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Social capital				
Planning	• Rules and regulations/red tape • Consultation in order to plan • Creating capacity for achievement/adaptation • Being strategic about the future – facilitates action towards outcomes for the city and the community	**Constraints:** • Transparency • Complexity of climate change – too many rules, strategies and plans • Resistance to change • Uncertainty about the impacts of climate change makes planning difficult • Extreme weather events (need to be viewed as 'reality') • Fear (can encourage change but also can be paralysing) • Promoting greater multiple benefits of climate change solutions (and planning for them!) • Market-led rather than 'traditional' planning controls) opposition + stopping **Enablers:** • Opportunities/innovation/new markets • Focus on enabling outcomes (planning = removing barriers)	**Change needed most:** • At decision making level (led by Federal Government and vertically down) • Integration of climate change impacts with understanding of social issues and new forms of governance • Wherever people are more vulnerable and isolated • In particular sectors **Change needed least:** • Councils have already completed risk assessments	• All governments and community can benefit from sharing experiences • Decision-makers • Champions – all levels of government and community (incl. chambers of commerce, etc.) • 'Soft' approaches to planning by planners • Industry to lead planning (? Are they appropriate)

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Resource sharing/ cooperation	• 'Community' – sharing equipment and resources (cars, etc.) • Green space – community self-sufficiency supports climate change adaptation • Civic education – ability to share and understand social responsibility • At firm level – business clusters and networks supporting innovation • Education sector interacting with business community • New forms of shared housing – potential response to huge rents driven by population growth	**Constraints:** • Huge rents limiting affordability of housing, e.g. in Randwick area – high rents result from opportunism – little invested in housing stock in the area. 45–50% population turn-over (4–5yrs) – university and large teaching hospitals drive transience – leads to need to 'retrain' population about climate change regularly • Social diversity is high in Sydney – poses challenges due to civic experience and limits innovation • Economic polarisation • No resource sharing between large organisations and small organisations	**Change needed most:** • Community events/ workshops to provide a community purpose (business is part of community) • Tenders need to incorporate social responsibility to encourage large organisations to put skills and resources back into community/ area • Climate adaptation should be a priority in partnership with educational community (many businesses/ SMEs do not have funds to invest) • Raise awareness of opportunities for sharing services and resources	• Local government – operates at the appropriate scale 'community level' • Community – 'grass roots' projects should be encouraged • Associations and funds • Social enterprises • Funding from federal and state • Educational community • Fire volunteers with broader community

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Legislation/policy	• Supportive/non-supportive political framework (particularly in relation to climate adaptation incentives) • Direction/rules to follow • Policy can be reactive • In business terms equivalent to strategy • Long-term objectives provide a framework to achieve climate adaptation outcomes and objectives over longer timescales	**Constraints:** • Short-term political cycles • Lack of cohesion between tiers/levels of government • Conflict between stakeholder interests (e.g. large businesses vs government vs community) • Lack of clarity around details about how to implement policy (e.g. how do you roll-out climate adaptation policy) • Lack of ownership of the issues and resources to deal with them at any level of government • Limited consultations (don't often consult the right people) **Enablers:** • Broad community support for change, e.g. Kevin Rudd was able to tap into community support for action on climate change	**Change needed most:** • Greater vertical connections between tiers of government • An integrated approach to implementation during policy formulation • More attention to roles/ responsibilities/ timing of climate change action • Better consultation with communities about policy change • Better scenario planning/ risk analysis (policy makers need to analyse best/worst case and communicate it better)	• Government at all levels • Community

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Engagement/consultation	• Must be inclusive – address all communities, i.e. languages, cultures, ages • Can be effective at fostering change • Needs to include different groups, i.e. residential, industrial, NGOs, etc. • Setting clear problems for people to solve for their circumstances, e.g. a road that doesn't flood • A conversation reaching shared understanding and common values • Involving people in defining the problem and developing an action plan – greater commitment	**Constraints:** • Lack of leadership with an ability to communicate effectively to promote change, e.g.in agriculture/business opinion leaders better accepted by audience • Reluctance of business community to accept information about climate change from government • People lack time/ resources and capacity to implement change • Uncertainty about climate adaptation outcomes leads to lack of confidence in changes **Enablers:** • People more committed through engagement to things they've invested in less likely to abuse the system – reluctance to accept something for free • Emotional and intellectual involvement in developing solutions to increase adoption	**Change needed most:** • Leadership – identify and promote champions from industry/community – reduces reliance on government action	• Government agencies to partner with universities to get environment students out into business to undertake climate adaptation audits/check-lists and then develop programs • Universities to make their knowledge more readily understandable and use their industry partnerships to distribute information • NGOs – galvanise community change, e.g. USA community gardens

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Physical capital				
IT/telecommunications	• Tools to help work and live • Smart grids • Connecting people/communities • Information dissemination • National Broadband Network (infrastructure – cost effective and cost accessible) • Social media (virtual)	**Constraining:** • Set-up costs • Consistent messaging (can be both constraining and enabling depending on methods used and simplicity • Inadequate infrastructure (telecoms, broadband, etc.) • Pace of change can be stopping/ promoting change in relation to age of population/ level of education **Enabling:** • Community media messages (TV, etc.) • IT has potential to reach community with effective forms of messaging e.g. text messaging	**Change needed most:** • Availability of infrastructure • Training • Policy resolution around financing the roll-out of smart grids – How much? Who pays? • Incidental messaging through use of technology, e.g. exposure via screens not just targeted messaging	• Media outlets bear some responsibility for disseminating more positive/ less political messages • Government action • People need to adopt new technology – use technology and apply technology to climate adaptation
Housing	• Accommodation suited to: – individual lifecycle – geographic restraints – social affordability – cultural requirements • Different types of physical dwellings, i.e. units, villas, dwelling houses	**Constraints:** • Physical constraints, i.e. flooding, geographic • Council planning rules (zoning/ changes) • Access to finance (areas of hazard risk); property values • State government metropolitan housing policy • Traditional bricks and mortar culture and large house size **Enablers:** • Technology change	**Change needed most:** • Local government level • Public transport accessibility • Community understanding of a building's environmental footprint (e.g. house vs unit) • Public housing stock increase	• Development industry to embrace technology • Government

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Services – health/ education	• Service availability • Wide access • Location • Service reliability • Capacity • Flexibility • Design aspects • Power source for health services	**Constraining:** • Individual/community scepticism • Money influencing decision-making • Legacy systems and large investments can lead to technological redundancy (which can both enable and constrain) • Land availability for more services • Affordability • Economic driven perception/ society, e.g. constructing standard vs green building – fails to appreciate multiple benefits and cost savings **Enabling:** • Exposure to major health event • New technology and knowledge • Education of the next generation of decision-makers • New 'greener' materials and buildings • Legislation, e.g. green stars scheme • Public–private investment/ donations for infrastructure • New markets for education services, i.e. overseas students • Research and development	**Change needed most:** • People who commission buildings most need change • What are the incentives to drive triple-bottom line outcomes? • Building design and management requires education about benefits and features of new infrastructure. Requires recognition that long-term recurrent savings will/or may out-weigh the additional upfront infrastructure costs • Life-cycle costing to demonstrate long-term benefits and investment for the future – design needs to incorporate climate change • Societal change: social-economic, environmental, civil leadership, cultural change is needed	• State • Federal • Industry – architects, designers, developers, engineers, private (universities and healthcare providers) • Role for state and federal government incentives for assisting sustainability building/ infrastructure

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Transport	• Sydney is ridiculously car dependent equals carbon dependent • Need transport alternatives to cars • Efficient transport is important for achieving workforce mobility and promoting productivity	**Constraints:** • Lack of integrated transport planning • Investment focus on road building (at federal level) • Legacy issues of past planning leads to current winners and losers	**Change needed most:** • West and East of Sydney to cope with density issues • Longer-term planning • Climate resilience of current infrastructure	• Government should be prepared to go into debt to build mass transport systems • Individuals make choices and should take responsibility for them • Explore and promote alternative transport (bike racks on buses)
Energy	• Energy intensive industries to change technology to use substitute energy sources • Generation – alternative generation sources/ decentralisation – small scale electricity generation • Use of electricity – energy efficiency programs and physical capital associated with this • Agriculture – cost of production will increase because of cost of energy – fertilizer production requires energy – peak supplies of Phosphorus and Potassium • Southern Sydney councils (x8) group example – cooperative to promote renewable energy master plan	**Constraints:** • People don't know what's available or what to choose in relation to energy efficiency • Planning regulations both at local and state government levels – (heritage, regulations) make it difficult to put solar/ wind power in at a household and community scale. In contrast with Europe where community renewables projects are more common • Lack of adoption because of upfront costs and need for cultural change • Use of bio-solids for energy/fuel in agriculture • Language barriers in some parts of Sydney to getting information **Enablers:** • Example, RTA program worked with industry to assist knowledge growth in energy efficiency • Agriculture – water efficiency systems promoting improved energy efficiency (pumping costs)	**Change needed most:** • Need to facilitate easier use and access of renewables • Opposition to sustainable energy efficient greenfields development – most need to get change in legislation now for this • Requiring developers to build in a sustainable way (e.g. Europe/ Scandinavia) – need to promote local/ decentralized energy systems – reducing reliance on mainstream grid energy system • Reducing reliance on energy from o/s – imported fuel/ petrol	• Incentives/penalties (Councils, state, federal governments) for business to change, e.g. environmental rebates for landfill? • LG rates system could incorporate penalties • Introduce an energy levy • Councils – greenfields stipulations if not state significant. • IT support can be provided by industry state associations

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Natural capital				
Waste management	• Cost and resource issue (environmental and economic) – can be a revenue generator • Innovation • Efficiency • Big supply chain (many opportunities but often high risk) • Links to climate change mitigation through GHG emissions • Quality of life (amenity /individuals being controlled by requirements)	**Constraining:** • Resistance to change • Individual laziness about recycling • Cost: up front for collection/ processing; to business through packaging • Bad experience in past • Lack of information (especially availability of incentive funding) • Difficult wastes • Courage! to implement (invest) **Enablers:** • Constraints on space and land use • Promote • Consumers • New waste technology (exciting!) • Small steps,–e.g. small red bins • Availability of incentive funding	**Change needed most:** • Councils to be more involved (contracted/ strategic) with waste management • Business need to be more responsive • Clarity on regulation • End of chain responsibility and control • More demand for recycled products (diversity) • Consumer behaviour: stop making and buying disposable products (e.g. cooling fans) • In places where people are under economic stress • Examine what we import – quality/ packaging implications?	• Government (all levels) – cultural change, information • Politicians (stop distorting reality with politically motivated messages)

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Greenspace/reserves	• Sydney's green spaces need to be better utilised • Remnant habitat, parks and other open spaces/ reserves (nature strips) • Non-protected spaces, e.g. Cumberland plains and woodland • Increase green space/ green walls/ roofs/ community gardens	**Constraint:** • Lack of recognition of worth • Lack of community willingness to pay for green space • Demand for land (Western Sydney) – driven through need for employment • Private vested interests • Planning regulations (in relation to green walls) • Height of building – infrastructure issues	**Change needed most:** • Cumberland plains • Western Sydney land and private property • Randwick – funding of maintenance /improvements • Governance of responsibility and maintenance of green space • Community gardens and more permaculture	• Local Government – funding directives (rules and regulations from state) • More assistance • Investment by owners of private land • Establish evidence base for economic importance of green space – for decision-makers
Water security and quality	• Securing access to safe water quantity/quality • Water is a limited resource	**Constraint:** • Variation in pricing of water (business vs households) • Pricing by source for various water sources should reflect different user values **Enablers:** • Improvements in technology of water recycling – enhancing water efficiency • Master-plan suburbs potable water isn't used for toilet flushing	**Change needed most:** • Education on water quality applications • New suburbs should have different infrastructure set-up (already happening, e.g. Rouse Hill) • Change is needed most in existing urban suburbs not new suburbs • Community needs to be more aware of their ecological footprint	• Governments at all levels need new policies and improved education. Come up with a strategy to provide viable alternatives • Communities need to change their mindset and awareness • Charge more for water at household value

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Food supply and security	• Food miles – localised production • Loss of agriculture lands in Sydney Basin • Transportation of food into the centre of Sydney • Balance of trade in agriculture • Trade implication • Dependency on imports vulnerable to climate change, biosecurity and regional conflict	**Constraints:** • Who are tomorrow's local farmers? • Subdivision of agricultural land (nationally) • Last year University of Western Sydney – Hawkesbury did not fill agriculture degree classes **Enablers:** • New technologies, innovations in food production (water re-use) • Disease threats (quality assurance)	**Change needed most:** • Getting people into agriculture – more income to producer • More direct supply chains (producers to consumers) • Educate kids about where food comes from • Exploit expansion/ niche opportunities due to climate change, i.e. dry elsewhere or earlier production cycle	• Planning system needs to preserve agriculture lands (Agriculture Forever WA) • Promote local agriculture – farmers markets (e.g. Penrith area) • Updated data for agriculture regarding local climate changes • Demonstrate advantages for maintaining green/ agricultural space for cities

5 Natural and cultural assets

5.1 Findings

Climate change impacts such as rainfall patterns, extreme heat and changes in temperature, flooding in Western Sydney, increasing frequency and intensity of bushfires and sea level rise and associated inundation, produce both direct and indirect impacts on natural and cultural assets. Direct impacts may include changes to geomorphology and terrestrial, aquatic and marine ecosystems, loss of biodiversity, pollution and erosion, decline in potable water quality and damage or loss of indigenous sites, rehabilitation sites and significant cultural assets. Indirect impacts may include an increase in invasive species and biosecurity issues, risk to identity and a sense of place, loss of recreational spaces, changing consumption patterns, increases in wildlife injury and mortality and declining participation in volunteerism. External drivers are also likely to shape the extent of direct and indirect impacts caused by climate change. Such external drivers that were identified include changes to land-use practices, population growth and demographic change, demand for indigenous cultural experiences, economics of food production, politics and property prices, localism and investment and economics. Both direct and indirect impacts are likely to produce effects on other sectors that are interlinked to natural and cultural assets. Cross-sectoral impacts include declining environmental health, increased energy consumption, changes to community cohesion, rising costs of primary production and competition for resources, and mental and physical impacts from a loss of urban green spaces.

Various strategies were identified to enhance the adaptive capacity of natural and cultural assets to climate change and other stresses. These include improved communication and coordination between the three tiers of government, two-way community consultation and engagement as a process to increase community awareness of risks, bi-lingual communication and cultural connection, reframing issues of climate change, ecosystem service provision, appropriately valuing urban green spaces and cultural heritage, innovative and creative solutions and employment opportunities, and active environmental and community NGOs. For example, in supporting ecosystem services and valuing urban green space, there is a need for Sydney-wide green space targets with relevant Acts and Regulations to place emphasis on urban design. This can be supported through the leadership of the Planning Institute of Australia, the Urban Development Institute of Australia or the Office of Environment and Heritage in providing spaces for innovation and developing tools to value ecosystem and social services provided by the environment. Interrelated to this strategy is the need for greater connection to Aboriginal communities and assets through Aboriginal elders, with local and state governments providing greater incentives to connect to the land and the involvement of schools and other government agencies in education. New approaches to engagement and consultation related to climate adaptation are also required, that recognise that climate adaptation is constantly evolving. For example, climate change action groups need to shift their message into more relevant media that are culturally and regionally specific and government agencies should ensure engagement requirements remain in the planning system.

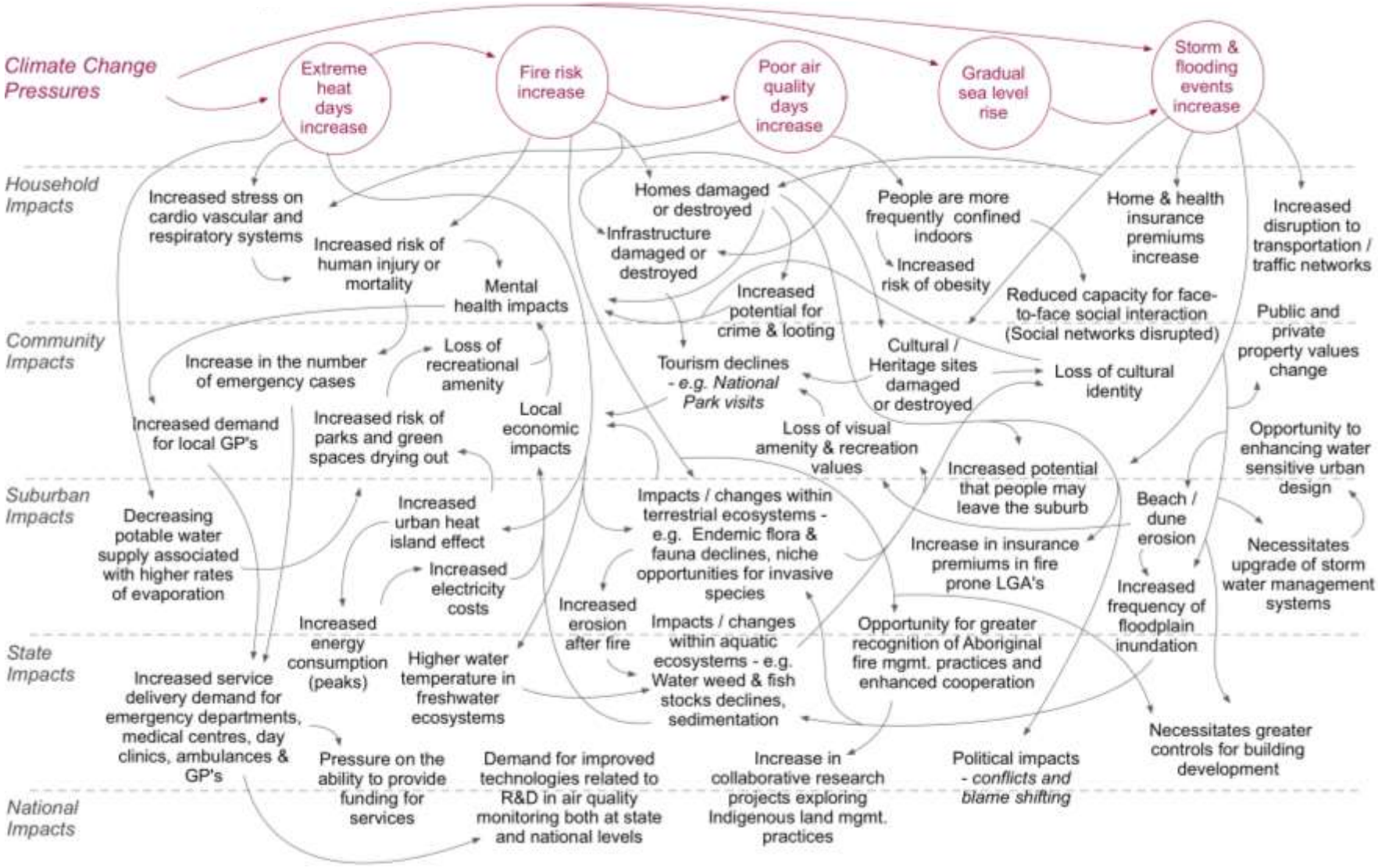

Figure 6: Impact pathways diagram – Natural and cultural assets

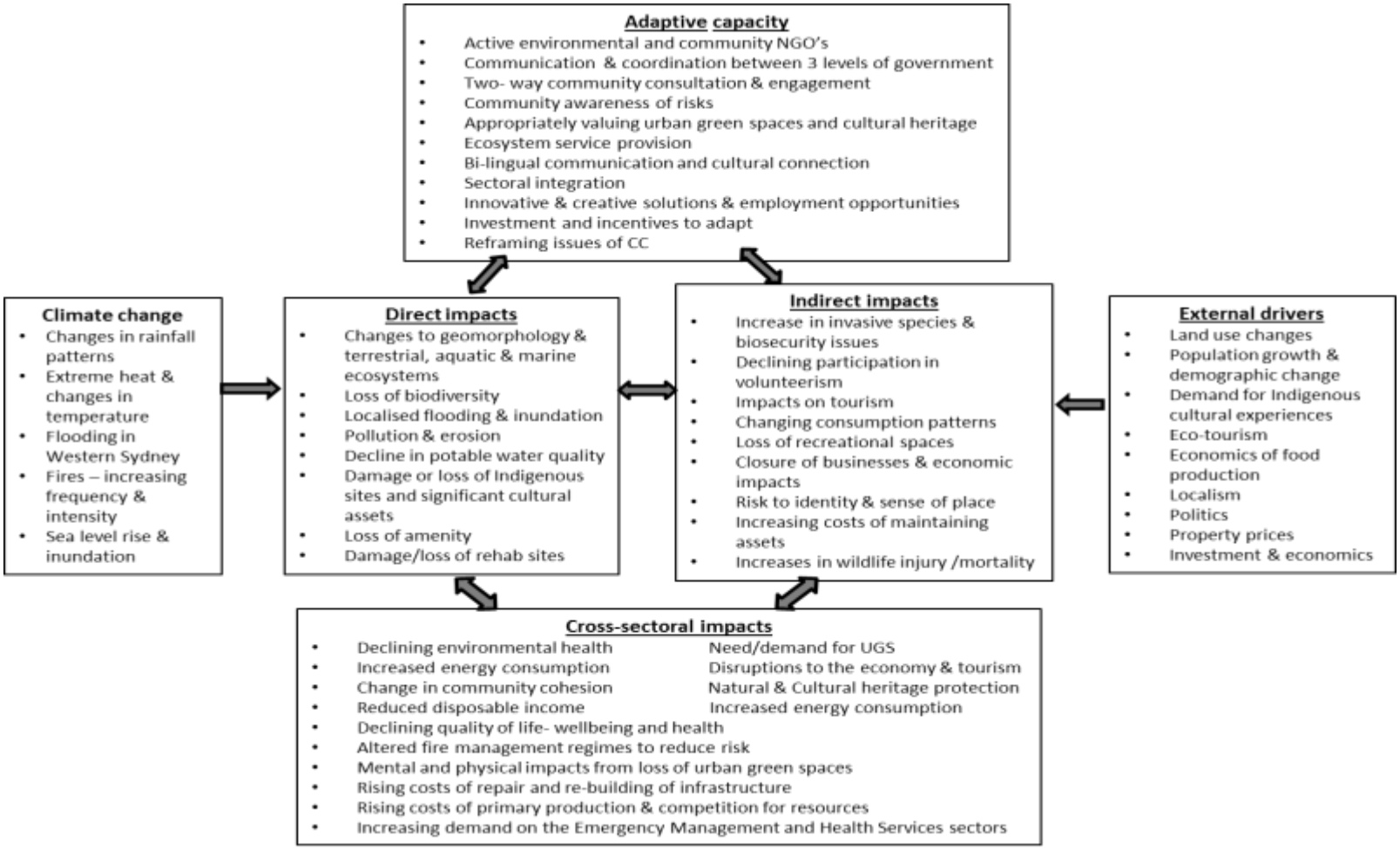

Figure 7: Natural and cultural assets sector vulnerability to climate change in Sydney

5.2 Workshop outputs

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Financial capital				
Sources of funding	• Life or death for many organisations • Grant applications (e.g. funding themes, bushcare / biodiversity, coastal management, heritage) • Co-contributions to access grants • Rates/levies • Developer contributions are a significant source for council perspective and state • Impact / or polluter pays model • Rebates • Philanthropy	**Constraining:** • Requirement for matching funding on grant applications • Policy and regulator settings • Coordination between tiers of government • Lack of political will to support funding for climate change • Need for leadership (social, community, government) **Enabling:** • Flooding events or bush fires trigger action • Community/grass roots activism and schemes • Industry lobbying can be enabling or constraining (promotion of climate change scepticism)	**Change needed most:** • Long-term policy/regulatory setting on climate change, e.g. Sea Level Rise policy • Leadership • Prioritise funding to climate adaptation • Subsidise renewable energy schemes • Green space funding particularly in urban areas	• State and federal governments need to work in collaboration for SLR policy • Reinstate Climate Change Commission • COAG (start climate adaptation action at this level) • Community to push the climate change agenda forward to politicians • Developer and large private sector, infrastructure (e.g. real estate) to take bigger role/ leadership • More need for research institutes to provide solid data that supports lifestyle changes needed under changing climate • Media to communicate/ present bipartisan views/ information
Investment	• Directing resources, time, money and people on things (technology, infrastructure, skills, education, land, alternative energy, green spaces, carbon heat offsetting) to offset the impacts of climate change	**Constraints:** • Federal Government (political forces) • Community apathy • Vested business interest and their ability to spend on marketing to influence community beliefs • Disconnect between the scientific data and what the community receives/hears	**Change needed most:** • In the communication of the message/ issues and marketing of climate adaptation • Change message from focus on risk to opportunity of climate adaptation	• Encourage identified ‘private trail blazers’ and community influencers • Local Government/business interaction – taxes on, or disincentives for polluters, e.g. car companies, energy providers

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Incentives (cultural)	• Provide an opportunity to promote good initiatives – the 'carrot' • A tool we can use to establish benchmarks and establish values to drive changes • Financial fines and rebates • 'Access to country' – NPWS • Education/information can also incentivise → demand from public for positive action	**Constraints:** • Poor design of schemes (short-termism) • Lack of long-term vision • Uncertainty over timing of climate change impacts • Lack of collated information on location of cultural and natural assets • Institutional inertia • Vested interests (those benefiting most from maintenance of the status quo)	**Change needed most:** • On urban developments, to reduce our resource use • Aboriginal cultural knowledge: – not recognised/valued or valued by businesses, therefore not incentivised – recognition not part of the standard business model	• Reintroduce green loans (banks) • Longer-term design of cultural schemes • Incentives for Aboriginal community involvement in environmental and cultural activity areas • Cost–benefit analysis of incentives to protect cultural or natural assets
Funding priorities and models	• In a complex environment with competing needs for resources, where do you set priorities for allocating funds? • Temporal scale is important. Short-termism → lack of long-term planning and funding and pursuing the political 'fashions' of the day, e.g. weed funding really needs to be 10 year program to be effective • Funding based on politically driven objectives not necessarily where council needs, therefore does council go for it or not? • Cost of infrastructure maintenance not considered in funding models – 'it's about <u>new</u> development' • Inadequate communication of full value of services → only appreciation/ acknowledgement of the tangible and immediate costs without consideration of the associated benefits of a full and	**Constraints:** • General shortage of funds • Competition for funds • Change of programs with government change • Lack of definition and planning • 'Squeaky wheels' • Tax system: too little revenue to government • Public perceptions about tax • Federal government changes to grant allocation after LG already committed to program delivery • Public distrust enhanced of government because of failure to deliver → transparency re: what level of government is funding and delivering to commitment	**Change needed most:** • Long-term bipartisan commitment to providing resources (AG – NSW Government) • Local government – create long-term plans (PLAN) and <u>stick to it, fund it</u> (ACTION) • Community support and political process • Promote value ($) of green infrastructure and other climate adaptation return on investment • Changing valuation perceptions, e.g. gross progress indicator not GDP • Greater flexibility in funding timeframes • Need more guaranteed, multi-year funding (not waiting until	• All levels of government → long-term commitment to funding and effective communication on the value/ outcomes of climate adaptation • Promote and establish private–public partnerships for climate adaptation

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
	successful service • Financial incentives provide (positive) alignment between different levels of government to deliver programs, e.g. sustainability education program	• Short-term planning and political cycle **Enablers:** • Government grants require Monitoring Evaluation Reporting and Improvement as a provision of funding which increases transparency and accountability • Biodiversity fund re bio banking • Market Based Instruments for carbon – focus on business changes	December to hear if successful) • Funding that is less reliant on outcomes re: natural asset development, e.g. drought year may not produce outputs or outcomes but funding is still needed • Tax payer funded → public perception re: tax and appropriate use of government revenue • Transparency of tax uses for public purposes	

6 Emergency management

6.1 Findings

Various climate change impacts such as flooding in Western Sydney, changing seasonality of rainfall and fire, extreme heat and increasing fire risk, produce both direct and indirect impacts on the emergency management sector. Direct impacts include increasing risk to life and property, localised flooding, disruptions to transport and the supply of food, decline in water sources and quality and increasing demand for services. Secondary or indirect impacts include those relating to increasing use of public spaces as refuges such as beaches and retail outlets during periods of extreme heat, increased incidence of fatigue and health issues amongst emergency management staff, increasing need for evacuation centres and associated logistics, the need to re-allocate resources to response and recovery, and increased incidence of water borne diseases. Both direct and indirect impacts were noted to have cross-sectoral impacts such as declining quality of life, re-prioritisation of budgets, rising costs of primary production, impacts of hazard reduction on human health, increasing demand for energy, and economic costs to both local and state governments. External drivers shaping both cross-sectoral and climate change impacts include land-use changes, population growth and distribution, ageing population, lack of regional scale planning and level of insurance cost.

Various strategies for enhancing adaptive capacity were identified, including improved cross-agency cooperation and coordination, strategic planning, increasing research of telecommunications, building the resilience and self-supporting capacities within communities, household and individuals, decentralised services (e.g. water, energy, waste), greater access to information about risks, and valuing emergency management services. For example, there was a greater need for state/federal government to work closely with local government to provide resources and policy that supports small communities to adapt to population change. There was also a need to maintain ongoing training and competency programs for emergency management volunteers through a centralised rather than agency-specific service. There was also a need for agile and responsive policy-making that can shape how climate risks are perceived by communities. For example, cross–agency agreement is needed on climate related terminology, as is an agreement by relevant agencies to spatially classify risk and publish maps, in order to produce consistent and varied strategies to communicate risks and roles. Improved strategic planning in the water sector in relation to water supply and quality under climate change was particularly pertinent. Investments in new and innovative strategies and technologies for water storage and exploring opportunities to decentralise services to reduce reliance on state or federal governments was also relevant.

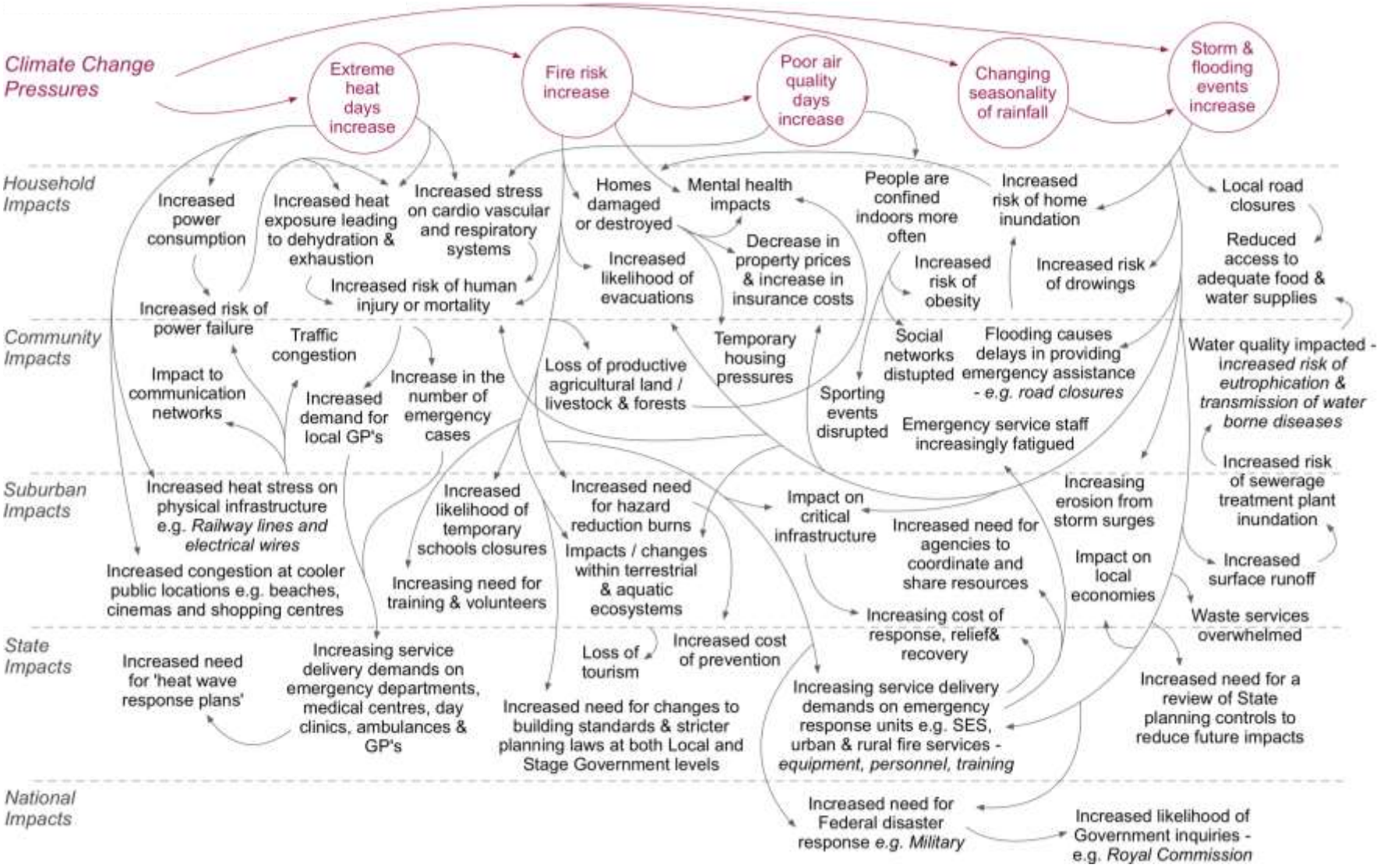

Figure 8: Impact pathways diagram – Emergency management

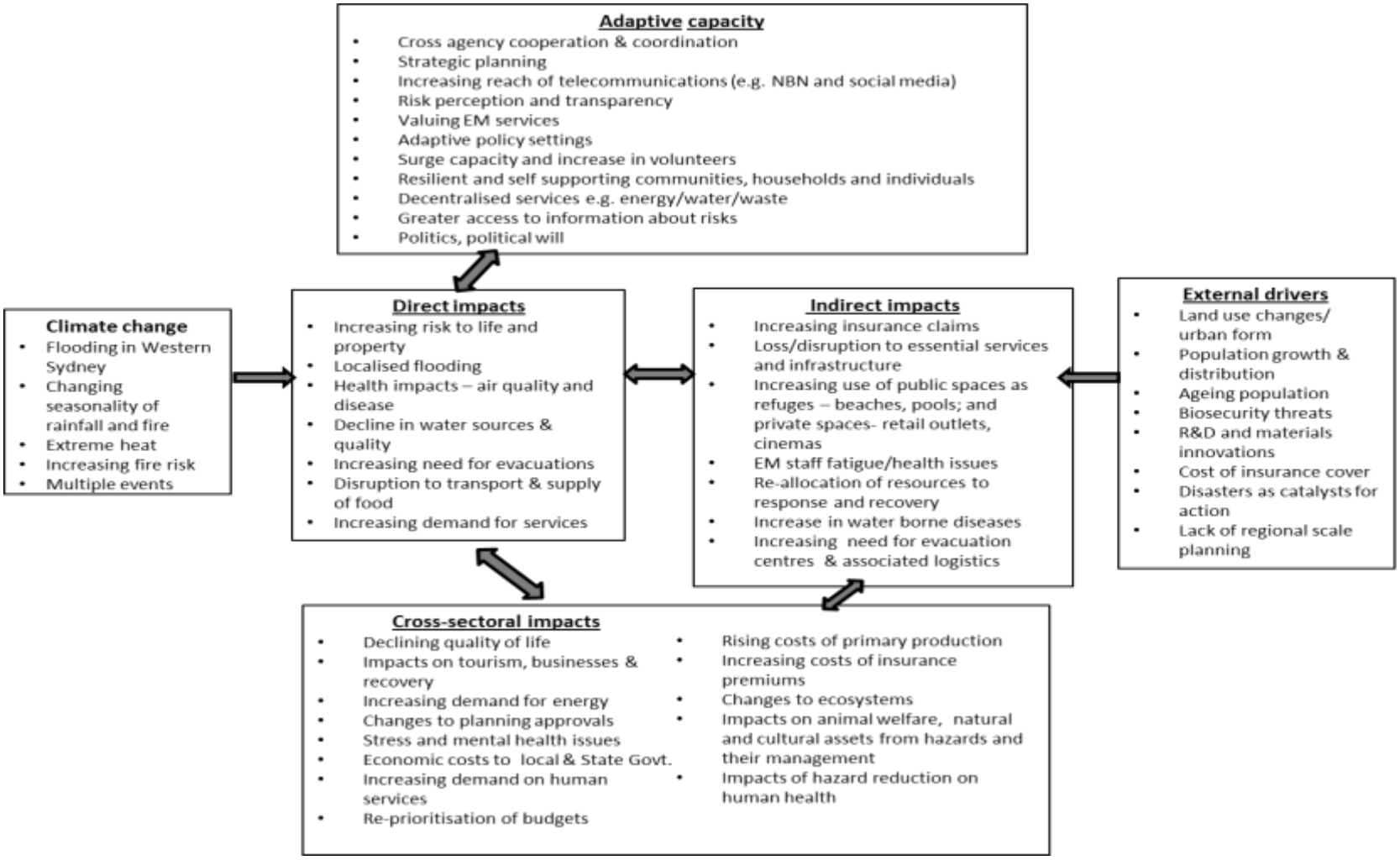

Figure 9: Emergency management sector vulnerability to climate change in Sydney

6.2 Workshop outputs

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Financial capital				
Incentives	• Insurance • Subsidies (to be adaptive) • Cost-sharing • Incentives for volunteers • Private investment regimes • Reducing insurance through design standards	**Constraints:** • Someone pays more somewhere • Politics of increasing costs • Can't get funds for betterment • Recognition of risks • Funding, e.g. emergency service	**Change needed most:** • Fine grained information helping to deliver realistically priced insurance (car insurance) • Betterment required following disaster • Spread risk • Use insurance as leverage for adaptive behaviour • Broader levy for emergency services or exemption from levy if you have insurance • Use planning – reduced premium • Building standards 'incentive' for insurance industry	• Insurance industry – should pay for information • State government

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Insurance	• Coverage and cost • 'Tax system' – vicious cycle – property investment tax free • 'Insuring future' – property, wellbeing, security, life • Managing risk – passing on risk • Moral hazard issue	**Enablers:** • Sharing knowledge – flood, fire – don't advertise so people and insurance companies don't know • Knowledge – people • Personal responsibility • Planners – insurance – risk process – discussion	**Change needed most:** • Make insurance accessible to more people, e.g. lower income • Insurance companies get involved in discussions of planning and designation of areas • People are compensated for good actions • Insurance companies promote risk areas • Breakdown (explanation) of premium increase and actions to decrease premium (self-insurance)	• Community insurance – how to minimise exposure to risk, would drive discussion on risks about climate change • Community burden • Insurance part of 'prevention' actions
Incentives	Strategy could be: • Property preventative action giving insurance premium discounts • Provide people with reason to meet the desired outcome • Financial incentives are difficult for agencies to implement • Councils– smaller incentives and guidelines to declare – not emergency organisations but provide assistance to EM response agencies and there is a long period of unknown if council will recoup expenditure – needs to be S.44 emergency to get grants, e.g. spills – councils assist with remediation with $ outlay but who pays? • Health care services = activity based funding	**Constraints:** • Grants need to be streamlined for best effectiveness and efficiency • Improving medical and resourcing funding so medical costs not increased and allow $ for incentives • Insurers offering discount for policy holders who do home fire audit • Equity of implementing incentives – transparency • Idea of incentives has negative connotations – welfare society concept • 'Value' of the work that organisations do	**Change needed most:** • Tax breaks for volunteers – funded like Defence Reserves • Health services and allied health – lack of staff – therefore incentives to get more people into health care services/industry – free university • Need to be relative to priorities • Getting people to evacuate – incentivising positive behaviours	• Ensuing Exec/org. leaders understand needs to change • Bipartisanship • Health and activity based funding – $ is bottom-up – staff need to document activities to get $ • Insurers

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Human capital				
Risk perception	• Acceptance of risk varies through community	**Constraints:** • Lack of experience • Education • Planning	**Change needed most:** • Remedy community denial	• Consistency at all government levels
Moral hazard	• Expectation/obligation of government as insurer of last resort • Disincentive to adapt, insure, manage and prepare	• Political reality/cycles (negative) • Cultural – many other countries act differently, e.g. army responsible for disaster management • Increase incidents with no insurance **Enablers:** • Resilient communities; want to be self-supporting • Insurance companies • Budget issues (state and federal)	• Levy to support private insurance • Incentives/subsidise insurance or infrastructure improvement	• Insurance companies working with government • Householders
Training	• Achieve, maintain competency with emergency management sector and in broader community, e.g. evacuation, RFS volunteers	**Constraints:** • Time • Money • Interest/motivation/perceived need • Resistance to change • Training material/knowledge **Enablers:** • Incidents • Community influence and integration • Campaigns	**Change needed the most:** • Community level • Volunteers maintaining competency • Strategic level – government, policy	• Centralise (MPES)/ coordinate strategy, i.e. not agency basis

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Risk perception	• Changing behaviour to reflect level of risk • Community/agencies/decision-makers – going beyond the obvious (immediate prep) to longer-term strategies, e.g. RFS now saying, 'If you don't do this you will die' • Full cost of impacts	**Constraints:** • Inconsistency in policy-making • Terminology can be esoteric to sector – not plain English, can be conflicting within sector, e.g. hazard–prove 1 in 100 year flood • More effective communications needed • Acronyms • Lack of individual responsibility – reliance on government • Lack of planning for infrastructure and population – lack of strategic planning • Lack of resourcing for provision of services **Enablers:** • Agile and responsive policy making (adaptive)	**Change needed most:** • Hawkesbury–Nepean community information needs government action • Biggest money/impact in Australia • 'Red Cross doing a great job in communicating heat risks'	• Agree cross-agency on terminology • Everyone needs to play a role • NSW combat agencies to spatially classify risk and publish maps • Consistent and varied strategies to communicate risk and roles

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Population change	• Local governance • Number and demographics of population • Population changes drive development – attached to + knowledge of issues of population in areas – gentrification • Benefits and limits to living in space (knowledge of place) • Higher turnover – loss of corporate knowledge • Education and health of population • Ethnicity and understanding of EM and different networks and trust, e.g. women • Affluence (ability to adapt and respond) • Disadvantaged communities/poverty	• Awareness and information (in a form that is accessible and digestible) • Lack of social cohesion (esp. in new areas) • Target community champion • Plugging change in a square box	• Lower North Shore – loss of school space • Design own space • No population in risk zones • Housing problem • Opportunities to create networks • Bush care and land care	• State/Feds work with councils to provide resources and policy to allow smaller communities to adapt to population change • Re-design our space
Social capital				
Legislation and policy	• Provide framework and incentive to develop social capital • Planned, well thought out • Well timed	**Enablers:** • Networks currently forged out of necessity • Australia has strong volunteering culture – changing population and ethnicity **Constraints:** • Silos – focus on own path • Little explicitly promoted/ political drivers	**Change needed the most:** • Better engagement between politicians and community • Mobilising community involvement – incentives, capitalising on increased interest after incidents	• Decision-makers – politicians, policy-makers need foresight, evidence-based

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Legislation and policy	• Who owns the problem, e.g. compulsory insurance system • Distributing • Accountability • Costs • Actions • Support more resilience • Mitigating/minimising risk • Allocating accountability • Clearly defined roles, e.g. flood management policy, etc. confused/fragmented • Preparation for natural disasters – help or hinder • Patchy legislation coverage for different hazards, e.g. flood	**Constraints:** • Patchy legislation • Policy lobbyists • Party interests • Action only occurs when there is an event or cost/risk • Lack of understanding • Perceived impacts on property values • Poor understanding of science process • Natural hazards are never a good news story • State government 'frightens' quickly • Social licence to change	**Change needed the most:** • Leadership to make hard decisions • Broader community support/awareness • Integration • More support for councils	• State government needs to coordinate/provide framework
Engagement and consultation	• Develop community ownership – lead to realistic demands	• Consultation – skill, honest	• Set ground rules • Manage expectations	• Global – local/ state and fed. governments • All organisations who want to work with public • Gosford or Wyong Council website 'you said we did'

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Planning	• Town planning – council's bushfire prone lands identification – impacts on housing types and areas. Also flood-prone land and building/planning constraints – impact to community and property value • Access planning/evacuation • Planning = risk identification and resource allocation • Different levels of planning – scale: individual – government – community, e.g. Community Planning Units • Planning = mitigation	**Constraints:** • Time • Resources • Funding • Personnel • Motivation • Buy-in • Politics/ideology • Community sentiment • Attitude **Enablers:** • Immigration – localised • School program – education and engagement • People • Needs risk assessment and reviews/enquiries/audits • Community sentiment • Failure • Research • Learning from other events • Experience and intelligence engagement – community • Change (i.e. forced change like climate change) • Demographics • Community involvement and ownership	**Change needed most:** • Need to promote integrated planning – whole of community/government planning • Getting community to think beyond individualism to thinking about the community • De-politicisation of the process • Need to change people's understanding – education and engagement to make more palatable to community • Command and control structure – ensuring this is maintained at a local level with people who need to know • Transparency – clearly communicating with community, e.g. flooding and planning and property prices	• Self-responsibility for shared outcomes • Community leaders have role to motivate change • All levels of government and politicisation – bipartisanship • Inter-agency collaboration – individuals' relationships and networks – getting Executives/org. leaders to have the integration discussion

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Engagement and consultation	• Collaborating with community to understand the shared experience • Two-way dialogue with community and policy-makers • Strategic and local knowledge working together • Means (places/technology) to understand risk and respond	**Constraints:** • Money/funding • Political will to 'tell all' • Reactive to events **Enablers:** • Events promote change • Innovative examples (need to share knowledge) • Recognition/Community Resilience Innovative Program (CRIP) • Social media platforms	**Change needed the most:** • New communities in growth centres • Vulnerable communities (impact, age, social/ economic profile) • Not always the poorer people	• Voluntary community 'disaster exercises' • Opportunity for private sector to fund/support • More funding from state/Commonwealth to support • Import 'Local Action Group' from UK (Cumbria region)
Physical capital				
Roads and Transport	• Essential to move goods and people • Emergency response • Evacuation route • Different risks in different areas (flood, fire, other)	**Constraints:** • Planning opportunities/ constraints • Financial resources • Emergency planning • Local protection areas, e.g. motorway flooding in Wollongong	**Change needed most:** • Community education re: response, expectation management • Testing and modelling local/state	• Testing and modelling local/state • Locate problem areas
Roads	• Underpins emergency response (moving in and out) • Most vulnerable and uninsurable public asset • Repair/betterment has huge social economic consequences • 80% roads are council responsibility • Disaster event precipitates changes to roads (e.g. proactive action in Hawkesbury Nepean to raise roads before flood)	**Constraints:** • Scale financially and scale of works • Road building/maintenance resources • Pre-disaster standard (very technical) • Current funding arrangement is biased against improving the road	**Change needed most:** • Hawkesbury–Nepean in-fill development has exceeded the capacity of roads to evacuate the area • Funding arrangements between state/local/ Commonwealth to maintain roads	• State government • Review evacuation route capacity in new suburbs and Hawkesbury–Nepean • Identify critical roads and prioritise funding accordingly • Federal Assistance Grants (advertised for roads) need to be spent on roads • Research into adaptive road management /design /technologies

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Tele-communications	• Critical and becoming more critical, i.e. lead time warning, etc. • Through the whole EM process • Social media – adds to intelligence • Needs more protection • Reliant on electricity/power – needs new technology	**Constraints:** • All telecommunications locations (e.g. sub-stations) commercial in confidence • Lack of control of it (telecom locations) – controlled by private interests • Reliability of service requirements • Operate under Commonwealth law, e.g. local flood controls will not apply • Sometimes in vulnerable locations because of community objections (e.g. phone towers) **Enablers:** • Integrated with everyday life • New technology/media promotes change (esp. social media)	**Change needed most:** • Need link/relationship between emergency management and private interest • Recognise the importance of telecommunications to EM esp. new media • Mindset change	• COAG • Commonwealth • NSW Government needs to recognise importance – NSW has chosen not to engage on this issue
Residential	• Legacy – below standard and continuing to put people in wrong place • Industry driven – not given options that are out there for good design • Land-use planning issues	**Constraints:** • Legacy – people are there • Costs money – short-sighted building • Lifestyle (free change) • Standards (flood not the same, backwards rather than forward planning) • Individuals not accepting risk • Stuck in old mental models (more space is better) not 'limitability'	**Change needed the most:** • Fast rail linear cities • Access to country so don't need urban space • Land-use planning regulation – you can't! take risk into consideration, e.g. Campbelltown – pulling houses down and re-designing – South Sydney	• State government competitions for innovative design • Fed. builds fast rail • Private companies build – competition • Insurance companies valuing risk property • Share risk and loss with banks – lenders/owners

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Plans	• CYA (protecting interests) • Operational • Natural environment protection • Preparedness • Prevention • Coordinated response • Well-tested, adaptable	**Constraints:** • Time – review, re-write, communication, impact, resistance to change on other plans, consultation, diff. political masters of diff. agencies • Uncertainty • Resources to implement • Inter-agency communication • Government/political agenda **Enablers:** • Legislation and incidents promote change • Community need • New evidence/knowledge/ research	**Change needed most:** • Make plans usable, concise • Buy in/involvement of users • Often good at making plan, bad at implementing and testing • Communication and feedback • Better at operational than preparedness and prevention	• Whoever's plan it is – drive change as needed

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Telecommunications and IT	• Cross-agency communication – ability to operate • Command control – immediacy of information – leads to expectation of continued info provision to retain integrity of news source and public trust • Manage multiple sources of information • Community education and warnings • Loss of operation/business continuity if communications/IT fails – full service loss to community • Communications = safety for individuals and community • Reliance on modern communications – is this an issues in itself?	**Constraints:** • Funding • Infrastructure– old infra. therefore issues • Pace of change in tech/telcos – legacy • Access to IT • Specialisation of knowledge • Service providers coverage **Enablers:** • NBN • Social media	**Change needed most:** • Need better service coverage from providers • Contingency planning for communications breakdown – training to use alternative and prepare for situations, e.g. government radio network • Maintenance of training and infrastructure • Capacity to use social media to maintain public engagement • Build capacity of emergency management services to respond and provide input into an event of communications breakdown/extreme event • Avoid convergence of media/telco sources, e.g. internet reliance	• IT, public affairs and communications people need to talk to enable more clear interaction with public – greater transparency • Integration between service provider and government/implementers so there is infrastructure to support services
Natural capital				
Water quality and supply	• Portable water during emergency – reticulation reliability • Short-term supply of water stopped by event • Long-term quality of water/contamination	• Perceived security	**Change needed most:** • User demand	• Risk manage supply

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Flooding and Inundation	• Flash, riverine, storm surge and coastal inundation, tsunami • Damage to roads/bridges – access issue • Property damage and risk to life • Loss of services (power, water, sewerage) • Recovery operations for emergency response services • Recovery/evacuation centres – isolation – disease risk – mosquitoes • Public health – water-borne diseases • Water security/contamination risk	**Constraints:** • Apathy • Lack of transparency – government info passing on/releasing flood prone land maps • Flood studies are time/resource intensive and flood events change landscape/land-use change makes studies at detailed scale redundant quickly • Land-use pressures – demographics • Community experience lack of organisational capacity • Personal responsibility • Not learning from past events re land-use planning • Risk perception **Enabler:** • Funding	**Change needed most:** • Land-use planning • Public communication (floods) – making it 'appealing' to take notice of planning • Public perception needs to change – through education, positive reinforcement, marketing/messaging re preparedness • Community ownership of risk – balancing personal responsibility/preparation with emergency management response agencies' services	• Community ownership, self-preparedness • LG – land-use planning with support of state government with support of elected officials (councillors) when challenges are made • Emergency management services need to promote, educate, engage • Integrated, multi-agency collaboration to planning and response (from household scale issues like drainage cleaning through to appropriate funding)
Water quality and supply	• Essential resource: – sustains the food chain – delivery at the top – critical for health and waste disposal • Sydney exceeds supply capacity • Vulnerable to biosecurity • About utilities – relates to energy and telecommunications	**Constraints:** • Prone to infrastructure failure (e.g. Transport failure leading to health impacts or Glenfield over top (Nov 22 2013) 150 ML • Water sharing between human and biodiversity/ environmental needs	**Change needed most:** • High risk areas re fire fighting • Address infrastructure vulnerabilities to climate change • Treat urban areas as 'catchments'	• Strategic planning for water supply in relation to changing climate • Innovative solutions to water storage (e.g. underground water storage) • Investigate new technologies, e.g. solar • Localising energy and water supply to reduce reliance on infrastructure

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Flooding and inundation	• Political event – outrage greater • Loss of housing • Risk to life/ property/ infrastructure • Focus on Sydney – supply chain impacts • Doesn't happen often – memory poor • Isolated or whole of Sydney • Population density • Role of Sydney and importance to economy – global news story (impact on tourism)	**Constraints:** • Housing demand/land shortage – Dept of Planning – lack of perception of risk • People like to live near water but this has risks • Lack of policy on development on floodplains • Developers bear no risk – little accountability – no/low infrastructure– true costs of land under-estimated • Transferring to home owner or council	**Change needed most:** • Western Sydney – housing demand/land shortage – Dept of Planning – lack of perception of risk • State level planning with more support for councils • Legislation/policy resilient to change of government	• State government – Dept of Planning
Multiple events	• A number of sequential events at one location • Resource overwhelmed – human and equipment • Multiple locations for multiple hazards • 2 degree impacts and chain of events • Unpredictability • Response time • Situational awareness • Out of scale • Difficulty of objective of response	**Constraints:** • Silos • Time • Lack of planning for multiples • Lack of training in multiple events/knowledge of multiple events • Resource constraints • 'Perceived government responsibility' • Ageing population • Loss of volunteers • Lack of community resilience • Lack of 10th man, no one looking at cursors and case	**Change needed most:** • Inclusion of people in process of planning • Need resilient communities • Need equipment for evacuation and agency response • Need more investment for infrastructure • Invest in prevention and irrigation – building resilience • Planning needs to be disaster management plans and take into consideration for multiple events in communication plan	• Community leaders • Good network • Good policy – resources, promote community events, all levels • Local Emergency Management Committees

7 Built environment and infrastructure

7.1 Findings

Climate change impacts such as sea level rise, extreme heat, storms and flooding have both direct and indirect impacts on infrastructure and the built environment. Direct impacts include damage to infrastructure, increased demand for services, mortality and health impacts, particularly on disadvantaged communities, disruptions to employment and increased demand on accessible spaces such as public refuges. Indirect impacts include reduction in property values, economic and supply chain disruptions to businesses and tourism, increased household expenditure on utility bills, changes to building design, codes and materials and increasing infrastructure maintenance costs. Various external drivers were also noted as having the potential to shape the severity of climate change impacts. These external drivers include increasing demand for housing and employment through population growth, various funding arrangements between state and local governments, planning and building decisions, pressure to develop on hazard-prone land and Sydney city growth development plans. Both climate and non-climatic drivers were perceived to have the potential to produce cross-sectoral impacts which include declining quality of life, changes to future planning and related infrastructure, changes to immigration and foreign aid budgets, food shortages and delivery disruptions, land scarcity, mortality and migration of species, and increasing demand on emergency and health services.

Key strategies to enhance adaptive capacity of the built environment and infrastructure sector include improving transparency and accountability through improved policy integration. The increased incorporation of green spaces into planning and design codes, public–private partnerships, long-term asset management plans, integrated planning that correlates with population growth trends, training in engagement skills for infrastructure and built environmental specialists and support for research, development and innovation sharing would also serve to improve adaptive capacity in this sector. For example, there is a greater role for local government and the Department of Planning and Infrastructure to play in the identification, development and promotion of urban green spaces in environmental plans and planning controls. Linked to this was the identified need for greater training in community consultation and engagement skills for those working within the built environment sector. State government could also play a greater role in collating case studies related to built environment approaches/best practices/failures and develop web databases of such information to enable peer-to-peer learning across various tiers of government. Creating support and spaces for innovation was also seen as a key adaptation strategy. This will require new skill sets and political support through committed long-term policy and funding to facilitate collaborative research ventures across states and through international partners.

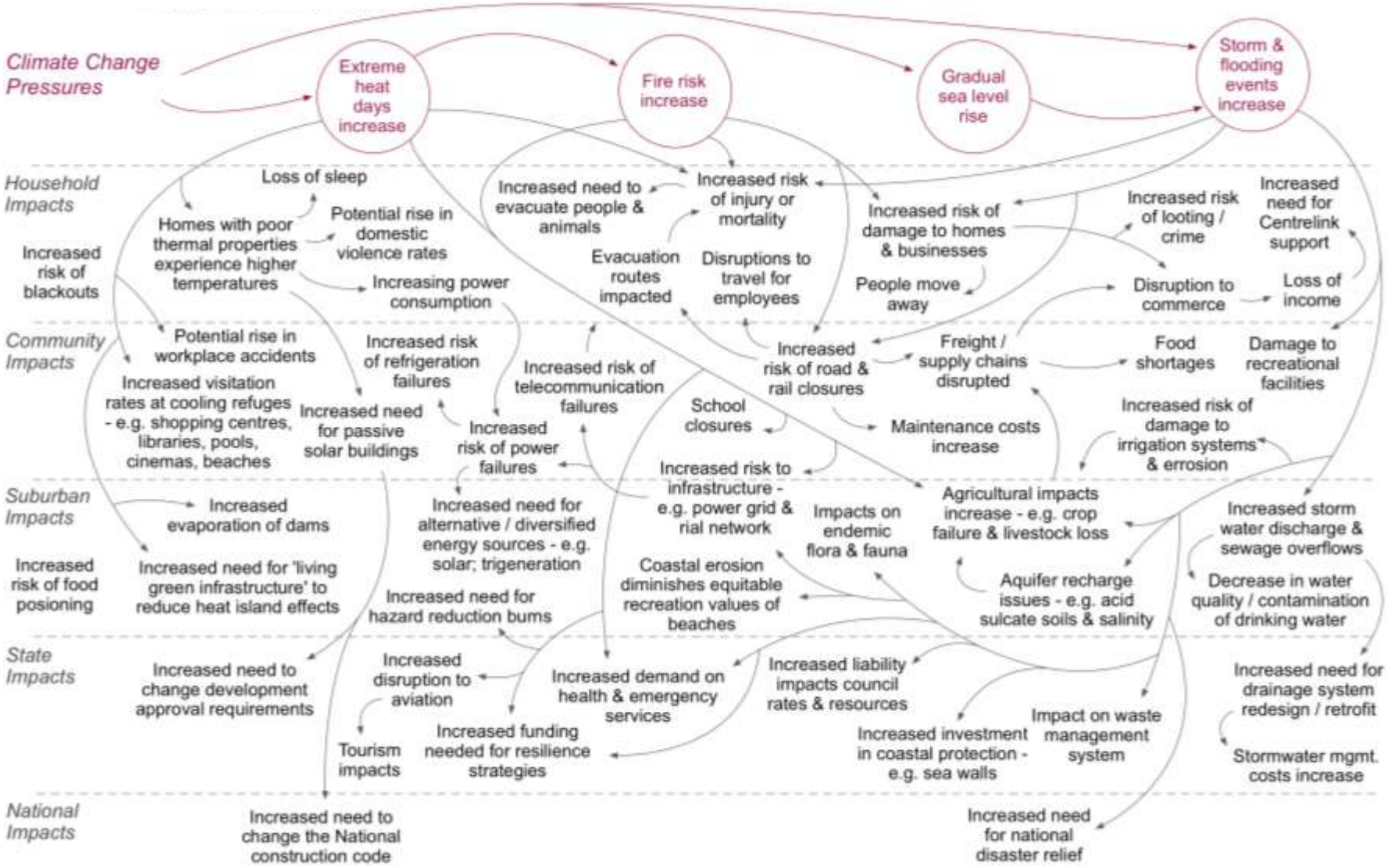

Figure 10: Impact pathways diagram – Built environment and infrastructure

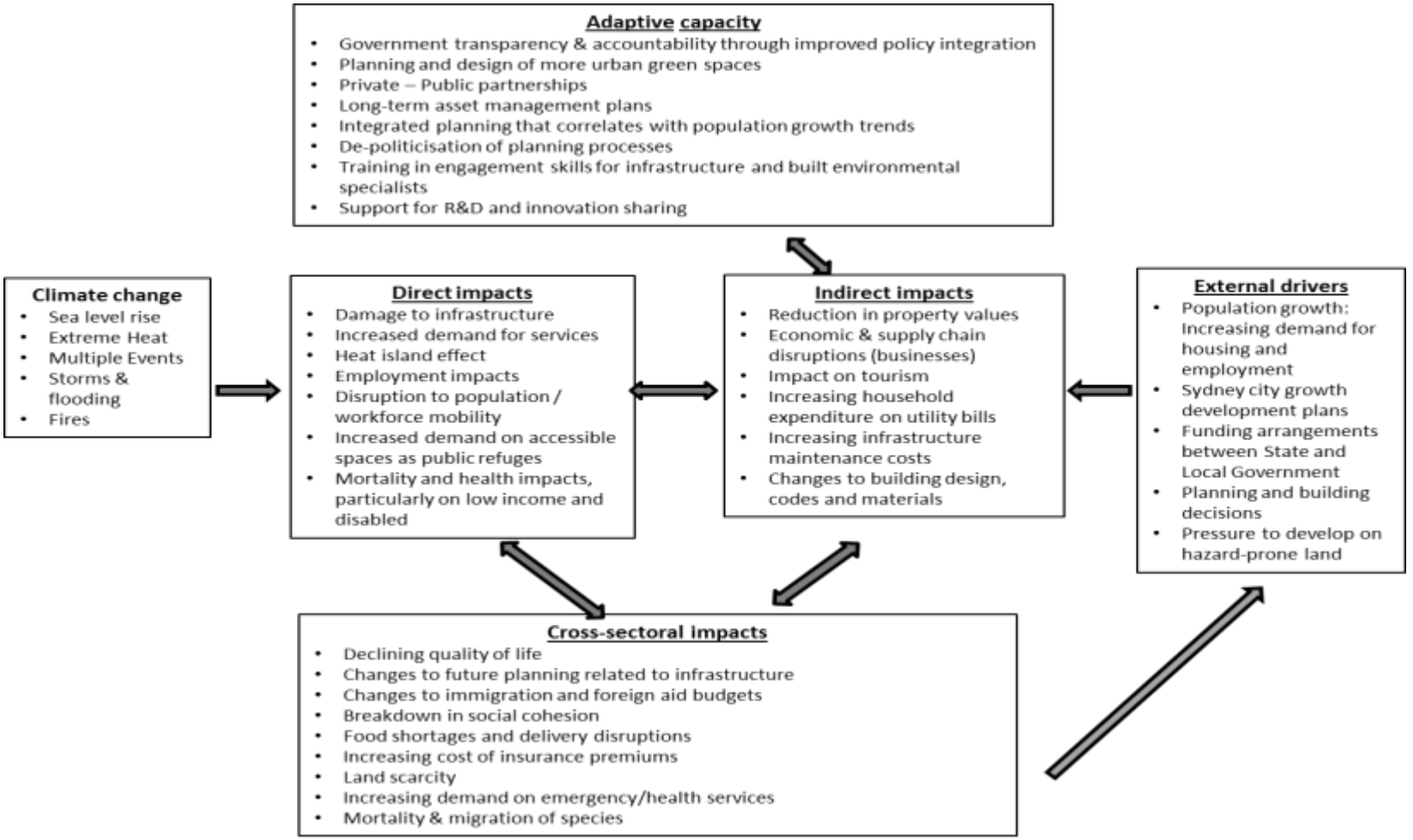

Figure 11: Built environment and infrastructure sector vulnerability to climate change in Sydney

7.2 Workshop outputs

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Financial capital				
Moral hazard	• Risk perception and responsibility • Need to look after disadvantaged • Normal human reaction • No. of times government steps in – how many of these are unavailable	**Constraints:** • Increased personal/government accountability – policy changes and associated defined positions – liability • Education about the limitations of government • Government transparency and accountability • Define a level of service – look after yourself for 72hrs in a disaster • Expectation in community that government will visit in 72hrs • Stop putting people in vulnerable areas – current and future vulnerabilities – define hazard areas – border to border hazard assessments • Implement bush fire policy and regulation for other natural disasters	**Change needed most:** • Motivation to tell people what hazards are • Insurance vulnerability assessments • Resourcing of councils to implement disaster plans and regulations • Accountability linked to liability via transparency at each level of government • Community attitude to hold government to account – demand change when things go wrong	• State government to tell people what hazards are • Community education – appropriate levels of government

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Investment	• Planning for capacity of Sydney region • Ensure long-term planning incorporates climate change ($) • Spending aligns with long-term planning • Enough $$ for employment/ enough land for home/ environment/recreation/ infrastructure/maintenance • Diversity in investment opportunities – enabled by long-term strategy • Investment information – budget for big ideas	**Constraints:** • We don't invest money in getting information analysed • Can't see return on investment • Political cycles – always want quick gain • Government skewing markets – water, energy, waste disposals	**Change needed most:** • Adaptive investment – can change for all • Political support for big ideas and long-term • Incentives for community to invest • Easy access to information when making financial investment decisions • Facilitated discussion between investors and government	• Community has to invest in decisions • Banks, insurance companies – drive risk, influence individuals spending – campaigning government • Local government, local government support, community, co-ops • Pricing, true pricing
Incentives	• When there were rebates for environmental/adaptation got increased take up and cheaper products • Financial incentives across sectors, e.g. household, business to encourage innovation	**Constraints:** • Unclear responsibilities between private and government liability/footing the cost of adaption/risk, e.g. if you buy a house in a flood-prone area • Balancing the responsibility of individual interest vs greater good, e.g. should tax-payers who are not responsible have to pay others, e.g. if I live in Marrickville should I pay for a new road with 3 houses somewhere else • Poor implementation, e.g. solar bonus, pink batts	**Change needed most:** • Targeted and practical incentives need to be reintroduced re energy and water appliance • Incentives for private enterprises to give out regarding moving to better locations or rebuild roads in better places	• Need a proper economic analysis of where government should spend the money across all the sectors that have flow-on impacts from climate change • Make sure incentives are thought out properly and are longer-term and implemented well and try and take the politics out (scientific and community tested and independent)

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Funding priorities and models	• Making a commitment to objectives • Crowd-funding (private/public sector) • Levy (e.g. local environment levies) • Allocated in delivery plan • Depends on corporate planning process • Philanthropy	**Constraints:** • Lack of community input into funding processes • Lack of community engagement across government programs • Visibility of funding (transparency) • Trade-off • Clear evidence-based funding decisions	**Change needed most:** • More effective community engagement/consultation process, e.g. New York Central Park and Golden Gate Park funded communities • Local Government Areas need more influence on funding decisions	• Raise bonds – public ownership of infrastructure and issue
Investment	• Understanding and mitigating potential risks • Subsidies and taxes (carrot/stick) • Out-dated funding models • Insufficient to cover $c • Use of economic incentives • Investment in green infrastructure and technology • Innovative funding and investment to promote environment • Capital into infrastructure – planning, policy, programs • Over short, long and medium term	**Constraints:** • Federal government (political ideology) • Subsidies/taxes to promote climate adaptation • Difficulty in accounts for non-market benefits • Who pays and who benefits (free-riders) • Government structure in achieving integrated outcomes • One government body to take overarching responsibility for the issue • Lack of coordination in funding (lack of governance) • Political cycle driving need/want for short-term wins	**Change needed most:** • Innovative partnerships and funding models (public–private–partnerships, venture capital funds • Distributed with infrastructure – promote non-market benefits, externalities • More integrated planning – investment over longer term/strategic/beyond financial – social/ environmental/ economic • Adaptation funding added to clean air fund • More accountability (better integrated government policy/ financial investment)	• State and local government/Fed • Funding bodies – CEFC • Venture capitalist/ investment banks (private sector) • Corporations, e.g. insurance companies

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Investment		• Influence of media • Lack of political will • Need better cost–benefit analysis to understand • Incentives needed • Science serves investment, not vice versa • Science and technology not taken seriously by government • Competing demands for funds	• Tax-breaks/incentives to invest • Science community – need to speak up • The community – need political will to change • Cross-subsidies are inefficient	• Cultural change • Community and individuals need to drive change at political level to create a financial investment • State government to provide leadership and direction • Government to develop framework to make investment easier/more attractive • Australian science community needs champion
Human capital				
Population change	Is planning/responding to this: • Increased infrastructure – but changing infrastructure need because ageing/young people – changing demographics • Density • Increase in population • Expectations/values in terms of being in a global city • Increased resources to local government ($$ and people) • Increase service need, e.g. health and education • Diversity	**Constraints:** • Prioritisation of economic growth • Lack of planning for growth, e.g. building new schools, hospitals in urban areas – for service provision – funding • People have accepted position of government (state), politics (state), rhetoric 'NSW open for business' • Power of cities to pull people in • Councils don't have resources to look after existing assets	**Change needed most:** • Infrastructure target alongside population and housing growth • Asset management plans/long-term planning at all levels of government • Non-competitive grant programs funding based on priorities – informed by Local Government asset management plans	• Essential services – taxpayers • More user-pays type processes – with equity, e.g. health, recreation – above critical services • Private–public partnerships

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Innovation	• Confidence to change and try new things – needs to be evolution not revolution • Applying existing skill set in new way/a new skill set • Being able to conceptualise – flexible change, innovation part-time • Vision – place in future • Networks, skill set, knowledge and people supported to change	**Constraints:** • Political attitude is disenchanting and won't build vision and confidence • No backing (express, commit policy and $) in cohesive way (long-term planning) • Lack of cooperative mindset with us • Community no vision • No big ribbon • People want to see results – only a few people are doing • Transformative change is scary	**Change needed most:** • Places for people to be innovative in facilitation – sharing innovation • Economic viability of change • Transition of innovation (not dramatic change) • Forum from stable people	
Knowledge and skills	• Knowledge is power – enables and facilitates • Knowledge is understanding • Needs to be current – need to be open/flexible in approaches and learning • Ability to communicate and create good networks • Public knowledge and skills re climate change – reluctance to engage – scepticism • Influence of public leaders, e.g. Prime Minister • Engagement is a subset of knowledge and skills	**Constraints:** • Lack of training • Funding • Lack of will (organisational, political, etc.) • The way people are trained • Media **Enablers:** • Cultural change • Generational change	**Change needed most:** • Need for increased understanding of climate change in broader community • Leadership and political influence • Need for better/clearer communication of evidence-based policy development • Need to consider/talk about what is happening overseas	• Bipartisan leadership • Act local think global – everybody • Unis/learning organisations/TAFE

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Innovation	• Thinking outside the square • Creativity • Investment • Entrepreneurialism	**Constraints:** • Stopping our complacency • Our social values (too geared towards making money) • Our closed mind • Conservatism (reluctance to change) • Investment, research (need much more) • Risk perception that it's high risk • Education system and access • Promoting fear • State government actions, e.g. economic framework for investment in innovation	**Change needed most:** • In our education system at all levels (incl. adult education and tertiary) • More investment in teachers • Individual responsibility • Allowing/providing physical space for innovation • More collaboration	• CSIRO needs to be better promoted • We all do – individuals, communities, in deciding who we vote for • State and Fed. Government investment in education and research • Private investment • More joint ventures with neighbouring countries and knowledge exchange, looking outwards

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Risk perception	• Politics influence risk perception • Assessing risk/tools • Personal risks – short-term – we tend to focus more • Long-term risks – climate change on short-term agenda rather than long-term • Knowledge of what could happen and severity of it and role you play in risks • Need to make informed choices – knowing if you're vulnerable • Education • Understood differently by everyone • Spatially different risks across Sydney	**Constraints:** • Need different approach to risk perception • Lack of info/understanding risks – no action • Change priorities (drought – flood) • Media (hostile to climate change science) • People see clear need and path to act, e.g. water restrictions, benefit. Need clear messaging on other climate change impacts • Readiness strategy – communications framework – ramp up programs for actions – quickly • Frequency of events (people discount the future) • Lack of experience • Inconsistency of policy adoption **Enablers:** • Shifting social values (e.g. people who experienced the depression good at managing waste) • Shifting social networks and community cohesion	**Change needed most:** • Better tools to show climate adaptation impacts/impact of mitigations – return on investment • Learn from experience, e.g. people in Brisbane – more flood aware • Prioritise resilience (not just emergency management) • Better cost–benefit analysis • Definitions and situational awareness • Education and provision of risks • Communication – clear messaging	• Appoint people to deal with resilience in Local Government (specialised role) • Government – change risk perception in community • Whole-of-government approach – strengthened call for emission reduction through climate event • Sub-regional planning strategies need to identify and communicate the risk of regions • Identifying vulnerable communities due to SES or demographics

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Social capital				
Resource sharing and cooperation	• Community groups share Landcare resources • Trust in local government – believe in actions of councils • Planning • Amalgamation of services • Regionally important green spaces (whatever we are planning for, e.g. transport pathways) are link between council and area service providers • Dual purpose and dual use • All community service groups are sharing	**Constraints:** • Silos – all silos • Adversary community groups • Legislation, e.g. endorsed land act • Community attitudes/perceptions/ • Territorial • Risk, e.g. schools – potential liability • Vision – community • Volunteer • Lifestyle changes • Do we know what social resources we have – gap analysis	**Change needed most:** • Legislation needs to change • Buildings and facilities are built for dual purpose • Facilitated networks • Information and transparency for community to be engaged in – reasons/ barriers	• Community drives government • Government facilitates final projects • Private sector required in developments • Community provide time, e.g. men sheds • Community action groups – educated and supported • Continue to fund neighbourhood centres (government) • Engage with users of space in positive way – scouts/guides
Planning	• Increasing social cohesion to increase community resilience to climate change impacts • Everyone more stressed, greater need for social services and sharing this burden as government won't have enough resources	**Constraints:** • Technology positive and negative • Resources at local government level need to be funded	**Change needed most:** • Ensuring people have access to the info they need to help them adapt to climate change, e.g. going to libraries when hot, regular checks of vulnerable people • Need to take advantage of existing/new technology for looking after/checking on each other	• Local government needs to be adequately resourced to help local communities adapt

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Engagement and consultation	• Difficult! • Need for good engagement skills to get the 'true' story • Fact finding and buy-in for policy development – sense of ownership • Needs to be honest and open • Can't be an end in itself – need more defined outcomes – needs to feed in to change outcomes • Wisdom of the crowds – diversity of opinion – innovation (opportunity for) • Representative– how to get everyone and also tap into a changing demographic	**Constraints:** • Time • Fear of outcomes • 'Fake'/lip service consultation • Political pressure – time/deadlines **Enablers:** • Social networking – more casual engagement, but also ensuring accurate info • Need to relinquish some control back to community so they can be more self-reliant (this would promote change) • Media • Education in schools – influencing parents/family	**Change needed most:** • Skilling up • Systems approach • Sharing good engagement/ collaboration – website recording all current actions and sharing experience • Using social media/networks for learning • More training in engagement skills for all built environment specialists – also a need for attitudinal change to allow community an authentic voice Local Government NSW or OEH	• Web database of case studies/top priorities of other LGs/agencies to help share info/skills – peer-to-peer learning • ROCs network system • State government role to play re systems/collating case studies, re built environment approaches/best practices/failures

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Community cohesion	• Everyone singing from same hymn book • Talking to your neighbour • Living in same place for a long time • Identifying with your community, a sense of community, shared sense of values • Creating common understanding	**Constraints:** • Design of built environment – democratic use of space • Perception of safety (fear) – well lit streets • Purpose, shared interest • Active/public transport – not private car **Enablers:** • Use existing networks • Activation of spaces – events participation – common	**Change needed most:** • Neighbourhood level – shared places to encourage cohesion • Culturally and Linguistically Diverse community need shared public spaces protection • Social networks/social media promote cohesion even though not a place • Near high density suburbs	• Planning should guide development that has positive community cohesion guidelines (SEPP 65) • Councils promoting community gardens/ verge planting, e.g. Auburn City Council cookbook of different Culturally and Linguistically Diverse recipes linked to community • Staggered work hours to get more people on the street • Explore social media to build cohesion and reduce congestion (rage)
Social values	• What we think is important but depends on context	**Constraints:** • Political and economic climate • Media • Researchers • Community leaders • People don't like change • Not enough 'disasters', i.e. climate change is invisible • People are 'time poor' • Perception that change is for radicals • Issue is too big to get a hold on/ beyond our scope until a disaster happens	**Change needed most:** • Schools – get in early to educate kids • Staged government regulations (slowly ramp up) • Clear well informed messages	• Us – we all have a part to play • Mainstream media. Need to be more responsible on all levels • Government – need to slowly ramp up regulations

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Physical capital				
Energy	• More efficient and cleaner • Sustainable – green, stability of supply • Decentralised energy mix • Level of service – community expectations of lighting • New technologies – increase energy efficiency (LEDs), create/generate (solar)	**Constraints:** • Long-term planning out to 100yrs • Regulation to promote change – current regulation promoting status quo, interest of current incumbents, disincentive to innovation • Natural disasters/extreme events – making move to decentralised, resilient energy systems	**Change needed most:** • Staged approach to change – replacement/augmentation/ decentralisation • No privatisation of electricity system – decentralisation • More competition for providers and technology	• State to national conversations – national grid – national leadership • Federal government needs to change disaster funding requirements that require like for like replacement

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Water and sewerage infrastructure/waste	• Health and wellbeing of community • It is a social service that should be provided to all • Security against climate change • Pre-requisite to growth – need to ensure growth is in area where water is secure • Pipes, pumping stations, distribution networks	**Constraints:** • No disincentive to create waste • We don't have true costs – pricing to lowest value (e.g. rice) • Attitude to water – attitude to recycled water • Community perception • Cost increase • Monopolisation • Too much political interference in system, e.g. desalination plant • Legal and regulatory structural problems/difficulty with planning regulations **Enablers:** • View of sewerage water being a valuable and finite resource • Cost effective solutions	**Change needed most:** • Look at innovative system for security of service • portable top-up – invested agendas • Correctly operating plants • Decentralised solutions – treatment, health. Risk and funding (problems however) need combination of options – checks and balances needed • Regulations need to be reviewed and streamlined • Need cultural change re water use • Community education • Greater balance between domestic and industrial use/price, etc.	• Individual needs to change actions • Tertiary/education/ science needs to promote research • State government (as they control price)

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Residential development	• Thermal comfort and building designs • Flood resilience – planning guidelines • Retrofitting old housing and development for energy and water efficiencies • Water sensitive landscaping • Waste management – composting • Renewable energy generation • Increased density • Managing growth and land • How services are planned • Traffic/transport routes to be connected • Safe buildings • Sustainable building and communities • Tension between land for residential development and land for natural/passive uses • Residential pressures in Sydney's food bowl – including food miles, etc. • Needs for community infrastructure to support new developments	**Constraints:** • Split incentives (tenant /landlord, strata/tenant) • High upfront cost or perceived increased cost • Lack of knowledge/ awareness/benefits • Lack of risks perception • Incentives/rebates for government to promote energy and water efficiencies • International competitiveness / best practices/innovation • Review of standard (BASIX) • Conflicting attitudes – a need for attitudinal change around new housing design standards – 'a perceived' lower standard re design quality and lot sizes – not considering amenity • Apartment size and dwelling mix –innovation to change to more sustainable housing • Market demand/housing cost and affordability • Vested interests pressure on government • De-politicisation of planning process is needed • Developers' profits, e.g. cooperation on S.94 didn't decrease cost of land • Different choices for housing material and style	**Change needed most:** • Review of existing standards (i.e. BASIX) • More incentives to drive change • Learning from successful/ non-successful case studies • Incorporating flood mitigation guidelines into existing plans • De-politicisation of planning process – BASIX needs to go further to achieve sustainability – is open to owner/developer 'tweaking' – needs a regulator/MER • Comprehensive understanding of the profit phases of development • Educate community re demographic/population pressures of future • Need more passive/renewable design – mandated (e.g. solar green, etc.) • Need a more sophisticated community conversation so they demand more sustainable developments • Need more incentives and education for community and developers • Need for Research and Development to reduce costs of more renewable/sustainable developments	• Planning Department • State and local government • Developers/private sectors • Bipartisan political support and conversations • Adjustments to S.94 to make developers do 'climate change' ready • Local Government levy for resilience fund (state too?) • Increased engagement in strategic planning and community debate to raise awareness re residential development • Unis/researchers to 'tell the stories' more clearly e.g. Green Square

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Roads and Transport	• Major rates of access for people, services and goods	**Constraints:** • Costs – lot of money involved when looking at change, controversial area • Lack of long-term bipartisan planning • Who is responsible for what? • Are roads also being considered in other transport/urban planning • Equity issues – if oil prices increase it will become less affordable • Competing land uses, e.g. getting rid of existing houses/cost of land • Maintenance of roads in face of climate change impacts • Private versus public ownership of transport	**Change needed most:** • Long-term vision and bipartisan, e.g. new government funding for roads and public transport – can be cheaper to fund new roads – maintaining existing roads • Shift from car-based transport to public forms • Encouraging alternative communication, e.g. tele-community • Jobs closer to home • Looking at key infrastructure, e.g. airports, transport hubs, trains stopping because of heat • Greater reliability of public transport to keep going and catering for communities with higher needs, e.g. elderly • Look at lots of networks that don't fall or if one aspect is impacted on or shuts city down • De-centralisation of Sydney centric transport hub	• Our leaders need a coherent, long-term (40 – 50yrs) plan not based on political influence • Need to have a funded plan (mixed funding source incl. private) • Everyone needs to get real and understand limitation of transport networks. In big cities, e.g. we know what works, e.g. congestion tax in London to pay • Subsidise train transport (e.g. employers) • Don't see Sydney in isolation – protect the economic place of Sydney, i.e. freight is an integral part of this

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Natural capital				
Multiple events	• Coincident events (heat wave and bushfire, rain or flood) • Consequent event (storm, flood, bushfire)	**Constraints:** • Increasing climate variability • Increasing intensity and frequency of events • Lack of awareness, knowledge of climate science (political will) • Also conflicting reports on science • Upfront costs of education and capital cost (e.g. spend now to save later)	**Change needed most:** • Organisational structures to change response capability • Political will • Clarification of roles and responsibilities • Long-term planning needed – in vulnerable areas • Acceptance of living with natural hazards	• Accountability down to individual level – changing behaviours to reduce climate impact • Reviewing 'trigger' for disaster relief (section) to include multiple events (refining different criteria to account for)
Water quality and supply	• Availability • Ecosystem services • Natural water systems • Security and equity • Fit for use – using particular water for different uses (recycling)	**Constraints:** • Costs – calculate on delivery cost – too cheap/not valued • Community attitudes – resistant to recycling • Can afford new so no concern for recycling • Variability of our climate – too much rain then drought • Commercial interests in making recycling/alternative water un-economic • Polluters • Development pressures • Desal plant – have to pay for the contracts • Topography – development rolls out with water – system break-through decentralisation possible	**Change needed most:** • Incentives – none to disincentives – industry, households. Few demonstration projects, no focus since drought broke, make water priced according to scarcity and variability • Fed/state government attitude to climate change • Separate between critical and discretionary water use – benchmarks • Developer contributions need to change – no cost if Sydney water, cost if you run your own system	• State government IPART – policy • Local incentives to conserve water • Natural resource economists need it have more say

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Food supply and security	• Sydney depends on transport links for food – interstate and overseas • Can't always guarantee food security because you could have a disaster that will impact on availability (having trading partners)	**Constraints:** • Dependency on other areas for food but now need to look at ways to adapt our own agricultural industries to increase in extreme weather	**Change needed most:** • Innovation – more research into where food needs to be placed or localised, e.g. breeding for agriculture that can cope with climate changes and different patterns • Protect viable agricultural land e.g. BSAL in Hawkesbury • Need water security to meet emerging agricultural needs, e.g. not growing rice, water-dependent crops in Australia • Right crop for the right climate	• Agricultural industry needs to include climate adaptation

Indicator	What does the indicator mean?	What is stopping/promoting change?	Where is change needed the most/least?	Who needs to do what?
Green space and reserves	• Sporting fields • Creek lines • Parks • Street trees/vegetation • Physical and mental health outcomes (healthy and active living) • Environmental services – ecological systems, connectivity, living spaces, cooling for health benefits, cost benefits in terms of less HVACs • Places for community expression and changing ethnicity • Breathing space • Places for passive and active recreation • Diverse green spaces, i.e. streetscapes, etc. and also biodiversity and connectivity • Rainfall infiltration and storage • Different cultural uses • Pressure from built environment puts pressure on green spaces – also management of green spaces may impact built environment, e.g. bushfire risk • Balance of built form • Carbon sinks and Urban Heat Island management – heat sink	**Constraints:** • Need for increased housing and development • Less green space, people will value it more • Cost of maintenance and liabilities in maintaining the green spaces • Lack of information or bad experiences with previous projects • Value of land • Community perception – because of levels of knowledge re benefits or climate pressures • Demographic differences (those who already have space) **Enablers:** • More successful case studies and demonstration project • Providing environmental services (cooling, living spaces, health, cleaner air, etc.) • Different community priorities	**Change needed most:** • Policies/guidelines to protect and promote green spaces • Promoting benefits of environmental services to developers • Incorporate or encourage planning and designs for more green spaces (roofs, walls and parks) • Need more innovative asset management – cost sharing • Need to promote balance – between density (pop) and space • Sub-regional/networks of green spaces to allow for movement through the city fabric • Recreational needs analysis • Network to carry cyclists/ pedestrians – biodiversity access/movement • Greening streets as de-facto parks	• Planning and Councils to encourage and promote green spaces in environmental plans • Sub-regional delivery plans and Metro strategy • LG to identify, develop and promote green space through Development Control Plan, planning controls, Local Environment Plans • Influencing engineers – attitudinal change • Universities need to change engineer courses to appreciate/consider green space and sustainability • Finance sections of council/state government need to work with strategic managers to get more innovative and integrate asset management • Local and state governments need to understand networks – integrated and collaborative planning

Appendix A: List of sector workshop participants

Participants in the human services workshop

First name	Last name	Organisation
Alecia	Brooks	Cancer Institute
Judith	Bruinsma	Western Sydney ROC (WSROC)
Judy	Christie	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
Bill	Dixon	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
Philip	Edney	Canada Bay
Andrew	Eldridge	TAFE NSW – Sydney Institute
Mathew	Ferguson	Office of Communities
Jessica	Fletcher	TAFE NSW – South Western Sydney Institute
Deborah	Gardener	TAFE NSW – Western Sydney Institute
Lynne	George	Marrickville City Council
Elizabeth	Hansell	Hurstville City Council
Isabel	Hess	Department of Health (DoH)
David	Johnston	Hornsby Shire Council
Vanessa	Keyzer	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
Tracy	Leahy	Penrith City Council
David	Linden	Hurstville City Council
Kieren	Lynch	Environment Protection Authority (EPA)
Claudine	Lyons	Department of Health (DoH)
Christine	McBride	City of Sydney (CoS)
Eugene	McGarrell	Department of Family and Community Services (FaCS)
David	Mitchell	Department of Planning and Infrastructure (DPandI)
Amanda	Neirinckx	Department of Planning and Infrastructure (DPandI)
Kristie	Owen	Sutherland Shire Council
Ruth	Paillas	Local Government NSW
Fidelma	Rogers	Aboriginal Affairs
Peter	Sainsbury	South Western Sydney Local Health District (LHD)
Kye	Sanderson	Hurstville City Council
Norma	Shankie-Williams	Department of Planning and Infrastructure (DPandI)
Helen	Sloan	Southern Sydney Regional Organisation of Councils (SSROC)
Stephen	Summerhayes	Sydney Coastal Councils Group (SCCG)
Olga	Yoldi	Regional Development Australia Sydney (RDA Sydney)
Pamela	Young	Department of Education and Communities (DEC)

Participants in the economy and industry workshop

First name	Last name	Organisation
Samantha	Bones	City of Canada Bay
Judith	Bruinsma	Western Sydney Regional Organisation of Councils (WSROC)
Rafael	Chemke	Sydney Harbour Foreshore Authority (SHFA)
David	Coleman	Canterbury City Council
Bill	Dixon	Hawkesbury–Nepean Catchment Management (HNCMA)
Andrew	Docking	NSW Department of Primary Industries
Bruce	Dowdell	Transport NSW
Craig	Edmondson	Hurstville City Council
Wayne	Gates	Office of the NSW Small Business Commissioner
Duncan	Gilchrist	Marrickville Council
James	Goodwin	Environment Protection Authority (EPA)
Paul	Judge	Bankstown City Council
Sam	McGuinness	Waverly Council
Louise	McMahon	Hurstville City Council
Nick	Meulengracht	NSW Trade and Investment
David	Mitchell	Department of Planning and Infrastructure (DPandI)
Jill	Morris	NSW Department of Premier and Cabinet, Urban Productivity Branch
Amanda	Neirinckx	Department of Planning and Infrastructure (DPandI)
Kate	Norris	NSW Trade and Investment
Julie	Scott	Liverpool City Council
Andrea	Tattam	Leichhardt Municipal Council
Suzanne	Williamson	Randwick City Council
Christine	Winning	Macarthur ROC
Olga	Yoldi	Regional Development Australia Sydney (RDA Sydney)

Participants in the natural and cultural assets workshop

First name	Last name	Organisation
Sharni	Adameitz	Arts NSW
Belinda	Atkins	Mosman Municipal Council
Olwen	Beazley	Office of Environment and Heritage (OEH)
Linda	Bell	Office of Environment and Heritage (OEH)
Margaret	Bottrell	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
Cara	Brigham	Urban Growth NSW
Jodi	Cameron	Hawkesbury–Nepean Catchment Management Authority (HNCMA)

First name	Last name	Organisation
Katy	Christian	Lane Cove City Council
Vicki	Currie	Marrickville Council
Michael	Dean	Sydney Coastal Councils Group Inc.
Bill	Dixon	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
Bronwyn	Englaro	Randwick City Council
Ralph	Forinash	North Sydney Council
Tim	Hager	Office of Environment and Heritage (OEH)
Susan	Harrison	Office of Environment and Heritage (OEH)
Emma	Hawkins	Woollahra Council
Wendy	Hills	Office of Environment and Heritage (OEH)
Frances	Jackson	Royal Botanic Gardens, Sydney
David	Kirkland	Western Sydney Parklands Trust
Tanya	Leary	Office of Environment and Heritage (OEH)
Stuart	Lovejoy	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
Yvonne	Lynch	City of Melbourne
Kieran	Lynch	Environment Protection Authority (EPA)
Kim	Macqueen	Pittwater Council
Sam	McGuiness	Waverley City Council
Claudia	Miro	Sutherland Shire Council
Bob	Moffat	Sydney Opera House
Allan	Raine	Department of Primary Industries | Office of Water
Matt	Riley	Office of Environment and Heritage (OEH)
Shelly	Rowell	Sydney Opera House
Jonathan	Sanders	NPWS Cumberland
Kath	Schilling	Office of Environment and Heritage (OEH)
Daniel	Sealey	Sydney Harbour Federation Trust
Norma	Shankie-Williams	Department of Planning and Infrastructure (DPandI)
Brianna	Sharpe	Aboriginal Affairs
Lorraine	Simpson	Randwick City Council
Harkirat	Singh	Hurstville City Council
Helen	Sloan	Southern Sydney ROC
Steven	Smith	Mosman Municipal Council
Cath	Snelgrove	National Parks and Wildlife Service
Nancy	Tarlao	Ryde City Council
David	Watts	North Sydney Council
Graham	Wilson	National Parks and Wildlife Service

Participants in the emergency management workshop

First name	Last name	Organisation
Robert	Adam	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
Matthew	Adams	Office of Environment and Heritage (OEH)
Ian	Armstrong	Sydney Coastal Councils Group
Alannah	Ball	Department of Housing
Peter	Belshaw	Blue Mountains City Council
Warren	Birkinshaw	Hurstville City Council
Richard	Blair	Campbelltown City Council
Richard	Broome	Department of Health (DoH)
Judith	Bruinsma	Western Sydney Regional Organisation of Councils (WSROC)
Joseph	Buttita	Blacktown City Council
Daylan	Cameron	Office of Environment and Heritage (OEH)
Santina	Camroux	Department of Planning and Infrastructure (DPandI)
Hamish	Clarke	Office of Environment and Heritage (OEH)
Alana	Clements	Disaster Clinical Nurse
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Paul	Collings	Willoughby City Council
Mike	Corliss	NSW Ambulance
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Greg	Davis	Office of Environment and Heritage (OEH)
Bill	Dixon	Hawkesbury–Nepean Catchment Management Authority (HNCMA)
John	Dodd	Campbelltown City Council
Matthew	Drago	Kur-ring-gai Municipal Council
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Carina	Gregory	Hurstville City Council
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First name	Last name	Organisation
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David	Parsons	Sydney Water
Elspeth	Rae	State Emergency Service (SES)
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Andrew	Richards	State Emergency Service (SES)
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Jenny	Scott	Kur-ring-gai Municipal Council
Corey	Shackleton	Rural Fire Service
Lew	Short	Ecological Australia
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First name	Last name	Organisation
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Chris	Chung	Auburn City Council
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Emma	Howcroft	Canterbury City Council
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William	Manners	Fairfield City Council
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Linda	McClure	Willoughby City Council
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Barbara	Schaffer	Government Architects Office
Jenny	Scott	Kur-ring-gai Municipal Council
Corey	Shackleton	Rural Fire Service
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Brian	Woolley	Canada Bay Council
Hudson	Worsley	City of Sydney (CoS)
Choonghan	Yeo	Randwick City Council
Olga	Yoldi	Regional Development Australia Sydney