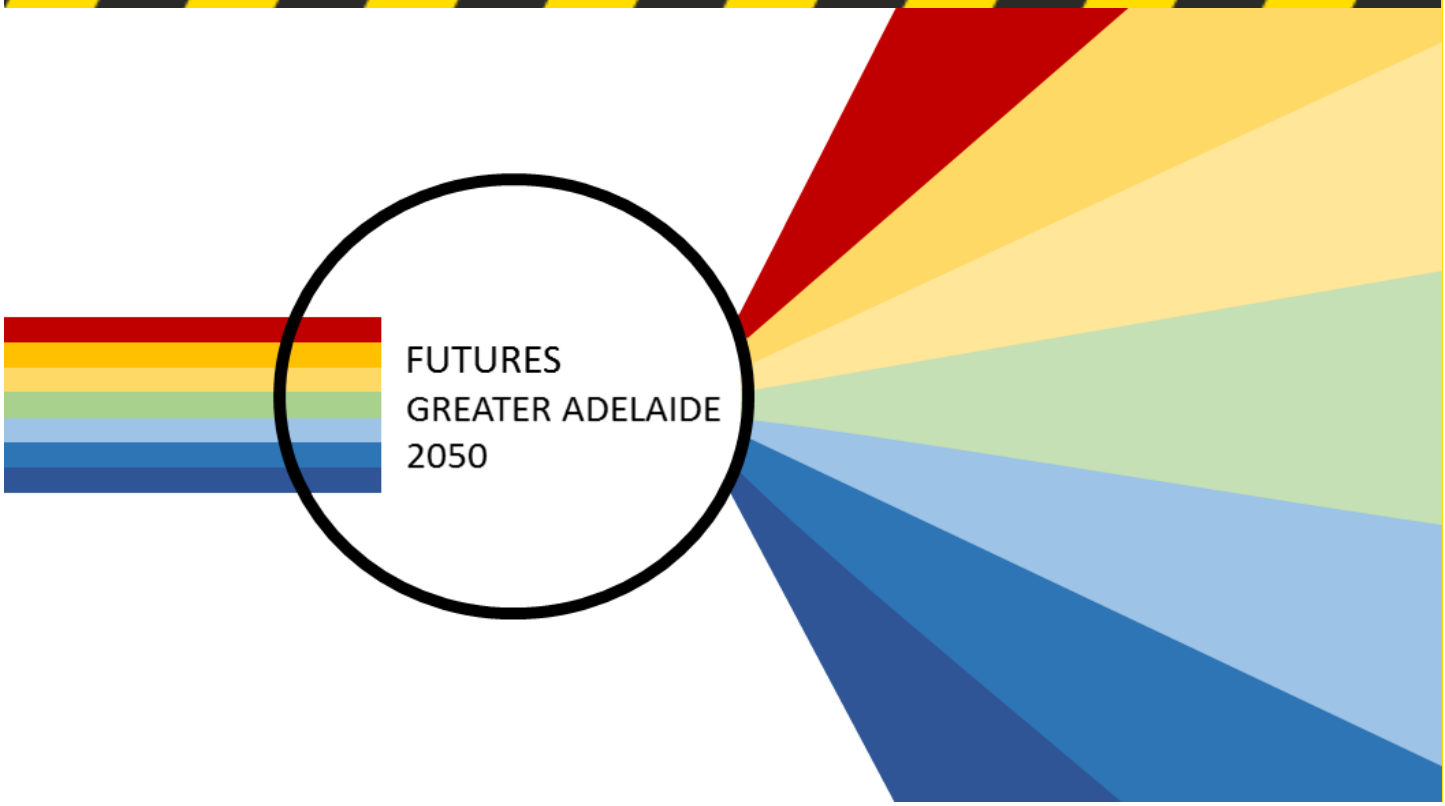
bnhcrc.com.au

bushfire&natural HAZARDSCRC

FUTURES GREATER ADELAIDE 2050

An exploration of disaster risk and the future

Graeme A. Riddell, Hedwig van Delden, Graeme C. Dandy, Holger R. Maier, Aaron C. Zecchin, Jeffrey P. Newman, and Charles Newland
The University of Adelaide, SA
Research Institute for Knowledge Systems, the Netherlands



THE UNIVERSITY of ADELAIDE

RIKS
research institute for knowledge systems

Version	Release history	Date
1.0	Initial release of document	24/01/2017

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Publisher:
Bushfire and Natural Hazards CRC

January 2017

Citation: Riddell, G. A., van Delden, H., Dandy, G. C., Maier, H. R. Zecchin, A., C, Newman, J. P. and Newland. C. (2015) Futures Greater Adelaide 2050: An exploration of disaster risk and the future, Bushfire and Natural Hazards CRC

CONTENTS

INTRODUCTION

Better to build a fence at the top of a cliff, than park an ambulance at the bottom
Helen Clark – 2015 Sendai Conference on Disaster Risk Reduction

Natural disaster risk is a combination of the natural hazard[1], exposure[2] and vulnerability[3]. As a result when considering future disaster risk and planning to minimise it, the uncertainty and complexity of each factor must be considered. Influencing factors on the three components of risk include political decisions, economic development, technological advancement, demographic changes and changing climate, many of which are mutually influential as well. The uncertainty and complexity that arise from these factors are critical to understand when considering long term disaster risk reduction planning, especially when planning decisions can have long lasting influence and large expense.

In an attempt to characterise, understand and subsequently make better decisions under these conditions the BNHCRC funded project "*Decision Support System (DSS) for Assessment of Policy & Planning Investment Options for Optimal Natural Hazard Mitigation",* was initiated. For Greater Adelaide the project looks to develop an integrated spatial DSS to model long term changes in risk and subsequently assist decision makers plan and implement disaster risk reduction policies and investments. Incorporated with the development of the prototype software package is a facilitated stakeholder engagement process informing the development and then subsequent use of the system.

In September 2014 the first stage of this process was completed with results documented in Van Delden et al. (2015). The second phase, of which this report documents, incorporated the development of exploratory scenarios[4] to better understand relevant uncertainties, develop strategic capacity in decision makers to consider uncertainties impacting on policies and provide a better understanding of the value and use of the developed DSS.

The process looked to discover critical elements relevant to disaster risk reduction[5] and consider how they change into the future. As a method for exploring the future, scenarios were developed considering the changes from 2013 to 2050. Five alternate futures for Greater Adelaide were developed by members of SA's State Mitigation Advisory Group (SMAG), assisted by the scenarios team at the University of Adelaide and Research Institute for Knowledge Systems. These were subsequently modelled and results of the qualitative and quantitative scenarios will be presented in this report.

[1] Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption or environmental damage. (UNISDR 2015)
[2] People, property, systems or other elements present in hazard zones that are thereby subjected to potential losses (UNISDR, 2009)
[3] The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR, 2009)
[4] Plausible descriptions of how the future might develop, as based on a coherent and internally consistent set of assumptions about the key relationships and driving forces (van Vuuren et. al., 2012).
[5] The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through the reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events. (UNISDR, 2009)

RESILIENCE

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
UNISDR 2015

Following the first stage of stakeholder engagement building resilience was considered as one main approach to managing and minimising disaster risk in Greater Adelaide. For the development of exploratory scenario factors, workshops participants were asked to answer the following two questions:

1. *What factors are relevant when creating and encouraging resilience for disaster risk reduction?*
2. *What would make these factors easy or difficult?*

In response to the first question participants offered four personal responses that were subsequently clustered together. These clustered responses are characterised below. In total 53 factors were noted across three break-out groups, which were clustered into 17 headings.

The five most prominent factors which were subsequently used in the scenario development process were:

- Available resources for action
- Stakeholder understanding and knowledge of hazard/risk
- Social cohesion
- Efficacious policy
- Infrastructure

Participants then discussed what would make these factors more or less difficult, and these discussions underpinned the scenario development.

MITIGATION

The lessening or limitation of the adverse impacts of hazards and related disasters.
UNISDR 2015

State funded mitigation activities were also considered as the main approach to minimising disaster risk, in collaboration with resilience. These two approaches can be considered top-down (mitigation) and bottom-up (resilience), and participants considered these effective methods for SA to manage disaster risk.

Again two questions were posed to participants:

1. *What factors are relevant when designing and/or implementing mitigation policies for disaster risk reduction?*
2. *What would make these factors easy or difficult?*

For question one, 47 responses were collected as being relevant factors for the design and implementation of mitigation policies. These were clustered into 15 groups and again are characterised by the below figure.

The five most prominent factors for effective mitigation policies are listed below. These factors were carried through to construct futures that would be either easy or hard to design and implement mitigation policies under.

- Data and knowledge
- Governance structures
- Holistic policies
- Institutional culture and perception
- Cost benefit considerations

Participants then discussed what would make these factors easier or more difficult and this fed into the developed visions.

SCENARIOS

Imagination is more important than knowledge Albert Einstein

The purpose of scenarios are to explore plausible pathways into the future. The future is a volatile, uncertain, ambiguous and complex place, but decisions and policies need to be implemented. Through a series of workshop these factors were explored with members of the State Mitigation Advisory Group (SMAG). Uncertainties and drivers were considered which resulted in five alternative futures for the City.

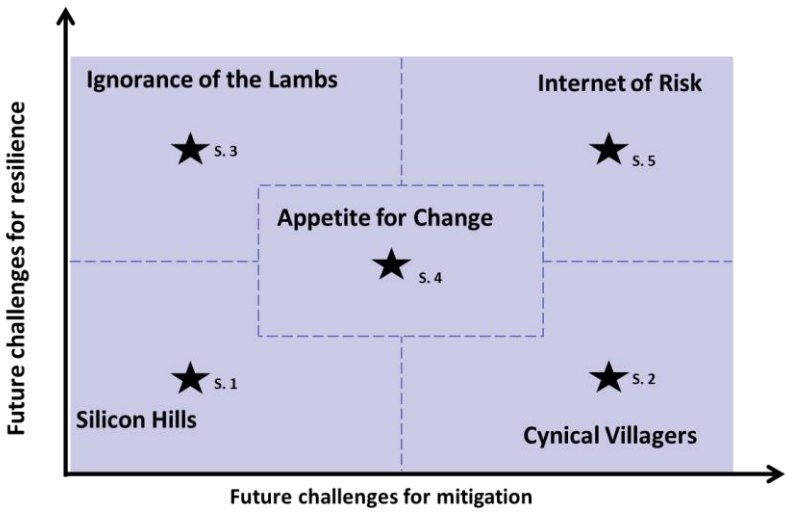
Exploratory scenarios offer rich, qualitative and quantitative descriptions of a future world state and look to incorporate assumptions for alternate world views (Rounsevell and Metzger, 2010). These assumptions can involve diverse ideas and opinions. The construction of exploratory storylines allows for the consideration of future, uncertain drivers by asking, "what can happen?" (Börjeson et al., 2006). This exploration of uncertain change in drivers can allow decision makers to test policy options in alternate, but plausible, future conditions.

By developing these scenarios with a diverse range of influencers and decision makers ambiguity can be challenged by encapsulating alternate worldviews and minimize it through facilitated discussion. Complexity is addressed by incorporating mental models of domain experts and stakeholders to identify causal relationships that could be difficult to ascertain from a purely scientific base, into a model framework. The increased creativity that is possible through participatory workshops and scenarios can also often lead to an increased understanding of the subtleties within the influence of social, economic and environmental drivers (Kok et al., 2011).

The scenarios developed for Greater Adelaide focused on two axes considering resilience and mitigation and the State's ability to reduce disaster risk. By focusing on these axes scenarios for the future were created to explore what would challenge the effectiveness of policies.

These scenarios and the development process had aims to:

1. To develop policy relevant scenarios capable of testing the efficacy of proposed policies, and to be used in the design of efficacious policies (either robust, adaptive or flexible).
2. Allow for social capital to be grown with participants and increasing strategic capacity in decision makers when consider policy alternatives and uncertain futures.
3. Allow for an understanding of difficult futures for decision makers to operate in and subsequently allow for an understanding of how to avoid this and catalyse action against these futures, if within the influence of participants and their networks.



Silicon Hills

Low challenges to mitigation and resilience

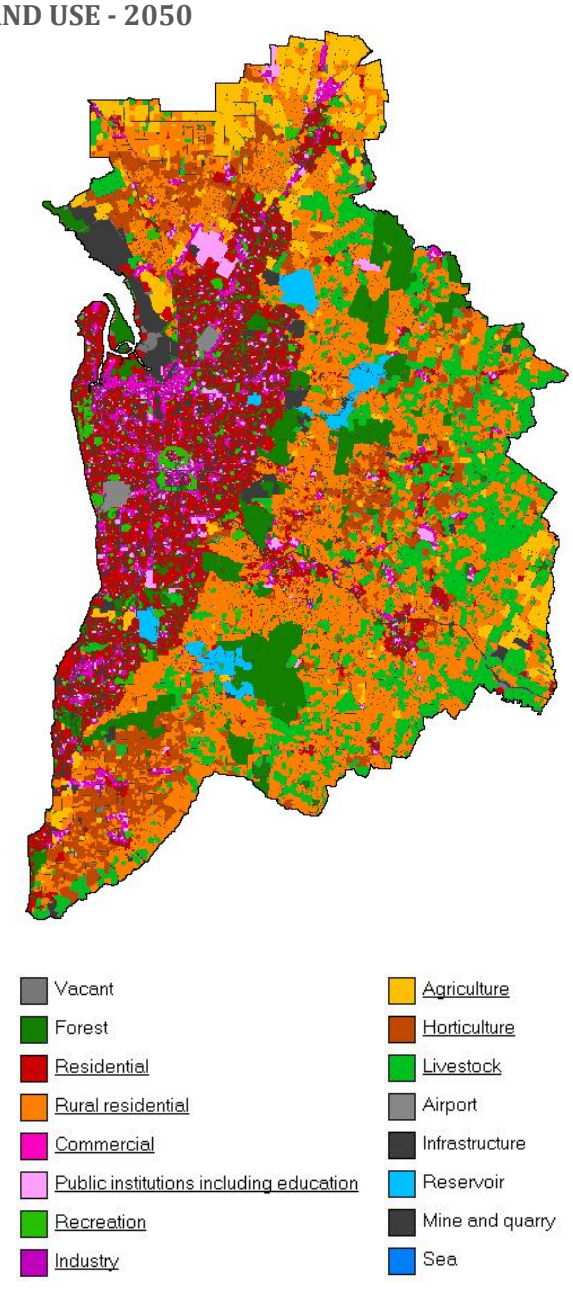
Greater Adelaide transitions towards a well-balanced technology focussed economy, driven by highly skilled and engaged locals and expatriates as well as immigrants looking to capitalise on the State's booming high-tech industry while enjoying the relaxed, nature filled lifestyle the Mt Lofty Ranges and Adelaide Hills offer.

The emphasis on enjoying and connecting with nature ensures well-maintained areas of local significance along with increased understanding and subsequent reduction of human impacts on the landscape. The focus on technology also sees an increase in localised industrial and commercial zones along with a growing service based economy, providing the convenience of a global city with the relaxed lifestyle of Adelaide.

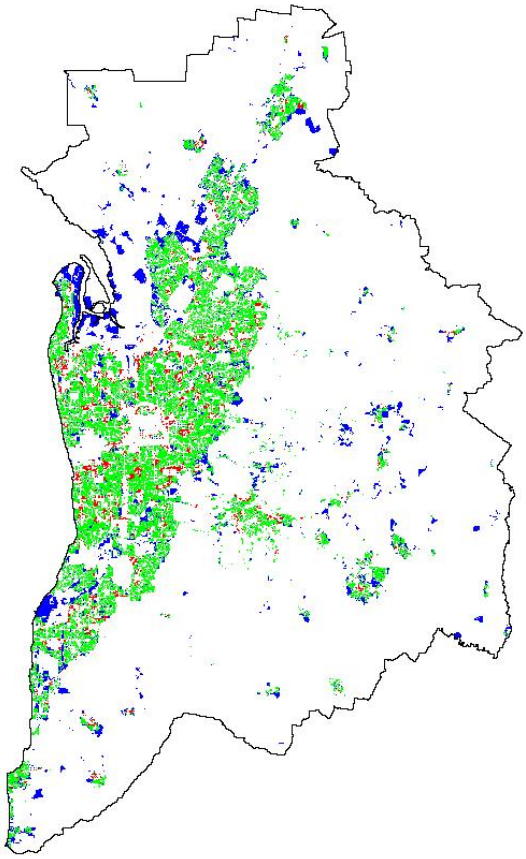
Greater Adelaide continues to be a place of high multi-culturalism, with new residents that have an appreciation of the land and are active in their pursuit of greater understanding and protection of nature. This leads to a focus on nature-based solutions to natural hazards, and a planning system focussed on understanding the risks prior to development. Community togetherness grows with new technology firms allowing employees the flexibility to engage in many activities outside the office.

The increased wealth within society allows for a greater emphasis on diverse urban form and development, and with improvement in construction technology, new buildings and infrastructure are becoming less and less vulnerable to multiple hazards.

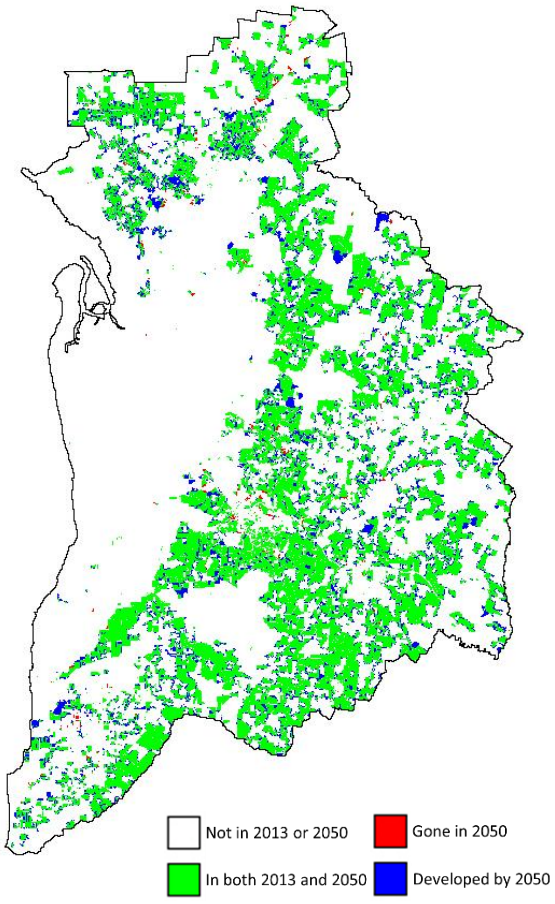
LAND USE - 2050



RESIDENTIAL LAND



RURAL RESIDENTIAL LAND USE



MOTIVATING FACTORS

A growing global valuation of the environment coupled with Adelaide's low cost of living with high amenity value sees an increase in immigrants with skills in technology, innovation and research & development. This leads to a shift in the economy stimulating high tech developments and a move away from low value industries. The international, highly-skilled work force facilitates global trade and awareness of and preparedness for global change. The wealth of the society in combination with their awareness of risks opens the road to effective mitigation in conjunction with enhanced community resilience, in line with global efforts for positive adaptation to climate change.

POPULATION & URBANISATION

With the increased emphasis on technology and increasing international standing of local universities and start-up companies, skilled, highly educated immigrants look to Adelaide as an innovative city and a gateway into Asian markets yet still with Australia's strict commercial protection laws. This sees a growing population with immigration from Europe and the Americas, along with increasing Asian student numbers who look to settle in Adelaide after graduation. There is a government emphasis to design new residential developments to incorporate greenspace and the latest in urban design as well as considering the hazard risk in initial developments due to the increasing environmental awareness of residents. These developments lead to an increase in higher density city living, due to Adelaide CBD's close links to green areas and the beach, along with further developments in the Adelaide Hills facilitating a 'tree-change'.

COMMUNITY PROFILE

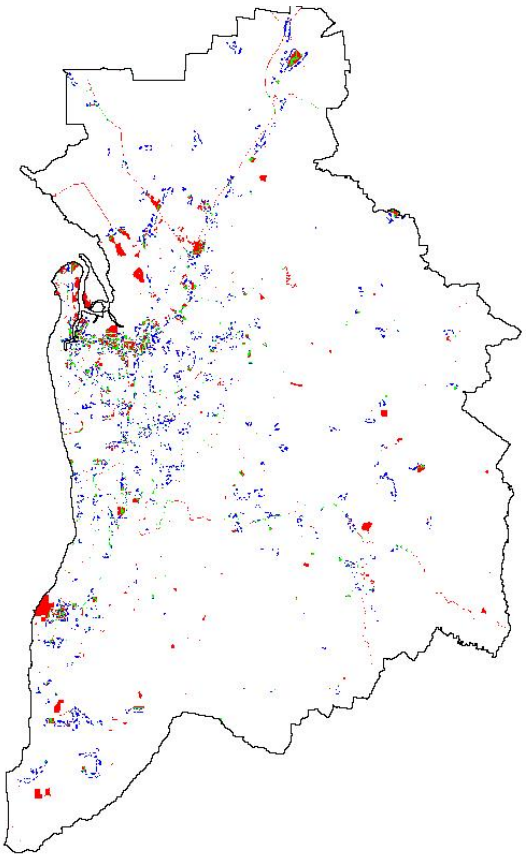
Greater Adelaide's multi-cultural community continues to grow in diversity but due to an increased will to integrate, driven by environmental awareness and the desire to be part of the community, vulnerability in new immigrants is low. The desire to integrate, along with increased government revenue, results in a rising enrolment and investment in public schools. This reduces inequality

between those not capitalising as easily in the technology industries and provides increased local knowledge throughout the community including the immigrant population.

ECONOMY & LIFESTYLE

Over the next 15 years small investments in tech start-ups and innovative activities focussed on small scale, advanced manufacturing begin to take effect, leading to increased innovation in both the services and commercial sectors. Several 'tech-hubs' take form, focussing industrial and commercial industries in high intensity areas. With the initial investments seeding the industry, coupled with the increased human capacity due to skilled immigration, an economy focussed on innovation and technology takes grip and sees income levels and government revenues grow as Adelaide becomes a central technology centre in the Asia Pacific region, and increasingly influential globally. Coupled with increasing research funding and growing service economy in support of high end technology, SA's economy is positioning itself as one of the fastest growing in Australia.

INDUSTRIAL LAND USE



POLITICS & INSTITUTIONS

With growing immigration and an increasing interest in planning and SA's future there is a slowly changing mentality in the community around government intervention. State government policies grow in influence through an emphasis on community consultation and stakeholder engagement together with the rising awareness that government intervention is required to deal with increasing risk of hazards. This results in regulations becoming more effective and easily implemented, and an emphasis on risk based land use planning.

TECHNOLOGY & INFRASTRUCTURE

The emphasis on harnessing technology for good grips the state and several entrepreneurial efforts prove to have significant benefits for the minimisation of risk. Mostly this lies in reducing the vulnerability of residents with immersive technologies used for education programs as to how to respond to a hazard event and also what safe communities should look like. Virtual experience centres enlarge the community's hazard preparedness as they simulate the hazard experience and coping strategies. Globally there is an effort being made around early warning systems and sensors for many hazards, particularly bushfire, earthquake and flood. This global interest coupled with the hazards present in the region and booming tech-industry results in the city becoming a global expert in knowledge and technology for risk reduction. Greater Adelaide also capitalises on efforts made in 2015-2020 in turning the city into a 'smart-city' to greatly improve its data collection and analysis capabilities which allow for a much more evidence based, and adaptive planning system.

Cynical Villagers

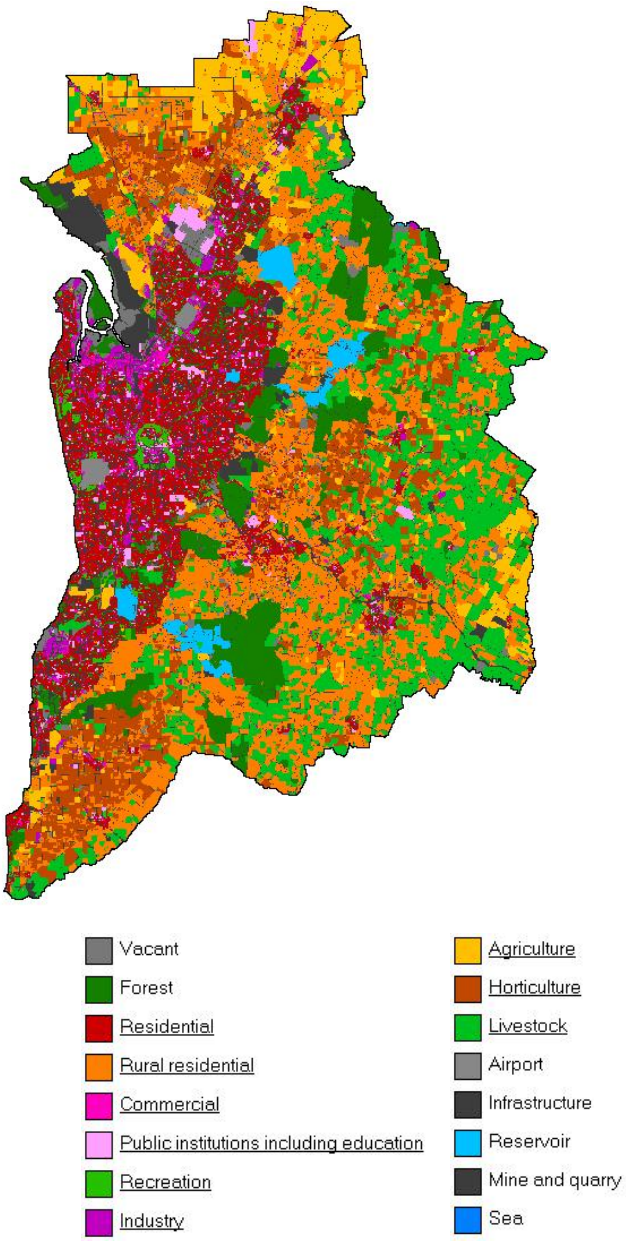
Low challenges to resilience. High challenges to mitigation

A growing amount of rural residential developments, coupled with low population growth sees Greater Adelaide increasingly suffering from urban sprawl. This sprawl is due to shifting population dynamics with an increase in lower-middle income groups and hence a drive for affordable homes and an ageing population looking to the hills for retirement.

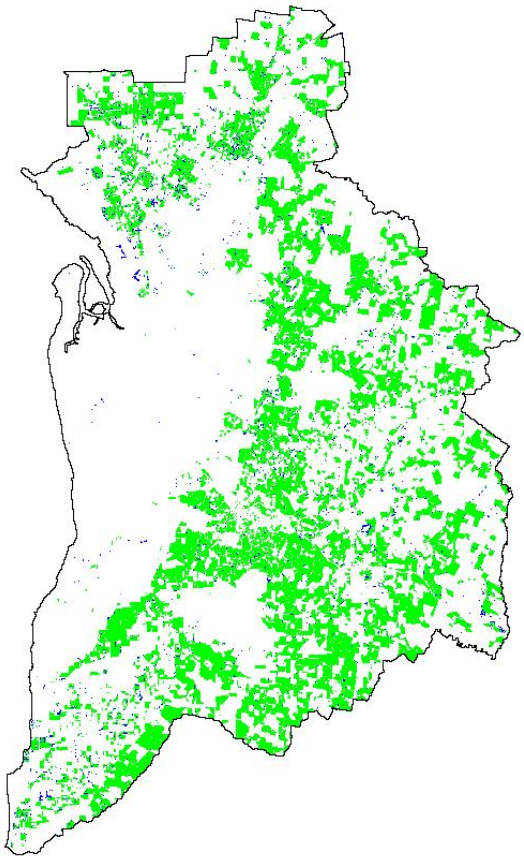
The landscape is a mixture of low density rural residential, natural vegetation and agricultural plots. There is a strong community preference for protection of the state's areas of environmental significance, a growing environmental consciousness and appreciation of the landscape's amenity value. The interest in nature and the countryside leads to high levels of local knowledge regarding the risks from the landscape however this is still unequal, with less connected and more vulnerable communities still finding it difficult to build self-sufficiency.

Economically, mining has taken a downturn with no other sector replacing its activity, and with the relatively small workforce an insular economy based on small scale agriculture and commercial industries is predominant in SA, making government revenue difficult. Due to restrictions in government revenue raising, and hence spending, there is a low emphasis on innovation and science and with greater online, public data availability government is further hamstrung by empowered citizens challenging government intervention with a NIMBY mentality. This is supported by data and a desire to challenge in the courts.

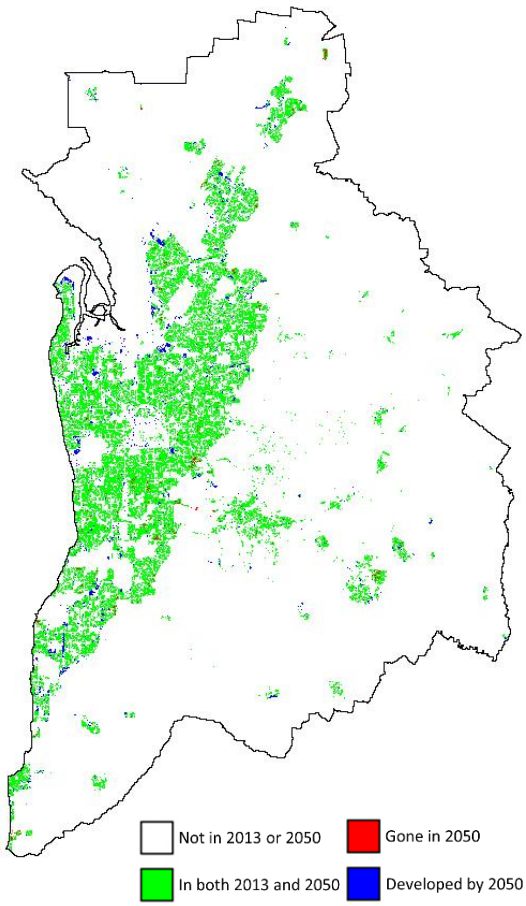
LAND USE - 2050



RESIDENTIAL LAND



RURAL RESIDENTIAL LAND USE



MOTIVATING FACTORS

With the downturn of the mining activity and an ageing population, Greater Adelaide experiences a shift towards a more nature based and high quality agricultural society, keen on living in the outer areas and hills and knowledgeable and protective about its land, the property on it, its surroundings and the local community. Local resilience flourishes driven by the availability of good quality data on the internet. Not all communities however have the same capacity to build resilience and there are have's and have not's in respect to hazard resilience. The wealth of information empowers the community and strengths their resilience, but also impacts on them challenging government with many court cases paralysing policy development and implementation.

POPULATION & URBANISATION

Greater Adelaide sees a slowing in population growth, particularly regarding the immigration of younger, skilled workers. Instead the steadily ageing population, full of baby-boomers, spreads out from Adelaide further, searching for their block of land. Urban sprawl grows particularly through an increase of rural residential developments. This results in a growing patchwork of homes throughout the Adelaide Hills interwoven with small agricultural and wooded blocks increasing the hazard interface to a significant extent. Although the population grows to be more resilient during the first decades of the scenario, this resilience declines with the increasingly ageing population, still living in the countryside, but no longer able to manage hazards at crunch time.

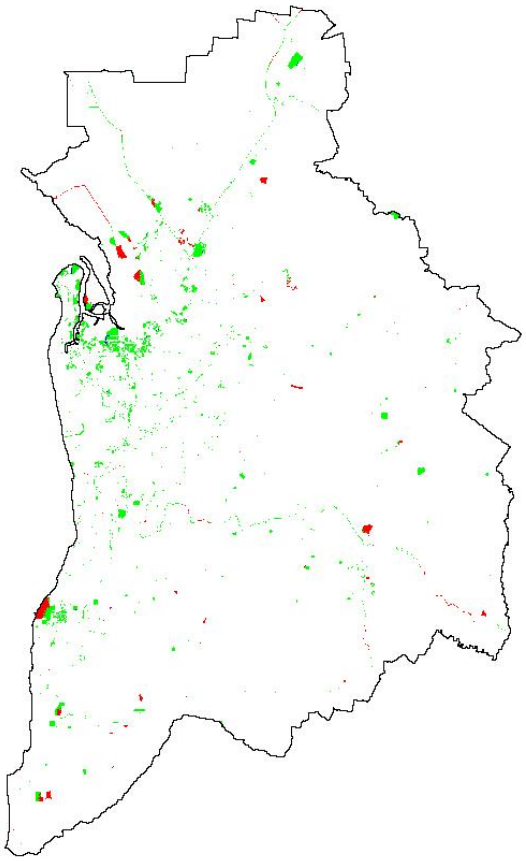
COMMUNITY PROFILE

The growing rural residential lifestyle results in increased local understanding, especially of nature, its value and its risks. However this understanding is highly localised and often misses larger scale concepts. Due to low economic returns and the highly inward looking economy there is a growth of the lower middle income groups. This has impacts on community dynamics with some communities with greater community engagement, skills and disposable resources able to organise and manage themselves, while others are left behind, generally those with less financial flexibility, the elderly or those less socially connected.

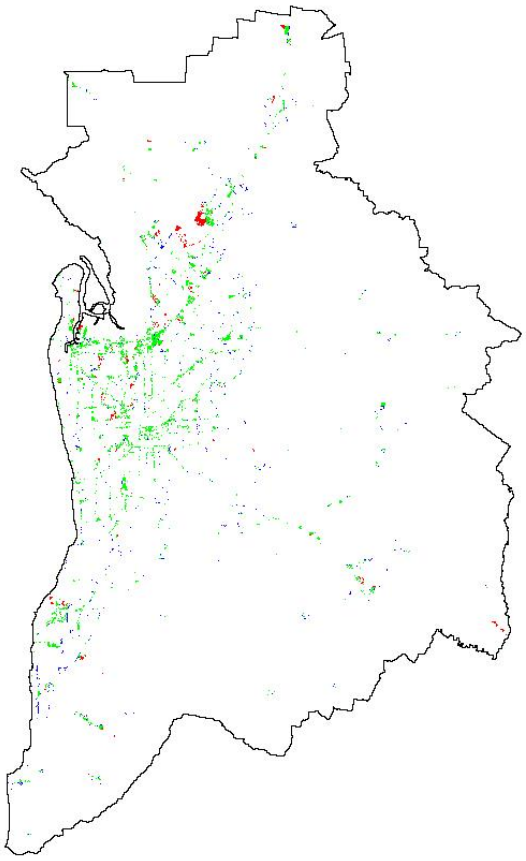
ECONOMY & LIFESTYLE

South Australia steadily sees the downturn in manufacturing and mining and the subsequent impact of reducing revenue to State Government coffers. In general there is no replacement activity to the same scale and instead the economy looks local with an increase in commercial and agricultural sectors. SA's economy also reduces its export capacity due to a smaller workforce, and as such becomes much more tuned to being self-sufficient. This builds resilience in the economy by stripping it to the State's requirements, however it significantly reduces the capacity for revenue raising for capital intensive projects.

INDUSTRIAL LAND



COMMERCIAL LAND USE



POLITICS & INSTITUTIONS

Tight knit local communities, protective over their property and individual freedom, see the government severely restricted in the development and implementation of policy. Community opposition is rife to central government decision making if it is seen to impose on the rights and freedoms of an individual. Growing availability of information and access of it through the internet empowers the population. Court cases to 'fight for one's rights are ominous, paralysing government to implement broader scale mitigation options as well as zoning regulations to avoid development in hazard-prone areas. Government paralysis is further compounded by its lessening revenue, particularly for capital intensive investment, and instead revenue is going increasingly into health and aged-care.

TECHNOLOGY & INFRASTRUCTURE

The world and SA is data rich but information poor. The people are empowered by access to data, allowing them to confirm anything they need confirmed regarding their small block of land or their community at the click of a button. This however sees community groups increasingly capable of challenging government and business in court. There is also a decline in innovation, and investment in science and research in SA, as it experiences a return to cottage-industries.

Ignorance of the Lambs

High challenges to resilience. Low challenges to mitigation

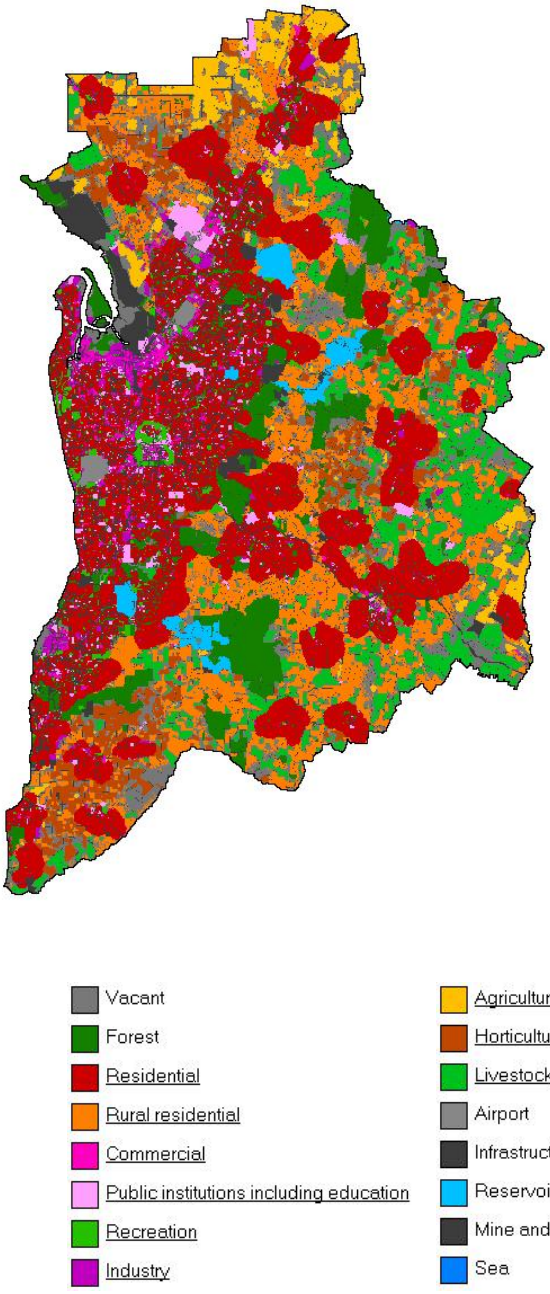
Greater Adelaide shifts towards an increasingly commuter lifestyle in the pursuit of lower cost housing. The region experiences a decline in rural living, with a shift towards highly urbanised centres throughout the region and lengthening of commute times between residential centres and places of work.

Population growth is high with increased immigration from migrants seeking a safe-haven in Australia from various global issues both climatic and socio-economic. This results in increasing community vulnerability and heavy reliance on government for both social and hazard-related support.

Due to the rising costs of risk mitigation, the Federal Government plays an increasingly important role eventually resulting in the loss of state-based policy, with the State Government becoming more of a service provider than a policy maker.

Coinciding with this is the loss of the manufacturing industry, and subsequent economic decline in the region. Because of this unemployment grows, adding to the need for Federal Government support, while those who can leave to work on the Eastern seaboard or overseas do so. However, they face challenges selling their properties with the immigrant population having a preference for cheap new builds in commuter suburbs rather than the more expensive inner suburbs.

LAND USE - 2050



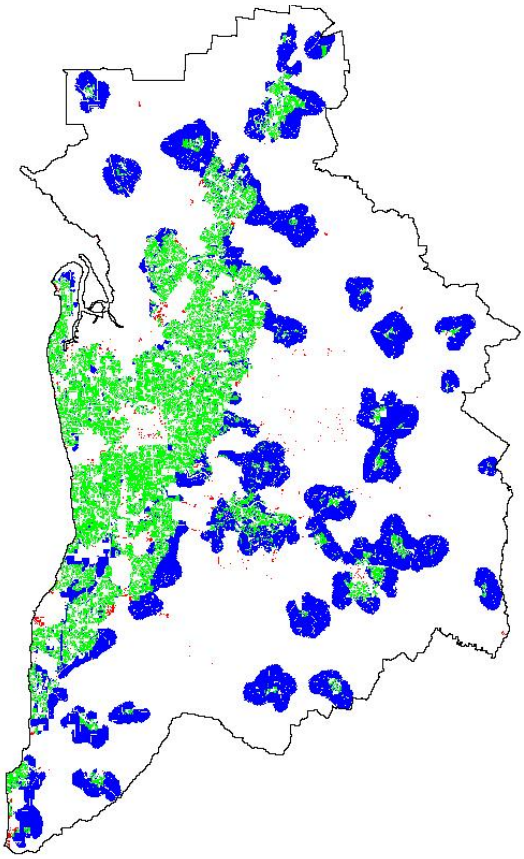
MOTIVATING FACTORS

Changes in community profile due to large immigration with Greater Adelaide becoming a refuge for people around the world, decreases the population's resilience, requiring a stronger role from government to protect its citizens. Due to the economic down-turn and increasing mitigation spending, federal government's role increases with the influence of the state diminishing. There is an acceptance of top-down mitigation, but due to limited finances only so much can be done. The population feels secure but reality creeps up on them when top-down mitigation is no longer able to protect them when severe hazards strike. The well-educated and 'old money' groups move to the east coast but with declining house prices in the State many are left on the market for extended periods as they are beyond the budget range of the immigrants and cannot easily be sold.

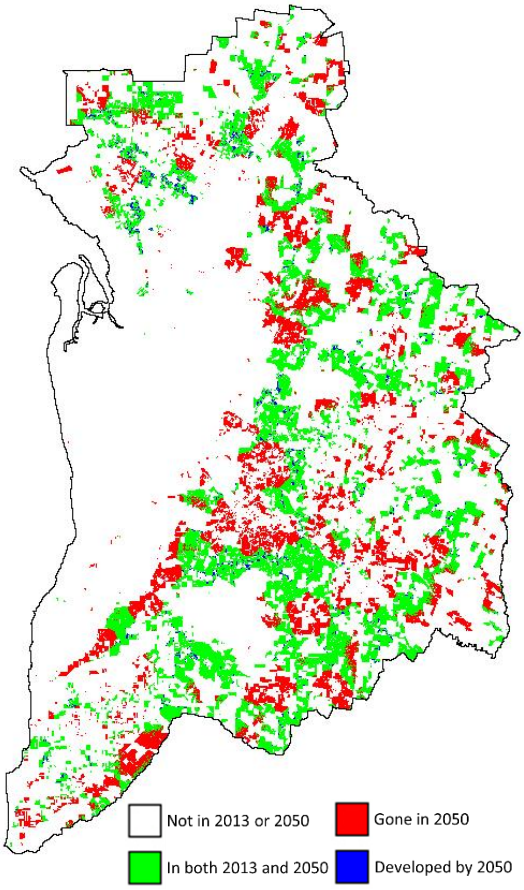
POPULATION & URBANISATION

SA's population is growing over the next 10 years, through increasing immigration from the Asian-Pacific region looking to capture some of the nation's prosperity in comparison to stagnating developing economies. There is also a growing refugee community from various conflict zones around the world. Rural residential communities slowly begin to disappear as new immigrants look for new, low cost developments. These urban centres are generally developed in the lowest cost land, far from the CBD and other centres of employment, in the Adelaide Hills, and Southern and Northern Plains. This leads to a focus on infrastructure corridors, allowing commuter suburbs to grow further and further from the CBD. This development pattern is precipitated by a lack of local and state-based planning regulations and more direction of a distant Commonwealth Government, which early in the scenario sees standard and enforced planning regulations, while this changes in the subsequent years as revenue demands overrule planning.

RESIDENTIAL LAND USE



RURAL RESIDENTIAL LAND USE



COMMUNITY PROFILE

Work-life balance pressures and the increasing distance from work to home places pressures on communities. There is a decline in local knowledge, understanding of the area and community connectedness. The region's demographic profile also shifts with Adelaide increasingly known for its low cost of living. Skilled workers see the struggles Adelaide is under with changing social and urban fabrics and look to move to the Eastern seaboard for greater employment opportunities. There is however minimal opportunity for the sale of their properties with many leaving inner suburban homes empty as they move East.

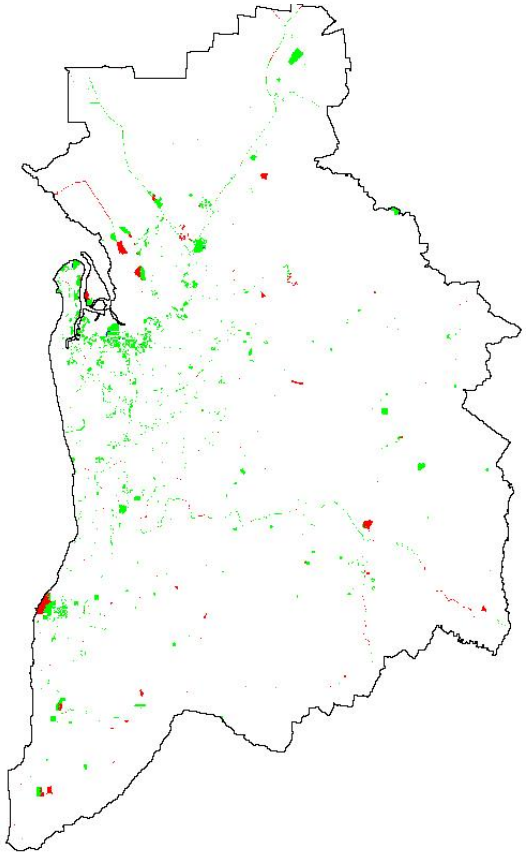
ECONOMY & LIFESTYLE

The region is under growing pressure due to the sudden collapse of the manufacturing industry and few options for transition industries. This results in growing unemployment and increased reliance on the government for social support. Those who have the capacity and ability to leave for work do so. This begins with an increasing fly in/fly out lifestyle for professionals working east, but subsequently turns to many moving permanently to the growing metropoles in Melbourne, Sydney and Brisbane. Growing unemployment also sees a more disengaged youth and increasing crime rates, especially in outer, commuter suburbs.

POLITICS & INSTITUTIONS

The economic climate for SA, and increased emphasis on large infrastructure projects sees the Commonwealth growing in influence due to its capacity to fund. There is every-growing social reliance on the Commonwealth. The State increasingly becomes a service provider for the Commonwealth and has significantly less influence and decision-making ability. Local governments are also removed from many planning and mitigation activities, eventually they reason that if they have no resources to fund activities what is the purpose in researching and considering them?

INDUSTRIAL LAND USE



TECHNOLOGY & INFRASTRUCTURE

Infrastructure solutions are seen as the most effective, with urban centres in at risk areas seeing significant structural mitigation measures put in place by the Commonwealth. In an attempt to raise capital the State begins to privatise infrastructure over the next 20 years. However with the increasingly dire economic circumstances of the region's residents, private entities experience less and less profit and subsequently reduced expenditure on maintenance. From 2035 onwards the state begins to inherit poorly-maintained infrastructure networks with massive costs to the public purse.

Appetite for Change

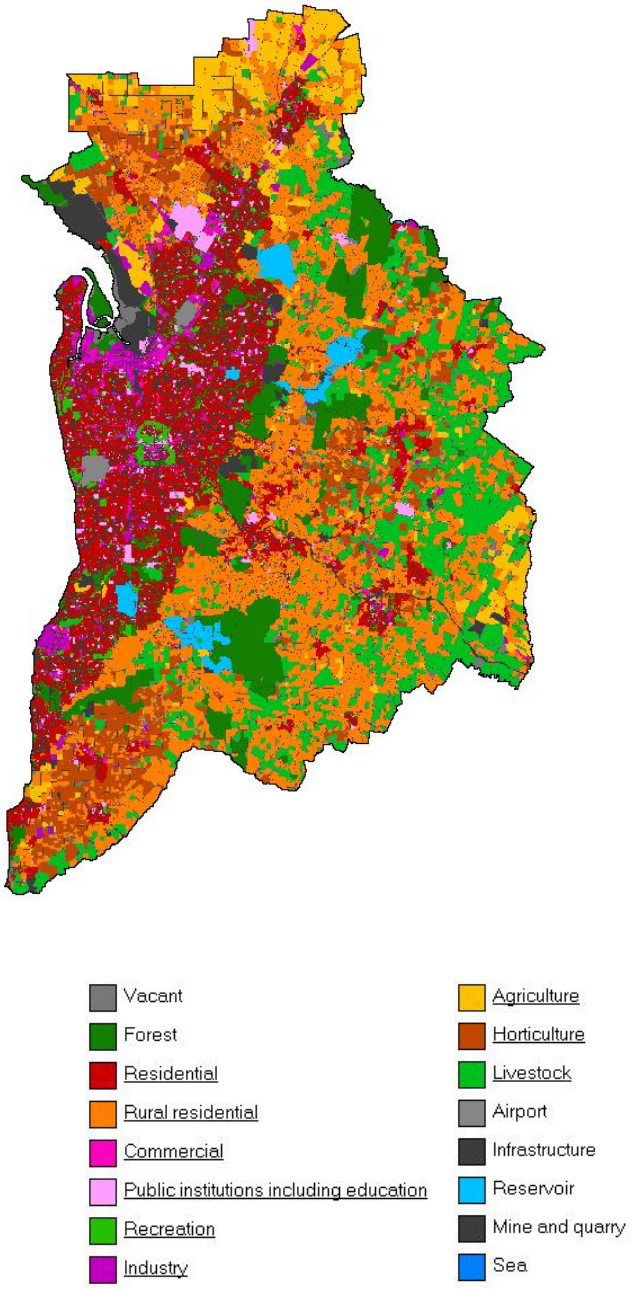
Moderate challenges to resilience and mitigation

Greater Adelaide continues on its current trajectory with declining manufacturing and slow population growth. In contrast to the decline in manufacturing, a rise of low value mining and an expansion of agricultural sectors over the next fifteen years leads to a slight expansion of rural residential areas and an increase in urban infill and sprawl around the fringes following the Greater Adelaide Plan.

This places increased pressure on urban drainage, not designed to meet the increasing stresses of urbanisation, and therefore increasing flooding. Property developers hold significant influence in terms of new development locations with an emphasis on profit not planning.

However with the increasingly apparent impacts of climate related hazards both globally and at home, a swelling in community awareness of risks sees the government become more empowered and enabled to set policy directions and fund some mitigation activities without voter disproval. This is catalysed by an accumulation of events impacting on both urban centres with the CBD suffering from drainage issues during intense rainfall events, and rural areas experiencing several significant bushfires in the Mt Lofty Ranges. This leads to improved risk governance structures and growing resilience to known and expected hazards in the later years of the scenario.

LAND USE - 2050



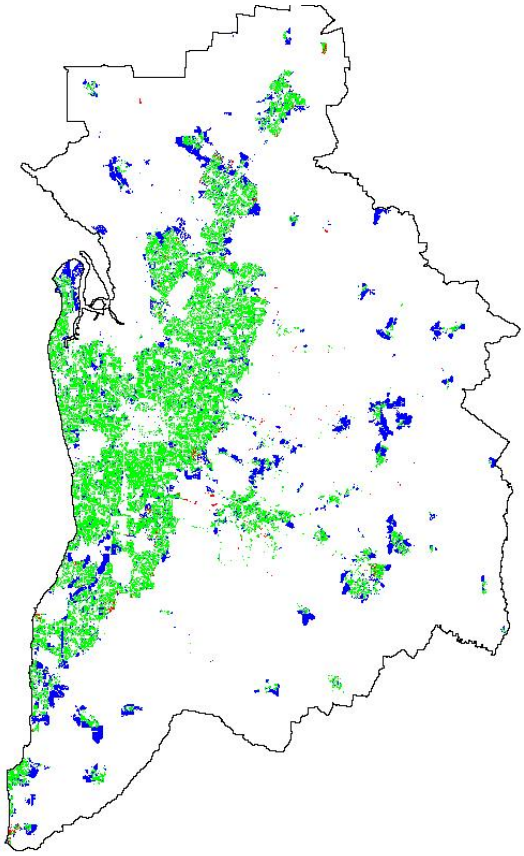
MOTIVATING FACTORS

The current projections hold steady, however, part way through a series of hazard events leads to an increased community awareness of the hazard risk. A change of behaviour occurs a few years later following on from the occurrence of a combination of hazard events. The realisation that large events cannot solely be dealt with through community preparedness and resilience and that top-down mitigation should be part of the equation too, leads to the subsequent acceptance of government intervention.

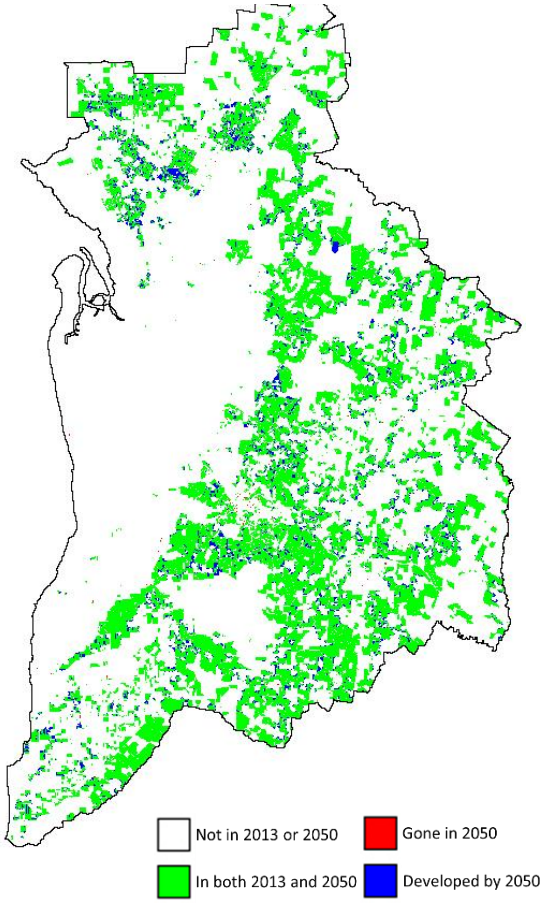
POPULATION & URBANISATION

Population trends progress as expected, following the medium projection scenario for Greater Adelaide. In general development follows the 30 Year plan with an emphasis on infill within the outer suburbs and low expansion into rural residential areas. New developments are left in the domain of developers with a greater importance placed on revenue than risk based planning. This begins to change with greater community awareness of risk, especially of coastal hazards, which has had the most prominent impact globally due to climate change.

RESIDENTIAL LAND USE



RURAL RESIDENTIAL LAND USE



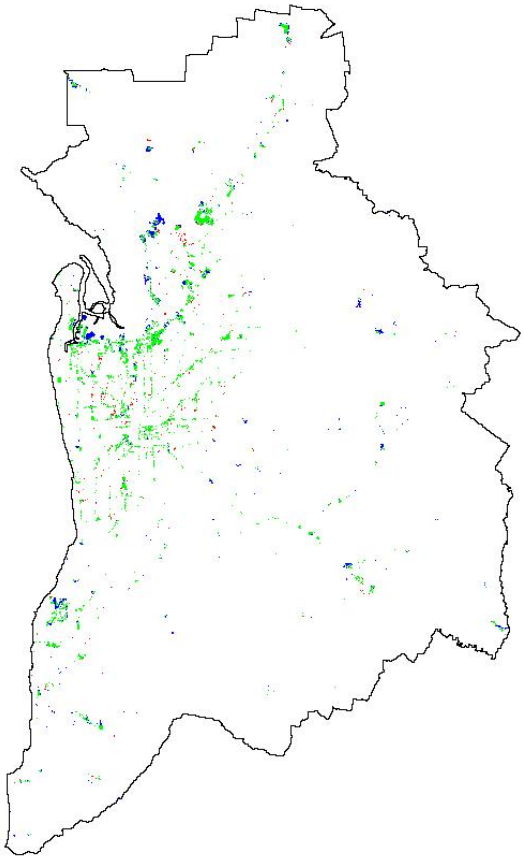
COMMUNITY PROFILE

The mix of socio-economic status from those who successfully transition between industrial sectors to those left behind sees variation in community structure and strength. Some communities experience a tightening with growing resilience to known hazards (both in type and magnitude), however others become more disparate. Not all individuals and households have the capacities to self-sustain while the communities that do, due to increased financial certainty, still remain unaware to the full range of events that could occur.

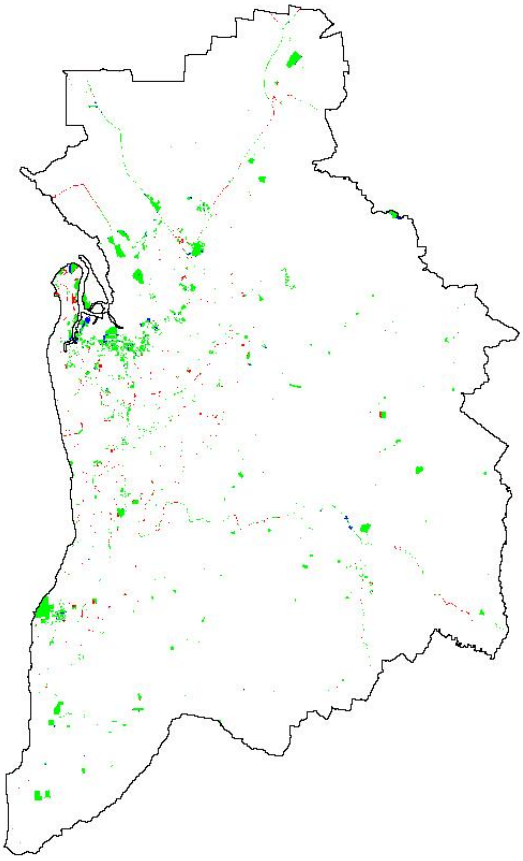
ECONOMY & LIFESTYLE

The economy of Greater Adelaide experiences a transition from capitalising on manufacturing, which suffers a rapid collapse over the next five years and mining which is used as a partial transition industry over fifteen years, to a world increasingly more aware of the environmental impacts of fossil fuels and the subsequent fall in their price. For Greater Adelaide this results in an increase in agriculture in the peri-urban area as it looks to position itself as a global food source especially to growing markets in Asia Pacific with a flavour for high quality South Australian produce. In conjunction with this professional services and commercial enterprises have remained stable shifting their focus from manufacturing to agriculture, with a marked increase in the healthcare profession meeting the challenges of an ageing population.

COMMERCIAL LAND USE



INDUSTRIAL LAND USE



POLITICS & INSTITUTIONS

The shifting economy and initial lack of obvious foresight and planning by government sees an era of mistrust and disillusionment grow. There is a greater emphasis on individual rights and responsibilities with most residents developing local level resilience to known events (in type and magnitude). However as events grow in impact, the realisation comes that individual resilience is not sufficient and government is given more flexibility and allowance to develop and implement risk mitigation policies. This is particularly true in structural measures for riverine and coastal flooding, along with land management for bushfire risk which was previously not in line with community expectations. Governance issues across all hazards also improve, and as government is restricted in size by revenue, it approaches risk management in a more integrated, all of government approach.

TECHNOLOGY & INFRASTRUCTURE

Urban infrastructure is increasingly put under pressure with increasing rates of infill stretching, in particular urban drainage, in its capacity to serve the public's function. Due to the loss of manufacturing industry the state also loses significant expertise in STEM related areas. There is however a small resurgence with the shift to agriculture as SA is seen as a leader globally in quality agricultural practices. There is also interest in exporting this knowledge around the world, especially the growing skills in agriculture in a semi-arid (increasingly arid) landscape, developing and implementing innovative renewable energy and irrigation techniques to maintain productivity.

Internet of Risk

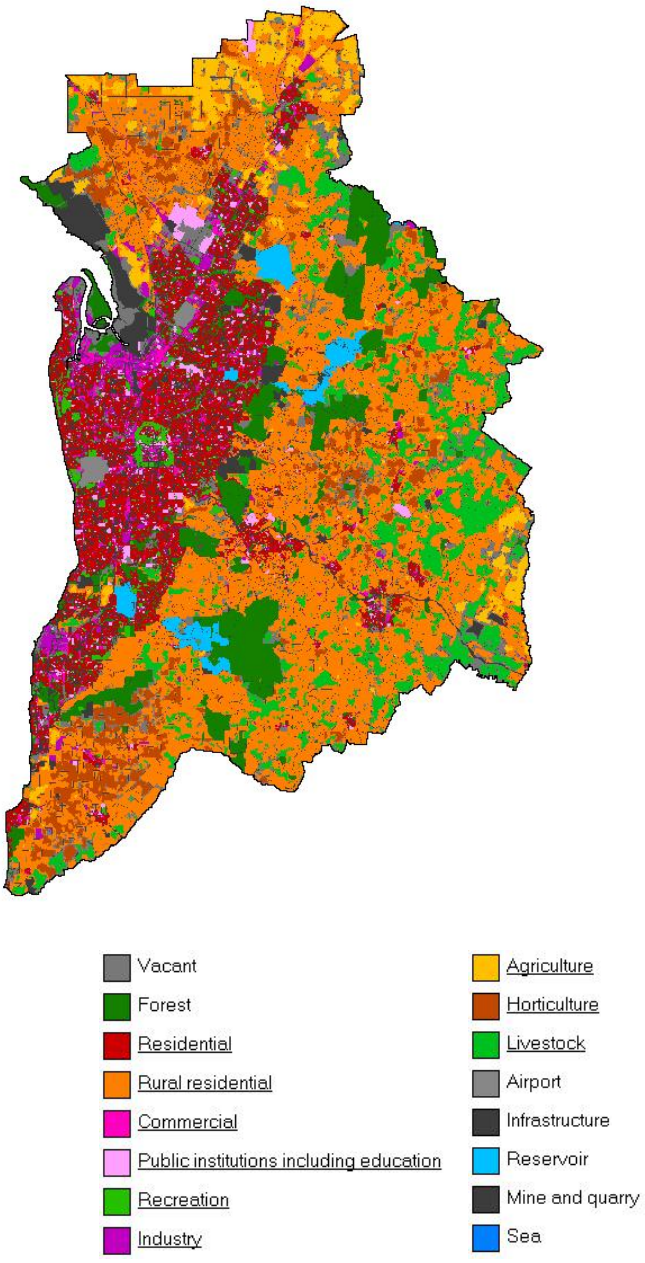
High challenges to resilience. High challenges to mitigation

Global connectedness drives an increasing reliance on the internet for social interaction and working styles. This reliance on the World Wide Web sees dispersed residential living as the attraction of the CBD and physical centres lessens, leading to a significant loss of physical connectedness and an increase in siloed communication between similar individuals and services by a small, but growing, services sector providing for the hordes of online workers.

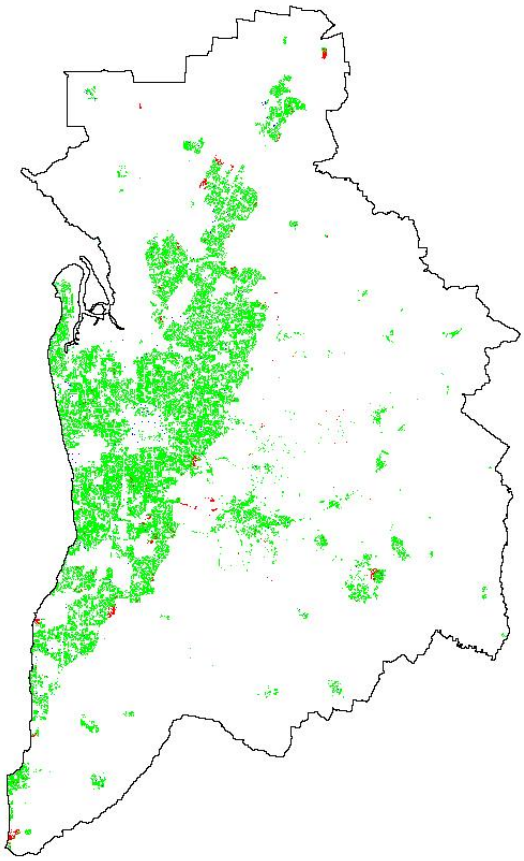
The majority of workers use the internet to work across the world, placing pressure on government revenue streams. Governments are struggling to re-adjust from revenue collection from the traditional economy which is slowly dying off with a loss of industrial and commercial sectors. This loss of revenue weakens institutional power, and the easy access to information is making a generation of 'Google Experts' who increasingly become more reluctant to accept government intervention.

There is also growing inequality between those capitalising on the global technology markets and those in service roles, who find themselves increasingly reliant on a government with increasing costs and decreasing ability to raise funds.

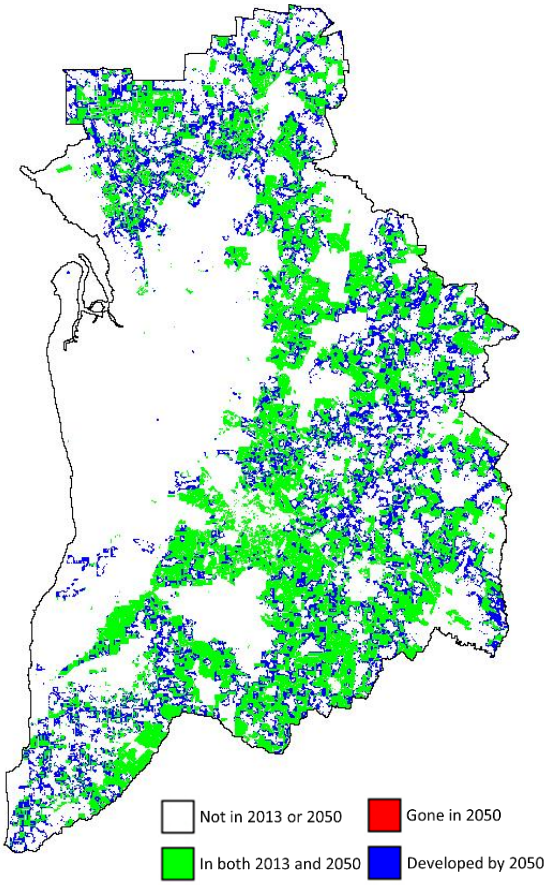
LAND USE - 2050



RESIDENTIAL LAND



RURAL RESIDENTIAL LAND USE



MOTIVATING FACTORS

The increasing reliance on the internet for social and work-related activities decreases the community connectedness and hence resilience due to the focus on global instead of local networks. The ability to search the net empowers the population, but without knowledge of the local conditions and communities it doesn't build the required understanding and awareness to deal with actual hazards. The understanding of theory rather than practice together with the feeling of empowerment leads to a reluctance to accept government intervention by the 'haves', while government funding is not sufficient to adequately support the 'have-nots'. Moreover the lack of resources in conjunction with an increase in hazard events limits the government's ability to put effective mitigation strategies in place.

POPULATION & URBANISATION

Population growth is low before stagnating in 2030-2040 due to low immigration and migration from SA by those who have the skills and capacity to do so. The urban landscape is also increasingly placed under pressure due to dispersed residential living with low levels of strategic planning and allocation of land for development. There are low levels of new urban development outside of residential, with demand for industrial sites reducing significantly post 2020, and commercial sites falling after that.

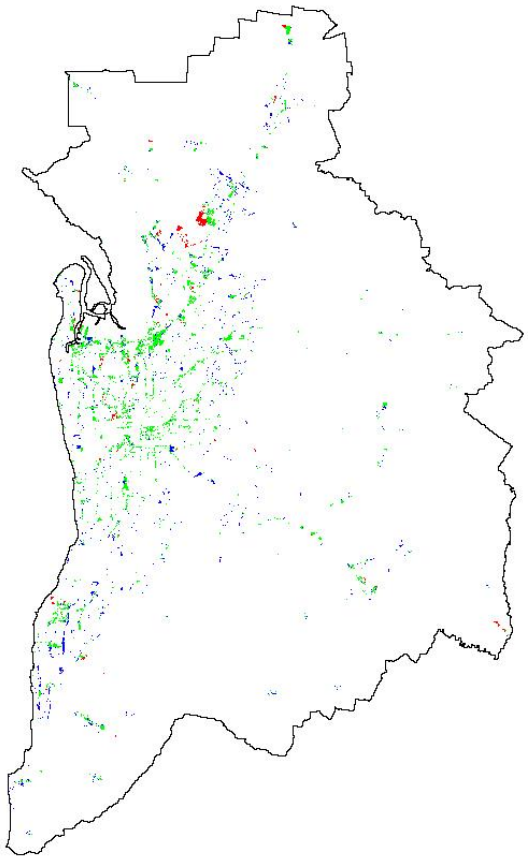
COMMUNITY PROFILE

Inequality is rife in the region post 2035 after steadily growing differences in individual's ability to work. Those trapped in traditional economies of manufacturing fail to transition to the new technology focussed economy, and with little re-training support from the State Government find themselves struggling to find work and requiring financial support. Their notion about risk is very limited as is their faith in being able to change any course of action. Those that were able to capitalise on the global technology markets however find themselves growing increasingly well-off. There is a growing arrogance with regards to the government, thereby limiting the acceptance of any top-down strategies. The digitalisation of the workplace makes the need to interact with local community obsolete and not knowing ones neighbours decreases the resilience of the community. The detachment from the land is an aggravating factor to this.

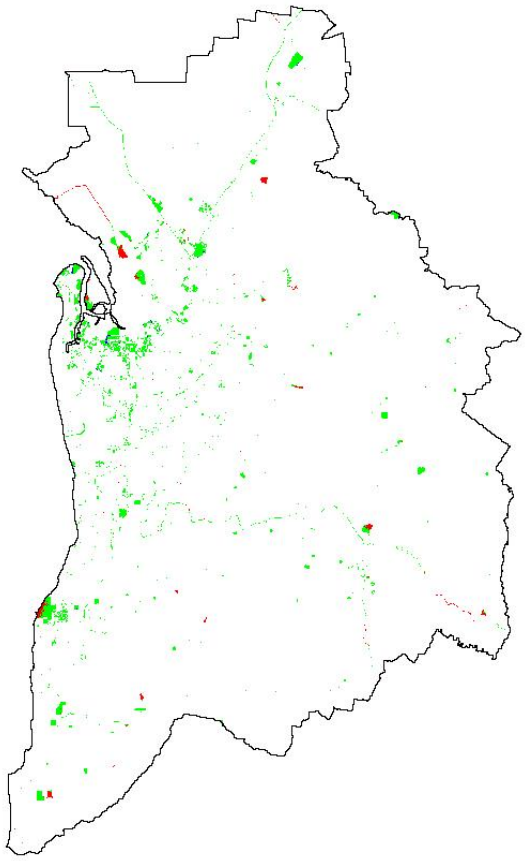
ECONOMY & LIFESTYLE

South Australia's economy is greatly impacted by the prevalence of technology and the ability to work anywhere in the world from the comfort of your own home and laptop. There is significant loss in intensive industry and commercial sectors. This leads to significant inequality between those capable of working within an economy centred on software development and other digital services provided through the web and those unable to sufficiently retrain post the decline of traditional sectors. Due to the large amount of free enterprise in the online economy, governments struggle for revenue raising as individuals work for multiple clients in a largely unregulated system. There is a small service sector that provides support services to those capitalising on the tech-economy including healthcare, education and personal services.

COMMERCIAL LAND USE



INDUSTRIAL LAND USE



POLITICS & INSTITUTIONS

Institutions within State Government struggle for effectiveness as revenue tightens. Society as a whole also begins to become less engaged with politics particularly at a State level as their interests and investments lie overseas. Governance issues are rife, most residing within central government agencies which feel their influence becoming less and less. This filters throughout the public service with an increasing emphasis on centralisation and 'small-government'. This also results in increasing privatisation of government services, as the State looks to raise capital. Private developers rule the landscape as government cannot resist their pressure to buy and develop pristine or hazard-prone locations. The ability for citizens to access immense amounts of information online, allows for continued opposition to government policies, resulting in political disengagement by the community. Residents of Greater Adelaide instead increasingly become individualistic with little concern for governance and society as a whole.

TECHNOLOGY & INFRASTRUCTURE

Technology in Greater Adelaide is booming in a backyard sense. Every home is increasingly wired into the web, however State owned infrastructure is creaking under the strain of disperse residential centres and a limited ability to undertake maintenance leading to an increasing risk of infrastructure failure impacting on prevention (e.g. levies, sea walls) as well as the suppression capabilities (roads, bridges, etc.). With the increased emphasis on online connectedness, community centres are also placed under pressure as they grow ever more redundant.

Main scenario drivers and outcomes

	Silicon Hills	Cynical Villagers	Ignorance of the Lambs	Appetite for Change	Internet of Risk
Population in 2050	1.9 M	1.5 M	2.5 M	1.8 M	1.5 M
Economy					
Community resilience					
Building stock resilience					
Residential land use developments	*Gradual growth urban and rural areas*	*Large increase in rural residential, mixed with other land uses*	*Residential commuter communities in the hills*	*Infill, some sprawl on the fringe and rural residential development*	*Large increase in rural residential*
Land use planning					
Education & awareness					
Structural mitigation					

Population and Employment

Population and employment change in 2030/2050 compared to 2013 (%)

	Silicon Hills	Cynical Villagers	Ignorance of the Lambs	Appetite for Change	Internet of Risk
Population	27/46	8/15	38/92	19/38	8/15
Population split over urban and rural	70/30 until 2050	66/34 until 2030 64/36 until 2050	80/20 until 2030 90/10 until 2050	72/28 until 2030 75/25 until 2050	65/35 until 2030 60/40 until 2050
Urban population	27/46	1/5	58/146	22/48	0/-1
Rural population	27/46	23/40	-7/-35	12/16	27/55
Commercial	40/82	-3/5	8/17	8/17	15/30
Public institutions including education	40/82	-13/-4	9/20	9/20	-13/-4
Industry	34/74	-14/-18	-14/-18	-4/-9	-4/-9
Agriculture	-22/-22	5/10	-22/-49	5/26	-22/-49
Horticulture	-22/-22	5/10	-22/-49	5/26	-22/-49
Livestock	-22/-22	5/10	-22/-49	-12/-30	-22/-49

Population and Employment

Motivation for employment and population quantification

	Silicon Hills	Cynical Villagers	Ignorance of the Lambs	Appetite for Change	Internet of Risk
Population	Adapted from 30 year plan based on storyline	Adapted from 30 year plan based on storyline	Adapted from 30 year plan based on storyline	Projections 30 year plan + extrapolation	Adapted from 30 year plan based on storyline
Population split over urban and rural	Current split	Adapted from current split based on storyline	Adapted from current split based on storyline	Initially current split, adapted based on model results	Adapted from current split based on storyline
Commercial	Developed based on current employment and storyline	Medium projections PSA forecast -10% & extrapolation	Medium projections PSA forecast & extrapolation	Medium projections PSA forecast & extrapolation	Average of medium and high projections PSA forecast & extrapolation
Public institutions including education	Developed based on current employment and storyline	Medium projections PSA forecast -20% & extrapolation	Medium projections PSA forecast & extrapolation	Medium projections PSA forecast & extrapolation	Medium projections PSA forecast -20% & extrapolation
Industry	Developed based on current employment and storyline	Medium projections PSA forecast -10% & extrapolation	Medium projections PSA forecast -10% & extrapolation	Medium projections PSA forecast & extrapolation	Medium projections PSA forecast & extrapolation
Agriculture	Medium projections PSA forecast, constant after 2030	Developed based on current employment and storyline	Medium projections PSA forecast + extrapolation	Developed based on current employment and storyline	Medium projections PSA forecast & extrapolation
Horticulture	Medium projections PSA forecast, constant after 2030	Developed based on current employment and storyline	Medium projections PSA forecast + extrapolation	Developed based on current employment and storyline	Medium projections PSA forecast & extrapolation
Livestock	Medium projections PSA forecast, constant after 2030	Developed based on current employment and storyline	Medium projections PSA forecast + extrapolation	High projections PSA forecast & extrapolation	Medium projections PSA forecast & extrapolation

NB: PSA – Planning SA, Source: Greater Adelaide Economy and Employment, Background Technical Report, Planning SA, September 2008.

Land Use

Land use change in 2030/2050 compared to 2013 (%)

	Silicon Hills	Cynical Villagers	Ignorance of the Lambs	Appetite for Change	Internet of Risk
Residential (urban)	15/22	1/5	58/146	16/34	0/-1
Rural residential	15/22	2/7	-7/-35	7/11	27/55
Commercial	17/40	0/5	8/17	8/17	15/30
Public institutions including education	8/21	-2/-4	9/20	9/20	-2/-4
Recreation	15/22	2/7	0/0	10/18	0/0
Industry	3/9	-14/-18	-14/-18	-4/-9	-4/-9
Agriculture	-6/-14	-2/-4	-22/-49	1/5	-22/-49
Horticulture	-22/-22	-1/-3	-22/-49	1/5	-22/-49
Livestock	-22/-22	-1/-2	-22/-49	-16/-33	-22/-49

Land Use

Motivation for converting population and employment into land use demands

	Silicon Hills	Cynical Villagers	Ignorance of the Lambs	Appetite for Change	Internet of Risk
Residential (urban)	Densification, 10% by 2030, 20% by 2050	No change in density	No change in density	Densification 5% by 2030, 10% by 2050	No change in density
Rural residential	Densification, 10% by 2030, 20% by 2050	Densification, 20% by 2030, 30% by 2050	No change in density	Densification 5% by 2050	No change in density
Commercial	Densification, 20% by 2030, 30% by 2050	No change in density	No change in density	No change in density	No change in density
Public institutions including education	Densification, 30% by 2030, 50% by 2050	No change in density	No change in density	No change in density	No change in density
Recreation (area projection)	Increase according to increase in residential surface	Increase according to increase in residential surface	No change in surface area	Increase according to increase in residential surface	No change in surface area
Industry	Densification 30% by 2030, 60% by 2050	No change in density	No change in density	No change in density	No change in density
Agriculture	Dispersion, 10% by 2050	Originally no change in density, based on model results 15% increase by 2050	No change in density	Intensification, 4% by 2030, 20% by 2050	No change in density
Horticulture	No change in density	Originally no change in density, based on model results 14% increase by 2050	No change in density	Intensification, 4% by 2030, 20% by 2050	No change in density
Livestock	No change in density	Originally no change in density, based on model results 12% increase by 2050	No change in density	Intensification, 4% by 2030, 4% by 2050	No change in density

CONCLUDING REMARKS

Uncertainty is an uncomfortable position. But certainty is an absurd one.
Voltaire

The scenarios presented in this report represent plausible developments for Greater Adelaide highlighting both challenges and opportunities for the region as it deals with future disaster risk.

The integrated manner of these scenarios, considering various drivers for change in the region, allows for a more comprehensive consideration of risk. Tomorrow's risk is being created today and it is hoped that the exploration of various alternatives provides policy makers a broader understanding of the dynamics of risk and the power of their influence and actions.

The results presented in this report particularly emphasise the role of exposure in the calculation of disaster risk. Managing exposure to risk is one of the most powerful mechanisms to reduce future risk and in urban environments it is critical to consider future land developments with global population projections estimating an increase of 400 million exposed to coastal and river flooding between 2010 and 2050 (Jongman et al., 2012).

The scenarios presented form the beginning of the scenario planning process. This process is designed to consider uncertainty and at its core is a non-predictive strategy for considering the future. Instead of considering probabilities about future outcomes, these scenarios present plausible stories that have been co-constructed and co-established by the group involved with their development. Therefore they present an integrated narrative of what could occur.

The five scenarios presented show both favourable and non-favourable narratives that can then be used to consider future initiatives and interventions. For each of the narratives responses can be considered as to how to navigate the challenges and opportunities presented in them. The narratives can also be used to test strategic options, considering under which future conditions these options are nullified or magnified.

Another report will follow in this series presenting the associated risk profiles for each of future scenarios. For each scenario, risk from hydro-meteorological, bushfire and earthquake hazards will be presented along with details regarding the drivers for these changes allowing policy makers a more dynamic form of risk assessments.

REFERENCES

Börjeson, L., Höjer, M., Dreborg, K.H., Ekvall, T., Finnveden, G., 2006. Scenario types and techniques: Towards a user's guide. Futures 38(7) 723-739.

Jongman, B., Ward, P.J., Aerts, J.C., 2012. Global exposure to river and coastal flooding: Long term trends and changes. Global environmental change 22(4) 823-835.

Kok, K., van Vliet, M., Bärlund, I., Dubel, A., Sendzimir, J., 2011. Combining participative backcasting and exploratory scenario development: Experiences from the SCENES project. Technological Forecasting and Social Change 78(5) 835-851.

Rounsevell, M.D.A., Metzger, M.J., 2010. Developing qualitative scenario storylines for environmental change assessment. Wiley Interdisciplinary Reviews: Climate Change 1(4) 606-619.

Van Delden, H., Riddell, G.R., Helfgott, A., Newman, J.P., Maier, H.R., Newland, C.P., Zecchin, A.C., Dandy, G.C., 2015. Greater Adelaide DSS Stakeholder Engagement Stage 1 Report. The University of Adelaide & RIKS.

IMAGE CREDITS

Creative Commons images

Contributor	Page
AlbertHerring	18
Blogtrenpeneur	19
Fibonacci Blue	08
Nathan Keirn	11
Risto Kaijaluoto	15
Tim Pokorny	12
Vladimir Šiman	03