Critical Infrastructure Resilience Strategy: Local Government Guide

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Introduction: Local Government Guide

Critical Infrastructure Resilience Strategy

NSW benefits from critical infrastructure (CI) that provides secure and reliable essential services such as water, energy, transport, telecommunications and health care, and enables the supply of important goods such as food. This CI is exposed to an increasing number of threats, hazards, shocks and stressors.[1] Disruptions to CI can result in loss of life, economic costs and harm to communities, including psychological distress.[2] More frequent natural disasters of greater magnitude,[3] and a heightened risk profile in relation to criminal threats, including cyberattack,[4] mean NSW's infrastructure and organisations must be more resilient than ever. The *NSW Critical Infrastructure Resilience Strategy (CIR Strategy)*,[5] released on 13 September 2018, encourages leaders in business and government to support the NSW community by improving critical infrastructure resilience (CIR) across the state.

The CIR Strategy promotes CI that can:

- withstand shocks and continue operating, or
- return to service as soon as possible after disruption, and
- respond to long-term stressors.

Focusing on physical infrastructure alone will not achieve this. The CIR Strategy aims to improve:

- **infrastructure resilience** – focusing on planning, designing and building resilience into assets, networks and systems (through resistance, reliability, redundancy and enhanced response and recovery)
- **organisational resilience** – ensuring the resilience of the organisations, personnel and processes that support infrastructure services (through organisational resilience, enterprise risk management, business impact analysis, preparedness, response, continuity and recovery)
- **community resilience** – focusing on the role of the community in building and maintaining its own resilience while contributing to CIR. Building community resilience requires an integrated approach from government and business (through information and warnings, managing service disruptions and community partnerships).

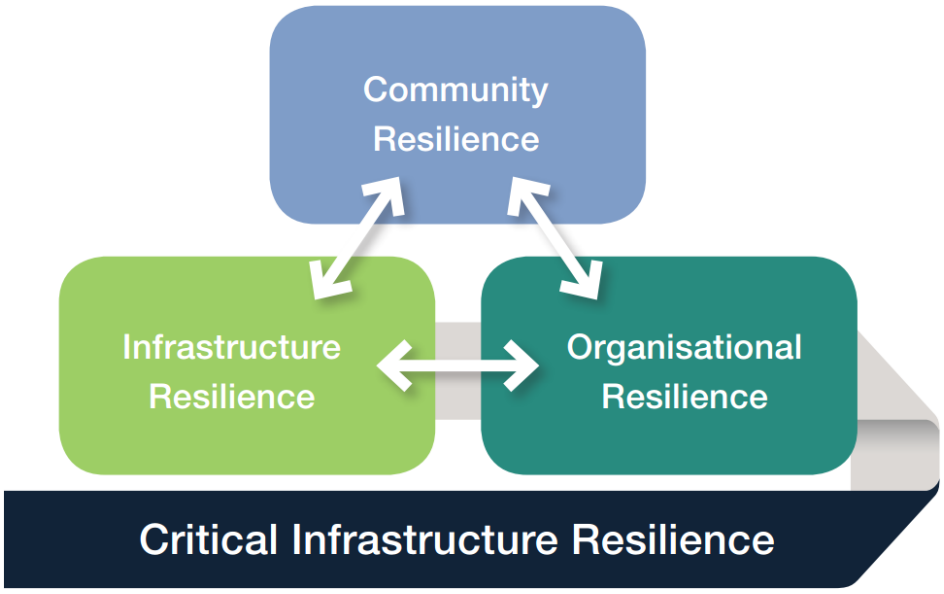


Figure 1: CIR is enhanced through infrastructure, organisational and community resilience

To achieve these outcomes, priority is given to:

- **partnering** for shared responsibility around CIR
- **preparing** for all hazards, not just those that are foreseeable
- **providing** continued service from CI, with minimal disruption.

The CIR Strategy provides the following benefits.

Strategy Benefits	
Critical Infrastructure Providers (Regardless of ownership)	• Reduced business disruption • Enhanced reputations and business confidence • Reduced total cost of asset ownership and increased return on investment • Better understanding of infrastructure interconnectedness, allowing vulnerabilities to be addressed across multiple CI provider organisations • Stronger cultures to meet business challenges (not just emergency events)
For Communities	• Reduced service disruption to the people and businesses of NSW • More effective emergency management arrangements • More resilient communities, reducing the social costs of disasters
For Government	• Enhanced capability and co-ordination of response and recovery agencies • Reduced response, reconstruction, and recovery costs arising from emergency events
For all of us	• Stronger partnerships between business, government and the community • Enhanced resilience against hazards and threats • Insurance premiums that incorporate the benefits of resilience-building activity • Improved adaptation to long-term stresses such as climate change and population growth

Key terminology

Critical infrastructure (CI) – the assets, systems and networks required to maintain the security, health, safety, and social and economic prosperity of NSW. These are underpinned by the organisations and people that support them.

Critical infrastructure provider (CI provider) – any organisation that provides CI in NSW, including privately owned organisations, local and state governments, and government-owned corporations.

Critical infrastructure protection (CIP) – minimises vulnerability to criminal and malicious acts, using physical, procedural, human and electronic defences. CIP is a key part of CIR. At the national level, CIP focuses on mitigating terrorist threats.[6]

In NSW, the NSW Police Force works closely with other NSW agencies and CI owners and operators on CIP.[7] The CIR Strategy complements existing CIP arrangements by encouraging CI providers in the all-threats and all-hazards approach to protecting CI.

Critical infrastructure resilience (CIR) – the capacity of CI to withstand disruption, operate effectively in a crisis, and deal with and adapt to shocks and stressors. It includes flexibility to adapt to present and future conditions. At the national level, the term 'CIR' is used to describe an all-hazards approach to CI activities across the spectrum of prevention, preparedness, response and recovery.

While CI providers are responsible for CIR in NSW, it is delivered as a partnership between infrastructure owners, infrastructure operators, the NSW community, and the local, state and Commonwealth governments. Within state government, Resilience NSW is the agency responsible for whole of government coordination in NSW, including the establishment of a CI Panel, re-development of the Criticality Tool, management of the CI List and oversight of CIR governance. The CIR Strategy categorises CIR outcomes into three types of resilience:

- **Infrastructure resilience** – planned, designed and built into assets, networks and systems
- **Organisational resilience** – the resilience of organisations, personnel and processes supporting infrastructure that supplies a service
- **Community resilience** – focuses on the role of the community in building and maintaining its resilience while contributing to CIR.

Overview of Local Government Guide

Local governments exist to serve communities and are responsible for providing significant infrastructure services (e.g. transport, water and wastewater infrastructure, and community facilities) in a prudent, transparent and sustainable manner.

This guide, which is structured around three priorities – Partner, Prepare, Provide – identified in the CIR Strategy, will assist local governments to implement the CIR Strategy and the priority activities and actions.

The success of the CIR Strategy largely depends on how it is applied to generate infrastructure resilience. This guide has been designed to help councils focus on implementing resilience thinking into business-as-usual practices. It is aimed at a range of local government roles (e.g. asset managers, engineers, emergency managers, executives, councillors, town planners, works managers, operations managers and business continuity professionals). It is intended to facilitate collaboration between local government stakeholders involved in enhancing CIR.

Table 1 identifies the roles and responsibilities that local government fulfils under the CIR Strategy – both as a CI provider and as the closest level of government to the diverse communities of NSW.

Table 1: Local government roles and responsibilities linked to CIR in NSW[7]

Infrastructure Providers
• Provision of CI service to customers under existing legal, regulatory and business arrangements • Meet or exceed existing legal, regulatory and business requirements • Primary responsibility for managing hazard and threat risk to CI assets they own or manage • Understanding the risks to infrastructure and ensuring provision of services during or soon after an emergency[22] • Appropriate level of security for assets they own or manage • Report incidents or suspicious activity to police • Appropriate level of emergency / security / business continuity planning for level of risk • Appropriate level of exercising / testing plans including inter-agency exercises • Underpin economic and social recovery of communities • Build community understanding and education on CIR and resilience in general
Local Government
• Meet or exceed existing legal, regulatory and business arrangements • Build resilience (not just CIR) within the local government area. Participate in regional resilience building, including through shared arrangement with other local governments such as Joint Organisations and Regional Organisations of Councils • Provide advice and education on hazards and threats within local government jurisdiction • Provide land use planning and disaster mitigation functions • Support and manage the natural environment impacting critical infrastructure • Provide local emergency and consequence management planning via Local Emergency Management Committee • Support LEOCON and assigned combat agency in response to local-level emergencies

Local governments are multifaceted organisations that deliver a wide range of services to their communities. They often experience competing pressures and priorities, and access to

funding and resources varies considerably between councils. This guide aims to add value to local governments by assisting them and the infrastructure they provide to be more resilient. It also identifies ways to enhance community resilience in relation to infrastructure. It does not seek to duplicate content from elsewhere. Instead, it identifies potential sources of funding for resilience building and mitigation.

This guide also provides tools, advice and case studies from NSW and further afield that highlight the steps local governments can take to enhance CIR. It includes an action plan for implementing the CIR Strategy and a self-assessment tool to evaluate and monitor performance over time against resilience goals. These include:

- appointing CIR champions
- attending Local Emergency Management Committee (LEMC) meetings held by CI providers
- ensuring CI providers participate in planning and exercises via the LEMC
- ensuring local government stakeholders participate in ongoing training and support in CIR
- building and leveraging partnerships to engage the community on CIR issues
- using a risk-based all-hazards approach to manage risks to CI
- considering climate change impacts and implementing adaptation strategies
- integrating resilience into the asset management lifecycle
- ensuring criticality registers of council assets are considered in emergency planning
- understanding CI interdependencies and taking them into account in emergency planning
- using map-based tools to record assets and inform CIR decision making
- ensuring robust processes are in place to conduct damage assessments of CI post-disaster
- maintaining evidence of continuous improvement in relation to organisational resilience practices
- leveraging the NSW Integrated Planning and Reporting Framework (IPR Framework) to embed CIR across local government boundaries.

Councils can use the Local Government Self-Assessment Tool to establish baseline data and identify gaps that will enable them to plan to improve CIR. By conducting an annual self-assessment, councils can provide evidence of continuous improvement in CIR. This would also ensure that local government data was available across NSW to measure advances over time.

In addition, council stakeholders can use Resilience NSW's CIR guides to assist with implementing the CIR Strategy.

Resilience Priority 1: Partner

*Local governments have a key role to play in promoting a collaborative **partnership** approach to sharing responsibility for CIR.*

Shared responsibility

Infrastructure owners and operators are largely responsible for providing CI services and for ensuring the security of their assets and the safety of their staff. This means they are best placed to effectively manage risks to their infrastructure.

'Critical infrastructure assets can be owned by local, state or federal government (e.g. roads, dams, buildings, etc.), privately owned (e.g. airports), community owned (e.g. irrigation systems) or involve public–private partnerships (e.g. electricity distribution, communications, etc.).'[8] No single agency or entity can do it alone, so multiple stakeholders must share responsibility for CIR. Resilience outcomes are best achieved when CI providers partner with all levels of government and the community (refer to Figure 2).

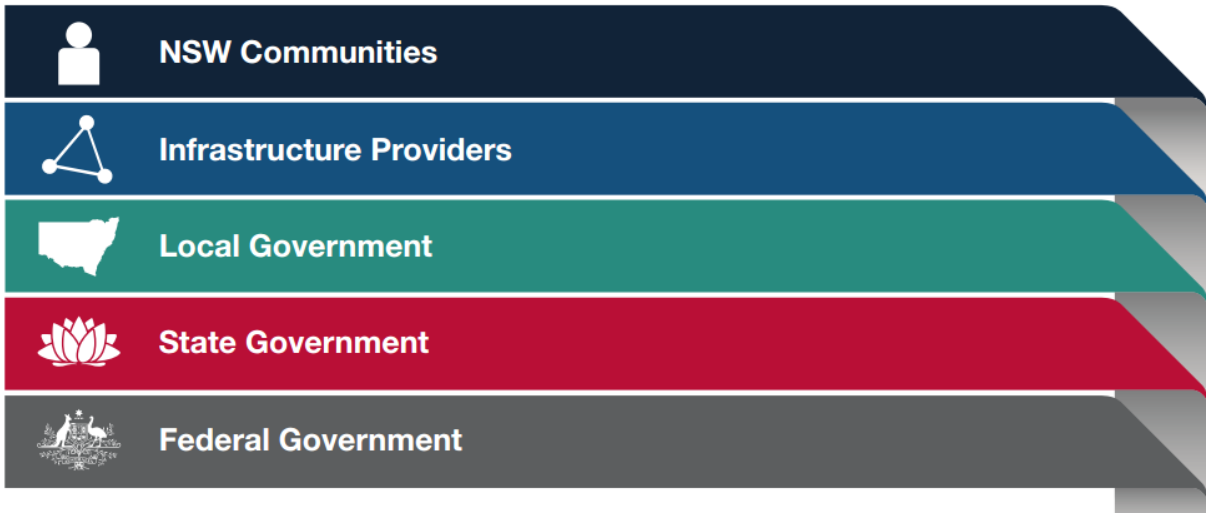


Figure 2: Partnerships for building CIR[5]

Internal partnerships – CIR champions

Many different professionals in local government have an interest in resilient infrastructure. Collaboration across council departments is vital for the successful implementation of the CIR Strategy (e.g. asset management, planning and emergency management).

Each organisation with responsibility for CIR should nominate at least one CIR champion. For local government, this might be the council's general manager (or a nominated delegate). The role of the champion is to ensure everyone involved in implementing CIR is on board, to bring multiple stakeholders together to achieve the strategic objectives of the CIR Strategy and to elevate the whole organisation's understanding of CIR.

Local governments should consider nominating a CIR champion for each department or service area that has CI assets. They should also consider and clearly communicate the role of the mayor and other elected councillors in CIR. The Joint Organisation Network of NSW councils can be leveraged to facilitate mutual assistance; e.g. sharing knowledge, ideas and information across council boundaries in each region.

External partnerships – Sector and cross-sector collaboration

The CIR Strategy identifies that cross-sectoral collaboration needs to be facilitated at the state, regional and local levels, using existing emergency management coordination meetings to engage CI providers (refer to Figure 3).

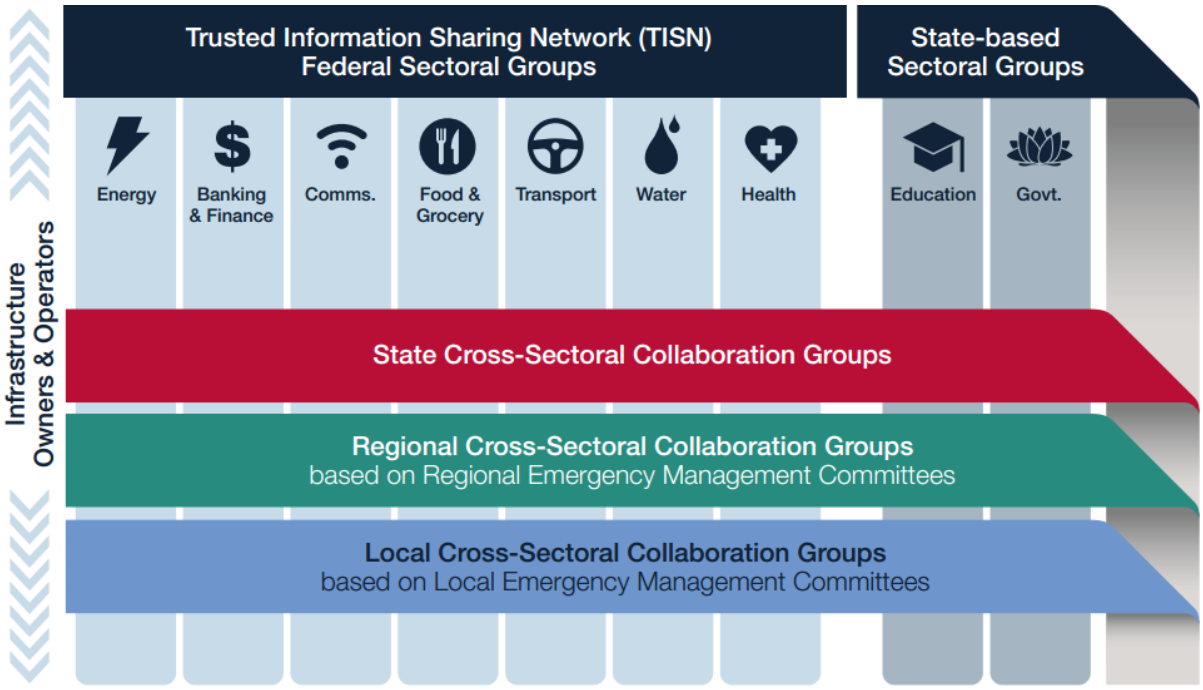


Figure 3: Sectoral and cross-sectoral groups[5]

In accordance with section 28 of the *State Emergency and Rescue Management Act 1989*,[9] a council general manager will be Chairperson of the LEMC. It is recommended that CI providers are invited and encouraged to attend these multi-agency meetings to proactively address issues relevant to CIR at the local level.

The invitations could be issued as part of the meeting business or a separate sub-group could be established under the LEMC structure to perform this task. A similar structure should be implemented for each Regional Emergency Management Committee (REMC).

Chairpersons will be required to show strong leadership to ensure that CIR outcomes are achieved. Involving CI providers at the LEMC and REMC levels is expected to:

- improve hazard identification and risk assessment
- assist with prioritising and funding mitigation and risk reduction works
- improve joint preparedness and planning efforts
- increase resources and understanding of strengths and limitations
- enhance the capability of local emergency management agencies to respond to and recover quickly from local emergencies.

The Australian Government established the Trusted Information Sharing Network (TISN) for CIR in 2003. It is Australia's primary national engagement mechanism for business–government CI information-sharing and resilience-building initiatives. 'The TISN provides a secure environment for critical infrastructure owners and operators across sector groups to regularly share information and cooperate within and across sectors to address security and business continuity challenges.'[10]

Community partnerships

One of the key outcomes of the CIR Strategy is to improve community resilience to infrastructure service disruptions. Local government has a key role to play in this space. Building CIR requires an integrated, collaborative and supportive approach to partnering with all elements of the community. The CIR Strategy identifies the following roles for NSW communities.

Table 2: Roles the CIR Strategy identified for NSW communities[5]

NSW Communities
• Individuals and communities sharing responsibility to prevent, prepare for, respond and recover from emergencies[22]
• Have an awareness of the threats and hazards that affect their locality[22]
• Be involved in emergency management arrangements, perhaps by volunteering[22]
• Build community support networks ahead of emergencies
• Individual resilience – prepare for prolonged outages without external assistance or essential services
• Respond to government advice on the use of CI (e.g. demand reduction in times of stress to electrical networks)
• Help CI providers by reporting damage to CI
• Report suspicious behaviour around infrastructure
• Use CI (e.g. transport) responsibly

Communities are often unaware of the complexities associated with CI and take for granted that it is secure and reliable. However, they are acutely aware of the reduced amenity caused by service outages. Local governments can provide information to communities about how to respond when CI fails. They can also undertake initiatives during the prevention and preparation phases that enhance community resilience and reduce the impact during response and recovery phases (refer to the Disaster Dashboard case study in Appendix B).

Resilience is a shared responsibility for individuals, households, businesses and communities, as well as for CI providers and governments.[11] Rather than just focusing on the number of customers affected, CI providers and local governments are encouraged to view communities as active partners and a valuable resource in enhancing CIR before, during and after a disruption or emergency. Resilient individuals and communities are dynamic and can mitigate against and bounce back from disruptive events. They understand their local demographic and can prepare for anticipated hazards and threats. Resilient communities can continue to operate under stress, adapt to adverse or changing conditions, and withstand and recover rapidly from disruptions. In a large-scale emergency, CI providers and governments are unlikely to be able to provide an effective response without a bottom-up approach that seeks community input and assistance. This will be crucial for minimising the impact of an emergency and reducing the recovery effort. For example, during heatwaves when the electricity network is near capacity, community load reduction can help to keep the network functioning. For further information, refer to the partnering case studies in Appendix B.

CI providers and local governments may legitimately use a variety of methods and tools to engage with the community, depending on the goals, time frames, resources and levels of concern. The IAP2 Spectrum of Public Participation[12] (e.g. inform, consult, involve, collaborate and empower) is designed to help select the level of participation that defines the public's role in any community engagement program. It is particularly useful for new infrastructure projects and significant upgrades.

Table 3 is adapted from the NSW CIR Strategy (refer to page 17), providing further clarity for local governments on how they could work with CI providers to improve community resilience.

Table 3: Ways to improve community resilience

Improving community resilience	
 Community Information	CIR is enhanced when CI providers and governments prepare and support communities with clear, consistent and reliable information and warnings before, during and after service outages and emergencies. This enables individuals and communities to take appropriate action in a timely manner. Information about CI issues can be provided through media campaigns featuring key safety messages for individuals and communities. For example, a TV or radio campaign could be used to prepare residents for storms affecting the electricity network (refer to the Lismore Disaster Hub case study in Appendix B).
 Reducing Service Disruptions	Infrastructure and resilience investments should be based on community needs. This requires CI providers to consult with individuals and communities to create an evidence base for decision-making processes. This can be achieved by obtaining feedback via methods including surveys, meetings, educational presentations, forums and pop-up information stalls.

 Managing Service Disruptions	CI providers and local governments need to work with communities to increase preparedness for loss of service. For example, Get Ready NSW focuses on being prepared for an emergency in order to save lives. It includes individuals knowing the risks they might face; planning now for what to do in an emergency; getting the home ready; being aware of risks and hazards; and looking out for each other. A key strategy is promoting the need to have an emergency kit with bottled water, a torch and battery-powered radio to mitigate water and power infrastructure failure or service interruption. It also recommends training and exercises that involve community members as active partners in the response and recovery phase. The Get Ready NSW resource provides information relevant for councils, community service organisations, animals and businesses. CI providers and local governments also need to work closely to support vulnerable customers and communities. This may involve providing advice to vulnerable customers, pre-planning by drawing up lists of those customers (e.g. home dialysis patients), prioritising service restoration, and allocating emergency resources to vulnerable customers, where available.
 Community Partnership	The community plays an important role in capturing and sharing information before, during and after an emergency. It is essential to engage with the community to build networks and partnerships to address CIR. Emergency services organisations and CI providers could increase their focus on messaging that promotes partnerships with the community. Community members should be actively encouraged to report suspicious behaviour and CI asset maintenance issues. Continuous and enhanced messaging in these areas will assist CIR (refer to the partnering case studies in Appendix B). It is vital that CI providers obtain community input into emergency risk planning and management. This requires ongoing collaboration. Crowdsourcing geo-tagged emergency information and intelligence from technology such as smart phones can assist with conducting rapid damage assessments and enhancing community input into CIR (refer to the partnering case studies in Appendix B). Social media can also become a two-way communication channel for safety information.

Engagement activities that generate community interest and ideas can take many forms and councils will need to select strategies based on their appropriateness to the aims and scope of the project (refer to the IAP2 Spectrum of Public Participation).[14] It is important to evaluate the results, creating a feedback loop in which the information collected is assessed and used to adapt or improve future engagement activities.

Community engagement works best when it occurs early and is part of an ongoing process that builds relationships and trust over time. Programs such as Get Ready NSW provide opportunities to develop community partnerships and tools to promote community resilience activities.

Further information will be available in a separate guide on community resilience that is being developed and will be published at https://www.opengov.nsw.gov.au.

Sources of funding

Funding program	Information
Resilience NSW Exercise Program	Local governments can apply through their LEMC for funds to plan, deliver and evaluate exercises. Varying levels of funding are available for local, regional and state-level exercises from the SEMC through Resilience NSW.

Recommended further reading

NSW Government, State Emergency and Rescue Management Act 1989 – www.legislation.nsw.gov.au/#/view/act/1989/165/part3a/sec60d.

Council of Australian Governments, 2011, *National Strategy for Disaster Resilience: Building the resilience of our nation to disasters* – knowledge.aidr.org.au/media/2153/nationalstrategyfordisasterresilience.pdf.

Get Ready NSW (Councils) – https://www.nsw.gov.au/resilience-nsw/get-ready-program-for-local-councils

Resilience Priority 2: Prepare

*We must **prepare** for all threats and hazards, not just those we can foresee.*

All-hazards approach

The CI owned and operated by local government will likely be exposed to many hazards during its lifetime. So it makes sense to manage risk holistically, using an all-hazards approach. An all-hazards approach includes mitigating and planning for emergencies resulting from events that are naturally triggered (e.g. bushfires, storms and floods), technological (e.g. cyberattack) or malicious (e.g. sabotage and terrorism).

An all-hazards approach focuses on the consequences of the infrastructure disruption (e.g. loss of amenity to people, businesses and community) rather than the cause. This can provide a cost-effective solution because it means risk management measures can be adjusted to address multiple foreseeable risks. It also helps build resilience against unanticipated risks.

Local governments across NSW must focus on proactive risk management measures to build resilience into business-as-usual practices. This requires proactive identification, consideration and treatment of the risks their CI is exposed to and developing mitigation measures.

Significant guidance is available to local governments on managing risk, including the NSW Emergency Risk Management Framework[13] developed by the State Emergency Management Committee. It addresses gaps and disparities across the emergency management sector and improves decision making, focusing on disaster mitigation. The framework is informed by the National Emergency Risk Assessment Guidelines, and is consistent with ISO 31000 – *Risk Management*. The 2017 State Level Emergency Risk Assessment is also a useful source of information on hazards that can have an impact on NSW.[1]

Additionally, Resilience NSW has initiated the Disaster Preparedness Program for local governments. This program is funded for three years and aims to provide tools, resources and targeted risk and planning training to local government staff involved in emergency management. The program is currently being piloted with six NSW councils, but is intended to be rolled out across the state. Further information is available from Resilience NSW.

It is vital that councils identify assets that are critical to their operations and/or the community, and the local risks and hazards these assets or networks are likely to face. The LEMC, operating on a multi-agency basis, should review the outcomes of CI risk assessments. This will ensure that multiple perspectives are considered and that agencies have a shared understanding of the risks to CI at a local level. It will also assist agencies with evaluating and prioritising resilience projects to ensure that investments in mitigation achieve the best outcomes for the community.

Further information on risk management can be found in a topic-specific guide on organisational resilience that has been developed to support implementation of the CIR Strategy.

Climate change risk

Climate change predictions indicate that NSW will increasingly be affected by changes in temperature, rainfall and sea level, and extreme weather events.[14] Climate change will likely exacerbate the frequency and severity of natural hazard events, meaning there will be more floods, storms, bushfires and heatwaves, and flow-on impacts such as power outages and interruptions to transport and communications.

Almost all infrastructure is a multi-decade investment. Local governments are planning and building the infrastructure that current and future generations will be using in 2050, when the climate and NSW will be very different.[7] Therefore, local governments should consider sustainability and actively prepare for climate change by considering adaptation measures at the start of any CI project. This will help to integrate resilience, ensuring that CI can continue operating as far as practicable and be returned to service as soon as possible following any service disruption, both in the immediate future and in response to future climate risks.

AdaptNSW provides a wealth of information that can assist local governments to understand and adapt to climate change impacts. This includes modelling, interactive maps, adaptation checklists, tools and case studies.

The Institute for Public Works Engineering Australasia (IPWEA) has developed a Practice Note, Climate Change Impacts on the Useful Life of Infrastructure. All Local Government NSW members can download a free e-book from www.ipwea.org/publications/pn12-1free.

Additionally, a Cross Dependency Initiative tool to quantify climate risk to infrastructure is available in a topic-specific guide on interconnectedness that has been developed to support the implementation of the CIR Strategy.

Sources of funding

Local governments derive their revenue from rates, grants, user fees and charges, interest and other sources, and use it to deliver services and to develop and maintain community infrastructure. While opportunities exist to improve infrastructure resilience through capital and operational works budgets, local government finances are under increasing pressure from a number of competing demands.

Councils and other CI providers may already know what should be done to improve resilience but may be unable to fund improvements.

This section of the guide identifies a number of potential funding sources for mitigating the risks to local government CI. Application processes may have specific conditions and, in some cases, the council may be required to also contribute funds.

Funding program	Information
Natural Disaster Resilience Program (NDRP)	The NDRP is jointly funded by the Australian and NSW governments and aims to enhance the capacity of communities to prepare for and withstand the effects of natural disasters. The NDRP supports a wide range of activities, including research and development; disaster risk assessments; physical works and engineering measures; community education and engagement programs; and projects that support emergency management volunteers. The Australian and NSW governments each provide $26.1 million annually. Councils are eligible to apply for funding under the:

	• Floodplain Risk Management Grants Scheme • Bush Fire Risk Management Grants Scheme • Community Resilience Innovation Program • State Emergency Management Projects program.
Building Better Regions Fund (BBRF)	The $641.6 million BBRF is a competitive grants program that provides funding for infrastructure and community investment projects that will create jobs, drive economic growth and build stronger regional communities. Enhancing infrastructure resilience clearly helps to build stronger regional communities that are more able to cope with natural and manufactured threats and hazards, and adapt to a changing climate. Eligible applicants must apply during a funding round, and applications are assessed against the merit criteria and other applicants. For further information on the BBR Fund, refer to www.business.gov.au/assistance/building-better-regions-fund.
Safer Communities Fund: Infrastructure Grants – Australian Government	The Safer Communities Fund provides grants of up to $1 million to community organisations and local governments for local crime prevention and security infrastructure activities. Grants will fund up to 100 per cent of eligible project costs. For further information, refer to: https://business.gov.au/grants-and-programs/safer-communities-fund-round-5-infrastructure-grants.
Bush Fire Risk Mitigation and Resilience Grants Programme	Funding is available to supplement spending by public land managers and owners on bushfire mitigation works, providing access for fire-fighting and supporting projects that increase the resilience of NSW communities to bushfire. For further information, refer to https://www.rfs.nsw.gov.au/about-us/grants.
Office of Responsible Gaming – Infrastructure Grants	The NSW Government offers grants of up to $300,000 to communities across NSW for building, renovating and fitting out infrastructure for arts and culture, and sport and recreation, and for projects that enhance facilities that shelter communities and provide emergency services. For further information, refer to www.responsiblegambling.nsw.gov.au/funding-opportunities/infrastructure-grants.
Foundation for Rural & Regional Renewal (FRRR)	The FRRR has a range of grant programs throughout the year. For further information, refer to https://frrr.org.au/funding/.
Safe and Secure Water	The SSWP is a $1 billion regional infrastructure co-funding program established in 2017 under the NSW Government's Restart NSW fund. The SSWP co-funds eligible water and sewerage projects that deliver economic growth in regional NSW by improving public health, water security, environmental outcomes and/or

Program (SSWP)	social benefits. Councils are invited to lodge expressions of interest. Priority is given to regional projects that involve one or more local government areas. For further information and to access cost–benefit analysis tools, refer to www.industry.nsw.gov.au/water/plans-programs/infrastructure-programs/safe-and-secure-water-program/about\.
Restart NSW	The NSW Government established the Restart NSW fund in 2011 to enable infrastructure projects throughout the state. By June 2018, the government had spent $32.9 billion on the fund. It is a vehicle for delivering the government's 10-year Rebuilding NSW Plan by investing in new infrastructure. Infrastructure NSW is responsible for assessing and recommending projects that improve the productivity and competitiveness of NSW across all sectors. Restart NSW also provides a number of other infrastructure funding programs. For further information, refer to www.insw.com/restart-nsw/.

Recommended further reading

Resilience NSW, 2017, *Emergency Risk Management Framework* – https://www.opengov.nsw.gov.au/publications/19459.

Resilience NSW, *2017 State Level Emergency Risk Assessment: Executive Summary* – https://www.opengov.nsw.gov.au/publications/19463.

Australian Institute of Disaster Resilience, *National Emergency Risk Assessment Guidelines. Australian Disaster Resilience Handbook Collection. Handbook 10* – knowledge.aidr.org.au/resources/handbook-10-national-emergency-risk-assessment-guidelines/.

Resilience Priority 3: Provide

*No CI is immune to disruptions. However, the aim is to **provide** CI services with minimal disruptions and the ability to rapidly recovery from outages. To achieve this, local governments must manage their assets effectively by assessing and determining criticality, understanding their interconnectedness and interdependency, and being able to rapidly assess damage when an event occurs so they can reinstate services as quickly as possible.*

Infrastructure resilience – asset management

Infrastructure resilience focuses on planning, designing and building resilience into assets, networks and systems. The CIR Strategy identifies four elements of infrastructure resilience: resistance, reliability, redundancy and enhanced response and recovery, which are outlined in Figure 4. Improving any element improves overall infrastructure resilience. Considering all elements when planning and designing infrastructure markedly improves overall infrastructure resilience.

Infrastructure Resilience			
Resistance	**Reliability**	**Redundancy**	**Enhancing Response and Recovery**
Resistance is concerned with direct physical protection. It is CI's ability to withstand shocks to continue operation (e.g. storm surge barriers built to withstand severe storms)	**Reliability** is the capability of infrastructure to maintain operation in a variety of conditions (e.g. electricity networks designed to operate in extreme heat or extreme cold)	**Redundancy** is the adaptability of an asset or network to cope with loss of individual components (e.g. a hospital with two physically separate water supplies)	**Enhancing Response and Recovery** is infrastructure resilience designed to enhance a provider's ability to recover from disruptions. (e.g. modular infrastructure for single part replacement

Figure 4: Elements of infrastructure resilience[5]

Further information is available in a topic-specific guide on infrastructure resilience that has been developed to support the implementation of the CIR Strategy.

Local governments own and operate a myriad of infrastructure assets that provide services or amenities for their communities (e.g. transport, water and wastewater infrastructure, stormwater drainage, waste facilities, dams and community buildings). The capacity of councils to enhance CIR is governed by the resources available to them. Councils may need to consider new or innovative ways to fund current infrastructure renewal backlogs as well as improve existing works or undertake mitigation activities. To improve CIR, it is vital that service standards for both business-as-usual and post-emergency events for each CI asset are clearly defined and that resilience thinking is integrated into the entire asset management lifecycle (e.g. planning, design, operations and maintenance, and disposal or replacement). Increasing infrastructure resilience will likely decrease whole-of-life maintenance costs.

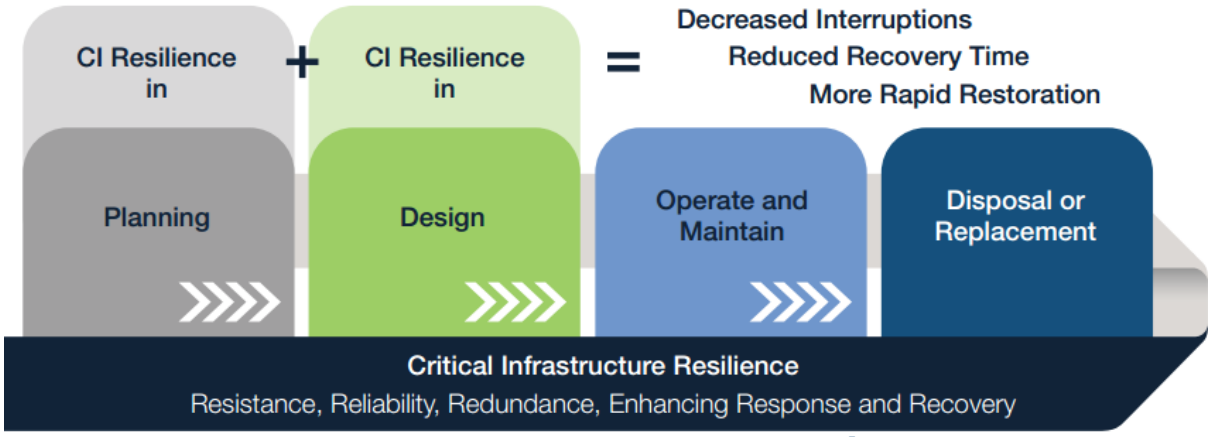


Figure 5: Areas of infrastructure resilience [5]

Further information is available in a topic-specific guide resource on infrastructure design, operations and maintenance that has been developed to support implementation of the CIR Strategy.

Enhancing resilience measures should be a 'no regrets' investment that protects lives, homes, schools, the economy and the environment. To build a convincing business case for securing funds, evidence shows that spending an additional 1 per cent of an infrastructure project budget on integrating mitigation early in the design can provide effective mitigation to natural hazards and climate change.[15]

The benefits are realised in the operations phase with minimal or no service interruptions, improved responses and reduced recovery times. This contributes to savings across all phases of the asset management lifecycle, especially after a disruption, when less time and money will need to be spent on recovery and reconstruction activities. Based on the increasing frequency and severity of natural hazards, only one large event is required to recover a 1 per cent investment in resilience via avoided reconstruction costs or improved response and recovery, based on good design.[7] Repeated exposure to hazards results in recovery of the 1 per cent investment many times over.

IPWEA is the peak association for professionals who deliver public works and engineering services to communities in Australia and New Zealand. It proactively supports local governments to implement effective asset management practices and has developed a number of tools and guides. Further details are available on IPWEA's website.

Defining infrastructure as 'critical'

Defining 'critical' infrastructure can be challenging for local governments because it partly depends on context, and wholly depends on perspective and purpose.

Criticality is complex and not necessarily fixed in time. For example, a dam that supplies water to a suburb may become critical over time, perhaps years, as a community expands to accommodate population growth; or as a result of an earthquake or changes in weather patterns; or due to ineffective asset management processes.

Assets that 'may become critical' are those that can impinge on critical assets. For example, if a low-priority access road is washed away or blocked by debris, it could impede access to a critical asset such as a hospital. These type of low-order assets can become critical quickly.

It is recommended that local governments adopt the criticality assessment model identified in the CIR Strategy, but scale the terms to assess criticality from their own perspective. The

model grades infrastructure according to the consequences of failure (vital, major, significant or low), rather than the likelihood that failure will occur. CIR needs to be approached as an ongoing process, rather than as a one-time exercise in which resilience levels (and asset-to-asset dependencies) change – and are recovered – over time.

Table 4: Context for criticality

State	Organisation	(LG) Local Government
Vital		
State-level impact, alternative unavailable within NSW, long-term impact to NSW	Organisation-wide impact, alternative unavailable within organisation, long-term impact to organisation function	LG-wide impact, alternative unavailable within LG, long-term LG impact
Major		
State or Regional impact, major effort or assistance required to restore, medium-term impact to NSW	Impact across most of the business, major effort or assistance required to restore, medium-term impact to organisation function	Affects multiple functions of local government, major effort or assistance required to restore, medium-term impact to LG services
Significant		
Local or Regional impact, additional assistance required from within NSW, short-term impact to NSW	Impact to one or more sections of the business, other business sections provide assistance, short-term impact to organisation function	Affects one or more significant functions of LG, assistance from other parts of the LG to restore, short term impact to LG
Low		
Local impact, additional assistance may be required from within NSW, minimal impact to NSW	Impact to one part of the business, assistance from other parts of the business may be required, minimal impact to whole of business function	Impact to one function of LG, assistance from other parts of the LG may be required, minimal impact to LG function

The starting point for local governments is to consider what is at risk if infrastructure they own or operate is destroyed or disabled, and how much that matters to the organisation and the communities they serve. This will assist local governments to define the criticality of their assets so they can prioritise service restoration, mitigation investments and so on.

Further information is available in a topic-specific guide resource on infrastructure criticality assessment that has been developed to support the implementation of the CIR Strategy.

Interconnectedness and interdependencies

Once local governments have determined the criticality of their assets, the next step in creating CIR is to consider infrastructure interdependencies.

The CI that underpins everyday life in localities across NSW is complex. It is heavily connected and is essentially a system of interacting, interrelated and interdependent components that form a complex and unified whole.

All CI relies to some extent on other CI for continued service provision. For example, water and wastewater infrastructure relies on energy, transport and telecommunications infrastructure to continue operating. Interdependencies can look like deficiencies in system design, but during normal operations they provide efficient and enhanced operational capability. Interdependencies can amplify CI failure, with wide-reaching consequences. There is the potential for cascading failures to create a 'ripple effect' felt in many parts of the community, not just by the CI providers. For example, an electrical substation could be

flooded, knocking out a water treatment plant, which in turn disables all food businesses in the local government area. Local governments need to understand these interdependencies to assist them to provide and support response and recovery services.

Figure 6 models interdependency based on electricity supply and illustrates the complexities involved in delivering essential services.

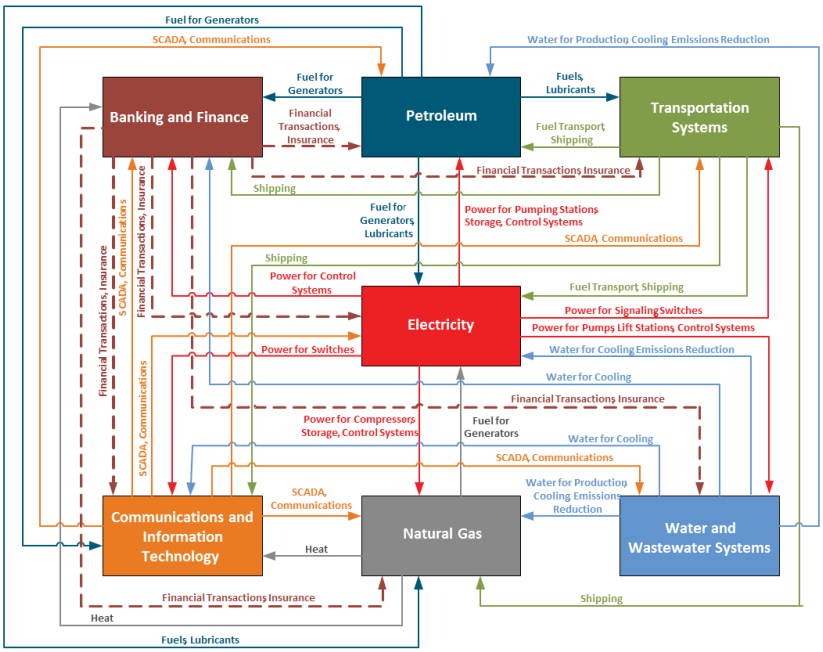


Figure 6: Example of infrastructure system interdependencies

Interdependencies are complex and initial exercises could involve mapping basic links or dependencies that can be built upon over time. Achieving CIR requires investing time and effort to identify and maintain data on these linkages. Working collaboratively with CI providers through the LEMC will result in better planning and consideration of local CI issues. Regional CI issues that are beyond the capacity of the LEMC to resolve should be escalated to the REMC for action.

More information on working with infrastructure interconnectedness and interdependencies is available in the NSW CIR Interconnectedness Guide on https://www.opengov.nsw.gov.au/.

Using geographic information systems for decision making

Good data enables good preparation and decision making. Access to powerful map-based tools via a geographical information system (GIS) allows local governments to record asset data and build CIR.

The value of GIS has been proven for asset management functions, such as record-keeping via asset registers, and for effective preventative maintenance. The value can be extended before and during emergency events. Hazard data, such as flood mapping, can be overlaid on CI to determine exposure. For example, it could be used to identify CI that is likely to be affected by a 1 per cent annual exceedance probability (AEP) flood event. It could also be used to overlay asset types such as low-criticality roads leading to a vital criticality water pump asset that might impede access if damaged in a disaster.

Additionally, map-based tools facilitate information sharing between owners and managers of CI systems and assets, and those that may need to help restore infrastructure services after

a hazardous event. Not all information needs to be open or shared constantly. However, robust processes need to be in place to share relevant information in a timely manner when the need arises.

Damage assessments

Being able to conduct comprehensive, timely and accurate damage assessments of CI after a major event that affects business and government continuity will be vital, and will affect the speed and efficiency of response and recovery efforts.

If a local government owns or operates the CI, it will also be necessary to conduct more comprehensive assessments later. Local governments should implement robust and standardised processes to ensure they have a complete picture of any situation. Good decision making requires accurate and comprehensive information, the flow of which will improve over time.

Further information about response and recovery is available in the CIR Strategy.

Organisational resilience

The people, organisations and processes that support infrastructure have as much impact on CIR as the assets, systems and networks themselves. Local governments need to ensure they have planned for what to do when interruptions to infrastructure service provision affect their organisation, and as providers of CI need to proactively work to enhance organisational resilience through resilience thinking and business continuity management arrangements. This will include a proactive approach to mitigating risk, undertaking business impact assessment, ensuring that business continuity plans are available to maintain the continuity of critical business processes, that staff are trained to carried out their duties and are regularly tested through scenario-based exercises. It is also vital to ensure that recommendations identified from exercises and real events are implemented to ensure lessons are learned.

Further information is available in a topic-specific guide resource on organisational resilience that has been developed to support implementation of the CIR Strategy.

The Hunter Joint Organisation of councils (refer to the case study in Appendix B) has developed a Disaster Preparedness Guide for Local Government in NSW on the importance of organisational resilience. The guide provides a checklist of activities that councils and other local government departments can use to achieve a baseline of preparedness and to move along a path to greater overall resilience.

Integrated planning and reporting

Local councils in NSW are required to undertake planning and reporting activities in accordance with the *Local Government Act 1993* and the Local Government (General) Regulation 2005. Section 8c[16] requires councils to:

- *Identify and prioritise key local community **needs** and aspirations and consider regional priorities.*
- *Identify and **manage risks** to the **local community** or **area** or to the **council** effectively and proactively.*

The Integrated Planning and Reporting (IPR) Framework allows NSW councils to draw their various plans together, to understand how they interact and to gain maximum leverage from their efforts by planning holistically for the future.

The Integrated Planning and Reporting Guidelines[17] for local government in NSW include 'essential elements' of planning and reporting, to comply with the Local Government Act. These include a community strategic plan, and a resourcing strategy and delivery program that covers asset management planning policy, strategy and plans.

The IPR Framework is a useful platform for local governments to report on CIR issues. It facilitates collaboration and assists with embedding CIR issues across local government boundaries. It may also help local governments to secure funding for resilience building or hazard mitigation works in the future.

Sources of funding

The following table lists a number of funding sources that are available following emergency events that affect CI.

Funding program	Information
Insurance	Local governments often use insurance to pay for damaged assets. However, it should be noted that under-insurance is often an issue and that not every asset is insured. Premiums can be cost-prohibitive and in many cases beyond the capacity of small councils to pay. Statewide Mutual and CivicRisk Mutual provide insurance to the majority of NSW councils. Over the past few years, these insurers have been actively running programs to support councils, including undertaking risk audits, providing grants for risk initiatives and projects, and assisting with producing baseline business continuity plans, exercises and asset management. Local governments should contact their insurer to discuss risk reduction funding and the possible cost benefits.
Disaster Recovery Funding Arrangements (DRFA)	The DRFA applies to eligible events that occur on or after 1 November 2018. All eligible events that occurred before or on 31 October 2018 are governed by the Natural Disaster Relief and Recovery Arrangements Determination 2017. Under the joint Australian Government–State Disaster Recovery Funding Arrangements 2018, assistance is provided to alleviate the financial burden on states and territories. It also supports the provision of urgent financial assistance to disaster-affected communities. Under these arrangements, the state or territory government determines which areas receive assistance and what assistance is available to individuals and communities. Where the arrangements have been activated, the Australian Government may fund up to 75 per cent of the assistance available to individuals and communities. This contribution is delivered through a number of assistance measures and may include:

	• personal hardship and distress assistance, including engaging a community recovery officer to work with individuals and families receiving personal hardship and distress assistance • concessional loans or interest subsidies for small businesses and primary producers • transport freight subsidies for primary producers • loans and grants to voluntary non-profit organisations and needy individuals • reconstruction of essential public assets • community recovery funds. In addition, clean-up and recovery grants may be available to assist businesses, including farmers, to resume trading as soon as possible. The grants may be used for cleaning up, replacing damaged equipment and stock, and other general repairs.

Recommended further reading

Australian Government, *Organisational Resilience: A Position Paper for Critical Infrastructure* – https://catalogue.nla.gov.au/Record/5283108.

Australian Government, 'Disaster Recovery Funding Arrangements 2018' – https://www.disasterassist.gov.au/disaster-arrangements/disaster-recovery-funding-arrangements.

Appendix A: Local government action plan and self-assessment tool for enhancing critical infrastructure

Local governments can use this action plan and self-assessment tool to assist with implementing the CIR Strategy. Councils can regularly revisit the tool to assess and monitor performance against suggested resilience goals. Using this tool will help to set baselines, identify gaps and plan actions.

Date of self-assessment: ……

ACTION	ASSESSMENT METRICS	SELF-ASSESSMENT SCORE (1–5)
Nominate at least one CIR champion to work collaboratively across council and with council Joint Organisations on CIR issues.	**1.** No champion is in place, there is no plan to appoint one, and no plan to improve the situation. **2.** At least one champion is in place and a plan is being developed to integrate CIR into council activities. **3.** At least one champion is in place, and a plan is in place to implement CIR. **4.** Champions are in place in multiple areas of council, and plans to implement CIR in those areas are underway or achieved. **5.** A champion is in place in all relevant areas of council (e.g. elected officials, planning, asset management and operations), and CIR goals have been achieved, with commitment and capacity to sustain or improve efforts at all levels.	
CI providers attend LEMC or infrastructure resilience subgroup meetings.	**1.** No engagement with CI providers, and few signs of planning or forward action to improve the situation.	

	2. CI providers don't attend LEMC meetings but engagement is occurring; achievements have been made but are incomplete; and improvements are planned. **3.** CI providers have limited attendance at LEMC meetings, demonstrating some commitment and capacities, but not all relevant infrastructure sectors are represented. **4.** CI providers for all relevant sectors regularly attend LEMC meetings. **5.** CI providers always attend LEMC meetings and have made a commitment and have capacity to sustain efforts at all levels.	
CI providers participate in planning via the LEMC or infrastructure resilience subgroup.	**1.** CI providers aren't involved in planning, and there are few signs of forward action to improve the situation. **2.** CI providers aren't involved in planning, but engagement is occurring and improvements are planned. **3.** CI providers are starting to be involved in limited or incomplete planning, but progress is ongoing. **4.** CI providers are involved in planning, and there are substantial achievements. **5.** CI providers are embedded in planning in the LEMC, and are committed and have capacity to sustain efforts at all levels.	
CI providers participate in exercises via the LEMC or infrastructure resilience subgroup.	**1.** CI providers aren't involved in exercises, and there are few signs of planning or forward action to improve the situation. **2.** CI providers aren't involved in exercises, but engagement is occurring; achievements have been made but are incomplete; and improvements are planned.	

	3. Discussions have begun with CI providers about exercises, and they have demonstrated some commitment and capacity. **4.** CI providers have participated in exercises, and plans to implement lessons are underway or achieved. **5.** CI providers participate in a program of regular exercises. Lessons are being learnt and they are committed and have capacity to sustain efforts at all levels.	
Key council stakeholders participate in ongoing training and receive support for CIR (refer to Resilience NSW)	**1.** Training needs have not been identified, no plan is in place to access support, and there is no plan to improve the situation. **2.** Training needs are being identified and a plan to access support is being developed. **3.** Initial training for local government stakeholders has been undertaken and stakeholders are aware of the available ongoing support. **4.** Some local government stakeholders have participated in training and are actively accessing the available support. **5.** The majority of local government stakeholders have participated in training, are accessing ongoing support as required, and are committed and have capacity to sustain and improve efforts at all levels.	
The council is building and leveraging partnerships to engage with the community to enhance CIR.	**1.** No community engagement is undertaken, no community partnerships have been formed, and there is no plan to improve the situation. **2.** Limited community engagement has been undertaken, but no community partnerships have yet been formed. **3.** Community engagement is actively occurring, but no community partnerships have been formed.	

	4. Community engagement is embedded, with one community partnership formed, demonstrating some commitment and capacity, but progress is not comprehensive or substantial. **5.** Community engagement is comprehensive and fully embedded, with one or more strong community partnerships leading to significant achievements, and there is commitment and capacity to sustain efforts at all levels.	
The council employs a risk-based all-hazards approach to managing risks to CI.	**1.** A risk-based approach to all-hazards planning for CI is not evident and there are few signs of action to improve the situation. **2.** A risk-based approach to all-hazards planning for CI is being developed, but hasn't been implemented. **3.** Risk-based plans are in place to help protect CI from disruption. **4.** A risk-based approach to all-hazards planning has been developed and risk reduction activities are being undertaken. **5.** A comprehensive risk-based approach to all-hazards planning is evident (this may be based on ISO 31000), with extensive achievements, and commitment and capacity to sustain efforts at all levels.	
The council considers new and existing CI in the context of climate change and implement adaptation strategies as appropriate.	**1.** Climate change impacts on CI are not considered, adaptation plans are non-existent, and there are few signs of planning or action to improve the situation. **2.** Climate change impacts on CI and adaptation measures have been identified and improvements have been considered, but not yet implemented. **3.** Climate change impacts on CI are proactively considered and adaptation measures have been partially implemented in some cases.	

	4. Climate change impacts on CI are proactively considered and adaptation measures have been fully implemented in the majority of cases. **5.** Climate change impacts on CI have been comprehensively considered and appropriate adaptation measures implemented in all cases, with commitment and capacity to sustain effort at all levels.	
The council integrates and embeds resilience into all aspects of the asset management lifecycle (e.g. planning, design, construction, operations and maintenance).	**1.** Resilience is not considered in any aspect of the asset management lifecycle and there are few signs of action to improve the situation. **2.** Resilience is considered in at least one aspect of the asset management lifecycle and improvements are planned. **3.** Resilience is considered in more than one aspect of the asset management lifecycle, council is committed and has capacity, and progress is ongoing. **4.** Resilience is considered in all aspects of the asset management lifecycle and resilience achievements are being attained. **5.** Resilience is comprehensively considered in all aspects of the asset management lifecycle and substantial achievements are being attained, with commitment and capacity to sustain efforts at all levels.	
The council has a criticality register for its assets and it is integrated into emergency planning.	**1.** Criticality registers do not exist for any asset type and there are few signs of planning to improve the situation. **2.** A criticality rating system is being developed but it hasn't yet been applied to council assets. **3.** Criticality registers are in place for at least some of council's CI asset types.	

	4. Significant work has been undertaken on criticality registers for council assets and these are used in emergency management planning (e.g. to prioritise restoration of council infrastructure services after a disaster). **5.** Comprehensive criticality registers exist for most critical asset types and are used in emergency management planning; and there is commitment and capacity to sustain this effort at all levels.	
The council understands interdependencies between local infrastructure and uses it in emergency planning.	**1.** Interdependencies between infrastructure are not understood and there is no plan to gain a better understanding. **2.** A plan for understanding interdependencies between infrastructure is being developed. **3.** Interdependencies are discussed with CI providers and are beginning to be understood at the local or regional level. There is some integration of interdependencies in emergency planning. **4.** Interdependencies are understood and are a key part of emergency planning. They are integrated into local and regional emergency planning, and exercises on cascading faults have been undertaken. **5.** Emergency management committees have a comprehensive understanding of interdependencies, which they regularly use in emergency planning; and ongoing work aims to improve this understanding.	
The council uses map-based tools, such as GIS, to record assets and inform decision making in relation to CIR. Possible inclusions to record for CI might be criticality ratings, interdependencies or the consequences of losing specific pieces of infrastructure.	**1.** GIS is not used to record CI assets or inform decision making. **2.** GIS is used to record some CI but a comprehensive geographical understanding of CI is not available. **3.** GIS is used to record CI and aids planning and decision making.	

	4. GIS is used to record all CI for asset management, but may not include information relevant to emergency management such as criticality or the consequence of loss. **5.** GIS is fully embedded and is used to record all CI assets and to consistently inform decision making.	
The council has robust processes in place to conduct post-disaster damage assessments and report on impacts to CI.	**1.** There is no evidence of processes to conduct damage assessments, no impact reporting framework and few signs of action to improve the situation. **2.** There is limited evidence of processes in place to conduct damage assessments and no impact reporting framework, but improvements are planned. **3.** Damage assessment processes and an impact reporting framework are in place, demonstrating some commitment and capacity. **4.** There is strong evidence that a damage assessment process and impact reporting framework are in place, with commitment and capacity to sustain efforts at all levels. **5.** Comprehensive processes are in place to conduct damage assessments and report on impacts to CI, and these have been tested in a real event or exercise.	
The council fosters effective organisational resilience practices and has implemented a program of continuous improvement.	**1.** No organisational resilience practices have been undertaken and there are few signs of planning or action to improve the situation. **2.** An organisational resilience strategy or plan is being developed or has been approved but not yet implemented. **3.** An organisational resilience plan is in place and progress is being made to improve the maturity of the organisation in relation to organisational resilience.	

	4. Good organisational resilience plans and practices are in place, and are being improved until they reach maturity. **5.** Organisational resilience practices are comprehensive, and there is strong evidence of continuous improvement, with commitment and capacity to sustain efforts at all levels.	
Leverage the IPR Framework to embed CIR across local government boundaries.	**1.** There is no evidence of the IPR Framework being leveraged and there are few signs of action to improve the situation. **2.** Plans are in place to leverage the IPR Framework to improve CIR. **3.** Council reports through the IPR Framework on infrastructure resilience and emergency management activity. **4.** The IPR Framework has been leveraged and some achievements have been attained. **5.** The IPR Framework is consistently leveraged to embed CIR issues, with significant achievements, and there is commitment and capacity to sustain efforts.	

SCORE	DESCRIPTION
13–20	The council is just starting on its CIR journey. If an improvement plan is not in place, consider contacting Resilience NSW to assist with planning to increase infrastructure resilience.
21–35	The council is on a journey to build infrastructure resilience. A plan may be in place, but if assistance is required, contact Resilience NSW.
36–50	The council is working well toward improving CIR. A plan is in place and resources have been allocated for planned actions and improvements. Resilience NSW is available for guidance and assistance.

51–64	The council is invested in improving CIR, and may like to look beyond its own organisation or local government area for other good practice, or to provide assistance to other regional organisations.
65–75	The council has mature infrastructure resilience practices and may like to collaborate with other councils and regional organisations to assist them in improving regional infrastructure resilience.

Appendix B: Case studies

Cross-sector collaboration – Partner

Central Coast LEMC

The Central Coast Council is located between the cities of Sydney and Newcastle, and was established in May 2016 through the amalgamation of the Gosford City and Wyong Shire councils. It administers 1,680 km^2 of land, with a population of more than 335,000 people.

The Central Coast LEMC has consistently had active and strongly represented CI providers. Their stable membership has facilitated the development of professional working relationships and they actively engage in emergency management.

CI providers regularly contribute short presentations on topical issues within their area of responsibility at LEMC meetings. They collaborate with the LEMC on community engagement initiatives, undertake joint planning, and help develop and review the Central Coast LEMC Emergency Management Plan.

They also often participate in emergency management exercises. This has strengthened professional relationships and cross-agency collaboration and increased understanding of each agency's strengths and capabilities.

During emergencies, CI providers supply a liaison officer to work in the Emergency Operations Centre, helping to reduce response and recovery times and providing significant benefits for the community.

Auckland Lifelines Group

In New Zealand, lifeline utilities provide infrastructure services to the community, including water, wastewater, transport, energy and telecommunications.

The Auckland Lifelines Group (ALG) was established in 2000 and is made up of lifelines organisations in the Auckland region. The ALG's mission is to identify measures and co-ordinate efforts to reduce the vulnerability of the city's lifelines to hazardous events and to improve service reinstatement after a disaster. It is a voluntary organisation and while it is not a legal entity, the ALG operates under the auspices of the Auckland Council, which administers funds and enters into contracts for services on its behalf. The ALG does not have an operational role in emergencies. Its role primarily focuses on risk reduction and readiness.

The ALG works with CI providers to help mitigate risks. Its previous projects include:

- assessing the criticality of Auckland's lifelines services infrastructure
- mapping network and asset interconnectedness between infrastructure types
- assisting with producing advice posters in relation to natural hazards such as volcanic ashfall.

For further information, refer to www.alg.org.nz/.

UK Local Resilience Forum

A Local Resilience Forum (LRF) is a multi-agency partnership formed by key emergency responders and specific supporting agencies under the requirements of the UK's Civil Contingencies Act (CCA) 2004.

LRFs are based on police areas and are made up of representatives from local public services (e.g. emergency services, local government, the National Health Service (NHS) and the

Environment Agency). These are known as Category 1 Responders and have defined legislative duties under the CCA Act.

LRFs are supported by Category 2 Responders, such as the Highways Agency and public utility companies. These organisations have a legislative responsibility to co-operate and share relevant information with Category 1 Responders through the LRF. Table 5 lists the Category 1 and 2 responders that form part of the London LRF.

Table 5: Members of the London LRF

Category 1 Responders	Category 2 Responders
Emergency services • British Transport Police • City of London Police • London Ambulance Service • London Fire Brigade • Maritime Coastguard Agency • Metropolitan Police Service **Strategic London government** • Greater London Authority • 33 local authorities **Health bodies** • Acute trusts • NHS England (London) (also representing clinical commissioning groups • NHS provider organisations • Public Health England **Government agencies** • Environment Agency • Health and Safety Executive Met Office **Other responders** • Airwave • Ministry of Housing, Communities and Local Government • Defence • Voluntary sector • Business sector • Faith sector	**Utilities** • Affinity Water • BT • Colt Technology Services • Essex and Suffolk Water • Lumen • National Grid • O2 Telefonica • Scottish and Southern Energy • SGN • Sutton & East Surrey Water • Telehouse Europe • Thames Water Utilities Limited • Telefónica • UK Power Networks • Vodafone **Transport providers** • Transport for London • Network Rail – Crossrail • HS2 • Heathrow Airport • London City Airport • Highways England • National Air Traffic Service • Port of London Authority • Abellio Greater Anglia • c2c • Chiltern East Midland Trains • Eurostar • Grand Central • Govia Thameslink Railway • Heathrow Express • Hull Trains

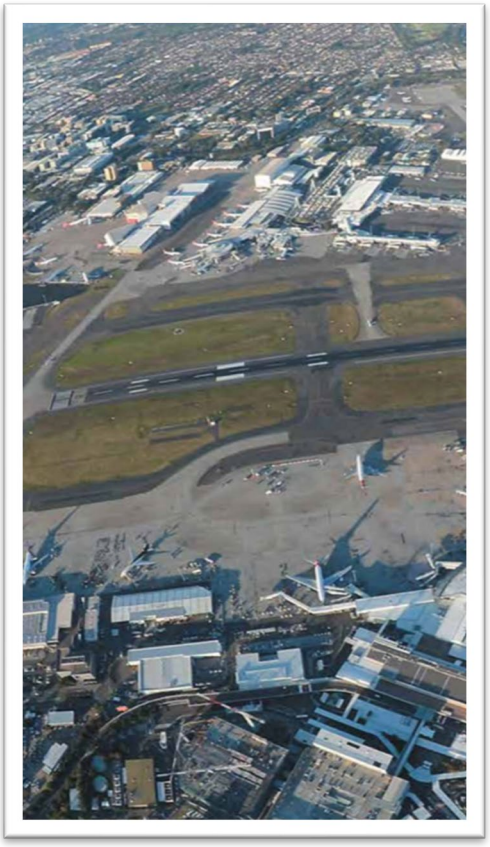
	• West Midlands Railway • South Western Railway • Southeastern • Southern Railway • Virgin Trains **Government agencies** • Health and Safety Executive • Air Accident Investigation Branch • Rail Accident Investigation Branch • Marine Accident Investigation Branch

The UK LRF model is a good example of how CI providers can access a forum to consult, collaborate with and disclose information with first responders, to facilitate planning and response to emergencies and produce a Community Risk Register.

A link to all LRFs is available on the UK Cabinet Office website at www.gov.uk/guidance/local-resilience-forums-contact-details.

Engaging the community in CIR – Partner

Engaging passengers in airport security



The September 11, 2001 World Trade Centre attacks and subsequent terrorist incidents around the world have heightened awareness of national security issues. The attacks had a dramatic impact on the aviation industry, and measures such as body scanning, shoe removal, longer security queues, and bans on bottles of liquid above a certain size have become the norm at airports.

Australia's national strategic approach to countering terrorism (prepare for, prevent, respond to and recover from a terrorist act) requires a multi-layered and collaborative approach based on strong relationships between governments, private industry, international partners and the community.

Sydney International Airport has actively engaged with clients in a partnership to reduce the risk of infrastructure service interruption. As a result of enhanced public messaging and education, passengers are aware of their shared responsibility in relation to airport security processes. Passengers provide additional eyes and ears on the ground for surveillance and are encouraged to report anything suspicious, such as unattended bags or questionable individual behaviour.

This is a strong example of how effective community engagement can enhance CIR by promoting shared responsibility to reduce risk.

Informing the community about the status of CIR–Provide

Lismore Disaster Dashboard

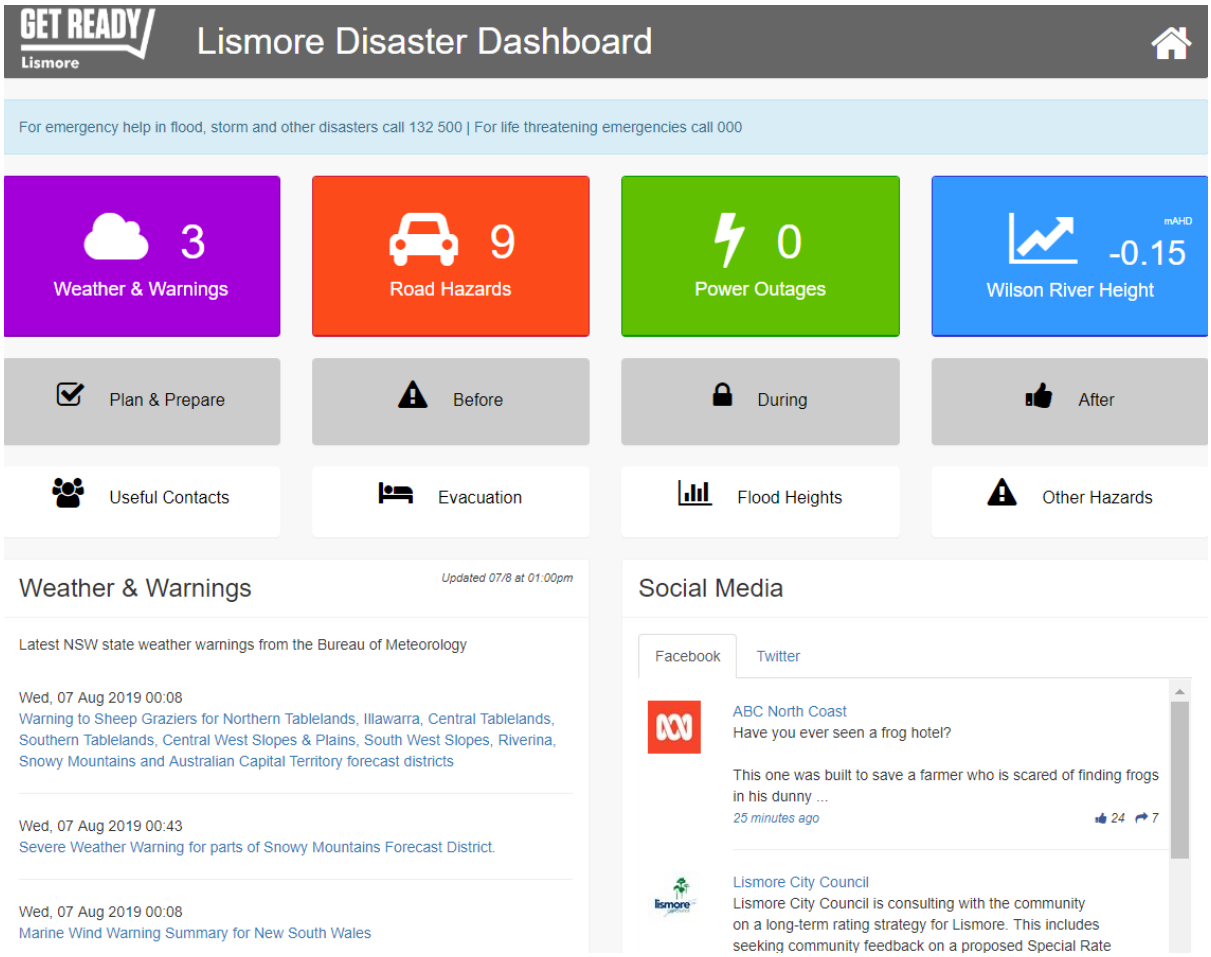
Lismore City Council has implemented an innovative Disaster Dashboard that delivers real-time online emergency information to the public.

It aims to reduce public risk and ensure the community is kept informed before, during and after emergency events. The dashboard is a one-stop shop for information during an emergency, bringing data together from a variety of sources to provide live updates on road closures, power outages, evacuation centres and school closures, as well as weather warnings and preparedness information for the community.

This authoritative information alleviates pressure on CI providers, leaving them to get on with the job of restoring services rather than answering enquiries or responding to community rumours.

The Disaster Dashboard is a great example of technology gathering information from multiple sources and providing it in real time to enable better decision making in emergencies. It is also a tool that assists multiple CI providers to work together to build community resilience.

Other NSW councils are investigating the provision of their own disaster dashboard.



Community as a partner in infrastructure maintenance – Partner

Using mobile apps to report infrastructure damage

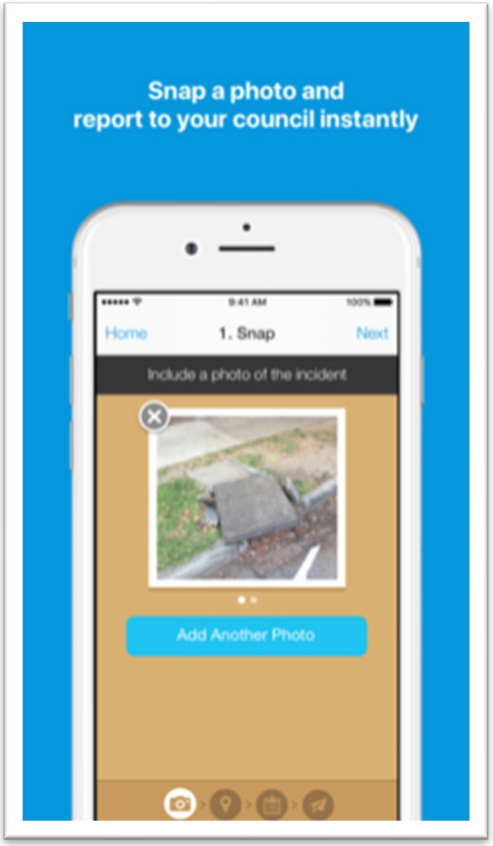
A number of NSW CI providers are using smartphone technology to enhance their response to critical and routine infrastructure issues.

Some organisations are using software they have developed in-house, while others are promoting the use of publicly available apps so that residents can easily and instantly capture, report and provide feedback to their council and other CI providers on common issues needing attention. Issues might include water leaks, potholes, fallen trees, cracked pavements, broken playground equipment, graffiti and illegal dumping.

Some platforms are becoming increasingly sophisticated, allowing the transfer of images and the use of smart phones' GPS location apps. These platforms provide an example of how smart phone technology can be used to crowdsource information to enhance responses to critical and routine infrastructure issues.

Further information is available from:

- Bega Valley Shire Council
- Campbelltown City Council
- Sutherland Shire Council
- Essential Energy



Planning for post-disaster waste – Prepare

Dealing with waste from natural disasters

Hunter Joint Organisation of Councils

Natural hazards such as bushfires, storms and floods can create significant quantities of waste. The type of waste (e.g. vegetation, household items or hazardous substances) depends on the nature of the event (e.g. rain and/or damaging winds), and waste may be burnt or sodden. The community expects the council to extend its standard waste collection activity to manage waste generated by naturally triggered disasters, which can quickly overwhelm the council's existing waste infrastructure and resources.

Without prior planning, councils can create further risks through poor waste management decisions made in the heat of an emergency operation. This can result in other assets becoming unusable. For example, there is a risk that without a pre-planned strategy, waste generated by a natural disaster may be dumped on sporting ovals, football pitches and other large open spaces. In some circumstances, this could result in these assets being unusable for a period of time. If assets are contaminated by hazardous waste or asbestos, they may be unusable for many years while clean-up and remediation works are undertaken.

Recent events across Australia have also highlighted the need to have pre-planned waste management strategies in place.

Tathra and districts bushfire

Bushfires burned more than 1,000 hectares of residential areas, farmland and forest reserves on 18–19 March 2018. A total of 69 houses and 30 caravans and cabins were destroyed. Another 39 houses were damaged. This event generated 20,000 tonnes of waste, with 6,000 tonnes of this waste contaminated with asbestos. The event resulted in $11 million clean-up and disposal costs.

Severe Tropical Cyclone Debbie

Severe Tropical Cyclone Debbie was a large and powerful category 4 system that made landfall near Airlie Beach on 28 March 2017. It continued south, causing significant damage and flooding in the Northern Rivers region of NSW. Around 20,000 people were evacuated from the Lismore and Murwillumbah areas, and 20,000 tonnes of bulky household waste was generated. The clean-up in the Northern Rivers cost around $200 million.

Resilient asset management – Provide

Kyogle flood mitigation works and water supply augmentation

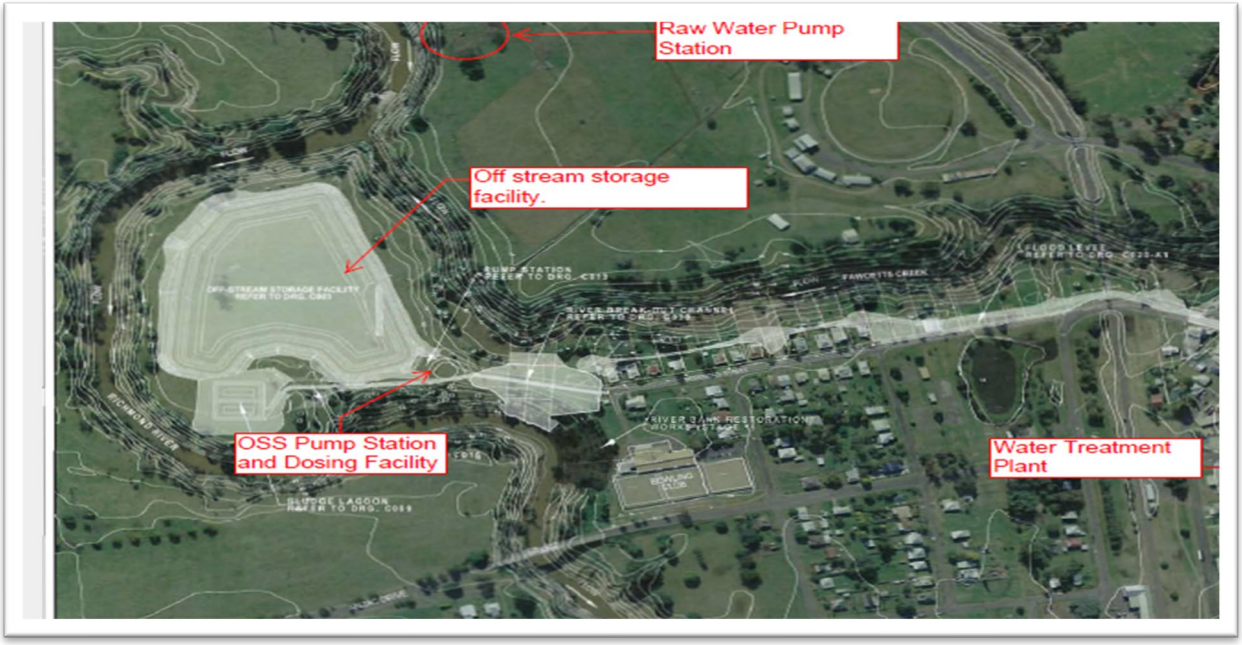
Kyogle is located in the headwaters of the Richmond River in the Northern Rivers region of NSW, close to the Queensland border. It falls within the local government area of Kyogle Council. Cattle grazing, dairy farming and forestry are the primary industries.

The Kyogle town water supply services around 3,500 people and the population is expected to grow by up to 4,500 people over the next 20 years. At the start of the millennium, Kyogle Council participated in a pilot project to undertake an integrated water cycle management process, using a catchment-wide approach to consider its future requirements. The council realised that it needed to use a holistic approach to solving its twin problems of flooding and providing adequate water supply.

After decades of planning and more than two years of construction work, the Kyogle Flood Mitigation and Water Supply Augmentation was completed in 2018. The NSW Government contributed $7.2 million of the $9.4 million cost of the project. It has improved drought and flood resilience, reduced water treatment and operational costs, increased treatment capacity and provided more consistent water quality.

The project's major elements included:

- modifying the existing in-stream weir and building an award-winning, innovative fishway
- upgrading the existing river extraction pumping station
- building a 200 megalitre off-stream storage (OSS) dam, and preliminary treatment and pumping facility
- upgrading the water treatment plant to meet current water quality standards and increase its capacity for growth
- combining flood modification works with the OSS civil works contract.



In March 2017, a severe weather event provided the first real test of the flood modification works. Off-stream storage ensured that the raw water source for the water supply was not affected by contaminants in the floodwaters. This shows that the water supply is more resilient to natural disasters and climate change impacts. A floodway opened a relief channel early in the event, which meant floodwater peaked lower in town. A levee bank protected low-lying areas, which still flooded, but the increased warning and reduced impact meant the water was not as fast-flowing compared to previous events.

This case study demonstrates that integrating resilience into the planning phase of the asset management lifecycle can provide a resilient water supply and solve a range of CIR-related issues faced by local governments.

Further information can be found in this short video: https://www.kyogle.nsw.gov.au/multi-million-dollar-kyogle-water-supply-augmentation-project-complete/

Upper Hunter Shire Council's resilient bridges

The Upper Hunter Shire is located in the Hunter Region of NSW, around 250 km north of Sydney. The local government area consists of about 8,000 km² of rich agricultural land and has a population of around 14,500 people.

Several communities within the Upper Hunter Shire are at risk of flooding. The council understands that acting to prevent flood damage may be expensive in the short term, but could save a lot in repair and replacement costs for decades to come.

The council's cohesive asset management strategy identifies its assets, the hazards they are vulnerable too and the level of risk. This has led the council to adopt a strategy of building both high and low bridges. The high bridges have decks that are above flood level. Below the decks, the spans are clear so that logs and debris can easily pass through without causing structural damage during a flood event. The low-level bridges are set at a height that allows larger debris and logs to pass over the structure rather than under or into it during a flood. This means that critical and non-critical assets can be inspected and reopened as soon as possible following a flood.

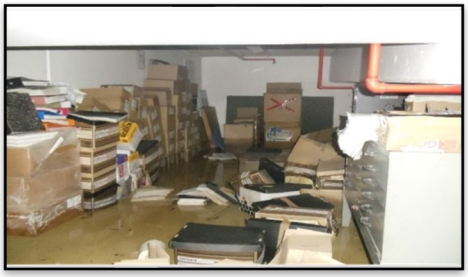
This case study demonstrates that integrating resilience into the design phase of the asset management lifecycle can protect bridges from flood-related damage and destruction.

City of Wagga Wagga

Improving capability of infrastructure to withstand flooding

Wagga Wagga, the largest inland city in NSW, has experienced large-scale floods throughout its history. The Murrumbidgee River and overland flooding from stormwater runoff are both sources of risk.

In December 2010, the Murrumbidgee River was already at 7 m when 65 mm of rain fell within three hours during the night. The river was predicted to peak at 9.7 m, and stormwater runoff had overflowed catchments at the Wollundry and Tony Ireland lagoons, flooding the adjacent council buildings, including the library, art gallery and civic centre basement.



With the assistance of Riverina Water County Council, Wagga Wagga Council had installed a temporary pump and pipeline within 10 hours to pump from the lagoon directly into the river.

Although the temporary solution worked, a better and permanent solution was needed.

The council's improvements included:

- increasing the capacity of the largest catchment lagoon
- installing floodgates between the catchment lagoons and the river
- installing bidirectional pumps
- building additional outflow pipelines.

The new system of pumps and weirs allows the council to reduce the level of the lagoon in preparation for stormwater runoff before an expected flood event and again during flooding.

The council also plans to install a green-space levee between the buildings and the lagoon to create a last line of defence. The levee will incorporate seating, artworks and natural features.

For more information, contact the council on 1300 292 442.

Appendix C: Abbreviations and glossary

Abbreviation	Meaning
All-hazards approach	An approach to managing the uncertain nature of emergency risk by building resilience to all or multiple hazards
CI	Critical infrastructure
CIP	Critical infrastructure protection (specifically, against terrorism)
CIR	Critical infrastructure resilience (against all hazards)
Dependency	When a CI relies on another CI, good or service for continued service provision
Disaster	When a hazard or threat intersects with a vulnerability, overwhelming the ability of local resources or business as usual to cope
EMDRR	NSW Emergency Management and Disaster Resilience Review
Hazard	A threat, usually natural, that unintentionally disrupts CI service provision
Infrastructure provider	An organisation responsible for providing an infrastructure service at a state, regional or local level, whether publicly or privately owned
Interdependency	When multiple CIs rely on each other for continued service provision
Mitigation	Measures taken in advance to reduce the likelihood or consequence of a hazard or threat
Sector	An industry or service group identified within the NSW CIR Strategy
SEMC	State Emergency Management Committee
SCADA	Supervisory control and data acquisition systems are used for remote monitoring and control to deliver critical services such as electricity, gas, water, waste and transportation
Threat	A hazard, usually man-made, that deliberately disrupts CI service provision
TISN	Trusted Information Sharing Network is co-ordinated by the Department of Home Affairs
Vulnerability	The conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards. (Source: NDRRF Glossary)

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