Public-private-partnerships (PPPs)
An industry perspective on their role as drivers of infrastructure resilience
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ABOUT THE RESILIENCE SHIFT

The Resilience Shift exists to inspire and empower a global community to make the world safer through resilient infrastructure. More people than ever depend on the critical infrastructure systems that provide essential energy, water, transport and communications services, and underpin food, healthcare and education. When this infrastructure fails the consequences can be catastrophic.

Supported by Lloyd’s Register Foundation and Arup, the Resilience Shift provides knowledge and tools for those responsible for planning, financing, designing, delivering, operating and maintaining critical infrastructure systems. Our aim is to ensure infrastructure systems are able to withstand, adapt to, and recover quickly from anticipated or unexpected shocks and stresses - now and in the future.

DEFINING RESILIENCE

Resilience is the ability to withstand, adapt to changing conditions, and recover positively from shocks and stresses. Resilient infrastructure will therefore be able to continue to provide essential services, due to its ability to withstand, adapt and recover positively from whatever shocks and stresses it may face now and in the future.

ACKNOWLEDGEMENTS

We gratefully acknowledge the contributions of PPP industry experts who informed our research. While most experts provided anonymous feedback through the interviews, they represented investors, developers and operators involved in the delivery of PPPs in Australia across a broad range of industries including: Water, Energy, Transport, Health, Social housing

We also acknowledge the traditional owners of the land on which we conducted this work, the Kulin Nation, and pay our respects to their Elders past, present, and emerging.
Foreword

There is no question that the resilience of our critical infrastructure systems globally is important. Society depends on critical infrastructure to continue to function (to protect, connect and provide) under ordinary and extraordinary circumstances.

The Resilience Shift’s vision of safer and better infrastructure means that those responsible for planning, financing, designing, delivery and operation of critical infrastructure need to understand what resilient infrastructure looks like, how to put resilience into practice, and why it is important. Our work to date has told us that the value that resilience provides is different for different stakeholders and can take the form of pains (where failing to consider resilience leads to direct or indirect penalties) and gains (where resilience yields tangible environmental, social, financial or economic benefits). Resilience value is different for public and private sector stakeholders, and PPPs create the potential for resilience value to be understood and realised by all those involved.

This guidance note shares industry insights on the role that infrastructure PPPs play in driving best practice for resilience. ‘Best practice’ could include long term thinking, risk sharing, whole system approaches and recognising future uncertainty through adaptive planning for example.

Creating a common understanding of how different policy instruments can drive best practice will allow public and private organisations to deliver infrastructure projects that both prevent or mitigate against known shocks and stresses, and are able to respond better to those events that can’t be predicted or avoided.

We’re delighted to have supported it.

The Resilience Shift team
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Investing in infrastructure resilience

Resilience has emerged as a critical agenda for the 21st century. This is in response to growing recognition of the diversity of shocks and stresses associated with environmental, economic, social, and technological pressures which is compounded by the uncertainty associated with rapid urbanisation, climate change and resource limitations. Secondly the complexity of interdependent systems which support an increasing global population and on which the future wellbeing of society depends.

Resilience is the ability of a system... 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.

The ability of critical infrastructure to accommodate both the expected and unexpected is a pre-requisite for ensuring the safety of life and property over the coming decades. The Resilience Shift seeks to develop a robust understanding of what this means in practice, within and between key critical infrastructure sectors globally. This will require creating new knowledge, approaches, tools and capacity that will transform the way in which infrastructure is planned, designed, constructed and operated.

Infrastructure investment globally is expected to reach US$79 trillion by 2040\(^2\). However, the Global Infrastructure Outlook estimates the global investment needed is closer to US$97 trillion. To close this $18 trillion gap, the average annual global infrastructure investment would need to increase by approximately 23% per year\(^3\).

This infrastructure investment is in part driven by the need to respond to the impact of natural disasters and climate change. Without these major investments, climate change may push up to 77 million people into poverty by 2030.\(^4\)
RELATED WORK

This report is part of a suite of knowledge products aiming to understand the policy instruments available to enhance the resilience of critical infrastructure. The Resilience Shift has supported research in the following areas:

- Understanding the role of public policy in enhancing critical infrastructure resilience
- Analysing the influence of resilience legislation
- Understanding the journey of a ratings tool for infrastructure projects from inception to common usage
- Exploring the role of Public Private Partnerships (PPPs) in enhancing critical infrastructure resilience (this report).

In parallel, five industry focused ‘Resilience Primers’ have been produced that explore the drivers of resilience from specific sector perspectives.

To learn more about the projects and publications, please visit our website.

Examples of related work (from left to right): The role of public policy in critical infrastructure resilience; Resilience primer: Ports; Resilience primer: Potable water
The relevance of PPPs to infrastructure resilience

This guidance document collates findings from interviews with investors, developers and operators, in the Australian infrastructure sector, about the role that public private partnerships can play in enhancing the resilience of critical infrastructure.

Public private partnerships (PPPs) are the focus for this study as they are consistently recognised as a value for money approach for governments to procure infrastructure as they:

- Leverage the expertise and efficiency of the private sector
- Raise capital from the private sector to deliver public goods
- Allocate risk to the party (public or private) best able to manage the risk.

PPPs are a long-term contract between a private party and a government entity for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance. The private sector assumes responsibility for the infrastructure and is therefore likely to invest in more durable materials or efficient technologies to drive down lifecycle costs. While not the cheapest option in the short term, they have the potential to drive savings over the long term through decreased energy usage, lower maintenance costs, or enhanced resiliency.

In Australia, PPPs are categorised as either ‘social infrastructure’ (i.e. non-income producing) such as schools, hospitals and prisons, or ‘economic infrastructure’ (i.e. income producing) such as roads and railways. They usually involve:

- Private sector finance, and
- The bundling of design, construction, maintenance and sometimes other services into a single long-term ‘whole of life’ contract.

While PPPs are not new in Australia, they tend to represent less than 10 per cent of total government infrastructure procurement. Their use is greatest in New South Wales (NSW) and Victoria, where all interviewees for this report were based. In understanding the ability of PPPs to enhance resilience in critical infrastructure, we aim to understand:

- Is there evidence to support the notion that PPPs drive long term decision making, which is an essential context for resilience?
- What are the key enablers in the design and delivery of PPPs for resilient infrastructure?
- What are the key challenges in the design and delivery of PPPs for resilient infrastructure?
- Do PPPs promote ‘systems’ rather than asset thinking?
Our approach

We interviewed leading practitioners involved in the design, delivery and operations of PPPs across multiple sectors. While interviewees chose to provide anonymous comments, projects discussed focused primarily on PPPs from the Australian state of Victoria, and included:

- Victorian Desalination Project PPP
- Bendigo Hospital Project PPP
- Metro Tunnel PPP
- West Gate Tunnel Project PPP
- Cross River Rail Tunnel, Stations and Development PPP
- Energy supplier operations in Victoria (privatised)

Interview questions included, but were not limited to:

- How does your sector define resilience?
- How well does the PPP mechanism respond to resilience challenges?
- How are resilience requirements considered in the tender specifications and evaluation criteria during the procurement stage of PPPs?
- How has the policy setting enabled or challenged implementation of resilience?
- What is the most effective delivery model to ensure infrastructure resilience?
- Are there any other levers that are particularly effective in driving resilience in your critical infrastructure?
- What mechanisms would help improve the delivery of resilience in critical infrastructure?
Findings

Key themes emerged consistently from our interviewees. These themes are outlined in Table 1 below, identifying whether these were viewed as an enabler or barrier to achieving resilient infrastructure.

Table 1: Enablers and challenges in driving resilience in critical infrastructure

<table>
<thead>
<tr>
<th>Theme</th>
<th>Enabler / challenge</th>
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<tbody>
<tr>
<td>Ownership and appropriate risk transfer drives resilient thinking</td>
<td>Enabler</td>
</tr>
<tr>
<td>Experienced government partners are key</td>
<td>Enabler / challenge</td>
</tr>
<tr>
<td>Policy into practice</td>
<td>Enabler / challenge</td>
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<tr>
<td>Insurer appetite is changing</td>
<td>Challenge</td>
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<tr>
<td>Whole of life design but not systems thinking</td>
<td>Challenge</td>
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</table>
Ownership and appropriate risk transfer drives resilient thinking

Ownership of the asset and an appropriate transfer of risk is a key enabler in driving resilience in PPPs. This assumes the investor intends on holding the asset for the full 20 to 30-year life.

The most consistent theme identified through our interviews is the importance of asset ownership and an appropriate transfer of risk to drive resilience in PPPs. Key findings from the interviews include:

• Holding the asset for a 20-30-year concession period encourages investors, developers and operators to address resilience in design and operations.
  - This is in part driven by the requirement to transfer the asset back to the Government at the end of the concession with a residual design life.
  - Resilience is a greater factor in design where the investor is also developing (and in some cases operating) the asset. Interviewees who invested and developed PPPs noted the increased understanding this required of the asset, which in turn resilience.
  - The Australian toll road operator, Transurban (www.transurban.com.au) invests in, develops and operates many of its PPP assets, providing an inherent incentive to address resilience in both construction and operations. This arrangement provides a clear incentive for the PPP developer (in this case Transurban) as there is a direct relationship with the customer, and therefore a fundamental requirement for a quality and uninterrupted service, enabling more resilient infrastructure. Further this arrangement drives consideration of reputation and coexistence with the customer over the long term.
  - Investors who intend to own the asset for 5-7 years then sell are less invested in long-term performance, and therefore resilience is not embedded.

• Regulators, market benchmarking and financial penalties drive improved performance and reliability of services, highlighting the need for Government tender documents to align resilient requirements with financial incentives.

• We note that infrastructure funds providing equity and investors providing debt are incentivised to focus on resilience both from a risk mitigation angle and a ‘responsible investment’ angle. While this incentive is not necessarily translated into obligations within the loan agreement, there is an indirect incentive to be more resilient to attract investors.

• The transfer of risk to the private sector drives greater innovation. The additional rigour which investors and lenders apply to the risk assessment and monitoring of a project is a key factor in the performance of PPPs over traditional procurements.
  - While organisations understand how resilience relates to natural disasters, our findings from the interviews suggest that unless organisations operate within a sector which has been noticeably affected by natural hazards and climate change, priority to resilience in design is addressed primarily through tender specifications or regulated design requirements.
CASE STUDY: VICTORIAN DESALINATION PROJECT (VDP) PPP

The Victorian Desalination Project (VDP) PPP is presented as a case study of a project developed following the impact of natural hazards and climate change. The VDP PPP was announced in 2007 during the Millennium Drought, when water storage levels were critically low: down to 16.5% in Melbourne’s largest reservoir.\(^9\)

The VDP is the largest desalination plant in Australia and ensures Melbourne’s water system is reliable and less reliant on rainfall, thereby providing resilience in Melbourne’s water system to drought, fires and climate change, and the needs of a rapidly growing population.

Located in Wonthaggi, the VDP comprises:

- The desalination plant: comprising 29 buildings including the reverse osmosis building - with a production capacity of 150 billion litres of water a year, flexible water ordering of between 0 and 150 billion litres, and the capability to expand to 200 billion litres a year.
- Marine structures: two underground tunnels located 15 metres below the seabed, and associated marine intake and outlet structures located more than 20 metres below the sea’s surface.
- Water transfer pipeline: 84 km, 1.9 metre diameter, two-way pipeline that provides desalinated water or catchment supplies to communities throughout Melbourne, South Gippsland and Westernport, as required.

Most risks, particularly relating to the design and construction phases have been transferred from the State to Aquasure.\(^10\)

Key resilience risks and the allocation between the Government and the SPV (Aquasure) are below:

<table>
<thead>
<tr>
<th>Risk</th>
<th>Government</th>
<th>Aquasure</th>
<th>Shared</th>
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<tbody>
<tr>
<td>Force majeure</td>
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<td>Construction</td>
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<td>Operations</td>
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<td>Power supply</td>
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<td>Construction</td>
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<td>Operations</td>
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<td>Design risks</td>
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<td>Water supply system</td>
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<tr>
<td>Water supply system damage</td>
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<tr>
<td>Insurance</td>
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<td>Construction</td>
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<td>Operations</td>
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One observation is that while risk is appropriately transferred, the ability to negotiate with Government post-financial close is limited. This can become costly for the private sector in unforeseen circumstances.

For example, when the Government’s first order of 50 GL was received, delivery fell short by 4 GL due to a delay in the power supply operations. The SPV required an extension of 1 – 2 weeks, however the Government exercised its rights under the contract to withhold payments and reduced the “water service payment” to Aquasure by $42m (covered by insurance). This highlights that while risk is clearly transferred, and ownership is clear, there is limited flexibility which can be costly to the private sector.
Experienced Government partners are key

Where Government partners are experienced in the development of PPPs and undertake the necessary pre-tender due diligence, the private sector can utilise bidding time to drive innovation and resilience.

The second key theme identified is the importance of an experienced government client. Most interviewees emphasised the role of Government in the success of the PPP, and the subsequent resilience implications. Key findings from the interviews include:

- Experienced government clients will have conducted thorough due diligence and prepared a well-informed and detailed tender specification. This enables the private sector to focus their bidding time on driving performance and innovation in resilience.
- If resilience concerns are not identified prior to financial close, further design challenges and costs are pushed downstream to the project lifecycle, compromising the quality of outcome.
- The lack of flexibility in negotiating with Government post-financial close under the PPP structure means that any changes can be slow and costly.

Through the interviews, the $1.1 billion Bendigo Hospital PPP was identified as a key success story in the impact of an experienced government on resilient PPP delivery.

The private sector can be their own worst enemy, wanting to do better each time which then moves the baseline of the Government’s expectations, incorporating it into the framework for future PPPs.

The Bendigo Hospital Case Study demonstrates that thorough documentation enables the private sector to utilise the bidding time to drive innovation, and through this a more successful PPP.

Innovation establishes a higher Government baseline for future PPP tenders. Enabling this pattern of behaviour is essential, if PPPs are to be leveraged for more resilience asset design and maintenance.
CASE STUDY: BENDIGO HOSPITAL PROJECT PPP

The Bendigo Hospital PPP is currently the largest regional hospital development in Victoria. The construction began in 2013, with Stage One of the Bendigo Hospital Project completed in January 2017, and Stage Two completed in 2018.

The lead parties within the consortium are Capella Capital as the sponsor, Lend Lease and Siemens as equity investors, Lend Lease as the builder and Spotless as the facilities maintenance provider. The project delivered:

- **Stage 1**: a new hospital built on one site located in Barnard Street, Bendigo
- **Stage 1**: 372 beds and 10 operating theatres
- **Stage 1**: an integrated cancer centre and mental health unit
- **Stage 2**: a helipad on top of a new multi-storey car park on Lucan Street connected by bridge link.

Our interviews found that the success of this project was embedded in the experience and expertise of the Department of Health and Human Services in delivering PPPs, having previously delivered Casey Community Hospital, Royal Women’s Hospital, Royal Children’s Hospital, and the Victorian Comprehensive Cancer Centre. This PPP was also delivered by an experienced consortium (similar to that used on Royal Children’s Hospital).

Resilience embedded in the project includes:

- A separate Diesel Rotary Uninterrupted Power Supply (DRUPS), one of only two in Australia and recognised in disaster resilience through combining the functionality of a battery or flywheel-powered UPS and a diesel generator. In addition, a 200kW grid connected solar PV system generates close to 260,000 kWh per year, equivalent to reducing emissions by 328,000kg CO²e.
- A helipad provided in addition to the tender specifications to enhance resilience in operations by reducing travel times for critical patients from Bendigo to Melbourne by 30 minutes. This also provides an alternate transport option for critical patients in the event of a natural hazard.
- Resilience is embedded in the design as the hospital is designed to operate in a ‘disaster mode’ through strict protocols for space, segregation and staging for processes, as well as World Health Organisation emergency preparedness training for all staff. In a disaster, hospitals become the epicentre for the community, and must function.
Policy into practice

Federal and State / Territory PPP policies are mature, however, resilience policies are currently emerging, and are not consistently embedded in infrastructure delivery instruments. There is an opportunity for resilience to be embedded in PPP policies, to drive a proactive approach to resilience.

Policies for the implementation of PPPs are well established in Australia by the Federal Government (Infrastructure Australia), and through this by State/Territory Treasury Departments. All interviewees had a sophisticated understanding of the PPP guidelines, which are relatively consistent (and aligned to Infrastructure Australia) across each State/Territory.

Policies related to resilience are currently seen at the Federal Government level through several guidelines, in particularly the Critical Infrastructure Strategy. However, this Strategy does not dictate State/Territory policies as is the approach of the Federal Government PPP policy. As a result, policies at a State/Territory level differ between each State/Territory as shown in Figure 2.
### Findings

**Figure 2:**

PPP / Resilience policies and guidelines

<table>
<thead>
<tr>
<th>PPPs</th>
<th>Resilience</th>
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<tr>
<td><strong>Federal</strong></td>
<td>Critical Infrastructure Resilience Strategy</td>
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<td></td>
<td>National Strategy for Disaster Resilience</td>
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<td></td>
<td>Australian Transport Assessment and Planning Guidelines</td>
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<td>Standards Australia: codes, standards and rating schemes</td>
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<tr>
<td><strong>State / Territory</strong></td>
<td>Community Resilience Framework for Emergency Management</td>
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<td>Critical Infrastructure Resilience Strategy</td>
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<td>Emergency NSW</td>
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<td>Resilient Queensland</td>
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<td></td>
<td>QLD Reconstruction Authority</td>
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<td></td>
<td>ACT Climate Change Adaptation Strategy</td>
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<td>ACT Government</td>
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<td></td>
<td>Land use planning</td>
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<td></td>
<td>Various</td>
</tr>
<tr>
<td></td>
<td>Social procurement framework</td>
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<td>Victoria only</td>
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**State / Territory based**

- Partnerships Victoria
- NSW Public Private Partnerships
- Queensland Treasury
- All other States / Territories utilise IA guidelines
You design to the standards at the time. Standards need to change if you want to drive industry behaviour.

Key findings from the interviews include:

- All interviewees had a sophisticated understanding of PPP policy guidelines, having invested, developed and operated projects under these guidelines multiple times.
- Interviewees were aware of specific State based requirements directly relevant to their asset, however they were not aware of Federal based policies focused on resilience, or specific levers. This suggests:
  - There does not appear to be a single Federal Policy/Guideline reference point for resilience, as is the case for PPPs.
  - There does not appear to be a clear integration of Federal policies/guidelines with State/Territory based resilience policies.
- Interviewees identified that they currently develop and operate PPPs in line with the defined tender specifications and evaluation criteria under the PPP, rather than through defined resilience guidelines. This highlights the complexities in addressing resilience, as resilience is specific to each individual sector/project. Examples include:
  - **Victorian Desalination Plant**: Resilience in water supply and quality e.g. reducing the risk of contamination from bushfires.
  - **Bendigo Hospital**: Resilience in operations to ensure the hospital is effectively running in the event of a natural disaster, noting that hospitals are a space for the community in such a situation.
  - **Metro Tunnel**: Resilience in the energy supply. However, it is noted that in the Victorian context where energy is privatised, the power supply is not provided under the PPP.

Looking forward, there is an opportunity to embed resilience policies and guidelines into the existing PPP guidelines to ensure better implementation of resilience policies, given the sophisticated understanding of Federal and State/Territory PPP guidelines.

Our research suggests that this could be achieved through the existing Critical Infrastructure Resilience Strategy (ensuring consultation at State/Territory level). The Critical Infrastructure Resilience Strategy is outlined below.

### CRITICAL INFRASTRUCTURE RESILIENCE STRATEGY

The aim of this strategy is the continued operation of critical infrastructure in the face of all hazards. The key outcomes the Strategy seeks to achieve are:

- A strong and effective business-government partnership
- Enhanced risk management of the operating environment
- Effective understanding and management of strategic issues
- A mature understanding and application of organisational resilience.

While not identified in interviews, it is also noted the Australian Disaster Resilience Knowledge Hub has proposed a conceptual model for public-private partnerships in emergency management.
Appetite of insurers

The insurance market is changing both in the appetite and cost to cover the risks associated with natural hazards and climate change.

The impact of insurance within PPPs is a concern for the PPP market, and was identified through our interviews as an evolving issue. This impact was identified in relation to both the cost and availability of insurance to the private sector.

In the context of resilience, and for each of the Victorian examples discussed (as outlined in Section 2), interviewees identified the following key considerations now and in the future:

- Insurance related to the stage of the project i.e. construction or operation
- The definition of force majeure relevant to that project
- Whether the risk is insurable by the private sector.

Key findings from the interviews include:

- For insurable risks, the cost of insurance was of largest concern. Interviewees noted the decision is often taken at bidding stage to either:
  - ‘design out’ the risk, where the risk is cheaper to design out than insure, or
  - Insure the risk, where the cost is less than ‘designing out’
- There is not always an urgency to focus on resilience as the majority of Australia has not directly faced the consequences of low probability high impact events (the exception being Queensland becoming more proactive due to the risk of flooding).

New Zealand was identified as leading the design of resilience in PPPs due in most part to the significant impact of the 2011 Canterbury Earthquakes.

Insurers are becoming less willing to cover and pay out claims associated with natural disasters, as is seen in the New Zealand case study. With the increasing size, cost and therefore risk of large PPPs, the ability and willingness for insurers to provide adequate cover is reduced.

- With the increase in force majeure events, the appetite by insurers may diminish, leading to an increased reliance on public entities.
  - Public entities are seen to provide lower cost insurance to PPPs. The 2018 UK National Audit Office (NAO) Report PFI and PF2 recommended the public sector self-insures as it considers the government is best placed to pool these risks.
  - This reflected the finding that private insurance was driving up the cost of PPPs in the UK, as bidders were pricing the cost of insurance at a 20% premium to the market price in order to provide protection against future price rises. We note that while insurance costs are increasing, the UK Government decision to move away from PPPs is not directly tied to insurance costs. In Victoria, the Victorian Managed Insurance Authority (VMIA) covers insurance for risks not covered by the private sector under PPPs. The ability for VMIA to take on more risk as the private sector appetite to cover these risks diminishes will have a significant impact on PPPs going forward.
- Innovative mechanisms such as Catastrophe Bonds are also developing in the market, however it is noted these products were not identified by interviewees.

“Do you design out the risk, or do you accept the risk because it’s supported by insurance?”
We are getting to the point where the insurance market won’t take on the risks that are being pushed their way. If there is a significant increase in force majeure events, the insurance market will start to carve out what they will and won’t cover with force majeure insurance – then who covers that?

CASE STUDY: THE IMPACT OF THE 2011 CANTERBURY EARTHQUAKES ON INSURANCE AND FUTURE DESIGN

The devastating 2011 Canterbury Earthquakes resulted in an unprecedented impact on the insurance market. There were more claims and affected policyholders than any other insurance event in New Zealand, and the insurance cost of the earthquakes far exceeded the cost of all previous disasters in New Zealand. Insurance cover is provided by several insurers including the Earthquake Commission (EQC), private insurers and reinsurers. Key impacts on availability and cost of insurance include:

- In the short-term there was a reduction in availability of new insurance in the region, impacting the ability for businesses and households to rebuild. For owners of earthquake-prone buildings and infrastructure without insurance, they can no longer access insurance cover in Canterbury or elsewhere in New Zealand.

- From a cost perspective, premiums were increased to fund increased reinsurance costs and larger excesses. On 11 October 2011, the Government announced that EQC levies would triple from February 2012 to meet EQC’s higher reinsurance costs and begin replenishing the Natural Disaster Fund.

- In the long term, insurers and reinsurers will reassess their risks and opportunities in New Zealand. There will be a review of EQC within the next few years which could affect the interaction between the public and private provision of insurance for earthquake related risk in New Zealand.

The impact is not only localised to insurance and has driven a clear objective by the Government to provide resilience by design, for example through the Transmission Gully PPP which provides a lifeline route to and from Wellington in the event of a significant storm or earthquake.
Whole of life design but limited systems thinking

Whole-of-life design is enhanced within PPPs, however the extent of systems thinking varies significantly by sector.

Throughout the interviews a strong focus on whole-of-life design was observed within PPP development and operations, however the extent to which systems thinking was applied, and the extent to which interdependencies within the system were recognised, varied dependant on the sector.

• Systems thinking was demonstrated in the health sector through the Bendigo Hospital PPP, primarily driven by the nature of hospitals being designed for ‘disaster mode.’ The systems thinking in Bendigo Hospital is seen through:
  - **Energy:** A Diesel Rotary Uninterrupted Power Supply (DRUPS) and specifically relating to systems - a 200kW grid connected solar PV system.
  - **Transport:** A helipad provided in addition to the tender specifications to enhance resilience in operations by reducing travel times for critical patients from Bendigo to Melbourne by 30 minutes. This also provides an alternate transport option for critical patients in the event of a natural hazard (e.g. bushfire, localised flooding).
  - **Social:** Resilience is embedded in the design as the hospital is designed to operate in a ‘disaster mode’ through strict protocols for space, segregation and staging for processes, as well as World Health Organisation emergency preparedness training for all staff. In a disaster, hospitals become the epicentre for the community, and must function.

• Interviewees related to economic infrastructure demonstrated an approach to holistic whole-of-life design, however perhaps by the nature of the sector and the Australian market context, systems thinking was limited. For example, in rail projects such as Metro Tunnel, energy is not packaged under the PPP. This is likely due to the nature of the privatised energy market, and the Government’s existing ability to negotiate with energy suppliers.

As discussed above and in the previous sections, PPPs enhance a holistic approach to whole-of-life design. Systems thinking however, was only observed in the health sector, due primarily to the need to operate as an epicentre for the community in a disaster.

“Resilience is relevant to the PPP market in the sense of having a holistic view of the asset compared to a traditional D&C (design and construction contract) which simply has a defects liability period.”
Conclusions

PPPs play a role in enabling resilience to be addressed in the design, construction and operation of critical infrastructure, due primarily to the 20 to 30-year concession period driving long term performance.

The extent to which resilience is embedded in PPPs is largely dependent on the following enablers, and the extent to which the identified challenges are overcome:

**ENABLERS:**
- A 20 to 30-year concession period
- Experienced government partners undertaking thorough pre-tender due diligence
- Mature documentation and expectations of PPPs in Australia through well-established policies and guidelines.

**CHALLENGES:**
- Inexperienced government partners, without sufficient time to undertake thorough pre-tender due diligence
- Emerging resilience policies which are not consistently embedded in PPPs
- Increased insurance premiums, and the diminishing appetite of insurers to cover risks associated with natural hazards and climate change.

Our interviews tell us that the effectiveness of PPPs for resilience infrastructure can be maximised by Government taking a proactive approach to resilience within PPPs, for example through:
- Undertaking rigorous pre-tender due diligence
- Streamlining resilience policy at a National to State / Territory level, and embedding resilience policies into the Infrastructure Australia PPP policy and guidelines
- Investigating further the use of government insurers such as the VMIA for PPPs, and the impact of this on both the Government and private sector.

To promote this shift to a proactive approach to resilience in PPPs, we need to bring the Government and private sector together to transfer learnings in resilience from PPPs across the range of sectors, and through this put resilience at the forefront of PPP planning and objectives.

This report focuses on the Australasian context and the findings suggest that there would be value in extending a similar study to cover other geographies.


3. Ibid


8. Ibid


