ATSE POSITION STATEMENT

OCTOBER 2022

Building a resilient Australia

Australian Academy of Technological Sciences & Engineering

Planning and design for resilience is a key component in mitigating the damage of major hazards, including naturally occurring events, the effects of climate change, geopolitics, technological disruption and cyberattacks.

When resilience is part of the planning process it not only makes systems and infrastructure less likely to fail under stress but also supports them to recover much faster.

The climate is changing, and Australia is already experiencing more frequent and severe storms, floods and bushfires. While limiting climate change is essential, we also need to ensure appropriate planning to mitigate the worst effects on Australian infrastructure, services and communities.

The relevance of resilience has been underlined in numerous reports, notably the recently released 2021 Australian Infrastructure Plan, the Security Legislation Amendment (Critical Infrastructure) Bill 2020, the National Climate Resilience and Adaptation Strategy, the Sustainable Development Goals (Sustainable Development Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable), and the United Nations Environment Programme Adaptation Gap Report 2021. These reports all link sustainability, productivity, safety and quality of life to resilience.

Hazardous events can be random in nature. They can also occur in the physical and digital environments. Therefore, resilience is most sensibly addressed by methods which consider the probability of their occurrence. Planning for resilience is built on four pillars - economic, environmental, social and cultural – and their interdependent vulnerabilities. As part of the overarching goal of establishing sustainable infrastructure systems, a more comprehensive approach to infrastructure system adaptation is necessary. The best chances for doing so are generally during the planning and design stages of infrastructure systems.

The Academy considers evidence-based tools, such as probabilistic risk assessments, which considers these four pillars, to be fundamental for building resilience into Australia's future planning processes. Probabilistic risk assessment supports infrastructure owners, designers and operators to make informed decisions regarding the likely impact and mitigation strategy for uncertain events, across the lifetime of infrastructure. The Academy supports continuous improvement in risk assessment modelling in line with the evolution of relevant technologies and evidence-based tools.

POSITION 1

Resilience must be built into the planning of Australian infrastructure, including transport, energy, water, social, waste and digital infrastructure.

The location, timing and severity of bushfires, cyclones, storms, floods, earthquakes, heat waves, as well as malevolent and abnormal events that include terrorism and accidents are highly uncertain, and the degrees of uncertainty and severity are predicted to increase for many of those events influenced by climate change.

The importance of resilience in everything we design, and implement is recognised across sectors. Resilience needs to be a key element in planning Australia's infrastructure, resource management, supply chain management and national security.

Decision-making can be difficult when the potential consequences are severe yet the probability of these consequences occurring is assessed to be extremely low. These extreme events (low probability but high consequence) need evidence-based decision-making tools so resilience can be built into planning systems.

POSITION 2

Probabilistic assessments provide the basis for evidence-based resilience risk assessment and management.

Probabilistic assessment uses the probability of a risk occurring in a system and accounts for that risk accordingly.

With advances in technology, monitoring and modelling of probabilistic risk assessments are now easier to undertake.

Probabilistic assessments allow infrastructure to be future-ready and should be central in system design.

POSITION 3

Achieving resilience relies on a system designed to include robustness, redundancy, resourcefulness and rapid recovery.[1]

ROBUSTNESS is the ability of the system and system elements to withstand external events or shocks without significant loss of performance.

REDUNDANCY is the ability of a system to function even after some of its components or subsystems have failed.

RESOURCEFULNESS is the ability to diagnose and prioritise problems and to initiate solutions by identifying and monitoring all resources, including economic, technical, and social information.

RAPID RECOVERY is the ability to recover systems and contain losses and avoid future disruptions.

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1. "A framework to quantitatively assess and enhance the seismic resilience of communities", M. Bruneau, S.E.Chang, R.T. Eguchi et al. (2003), Earthquake Spectra, 2003, 19(4): 733–752.

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