

DESIGN THINKING FOR INTERDEPENDENT SYSTEMS-BASED OPTION IDENTIFICATION IN BUSINESS CASES FOR RESILIENT INFRASTRUCTURE INVESTMENT

ABSTRACT In infrastructure investment we often "build back" instead of "building back better" (Udovyk et al 2025) or even "bouncing forward" (Graveline 2022). Bouncing forward implies recovery plus transformation where "disasters can be conceptualised as a catalyst for change" (Manyena et al 2011 p419) allowing a wider view of resilience incorporating social, organisational and economic aspects evident in systems interdependencies (Rinaldi et al 2001, Sun et al 2021). Where building back implies an infrastructural response, bouncing forward affords a systems perspective on the appropriate pathway to creating more resilient socio-technical environmental interactions particularly relevant for interdependent infrastructure in an uncertain and complex adaptive context (Rubim and Borges 2017).

For the last ten years, systems thinking has been advocated for use in government (HM Treasury 2015, Government Office for Science 2022; Nguyen et al 2023) to define a problem clearly as well as move past the simple quick fix to find meaningful leverage points and interventions to consider as options in business cases. Problem framing and leverage, analytical processes, are areas well covered in the systems thinking literature (Woolley and Pidd 1981, Meadows 2008, Cabrera and Cabrera 2015, Gomes and Schramm 2021), while methods for identifying options, a creative act, have less structured tools.

This paper discusses how frameworks from the systems interdependencies literature and methodologies from design thinking used in product development can be used to unlock creative systems thinking for option identification to "bounce forward" in the context of infrastructure failure due to extreme weather events. Through case studies in both Australia and the UK, our proposed approach shows that the most cost effective "bounce forward" solutions may not involve any further investment in infrastructure at all (Hawley 2012) and that presents a challenge for siloed and stretched departments and funding structures within government.