TRANSFORMATIVE CULTURE OF DISASTER RISK MANAGEMENT AS AN ENABLER TO RESILIENCE

Non-peer reviewed research proceedings from the Bushfire and Natural Hazards CRC & AFAC conference

Perth, 5 – 8 September 2018

John Rolfe

Queensland Fire and Emergency Services

Corresponding author: john.rolfe@qfes.qld.gov.au

Version	Release history	Date
1.0	Initial release of document	05/09/2018

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International Licence.
Material not licensed under the Creative Commons licence:

- Department of Industry, Innovation and Science logo
- Cooperative Research Centres Programme logo
- All photographs and graphics.

All content not licenced under the Creative Commons licence is all rights reserved. Permission must be sought from the copyright owner to use this material.

Disclaimer:
Queensland Fire and Emergency Services and the Bushfire and Natural Hazards CRC advise that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, Queensland Fire and Emergency Services and the Bushfire and Natural Hazards CRC (including its employees and consultants) exclude all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

Publisher:
Bushfire and Natural Hazards CRC

September 2018

Citation: Rolfe, J. (2018) Transformative culture of disaster risk management as an enabler to resilience. In J.Bates (Ed.), *Research Forum 2018: proceedings from the Research Forum at the Bushfire and Natural Hazards CRC & AFAC Conference*. Perth: Bushfire and Natural Hazards CRC.

ABSTRACT

Queensland Fire and Emergency Services (QFES) reviewed international disaster risk methodology with the view to developing a fit for purpose application that could be applied at the local as well as State level and would literally inform risk-based planning. The review focused on the three international tenants of disaster risk management: avoiding the creation of new risk; reducing existing risk; and managing residual risk. This review also specifically examined vulnerability assessment, determining residual risk and prioritisation for planning across the three levels of government that comprise Queensland's Disaster Management Arrangements.

Subsequently QFES developed the Queensland Emergency Risk Management Framework (QERMF) and undertook a concept trial of this risk methodology. In conjunction with the maturation of the methodology, QFES is leading a supported integration program. The supported integration program facilitates collaborative risk workshops aimed at supporting Local Disaster Management Groups and District Disaster Management Groups to undertake the QERMF approach to complete their disaster risk assessments holistically.

As Queensland matures its approach to disaster risk management some key themes need to be considered collectively to assist those involved with managing risk on a broad scale and within systems of government. These are:

- scientifically led understanding of hazard characteristics and their associated impacts;
- exposure and vulnerability assessments of broad areas and the essential infrastructure systems;
- linking disaster risk management with emerging industry pressures; and
- linking risk assessments to planning.

Key benefits in embracing an approach similar to the QERMF will enhance:

- community shared awareness of risk;
- the interconnectedness of systems;
- collaborative problem solving; and
- risk-based planning and the management of residual risk.

QFES is continuing to mature the QERMF approach and is undertaking research currently to refine assessments across socio-natural and anthropogenic hazards.

INTRODUCTION

Queensland Fire and Emergency Services (QFES) has responsibility under the Queensland State Disaster Management Plan to prepare the State Natural Hazard Risk Assessment. In addition, all Australian States and Territories agreed via the Law, Crime and Community Safety Council to conduct State level risk assessments by 30 June 2017 for collaboration and discussion at the national level. Leading up to the requirement, QFES had been extensively reviewing international best practice in natural hazard risk assessment. This research led to the development of a methodology, the Queensland Emergency Risk Management Framework (QERMF). The QERMF harnesses scientific data relating to each hazard and uses geospatial information systems to analyse historical and/or projected impacts to identify exposures, vulnerabilities and subsequently risk. Such a complex task required novel approaches and methods, and perhaps most importantly, a progressive mindset (QFES 2017a).

The QERMF also promotes sense-checking between scientific data, mapping and modelling with local knowledge during the risk analysis stage, which is of paramount importance. A proof-of-concept was assessed at the Disaster District level across Queensland in 2016 and this methodology was found to be effective in the identification of risk and, more specifically, in the identification of residual risk (QFES 2017a).

In November 2016, the Queensland Disaster Management Committee endorsed the continued development of the QERMF methodology to facilitate enhanced risk-based planning so that we may better prevent, prepare for, respond to and recover from disaster events. Concurrently, in 2016 the United Nations Office for Disaster Risk Reduction (UNISDR) commissioned the development of guidelines on National Disaster Risk Assessment as part of a series of thematic guidelines under its “Words into Action” initiative to support implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030. The guidelines, to which Queensland contributed, are the result of the collaboration between more than 100 leading experts from national authorities, international organisations, non-governmental organisations, academia, think tanks and private-sector entities (QFES 2017b).

The QERMF focuses on the Sendai Framework’s first and second priorities for action. Like the United Nations Words in Action guidelines, the QERMF is intended to provide consistent guidance in understanding disaster risk that would act as a conduit for publicly available risk information and action. This approach would also assist in the establishment and implementation of a framework for collaboration and sharing of information in disaster risk management, including for risk-informed disaster risk reduction strategies and plans. The QERMF encourages holistic risk assessments that provide an understanding of the many different dimensions of disaster risk (hazards, exposures, vulnerabilities, capability and capacities). The assessments would include diverse types of direct and indirect impacts of disaster, such as physical, social, economic, environmental and institutional. Both the United Nations ‘Words into Actions’ Guideline and the QERMF will take several years to mature. However, by keeping abreast with scientific and technological advancements and by also remaining connected at the local level, they are achievable and will produce tangible enhancements to the safety and resilience of the community (QFES 2017a).

SCIENTIFICALLY LEAD UNDERSTAND OF HAZARD CHARACTERISTICS AND THEIR ASSOCIATED IMPACTS

The Disaster Risk Management Knowledge Centre (DRMKC) of the European Union acknowledges that a greater focus on transformative processes is essential to improve our understanding of disaster risk. Cross sectoral partnerships and networks are required to improve the better use and uptake of research and knowledge including innovative tools and practices for risk management. Organisations such as the DRMKC, the Australian Bureau of Meteorology, Commonwealth Science Industrial Research Organisation (CSIRO) and Geoscience Australia lead and or support the translation of complex scientific data and analyses into usable information and provide science-based advice regarding the use of hazard characteristic data/information optimally within risk assessments. The approach adopted within the QERMF deliberately harnesses innovative practices in the communication of scientific outputs that contribute to the management of disaster risks at a jurisdictional and local level (Poljansek, Marin Ferrer, De Groeve & Clark 2017).

Presenting scientifically based hazard characteristics in a format that is understandable, relevant and useful to the stakeholders is paramount to the success of a risk assessment. It is important to reemphasize that exposure and vulnerability information drive the true understanding of impacts, risks and consequences (Global Facility for Disaster Reduction and Recovery 2014). The World Bank, through the Global Facility for Disaster Reduction and Recovery, have also noted that innovation and collaboration are necessary to improve the translation of technical information into transferable and useful information for decision makers and practitioners (United Nations Institute for Disaster Risk Reduction 2017).

More hazard data and models are available for identifying, analysing and managing risk and risk data generally is increasingly becoming more freely available as part of a global trend toward open data (Global Facility for Disaster Reduction and Recovery 2014). This is evidenced jurisdictionally and with recent focus on risk information by the recently formed National Resilience Taskforce. Risk information is often sensitive information as it requires government, private sector, communities and individuals to decide on action to reduce the impacts of a potential hazardous event. One such example would be the consideration to relocate a community from a flood plain. The chance of risk information translating into action depends to a large extent on sensitive negotiations. (Global Facility for Disaster Reduction and Recovery 2014)

In addition to the scientific inputs, effective natural disaster risk assessment requires consultation, engagement and contribution from a wide range of stakeholders. Many of whom are owners of risk and in positions to manage that risk. As each has a different and often conflicting understanding of disaster risk, they communicate disaster risk information differently, have different organisational and legal requirements, and different levels of financial resources to engage within disaster risk assessments (United Nations Office for Disaster Risk Reduction 2017). The QERMF assessment method very deliberately steps through how hazards manifest within an area of interest both spatially and temporally. This is of importance for practitioners to understand hazard manifestation in this manner as it can significantly assist in developing graduated

mitigation options and assist in developing and maintaining situation awareness of disaster management groups during actual disaster events.

Arguably, an aspect of change management the QERMF is addressing relates to a compliance driven culture of practice. A culture of practice has developed over time whereby practitioners would begin their assessments by generating a list of risks then focus on the intersecting axis of likelihood and consequence matrices to then list risk treatments/controls in registers. The word 'control' is often overused regarding risk management because it can convey the wrong message. It implies that complex situations can be more easily controlled that what they can be. But this can sometimes be a dangerous oversimplification. With regards to controlling nature often the best treatment options will aim to create a set of conditions that improves the probability that a desirable rather than an undesirable outcome will occur. Alberts (2007) notes that control is an emergent property, not a simplistic risk treatment selection.

Operationalised risk assessment is focussed on understanding disaster risk through more detailed understanding of hazard characteristics and exposure and vulnerability analysis. The analysis provides insight into the interaction of single and or multi-hazards with all elements of exposure such as essential infrastructure, access/resupply, community and social, medical, significant industries and environment then subsequently examines the vulnerability of those elements across both spatial and temporal dimensions (QFES 2017b).

All natural disasters, but cascading disasters in particular, have serious implications that can be overlooked in risk assessments due to a lack of scientific understanding of the manifestation and interaction of multiple hazards. Unfortunately, modelling such complex phenomena requires a significant amount of data and complex modelling tools and expertise, which often makes it impractical or not financially viable to conduct as common practice. Nevertheless, possible cascading effects of major hazards should be explicitly sought but with rapidly advancing technology the difficulty may well lay in discerning which is the most appropriate to use (United Nations Office for Disaster Risk Reduction 2017).

QFES staff facilitating the QERMF assessments deliberately and regularly liaise with scientific organisations to improve their own knowledge but to also keep abreast of the advancements with analysis, mapping and modelling for use within risk assessment processes. This information is then shared with all stakeholders such as emergency managers, government and nongovernment organizations, the private sector and community members. This approach also assists the scientific organisations who obtain a greater understanding of priority information requirements with regards to disaster risk reduction decision making.

EXPOSURE AND VULNERABILITY ASSESSEMENTS OF BROAD AREAS AND ESSENTIAL INFRASTRUCTURE SYSTEMS

Another component of disaster risk assessment this paper will discuss is understanding the availability and or effectiveness of existing capability and capacity for managing the risk. Understanding the inherent risk associated with hazard manifestation through science is a pivotal first step and then assessing the availability of fit for purpose local capability and the capacity of that capability is critical for identifying residual risk. This is the crux of Queensland's Disaster Management Arrangements – local government have primary responsibility for the management of disaster with support provided by Disaster Districts and or the State upon request for assistance as per the *Disaster Management Act 2003*. Visibility of the support requirements is obtained through the identification of residual risk within QERMF assessments and passed through the governance of Local Disaster Management Groups to District Disaster Management Groups then to the State and Commonwealth if required (QFES 2018).

One critical aspect of disaster risk that may or may not be able to be managed at a local level pertains to addressing the vulnerabilities inherent within our infrastructure and associated systems and networks. This must be addressed in a proactive manner as what further exaggerates the complexities of infrastructure is that they are highly interconnected and mutually dependent (Johansson 2010). Arguably, the increasing interconnectedness amoung infrastructure systems have made them more vulnerable. Once the systems are disturbed by external shocks and or failures they can spread rapidly to other infrastructure networks which may in turn lead to broad system failure (Wang, Hong & Chen 2012).

When assessing broad areas such as a local government area, interdependent infrastructure systems vulnerability analysis becomes increasingly important. Vulnerability and disruption related risk analysis are basic tools for infrastructure owners and operators when assessing their own systems however the application of the impacts to broader society varies considerably between sectors. Broad area risk analysis requires an interdisciplinary and cross institutional perspective (Wang, Hong, Chen, Zhang, & Yan 2011).

Therefore, broad area risk assessments must seek out inter-dependent features of the infrastructure systems that are within, intersect and or effect the area of interest (Wang, Hong & Chen 2012). The modelling from the real system to its representation is a crucial step prior to conducting a risk assessment. Modelling is important from a systems-based view which focuses on how the system itself may fail and the other is the event-based view which considers the effect of the severity and frequency of events (Kamissoko, Peres, Zarate & Gourc 2015). Owners and operators of critical/essential infrastructure are specifically requested to attend QERMF assessments and or to contribute pre/post workshop at a minimum as their expertise is pivotal in not only understanding impact and risk but also in determining viable solutions and risk treatment strategies both for short and longer-term planning horizons.

LINKING DISASTER RISK MANAGEMENT WITH EMERGING INDUSTRY PRESSURES

It is important to define the time horizon to be considered in natural hazard risk assessments. The selection of a time-horizon depends on the type of decisions that rely on the risk assessment outputs. Disaster risk assessments may not have a time horizon stipulated however are to be reviewed annually. Some preparedness and emergency management plans, whilst also reviewed annually, often address a time horizon of three to five years. A disaster risk assessment process that informs development planning should use longer time horizons, especially in the context of understanding longer-term risk trends from population growth and urbanization. A longer time horizon is especially critical when it comes to evaluating the benefits of investment in new development and in reducing vulnerability of infrastructure (United Nations Office for Disaster Risk Reduction 2017). The Queensland Government State Planning Policy 2017 does endeavour to address longer term horizons with state interests and strongly links to natural hazard risk assessment processes.

Recent developments proving to be most pressing with regards to changing risk assessment approaches is the requirement to address climate risk. Recent guidance from the Australian Prudential Regulation Authority identified climate risks as distinctly financial in nature with many risks foreseeable and actionable now (Wilder, Venuti & Chatterjee 2017). One facet demanding attention from government and business alike is the threat of climate litigation. Wilder, Venuti & Chatterjee (2017) note that there is an increasing trend in litigation concerning climate risk disclosure. It is conceivable that company directors who fail to consider climate change risks, could be found liable for breaching their duty of care and diligence in the future (Wilder, Venuti & Chatterjee 2017). With the actioning of climate risk initiatives such as Queensland's Climate Adaptation Strategy, and whilst concurrently facilitating natural hazard risk assessments it has become apparent that some risk practitioners are having difficulty distinguishing climate change from climate variability.

Understanding the difference between climate variability and climate change projections is a key point of clarification at present to ensure natural hazard risk assessments and climate risk assessments are complementary and not conducted in siloes. Climate projections are a necessary assessment and planning tool, the distinction with climate variability, particularly when using projections to make plans for the next 10–20 years must be taken into consideration. Informed natural hazard risk assessments consider climate variation, the complementary aspect of climate change assessments is assisting risk practitioners understand how climate change is affecting the manifestation of natural hazards in addition to climate variation. This is distinctly a gap in understanding which QERMF is seeking to address through close collaboration with the scientific community and to then communicate this information in a relatable form to stakeholders through initiatives such as the recently completed Emergency Management Sector Adaptation Plan (QFES 2018).

When using climate projections to 2030, the CSIRO (2018) through the Earth Systems and Climate Change Hub note it is important to:

- understand climate variability;

- understand the range of projections – use the Climate Futures tool to explore ranges of change for the relevant climate variables; and
- put variability and change in perspective, and what this means for the area of interest that is the subject of the disaster risk assessment.

LINKKING RISK ASSESSMENTS TO PLANNING THROUGH COLLABORATIVE PROBLEM SOLVING

Conducting risk assessments and planning to address complex endeavours can be seen through the lens of participating stakeholders and or from the perspective of the endeavour as a whole. When considering an endeavour, the tendency is to impose a solution on others (Alberts 2007). This is evidenced with some historical risk assessment efforts being driven from a top down perspective but failing to convert to reciprocation at a local level other than compliance-based outputs versus truly useful information with a clear line of sight through hazard – exposure – vulnerability – risk and the generation of risk-based plans.

The disaster risk assessment process requires an apolitical lens – the focus of bringing individuals and organisations together and leveraging the available information and expertise to create synergies toward action that may otherwise not be attainable (Alberts 2007). How a collective achieves focus and the degree to which that focus has been successful is evidenced through the creation of common intent and its transformation into coordinated action. Arguably, there is not only one 'right' approach to constrain our thinking and the risk assessment processes employed. The successful application of focus is not associated with a particular profession nor policy agenda and should be free from any baggage that this may entail (Alberts 2007).

Cognitive biases play an important role in any human endeavour. We focus on our goals, anchor our plans and neglect relevant information which give rise to a raft of unconscious bias giving greater rise to what is referred to as the planning fallacy (Kahneman 2011). In explaining the past, and more so in predicting the future it is difficult to think beyond our own frames of reference and we are prone to the illusion of control because we have worked through ordered processes, our risk registers/reports are neat and colourful and seem very logical. The main obstacle is that subjective overconfidence is determined by the coherence of the stories we tend to construct, not necessarily the quality and amount of information and scientific evidence that supports it (Kahneman 2011). Best practice risk assessment aspired to by QERMF seeks a convergence between the stories embodied at a local level with the most contemporary scientific information that is fit for purpose.

Convergence, when combined with focus it is about moving in the right direction both as individual entities and as a collective. Most significantly convergence does not imply control of one entity by another (Alberts 2007). Disaster risk assessments need to be recognised for what the endeavour is, collaborative problem solving. Within collaborative problem-solving individuals pool their understanding and effort and work together with common intent toward a stated purpose or goal. Collaboration has distinct advantages over individual organisational problem solving because it allows for:

- effective division of labour;
- incorporation of information from multiple perspectives, experiences and sources of knowledge; and
- enhanced creativity and quality of solutions stimulated by the ideas of other group members.

Bringing different stakeholders together is vital but is an insufficient condition for true collaborative problem solving because some social interactions do not involve commitment to shared goals, the accommodation of different perspectives and or sustained commitment over time to achieve the stated goals (Organisation for Economic Cooperation and Development 2015). Collaboration from the perspective of problem solving can be defined as the activity of working together towards a common goal, in this instance is the conduct of natural hazard risk assessments. There are several elements included in the definition. The first element is communication, the second element is cooperation which involves contributions to planning and problem analysis. A third element is responsiveness, implying active and insightful participation (Organisation for Economic Cooperation and Development 2015).

From this definition, collaborative problem-solving means approaching a problem responsively by working together and exchanging ideas and is particularly useful when problems are complex. Collaborative problem solving is a joint activity where small groups within an appropriate authorising environment transform current states into desired goal states. The difference between individual and collaborative problem solving is that in collaboration each of these steps is directly observable and actionable risk reduction plans are produced (Hesse, Care, Buder, Sassenberg & Griffin 2015)

CONCLUSION

The conduct of Natural Hazard Risk Assessments such as within the QERMF can be transformative and are a key enabler toward resilience. The use of scientifically based hazard characteristics in a manner that is accessible to stakeholders is paramount to the success of a risk assessment. Operationalised risk assessments focus on understanding disaster risk through detailed hazard, exposure and vulnerability analysis. Vulnerability analysis of exposed elements, including infrastructure, across both spatial and temporal dimensions when assessing broad areas such as a local government area is increasingly important for shared understanding.

Time-horizons considered in natural hazard risk assessments are a key point of clarification to ensure climate risk assessments are complementary and to also discern climate variability from climate change when determining disaster risk. The disaster risk assessment process requires an apolitical focus of bringing individuals and organisations together and leveraging the available information and expertise to create synergies that are otherwise not attainable to achieve something that individuals and organisations on their own could not achieve.

Collaborative problem-solving means approaching a problem responsively by working together and developing shared solutions which is particularly useful when problems are complex. Collaborative problem solving is a joint activity within an appropriate authorising environment that can transform current problem states into desired goal states through the medium of risk assessment.

The role of QERMF facilitators is therefore one of transformational leadership. Transformational leadership describes the ability of team members to secure the commitment of stakeholders to work toward the attainment of goals, amongst competing daily business as usual priorities, and take on the complex, challenging, but ultimately rewarding endeavour that is natural hazard risk assessment and risk-based planning. Such efforts are directly enabling a basis from which future resilient communities emerge.

.

REFERENCES

Alberts, DS 2007, 'Agility, Focus and Convergence: The Future of Command and Control', *The International C2 Journal*, vol. 1, no. 1, pp. 1-30.

Commonwealth Scientific and Industrial Research Organisation, 2018 Earth Systems and Climate Change Hub. Available from: https://www.csiro.au/en/Research/OandA/Areas/Assessing-our-climate/ESCC-Hub

Global Facility for Disaster Reduction and Recovery 2014, *Understanding Risk in an Evolving World: Emerging Best Practices in Natural Disaster Risk Assessment*, TheWorld Bank.

Hesse, FW, Care, E, Buder, J, Sassenberg, K, & Griffin, P 2015, 'A Framework for Teachable Collaborative Problem-Solving Skills' in P. Griffin & E. Care, (eds.), *Assessment and Teaching of 21st Century Skills*, pp. 37-56. Springer: New York.

Johansson, J 2010, *Risk and Vulnerability Analysis of Interdependent Technical Infrastructures – Addressing Socio-Technical Systems*, PhD thesis, Lund University.

Kahneman, D 2011, *Thinking Fast and Slow*, Penguin Books, Maryborough Victoria.

Kamissoko, D, Peres, F, Zarate, P, & Gourc, D 2015, 'Complex system representation for vulnerability analysis', International Federation for Automatic Control-Papers Online, 48(3), pp. 948-953. Available from: https://www.sciencedirect.com/science/article/pii/S2405896315004449

Organisation for Economic Cooperation and Development 2015, Collaborative Problem- Solving Framework, available from: https://www.oecd.org/pisa/pisaproducts/Draft%20PISA%202015%20Collaborative% 20Problem%20Solving%20Framework%20.pdf

Poljansek, K, Marin Ferrer, M, De Groeve, T & Clark, I 2017 *Science for Disaster Risk Management 2017: Knowing Better and Losing Less*, European Commission.

Queensland Fire and Emergency Services 2017a, *Queensland State Natural Hazard Risk Assessment*, State of Queensland.

Queensland Fire and Emergency Services 2017b, *Queensland Emergency RisK Management Framework – Risk Assessment Process Handbook*, State of Queensland.

Queensland Fire and Emergency Services 2018, *Emergency Management Sector Adaptation Plan (EM-SAP) for Climate Change*, State of Queensland.

United Nations Office for Disaster Risk Reduction 2017, Words into Action Guidelines – National Disaster Risk Assessment, Governance System Methodologies and Use of Results, viewed 30 June 2018, https://www.unisdr.org/we/inform/publications/52828

Wang, S, Hong, L, & Chen, X 2012 'Vulnerability analysis of interdependent infrastructure systems: A methodological framework', Physica A: Statistical Mechanics and its Applications, 391, pp. 3323-3335. Available from: https://www.sciencedirect.com/science/article/pii/S0378437111009794

Wang, S, Hong, L, Chen, X, Zhang, J & Yan, Y 2011'Review of interdependent infrastructure systems vulnerability analysis', Proceedings of the 2nd International Conference on Intelligent Control and Information Processing, pp. 446-451. Available from: https://ieeexplore.ieee.org/document/6008284/?reload=true

Wilder, M, Venuti, S, & McAdam, S 2017 *Recommendations of the Task Force on Climate-related Financial Disclosures – Review of Local Relevance Australia*, Baker McKenzie, viewed 1 July 2018, https://www.unpri.org/policy-and-regulation/tcfd-recommendations-country-reviews--Australia/2886.article