

Focusing post-disaster research methodology: reflecting on 50 years of post-disaster research

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Abstract

The 50th anniversary of cyclone Althea at Christmastime this year, 2021, prompts a reflection of a corresponding 50 years of post-disaster research by the Centre for Disaster Studies at James Cook University. Importantly, this reflection is on what is achieved through rapid-appraisal studies immediately following a disaster. This paper builds on earlier research into the methods and types of post-disaster surveys; taking into account new technology and the emergent issue of climate change. The paper identifies general findings and issues that have been uncovered through post-disaster surveys. What is seen is a continuity of the effects of disasters across decades and across events. Thus, it is important to interview people in affected communities for debriefing and also to enhance communication, education and awareness. Survey methods across a range of disasters during the last 2 decades are reviewed to identify research and survey approaches. The methods and approaches of post-disaster surveys should be driven by community needs and characteristics and surveys must propose focused research questions and purpose to be effective and contribute to better practice.

Introduction: remembering Althea

James Cook University was founded in 1970 and its researchers within the disciplines of engineering and geography have focused on hazard and disaster research. In 1971, Townsville was devastated by Cyclone Althea and December 2021 will mark the 50th anniversary of that disaster event. It provides an opportunity to record cyclone affects as part of hazard awareness and preparedness campaigns. Cyclone Althea was followed 3 years later by the destruction of Darwin by Cyclone Tracy. This major event in Australia's history of disasters generated the research findings that led to cyclone-resistant buildings that are safer as well as increased awareness in Australia through the communication of cyclone research.

Other researchers within James Cook University have participated in disaster research. This year, the diversity of the university's disaster researchers will be grouped under a new 'umbrella' multi-disciplinary collaborative research centre with over 100 members, called the Centre for Disaster Solutions. Both the current Centre for Disaster Studies (CDS) and the Cyclone Testing Station (CTS) are expected to retain their identities within this larger centre, not least due to their legacy of knowledge, established reputation and practical experience. A significant part of that legacy has been the capacity to carry out direct and valuable research during and immediately after disaster events.

Both the CDS and the CTS were established with objectives to undertake rapid-response post-disaster studies, including fieldwork observation and measurement of impacts. Consistent with standard emergency management practice, observation, documentation and analysis of lessons identified from disaster events enables adaptation and the development of relevant policy recommendations. Both the CDS and the CTS have made significant contributions to this process. Research and reports generated over the decades

have added to the depth of evaluation of environmental, societal and structural preparation and response to natural hazards.

This article reflects on the post-disaster experience of the CDS and its colleagues in the social and physical sciences. After more than 50 years of this research at James Cook University, it is appropriate to reflect on the history of rapid-response studies to examine disaster effects and methods of research.

A history of research

Table 1 provides a list of known rapid-appraisal studies undertaken by CDS researchers and allied disciplines at James Cook University following specific disaster events.

The research from major disasters in the early- and mid-1970s reflects the work of both engineers and geographers. After the formalisation of the CTS in 1977, separate engineering, structural impact assessments and wind-load reports were produced and are published on the university's website.¹ The studies listed in Table 1 were carried out in the days and weeks immediately following a disaster. Most of the studies are recorded in research reports that were provided to emergency managers and stakeholders at debriefing meetings. Some studies formed part of higher-degree research and are contained within theses. Many of the immediate post-disaster studies have been incorporated into academic journal articles and book chapters, often analysed in conjunction with other disasters and related to other literature (Oliver 1980). Given that most early studies only exist in hard copy format, Table 1 lists studies that can be tracked down and a publication identified. Most of the paper-based publications and associated grey literature developed before the 1990s is held by the CDS and James Cook University library.²



Severe Tropical Cyclone Althea devastated parts of North Queensland just before Christmas 1971 and was one of the strongest storms ever to affect the Townsville area.

Image: courtesy David Whitehouse and the Cyclone Testing Station

While the CDS and affiliated researchers have become increasingly constrained by time and funding, they have been less restricted by issues of research access and lengthy approval processes that government organisations often face. To enable rapid-response research and surveys after an event, the CDS maintains human ethics approval covering the conduct of post-disaster studies (renewed every 3 years) to carry out surveys. Any person undertaking this kind of fieldwork follows clear protocols and is trained and mentored by a researcher with relevant experience, including regular debriefing. A significant ethical emphasis is on the avoidance of stress and trauma for respondents. Consistent with the literature (Elmir *et al.* 2011, Oliver-Smith 1996), the conduct of surveys and interviews after a disaster has invariably been associated with catharsis providing people an opportunity to tell their story. In some circumstances the research may become, or may benefit from, participatory methods. Gibbs and co-authors (2018) discuss participatory research in bushfire-affected communities. If researchers are working in their local communities or identify issues or processes that are core to their applied research participation within the community they may be extremely effective in bringing about change or enhanced recovery. However, this research brings more stringent ethical demands and may be difficult to organise in the short period of a post-disaster study.

To ensure the value, relevance and appropriateness of any study undertaken, CDS researchers collaborate with relevant agencies and organisations to develop research instruments and questions. The aim of the CDS has been to provide practical knowledge and a better understanding of issues related to the needs of stakeholders.

Post-disaster findings

An analysis of post-disaster studies up to the early 2000s (King 2002) was commissioned by Emergency Management Australia to conduct an evaluation of post-disaster studies and methods. The study identified 7 groups of affects and issues including:

- the unequal distribution of the impact, both spatially and socially
- loss of services during the event
- lack of expectation and anticipation of the effects
- late or minimal preparation
- post-event community and neighbourhood response
- confusion concerning warnings and information in the media
- community coping capacity and resilience.

Subsequent studies reflect and repeat these themes. Significant numbers of post-bushfire surveys carried out under the auspices of the Bushfire Cooperative Research Centre and, later, the Bushfire and Natural Hazards Cooperative Research Centre affirm similar themes concerning awareness, preparedness, attitudes and knowledge and actions, especially concerning

1. James Cook University Cyclone Testing Station webpages at: www.jcu.edu.au/cyclone-testing-station.

2. Reports are available on the CDS website at: www.jcu.edu.au/centre-for-disaster-studies/about. Many pre-1990s reports are available on request from the CDS.

Table 1: Post-disaster studies in which the Centre for Disaster Studies and its colleagues participated.

Year	Disaster	Place	Key researcher	Institution/ Publication series	Research method*
1970	Cyclone Ada	Whitsundays, Qld	Trollope & Oliver	CTS	Eng. ES
1971	Cyclone Althea	Townsville, Qld	JCU/Hopley/Oliver	CTS, CDS	Eng. ES
1974	Cyclone Pam	North Queensland	Hopley & Harvey	JCU Geography Department	ES
1974	Cyclone Zoe	North Queensland	Hopley & Harvey	JCU Geography Department	ES
1974	Cyclone Wanda	North Queensland	Hopley & Harvey	JCU Geography Department	ES
1975	Cyclone Tracy	Darwin, NT	JCU/Walker & Trollope	CTS, CDS	Eng ES
1979	Cyclone Kerry	Mackay, Qld	Oliver & Walker	DIR	Eng ES
1979	Cyclone Peter	Cairns, Qld	Volker, Reser & Innes	DIR	Quant Qual
1981	Hurricane Allen	Caribbean	Oliver & Trollope	DIR	Eng ES
1982	Cyclone Isaac	Tonga	Oliver & Reardon	DIR	Eng ES
1982	Cyclone Max	Darwin, NT	Britton	DIR	Qual
1982	Bushfires	Tasmania	Britton	DIR	Qual
1983	Ash Wednesday Bushfires	Victoria	Britton & Oliver	DIR	Qual ES
1986	Cyclone Winifred	North Queensland	Oliver	?	ES
1989	Cyclone Aivu	Burdekin Shire, Qld	Butterworth <i>et al.</i>	BH, JCU	Quant Qual
1990	Cyclone Winifred	North Queensland	Butterworth	DIR	Quant Qual
1988	Floods	Clarence River, NSW	Britton	CDS	Quant Qual
1992	Cyclones Mark & Betsy	North Queensland	Sofield	JCU Tourism Department	Qual
1997	Cyclone Gillian	Townsville, Qld	King	CDS	Qual
1997	Flood	Cloncurry, Qld	King & Goudie	CDS	Qual
1997	Cyclone Justin	Cairns, Mareeba and Innisfail, Qld	King	CDS	Qual
1998	Floods (Cyclone Syd)	Townsville, Qld	King <i>et al.</i>	CDS	Qual
1998	Floods	Gulf of Carpentaria, Qld	Berry	CDS	Qual
1999	Cyclone Rona	Cairns, Port Douglas Wujal Wujal and Mosman, Qld	Berry	CDS	Qual
2000	Cyclone Rosita	Broome, WA	Berry	CDS	Qual
2000	Cyclone Steve	Cairns, Qld	Berry	CDS	Qual
2001	Cyclone Abigail	Mornington Island, Qld	McLachlan	CDS	Qual
2002	Civil War	Sierra Leone	King	CDS	Qual
2002	Terrorism	Bali	Gurtner	CDS	Qual
2003	Cyclone Zoe	Tikopia, Solomon Islands	Berry	CDS/ UNOCHA	Quant Qual
2004/5	Tsunami	Phuket, Thailand	Gurtner Nott	CDS JCU	Qual
2005	Tsunami	Maldives	Shaig	CDS	Qual
2006	Cyclone Larry	Innisfail, Qld	Goudie/Glick	CDS	Quant Qual
2006	Cyclone Monica	Darwin, NT	King <i>et al.</i>	CDS	Qual
2007	Tsunami	Cairns and Townsville, Qld	King	CDS	Qual
2008	Floods	Mackay and Charleville, Qld	Apan <i>et al.</i>	NCCARF**	Quant Qual
2011	Floods	Brisbane, Qld	Bird <i>et al.</i>	NCCARF***	Quant Qual
2011	Floods	Emerald and Donald, Qld	Bird <i>et al.</i>	NCCARF***	Quant Qual

Year	Disaster	Place	Key researcher	Institution/ Publication series	Research method*
2011	Cyclone Yasi	Townsville, Cairns and Mission Beach, Qld	Vachette King & Nott	CDS JCU	Qual ES
2012	Tornado	Townsville, Qld	Cottrell <i>et al.</i>	CDS	Qual
2015	Cyclone Pam	Vanuatu	Vachette	CDS	Qual
2016	Cyclone Winston	Fiji	Miller	CDS	Qual
2017	Cyclone Debbie	Bowen, Airlie Beach and Proserpine, Qld	Gurtner & Vachette	CDS	Qual
2017	Cyclone Debbie	North-East Australia	Gurtner	CDS	Qual
2019	Monsoonal floods	Townsville, Qld	Gurtner	CDS	Qual
2020	COVID19 Pandemic	Australia	Gurtner	CDS	Qual

Notes:

DIR - Disaster Investigation Report series that is an early monograph series of the CDS

CDS - Centre for Disaster Studies Research report

BH - Behavioural Sciences, James Cook University

***Research Methods:**

Eng.=Engineering field measurements

ES=Earth Science and Physical Geography Field measurements

Quant=quantitative social science

Qual=qualitative social science including observation and non-parametric quantification

**NCCARF funded, University of Southern Queensland with CDS

***NCCARF funded, Risk Frontiers with CDS

decision-making around stay and defend or leave (McLennan, Paton & Beatson 2015; Whittaker *et al.* 2013; McLennan *et al.* 2013; McLennan & Elliott 2011; Whittaker & Handmer 2010). With digital technologies, scientific innovation and an expanded capacity for data collection and synthesis, warnings have become more complex over the past 2 decades. Increasing public access to the Internet, with the proliferation of web-based technologies, apps and social media has led to concerns from emergency managers about the wide and relatively unchecked dissemination of conflicting, misleading or inaccurate information. Despite such concerns, an online survey of over 4,000 community members conducted by the CDS following Cyclone Debbie in 2017, found that most people made decisions based on information provided by informal and official ‘trusted’ information sources. Even with the evident limitations of web-based technologies (access to a compatible device, sufficient power, data download limits, technical competence, language capabilities) electronic media has the capacity to deliver timely, up-to-date and localised content better than traditional media. In contrast to previous generations, most people, particularly in highly populated areas of Australia, have access to numerous forecast and hazard maps, updates regarding local conditions and live videos.

Emergency management organisations have turned to web-based technologies and social media to expand public accessibility for warnings and information (Bird, Ling & Haynes 2012; Shan *et al.* 2019; Willems, Forbes & Simmons 2021). As trust, reliability and credibility is established, institutional websites such as the Bureau of Meteorology and local council-operated ‘disaster dashboards’ are regularly accessed and consulted. For the community, social media has proven to be a resource to share local information, advice and provides

support. Over the past 2 decades, warnings and information have transformed in both their effectiveness and complexity.

Consistent with changes in priorities and focus at the international level, building community resilience and risk reduction has resulted in Australia’s *National Strategy for Disaster Resilience* (Attorney-General’s Department 2011). The strategy makes it a priority for emergency services organisations to move beyond response and recovery efforts towards public awareness and preparedness. This approach has enabled an exchange of support, resources and communication that empower communities to be involved in their own safety rather than relying on emergency services agencies and service providers. However, people and communities were always resilient. The observation from repeated post-disaster studies demonstrates that the level of inherent resilience has not changed, but there is better capacity to use and focus that resilience. Alongside this resilience of society is the need to enhance climate change adaptation.

Beyond the original 7 groups of disaster affects (King 2002) there are emergent issues of social media and information technology and climate change adaptation, although both are modifications of resilience and warnings, respectively. Further, there is increasing recognition of the effects of hazard evacuations. Extensive short-term evacuations, displacements and relocations have taken place before and after events such as the Cyclone Yasi and the Queensland floods in 2011 and the monsoonal floods in Townsville in 2019.

Post-disaster studies are aimed at capturing local experiences and informing emergency managers of shortcomings, successes and improvements that might be made to education, awareness campaigns, preparation and protection, warnings, uptake of messages, evacuation, shelter and management policy.

Researchers also gain insight into emergency management performance and processes and can bring experiences to other agencies outside emergency management, such as areas of planning (King *et al.* 2016), social welfare (Quinell 1977), psychology and health (Zotti *et al.* 2013) and the roles played by allied professionals. The value of this research output is strongly determined by the purpose and research instrument employed.

Methods of post-disaster studies

Direct involvement in disasters is a powerful experience that informs and structures an understanding of the event. However, it can be subjective and must be guided by strong purpose, objectives and replicable methods. At the same time, researchers are in a relationship with stakeholders and partner organisations that have priorities and needs (King 2002). Methods employed in post-disaster studies must be objective, especially because of the subjective milieu of widespread destruction and trauma.

Tierney (2019) reviewed an extensive number of post-disaster studies, many of which were also identified in King's (2002) post-disaster review that analysed 130 studies from a number of countries and research funding schemes. The review identified types of hazards that had been studied and the global regions covered. There were different approaches and methods, partly influenced by the disciplinary background of the researchers. Research methods employed in these 130 studies mostly fell into 6 categories:

- case studies
- interviews and focus groups
- use of secondary sources
- post trauma studies
- observations
- economic analyses.

The choice of research methods is influenced by the disciplinary background of the researcher and also by the familiarity of the researcher with the disaster location and regular involvement and experience in assessing the effects of disasters. There are studies where the researcher is visiting the disaster-affected community for the first time or is working in an unfamiliar or new location. Emphasis in this context is placed on sampling and the representative nature of the survey to support and justify findings. This is especially important as part of a needs assessment or when using a survey to ascertain what has happened. Post-disaster studies conducted by researchers at the CDS have varied extensively according to the disciplinary background of the researcher, ranging from scientific field measurements carried out by physical geographers and environmental scientists to quantitative and qualitative surveys conducted by social scientists.

On the other hand, researchers who regularly carry out post-disaster studies or who are working in their community are broadly aware of what has happened and do not need to use a survey to measure every detail but focus on issues and processes. Researchers have moved into disaster studies from previous careers in developing countries and were familiar with

Rapid Rural Appraisal methods. There is a contrast between statistically representative samples of affected population and of rapid appraisal of emergent issues to contribute promptly to debriefing and lessons learnt.

Henderson and co-authors (2009) analysed surveys carried out in New Orleans after Hurricane Katrina. Most of these studies employed strict quantitative methods with rigid attention paid to sampling of the population. The surveys used a range of methods: census-type surveys, stratified random samples, convenience sampling (surveys carried out at centres and institutions such as evacuation centres) and purposive sampling to target minority and ethnic groups using organisations such as churches and welfare agencies. The surveys employed face-to-face, drop-off and pickup and telephones, both landline and mobiles. Henderson and co-authors (2009) recommended the importance of following strict social science quantitative methods that address sampling error coverage. However, they also recommended a sampling approach that relates to the purpose of the survey.

Whittaker and Handmer (2010) examined 9 post-disaster studies that were presented to the Victorian Bushfires Royal Commission following the Black Saturday bushfires in 2009. This analysis pointed to issues of awareness and understanding, decisions about stay or go and actions during the fire. They summarised a variety of methods, noting differences in studies that derived from the aims of the research. These varied according to the emphasis, for example, whether the survey recorded actual experiences of survivors or people's attitudes and awareness towards a hazard. Some studies were quantitative, some were qualitative and they consequently employed different sampling approaches including random, opportunistic, household face-to-face and telephone (Whittaker & Handmer 2010).

Steinfort (2017) stressed the need to employ a strong research method and the education and training of researchers. Zotti and co-authors (2013) reviewed an extensive literature of post-disaster studies relating to health perspectives, which stressed the need for consistency of research instruments. Lindell's (2013) assessment of post-disaster studies underlined the importance of consistency across survey instruments to improve comparisons. Lindell's (2013) analysis of disaster-impact models identified differences in research methods according to both the emergency management phases and zones of distance from the primary impact; derived from Dynes (1970). CDS climate change adaptation research that reviewed specific past disaster events (Boon *et al.* 2012) adapted Bronfenbrenner's social-ecological systems as a structure of support networks for individuals and communities. Any disaster is multi-dimensional in time and space.

Although not yet post-disaster studies, researchers have attempted to analyse effects and challenges of the COVID-19 pandemic. Pandemic studies illustrate the use of a range of mixed-methods social science surveys. Botton, Hoffmann and Vera-Cossio (2020) carried out extensive household surveys in developing countries. Dietrich and colleagues (2020) studied household economic effects of the pandemic and Hensher and Beck (2020) analysed travel during the early lockdowns in

Australia. A CDS survey constructed by Gurtner (Gurtner & King 2021) was an online survey of early consequences and knowledge of the pandemic and preparedness for it at the household level. Li and co-authors (2020) analysed COVID awareness categorised by demographic characteristics and Internet use.

Since 2010, research methods have expanded to the use of the Internet and social media as new approaches for data collection. Online research is relatively cheap to conduct and, as shown during pandemic lockdowns, use has increased of the Internet and social media platforms for communication and interaction. As Bird, Ling and Haynes (2012) illustrate from the Queensland 2010–11 floods, the use of social media both for researchers and communities emerged as a powerful tool. They also suggest that social media will not replace conventional survey methods or means of communication but will provide supplementary support and information.

Beyond the use of social media to recruit survey respondents, it also provides a rich source of secondary data of societal attitudes, issues and priorities. Jamali and co-authors (2019) used social media in a case study of Hurricane Sandy. Shan and co-authors (2019) reported use of the Chinese version of Twitter, Weibo, to carry out rapid-damage appraisal after a disaster. They accessed user information from multiple sources rather than contacting people as survey respondents.

Changing technology has transitioned from landline telephones to mobile phone use. Before 2000, CDS used telephone surveys as most households had conventional phones and users were listed in phone directories, as also attested to by Henderson and colleagues (2009) in the United States. The shift to mobile phone use has occurred in the last 15 years, but mobile numbers are

not broadly available in directories that can generate random samples within geographical regions.

Building resilience to disaster encourages enhancement of social capital (Aldrich 2012), which may include participatory research where the researcher works actively within communities. This allows for information discovery and to transform that knowledge into action that achieves tangible outcomes of communication, awareness and planned behaviour as well as long-term recovery (Gibbs *et al.* 2018, Easthope 2018).

Observational assessments of damage (Adams, Levitan & Friedland 2014) use information technology and drones to record damage to structures. Drone photography has provided immediacy but is hampered by relatively short times in the air owing to battery constraints. Google Earth is a remarkable and recent database of the whole planet that has been used to establish systematic sampling frameworks to carry out post-disaster surveys.

Organisational websites such as the Bureau of Meteorology with its tracking maps, warnings and modelling of hazards and point-of-time casting is widely used during events and is accurate and widely available. Internet access has jumped from desktops in homes to personal availability on smart phones and mobile devices. Information, communication and networking have created widespread access and secondary information for researchers as demonstrated by Shan and co-authors (2019).

Forecasts in the future of more extreme weather events due to climate change, especially floods, drought, bushfire and heatwaves appear more likely (IPCC 2021). Not only are more extreme events expected in coming decades, but they will bring new and emerging issues, challenges and novel community

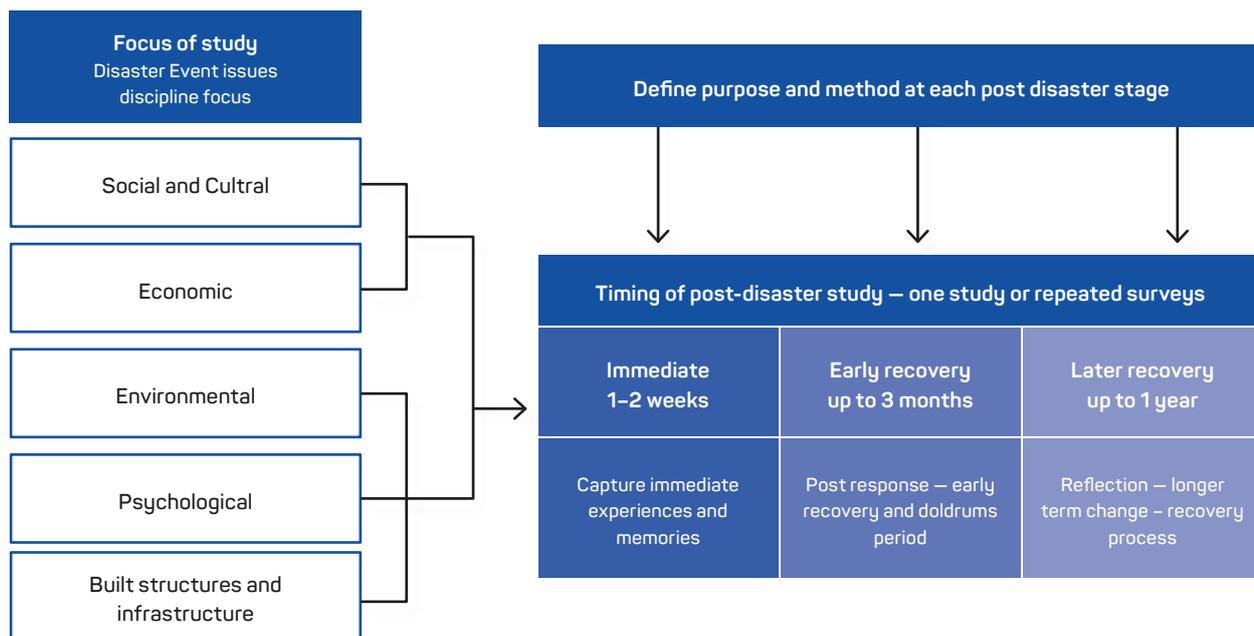


Figure 1: Post-impact assessment purpose and methodology.

Source: modified from Cottrell & King (2010)

approaches. It will remain important to survey communities after a disaster, using replicable and testable instruments, but equally it is important to use emerging technology and methods. Ideally, a mixed-method approach to post-disaster consequences may balance responses and information. Additionally, repeated surveys after many disasters also provides a longitudinal pattern of findings on behaviour and communication.

CDS researchers have used social-impact assessment methods over the last decades for its flexibility breadth and rapidity of delivery. Figure 1 is adapted from a social-impact assessment checklist (Cottrell & King 2010). It asks the question of what the research is attempting to find out. The emphasis is not on research methods (quantitative or qualitative) but on the research purpose. The intent of the research should guide the specific research questions, the survey instruments and type of delivery.

The purpose of post-disaster studies is more important than an evaluation of the representativeness of the sample. In the immediate post-disaster context there is rarely the time or resources to do extensive surveys. The post-disaster survey should focus on issues and processes that have a relevance to emergency management agencies in terms of warnings, preparation and education and also identify problems and experiences that were specific to the event.

Figure 1 summarises a question prompt list that requires definition of the purpose of the survey as each starting point. Only 2 criteria are used for illustration in this model; overall focus broken down into categories then structured into different time periods. The type of survey will vary according to the time that it is carried out after a disaster. The focus of the study shifts as communities move through different phases after the event. It is possible to add further dimensions of space–impact zones (Dynes 1970) and social ecological systems that support and configure individuals and communities.

Conclusion

This paper considered 50 years of post-disaster research at the CDS at James Cook University. Anniversaries of predictable natural events provide important opportunities for raising awareness, preparedness and education for future events. A long history of multi-hazard assessments provides its own longitudinal research outcomes. Each disaster contains elements of other disaster effects, sometimes in the same community but frequently affecting a new population and providing a comparison between places.

Post-disaster studies identify commonly recurring groups of affects. Some disaster issues can be addressed by changes in practice, but many will repeat with each event and need to be part of education of the community for safe preparation. This paper reviewed common types of research methods and changes that have responded to technology, but a significant theme in post-disaster studies and reviews of such studies is the importance of consistency, standardisation of survey instruments and the use of sound research techniques.

Of greatest significance is a clear purpose that defines a research question. In answering specific research questions, a mixed-methods approach is often a sound approach. Post-disaster studies usually do not have time or resources to blanket the whole community. Targeted, issue-defined questions provide useful outcomes that may contribute to changes in policy and practice. Findings from post-disaster studies have influenced codes, policies, legislation and emergency management generally. It is consequently important for researchers to work closely with emergency managers and response and recovery agencies. Post-disaster studies are not pure academic research, they must be of use to society and institutions

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