Queensland: Driving Reform and Continuous Improvement in Floodplain Management

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Background

The July 2011 Queensland Statewide Natural Hazards Risk Assessment identified that flooding (including both riverine and flash flooding) is historically the most destructive natural hazard in Queensland. On average, about two severe flooding events occur each year, causing significant damage to property, disruption to businesses and communities and on occasion, death and serious injury.[1]

While the Assessment used historical data, it would not have surprised readers at that time. In January that year the Toowoomba and Lockyer Valley floods had resulted in 23 deaths, as well as extensive property damage - the most devastating event in a season of state wide flooding and Queensland's 'summer of sorrow'.

In August 2011 the Interim report of the Queensland Floods Commission of Inquiry described the consequences of that summer as:

> "…shocking; no-one could have believed that people could be swept by a torrent from their homes and killed, as they were in Grantham; that nine motorists could be drowned in the attempt to negotiate floodwaters; that some towns could be completely isolated for weeks, or that every last citizen of others would have to be evacuated; that residents of cities like Ipswich and Brisbane could lose everything they owned in waters which wrecked thousands of homes."[2]

The Commission of Inquiry went on to make recommendations that directly relate to this conference; 71 were dam-related, 22 flood plain management related, 16 related to state or local planning instruments, and 33 applied to development.

Since March 2012 Queensland agencies have driven a strong agenda of reform and continuous improvement in floodplain management to collaboratively identify and address deficiencies and set the benchmark for best practice nationally. This paper covers work by the Office of the Inspector General Emergency Management, the Department of Natural Resources and Mines, and the Queensland Reconstruction Authority relevant to this area.

The Inspector-General Emergency Management

Implementation of the Commission's recommendations had barely begun when the State was again affected by flooding. In January 2013 ex-Tropical Cyclone Oswald caused flooding from Bundaberg to the New South Wales border. In a further review of arrangements to manage such disasters, former Australian Federal Police Commissioner Mick Keelty observed that "*the recent 2013 floods exposed some*

[1] Queensland Department of Community Safety, *State-wide Natural Hazard Risk Assessment Project Summary, Project Summary*, 2011, p1, http://disaster.qld.gov.au/Disaster-Resources/Documents/Project%20summary.pdf, accessed March 2016.
[2] Queensland Floods Commission of Inquiry, *Queensland Floods Commission of Inquiry Interim report*, 2011, p6, http://www.floodcommission.qld.gov.au/__data/assets/pdf_file/0007/8791/QFCI-Interim-Report-Preface,-Introduction.pdf, accessed March 2016.

entrenched flaws with the current system",[3] and recommended the establishment of an 'Inspector-General of Emergency Management'.

The role of Inspector-General Emergency Management (IGEM) was first established in 2013 and formalised as a statutory position the following year. The IGEM's primary role is to enable confidence in Queensland's emergency management arrangements. Through the establishment and implementation of an assurance framework, the Office of the IGEM helps to direct, guide and focus work of all agencies, across all tiers of Government toward the desired outcomes of emergency management.

The Emergency Management Assurance Framework

An early task of the new Office of the IGEM was to design an assurance framework. Developed in collaboration with disaster management practitioners, the framework provides a standard that can be applied by all Queensland disaster management stakeholders to ensure their legislative responsibilities are met and that programs are effective, aligned with good practice, and encourage the best use of resources.

The Framework comprises three sections: Principles, the Standard for Disaster Management in Queensland (the Standard), and Assurance Activities.

The Principles are fundamental to the establishment and continuous improvement of effective disaster management programs. They recognise the interconnectedness of disaster management across all levels of government, the private sector and the community. The four Principles, Leadership, Public Safety, Partnership and Performance are demonstrated through a shared culture of disaster management excellence, and strategic planning.

The Standard outlines the way in which entities responsible for disaster management in the State are to undertake disaster management. It uses an outcome-based approach to ensure disaster management programs better meet the needs of the community. The elements of the Standard are the basis for improving performance across Queensland's disaster management arrangements. The elements are:

Shared Responsibilities - six areas describing disaster management that governments, entities and practitioners need to deliver against in order to meet broader community expectations. They represent the key areas to be considered as part of an effective disaster management program.

Components - reflect the fourteen key capabilities of disaster management in Queensland within each Shared Responsibility. These capability areas form the basis for disaster management functions and activities.

Key Outcomes - identify the intended results of actions undertaken by entities. The Key Outcomes are grouped by Component under each Shared Responsibility to guide the performance of disaster management programs.

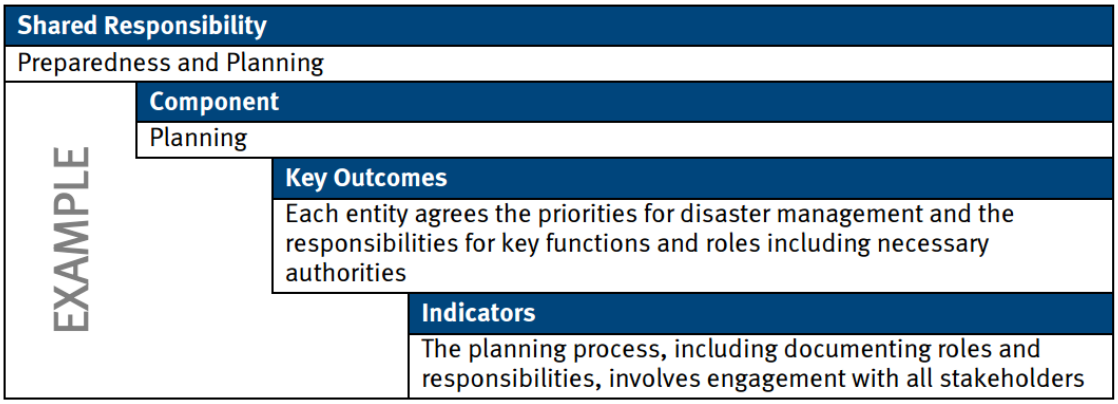
Good Practice Attributes - the sector agreed that an effective disaster management system can be recognised by the following attributes:

[3] Keelty M, *Sustaining the unsustainable: Police and Community Safety Review Final Report,* 2013, p26, http://www.cabinet.qld.gov.au/documents/2013/Sep/Police%20CommSafety%20Report/Attachments/Review%20report.PDF, accessed March 2016.

Attribute	Definition
Scalable	Able to be applied to any size or type of event and across all levels of Queensland's disaster management arrangements
Comprehensive	Considers all phases of disaster management, all hazards and an all agencies approach
Interoperable	Promotes interoperability of systems, programs and resources to enable seamless integration
Value for money	Ensures services and systems are able to be delivered by mechanisms that best represent value for money
Adaptable	Able to adapt to a changing environment and remain flexible to the needs of the community

The structure of the Standard is shown below. Each Component is supported by Key Outcomes that describe the desired results of disaster management for that shared responsibility. The Key Outcomes for each Component consider the five Good Practice Attributes.

Each Component is supported by a number of Indicators. These Indicators describe the expected activities or arrangements that will help disaster management entities achieve the Key Outcomes. Indicators should consider the five Accountabilities: Governance, Doctrine, Enablers, Performance and Capability.



The Standard forms the basis for assurance activities conducted by the Office of the IGEM. It does not replace the requirement for entities to perform their legislated functions. It should be applied together with existing doctrine, good practice guidance and Government policy.

The 2015 Callide Creek Flood Review

In February 2015, and for the second time in two years, the Callide Valley in the Banana Shire experienced major flooding. Several large floods in 2013 had caused the Callide Dam gates to be opened. The association between flooding and the dam gates prompted community concern that the operation of the Callide Dam had exacerbated flooding. On the evening of 20 February 2015, Tropical Cyclone Marcia brought significant rainfall and Category 1 wind gusts to the Callide Valley. The rain was intense over a short period, causing rapid stream rises. As the Callide Dam quickly filled, the gates opened automatically releasing water downstream. Many in the community saw the Callide Dam gates as the cause of the disaster.

While no lives were lost in the floodwaters, many were significantly and irrevocably affected. Homes and livelihoods were destroyed, businesses suffered losses, livestock perished, and crops and fences were washed away. Many people's safety was placed at risk by self-evacuating at night, with little warning.

An independent review into events surrounding this flooding of Callide Creek was commissioned by Police, Fire and Emergency Services Minister following a visit by Premier of Queensland to the Shire. The review, undertaken by the IGEM, particularly focussed on whether the operation of the Callide Dam near Biloela exacerbated flooding. It was the first real test of the Standard that the sector had agreed to only six months earlier. This section of the paper looks at how the outcomes of the Standard influenced the review's recommendations relevant to flood plain management.

The review was conducted from late February to June 2015. The review team met with affected residents, inspected the impacts of the flood event, and considered written public submissions. The IGEM attended a town meeting to hear residents' concerns. In addition, an independent market research company was engaged to survey 406 Banana Shire residents about the impact of the flooding and associated matters pertaining to the event and disaster management. The review team obtained records, written submissions and individual recollections, direct observations, and actions from a broad range of entities.

Performance of the entities was considered against a range of specific legislation and guidelines taken from relevant national and state publications. These included Attorney-General's Department, *Managing the floodplain: A guide to best practice in flood risk management in Australia*, Queensland Reconstruction Authority, *Planning for stronger, more resilient floodplains*, and the *2013-14 Queensland State Disaster Management Plan*.

Performance of entities was also considered against the Standard. Although it had only been recently released, it represents the input of disaster management practitioners from across Queensland about good practice, and set a benchmark for organisations upon which improvement strategies can be based. This paper considers its influence in three different areas.

Effective planning

The Standard was first used to set the review's expectations about how effectively the event should have been planned for.

> "Hazard identification and risk assessment are fundamental to effective disaster management and are the basis for planning and programs. Identification of hazards and assessment of risks should occur regularly and build upon lessons learned, experience, training and exercises. Planning must be based on the best available information and up-to-date data, including risk assessments. Effective risk assessments will identify specific roles for all phases of disaster management, and consider all types of events.
>
> Disaster management planning is effective when all entities work conjointly. Many different types of entities, including councils, emergency services, community groups, critical infrastructure owners, and the community need to be involved in deciding how to manage risks, and how responsibility will be shared when

> responding to disaster events. This requires agreement about how the entities can eliminate, avoid or substitute risks, or transfer residual risk. Collaborative planning supports effective response where duplication of effort or gaps in service to the community are minimised.
>
> A thorough risk-based planning approach will consider unintended consequences, inform and prioritise risk reduction activities and hazard mitigation strategies."[4]

The review found that Banana Shire's Local Disaster Management Plan[5] could have been improved through an integrated risk-based planning process. Stakeholder engagement in the planning process could have been increased, potentially reducing the likelihood of omissions and identifying circumstances where the local disaster response capacity would be exceeded.

Expectations of the Standard resulted in findings about the need to expand the roles of 'advisory members' to the Local Disaster Management Group (LDMG), including, in this case, the Dam operator. [6] Expectations again prompted the need to involve these experts in the planning process, to minimise the risk that mismatched expectations would result in gaps or duplication of service to the community.

Public engagement

The Standard set the expectations about public engagement:

> "Effective public engagement should empower communities. Public engagement should be a two-way process, where entities and the community work together to understand, prepare for, respond to and recover from disasters.
>
> Key elements of effective public engagement include:
>
> - Entities have a good understanding of the community profile, and how best to communicate with the community
> - Community messages and education programs are delivered in plain language and use multiple modes of delivery
> - Information is accurate, reliable, timely and relevant
> - Systems are in place to address public enquiries and dispel myths
> - Feedback is sought on public information and education activities."[7]

Based on these expectations the review was critical of the dam operator:

> "Engagement with the community on dams during floods is reflective of SunWater's position that the organisation has 'a limited role … in emergency management'. This appears to be supported by the information provided in the SunWater publication 'Dam Management During Floods'. The brochure does not mention that residents are 'relevant stakeholders' and instead says SunWater provides updates to 'council, police, emergency services and counter disaster

[4] Office of the Inspector-General Emergency Management, *2015 Callide Creek Flood Review,* 2015, p57, https://www.igem.qld.gov.au/callide/wp-content/uploads/2015/06/31May_CCK-1_REPORT_Volume-1_Complete_148pp_WEB.pdf, accessed March 2016.
[5] Completed as per the requirement of s57, *Disaster Management Act 2003* for Queensland local governments to prepare a disaster management plan.
[6] In line with Recommendation 4.15 of *Queensland Floods Commission of Inquiry Interim Report*.
[7] Op.cit., P 69.

groups … to ensure those agencies can fulfil their role of advising downstream residents".

In the lead up to the February 2015 event, SunWater could have provided considerably more information and better engaged the community or local media about what was occurring at its dams, including the likelihood that the dams would spill. We found limited evidence of media releases and information on Facebook and Twitter. The information provides the community with some understanding of the risks or likelihood of a risk occurring at its dams, but leaves room for improvement." [8]

Operational information and intelligence

The expectation of the review team on Operational Information and Intelligence was again heavily influenced by the Standard.

"Many disaster management entities will not have a formal intelligence unit, but will still have an intelligence function to manage. With the growing cooperation among disaster management groups, levels and the shared responsibility for disaster management, all entities could add value by developing some type of intelligence capacity. Intelligence capacity may be a full-scale unit or one person who serves part-time as an agency's point of contact to receive and disseminate critical information. According to the Standard for Disaster Management in Queensland (the Standard), the two key outcomes to achieve are:

- Decision making, tasking, communications and messaging are informed by accurate and current intelligence.
- Common situational awareness is created at all levels through a process for sharing operational information and intelligence products, across all entities.

The flow of credible information is often a challenge when coordinating a multi-faceted response to a disaster event. Decision-making needs to be based on a shared understanding of the current and pending situation. That understanding should be based on intelligence that is accurate, up-to-date and from credible sources."[9]

Such expectations were not found to be completely fulfilled:

"The LDMG met regularly and there was representation from the majority of key agencies. The LDMG consistently discussed the current weather situation and how Tropical Cyclone Marcia was developing and tracking. The LDMG was aware of forecast rainfall and wind speeds, including the predicted impact on the Biloela area. Having ready access to this key information and having discussed the issues, there was opportunity to use this information more meaningfully. Decisions to inform the public sooner, and with greater detail, would have been beneficial to community preparations."[10]

[8] Op.cit., p71.
[9] Op.cit., p79.
[10] Ibid.

The dam operator, too, was found to have some gaps in its ability to gather accurate up-to-date information from credible sources about what was happening at the dam.

> "For Callide Dam, SunWater's information sources are few and collection methods basic. … In the flash flood situation that occurred, having only one inflow gauge that was not designed for high flow may have resulted in less accurate predictions about when the gates would open, or the amount of flow through them. SunWater also told us that high winds during the event 'impacted the accuracy of the recorder', and that there was a delay of up to half an hour in receiving information from the gauges. In the period when SunWater was most reliant on information on the operation of the dam, data was scarce, unreliable and delayed"[11]

The full report shows more examples of how the Standard of Disaster Management in Queensland helps set expectations for the review of this event. The report can be accessed on the website of the Inspector General Emergency Management at www.igem.qld.gov.au/callide/download-pdfs/index.html.

Further work and results

In June 2015 the Office of the IGEM again proved the usefulness of the Standard in guiding a flood-related review. Following Seqwater's release of floodwaters from Wivenhoe dam in May 2015, the IGEM was asked to conduct a review of Seqwater's and SunWater's flood release communications. The expectations of the review panel drew heavily on the Standard for Disaster Management as the starting point.

> "The Standard for Disaster Management in Queensland provides key disaster management outcomes as follows:
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> - for hazard identification and risk assessment …
> - for warnings …
> - for communication systems … and
> - for public engagement…"[12]

The direction set by the Standard, and other guidance about warnings resulted in eight recommendations for action to improve practice.

There is evidence that reviews based on the Standard, such as these, do make a difference. In March 2015, soon after the Callide Creek flood, the Australian newspaper ran an article headed '*Flooded Biloela locals pour scorn on Dam Operator SunWater'*. It contained comments from local residents sharply critical of the warnings they received.[13]

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[11] Op.cit., p83.

[12] Office of the Inspector-General Emergency Management, *Review of Seqwater and SunWater Warnings Communications*, 2015, p22, https://www.igem.qld.gov.au/reports-and-publications/documents/DamWarningsCommunications.pdf, accessed March 2016.

[13] Available only through the Australian subscription service, http://www.theaustralian.com.au/subscribe/news/1/index.html?sourceCode=TAWEB_WRE170_a&mode=premium&dest=http://www.theaustralian.com.au/national-affairs/flooded-biloela-locals-pour-scorn-on-dam-operator-sunwater/news-story/064b6153f88bffa8cb6a891fd7ebb39a&memtype=anonymous, accessed March 2016.

In February 2016, the local paper for the area – The Bulletin – ran an article saying the opposite. Titled '*Dam water release warnings for Callide Creek Farmers*', the article highlights affected landowners on high alert as the dam began releasing water. Some, it said, were 'confident in the Shire's and SunWater's implementation of the Recommendations of the IGEM's 2015 Callide Creek Flood Review'.[14]

Complementary improvements in floodplain management

In parallel with this work to develop and apply the Standard, related work has concentrated on improving Queensland's ability to gather information to improve flood warnings and to assist local government authorities (LGAs) to understand their needs for flood studies and mapping.

Queensland Flood Warning Gauge Network Review

The aim of the Queensland Flood Warning Gauge Network is to ensure that people in flood-prone communities or locations across Queensland have appropriate warning of flood events.

The Queensland Government completed a state-wide Performance Review of the Queensland Flood Warning Gauge Network. This review identified that the Bureau of Meteorology (the Bureau) uses data from more than 3000 rainfall and river gauges owned and operated by 54 entities whose purpose is not flood warning. The review made 19 recommendations including the identification of priority LGAs requiring more detailed consideration for further improvements in their early flood warning systems. The Queensland Government is focussed on ensuring that the overall flood warning gauge network is efficient and coordinated appropriately.

The Queensland Reconstruction Authority (QRA), in conjunction with Queensland Fire and Emergency Services, the Department of Infrastructure Local Government and Planning, and the Department of Natural Resources and Mines, is working with priority LGAs to consider proposed improvements to the flood warning systems and to design improved networks.

The QRA will provide follow-up support to LGAs to develop grant applications and subsequent assistance in relation to the installation and commissioning of new instrumentation.

The key outcomes from this more detailed consideration and redesign of flood warning systems are:

- improvements to the flood warning gauge network is to be of a standard approved by the Bureau;
- the related transmission of data is suitable for use by the Bureau; and

[14] The Morning Bulletin, 7 February 2016, http://www.themorningbulletin.com.au/news/almost-a-year-since-callide-dam-gates-were-opened-/2922973/, accessed March 2016.

- there is real-time (or near real time) visibility of the data to relevant LGAs, the State Disaster Coordination Centre and the Bureau.

The Operating Environment in Queensland

The National Agreement on the *Provision of Bureau of Meteorology Hazard Services* to the States and Territories provides detail on the operating context in Queensland for flood warning and forecasting services. This includes agreed responsibilities for riverine and flash flooding forecasting and warning services.

General

The Bureau has historical and statutory responsibility for the issue of warnings of gales, storms and other weather-related conditions likely to endanger life or property. In practice, the Bureau issues these warnings whenever severe weather is occurring in an area or is expected to develop or move into an area.

In practice, the responsibility for flood preparation, flood monitoring, developing forecasts and warnings and the dissemination of these warnings are shared between all levels of government.

The Commonwealth Government agreed that it would be important to develop national standards for investment in, and operation of, flood warning networks and infrastructure.

Riverine flooding

The Bureau has the responsibility for the provision of forecasting and warning services for riverine flooding. It is acknowledged that the Bureau does not have the capacity to directly communicate with all LGAs during a major or wide-spread disaster on every occasion. To support the Bureau, the Queensland Government provides it with relevant flood information that is in their possession or control in order for the Bureau to provide flood warnings or forecasts.

Flash flooding

All levels of government collaborate in preparing the community for the potential of flash flooding, which by its nature may not allow sufficient lead-time for site specific warnings and forecasts. The primary responsibility for flash flood warnings lies with local governments supported by local and district disaster management groups. The 2015 IGEM “Review of Local Governments’ Emergency Warning Capability” made a number of recommendations to strengthen local governments’ ability to deal with flash flood warnings.

Implementation of priorities

Following the review of the Queensland Flood Warning Gauge Network, an implementation reference group has been established consisting of representatives

from Queensland Government agencies, the Local Government Association of Queensland and the Bureau.

As at April 2016, initial meetings have been held with 35 LGAs to validate the outcomes of the reviews and to confirm council requirements, a second round of meetings has been planned for an additional 15 LGAs. Further, draft reports provided by the Bureau have been prepared for eight LGAs.

The implementation reference group has identified priorities to be completed before 30 June 2016. The priorities include to:

- design upgraded flood warning networks for identified very high and high priority settlements in up to 40 LGAs areas.
- provide LGAs with the basis for “Investment Plans”
- establish governance arrangements, particularly at the whole-of-government level where responsibilities exist across multiple agencies.
- commence ongoing catchment /regional arrangements.

The following implementation stage will involve supporting LGAs with grant applications and actual program delivery for installation and commissioning. The group intends to provide assistance across the State. The findings from this project will be provided to the Bureau’s National Flood Warning Infrastructure Working Group Project and the National Flash Flooding Information Repository Project.

Guide for Flood Studies and Mapping

Since 2011 and in response to the Queensland Floods Commission of Inquiry, the Queensland Government has supported LGAs by delivering flood projects at town and catchment scales. With the Queensland Flood Mapping Program now complete, the Queensland Government sought to establish a process that would guide the procurement, management and implementation of cost-effective and fit-for-purpose flood studies to suit the Queensland environment and context. BMT WBM Pty Ltd, on behalf of the Queensland Government and in collaboration with a number of key stakeholders, developed a guide that seeks to assist flood practitioners create fit-for-purpose flood studies and mapping that encompasses best practice principles, promoting a consistent approach throughout the state.

The guide is primarily intended to assist LGAs and other floodplain management entities who may have little or no knowledge of how to prepare flood study project documentation and manage a flood study. The guide establishes a standardised approach that facilitates greater consistency for flood studies and mapping throughout the state based on best practice national flood risk management guidance and policies. Consultants may also use the guide when bidding or preparing flood studies.

Through a consistent approach to undertaking flood studies across the state of Queensland, a more cost-effective and fit-for-purpose approach to flood studies and mapping will occur. The guide assists users in determining the degree of effort required

based on the flooding problem, available data and outcomes sought in terms of flood risk management objectives.