

Department of Natural Resources and Mines

Flood ready Queensland

Queensland Flood Mapping Program

Flood mapping implementation kit



Australian Government



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About this document

Flood Ready Queensland – Flood Mapping Implementation Kit has been developed to assist a broad range of stakeholders more effectively implement the outcomes of flood studies. In particular, it aims to increase the use of flood mapping outputs, improving the community's understanding of their exposure to flood risk and therefore strengthening economic and community resilience.

The kit is intended to be a living document, that will be enhanced over time through feedback and comments. It aims to encourage effective use of available flood information to:

- improve community safety;
- increase business resilience through preparedness and business continuity planning;
- improve community resilience through increased awareness and preparedness to the hazard;
- position local disaster management groups to be better prepared to respond to flood events;
- reduce recovery costs borne by community, insurance industry and all levels of government.

Audience for the implementation kit

The primary audiences for this implementation kit are local governments and local disaster management groups (LDMGs). The kit supports the effective use of flood mapping products provided by the Queensland Government through the Department of Natural Resources and Mines (DNRM). The products are designed to assist the LDMG and council to continue to improve their disaster management and land-use-planning outcomes.

The kit contains background information to enable readers irrespective of their responsibilities, to understand how flood mapping products can strengthen a community's resilience to flooding events.

Introduction

Since 2010, Queenslanders have experienced significant disaster events, including floods, cyclones, droughts and bushfires. This has created financial burden on local communities, businesses and government agencies and the need to build a more resilient state.

In June 2014, the Queensland Government released the *Queensland Strategy for Disaster Resilience*. It is based on the understanding that building resilience to all hazards is vital to the future of the state. It identifies areas of focus and activities to be undertaken to enhance the foundations of Queensland’s disaster resilience to all hazards. Importantly it recognises that, a resilient community understands the risk of future disasters, including floods.

The vision of the Strategy *is to make Queensland the most disaster resilient state in Australia*. People who choose to live in hazard prone areas of the state must be aware of the disaster risks and accept the responsibility to prepare for and manage, to the best of their ability, their own response and recovery. This attitude of personal responsibility for resilience, as individuals and as a community, is the way forward for Queensland.

The Strategy defines a resilient community as:

A resilient community is one that possesses the capacities, skills and knowledge that enable it to prepare for, respond to, and recover effectively from a disaster and adapt positively to a changing environment. It is a community that works together to understand and manage the risks and vulnerabilities that it confronts, and enhances its capacity to address its vulnerabilities to all hazards.

Historically, most of Queensland’s towns and communities have been established on or near floodplains and as a result the likelihood of flooding that impacts the community remains. Given this exposure, comprehensive understanding of flood hazard and risk can empower a community to become as resilient as practicable to flood events.

The *Queensland Flood Mapping Program* (QFMP) provides flood mapping information to assist in preventing, preparing, responding and recovering from flood disaster. Implemented by DNRM, the QFMP delivers fit-for-purpose flood mapping to a large number of flood prone towns across the state. The program aims to be consistent with national best practices¹.



Queensland Strategy for Disaster Resilience is available at <http://dlgccr.qld.gov.au/information-for-the-public/community-recovery-and-resilience.html>




¹ Managing the Floodplain – a guide to flood risk management in Australia – Handbook No. 7

Background

Queensland Flood Mapping Program

QFMP provides flood mapping information that assists in mitigating, preparing, responding and recovering from flood disaster. The program aims to be consistent with national best practice.

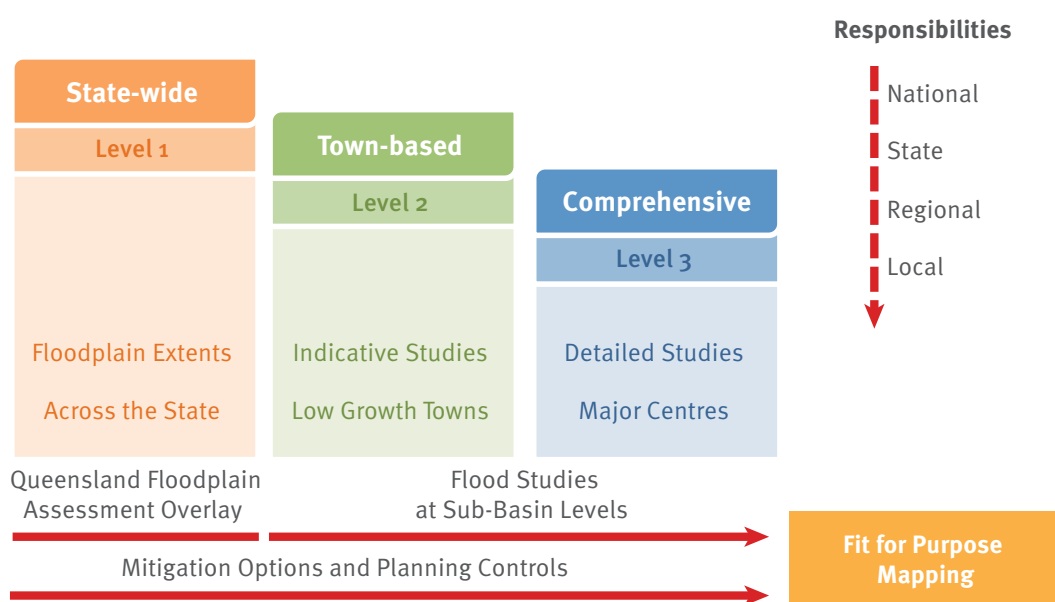
 Download a copy of *Managing the floodplain: a guide to best practice in flood risk management in Australia (Handbook 7)* by AEMI from <https://ema.infoservices.com.au/items/HB7-2ND>

Established after the 2011 floods and now part of DNRM, the QFMP delivers fit-for-purpose flood mapping working closely with a large range of stakeholders including council staff, hydrologists, technology, land use planning and emergency management experts.

Fit-for-purpose maps are advocated as a result of recognising not all communities require the same level of mapping to ascertain their flood risk. Figure 1 shows the three levels of fit-for-purpose flood mapping advocated. They are:

- **Level 1.** State-wide mapping known as the Queensland Floodplain Assessment Overlay. The overlay was developed through the application of a consistent state-wide methodology;
- **Level 2.** Town-based mapping that focuses on lower growth towns; and
- **Level 3.** Comprehensive mapping required for densely populated, higher growth centres and more complicated investigation areas such as coastal communities.

Figure 1: Different types of flood mapping methods



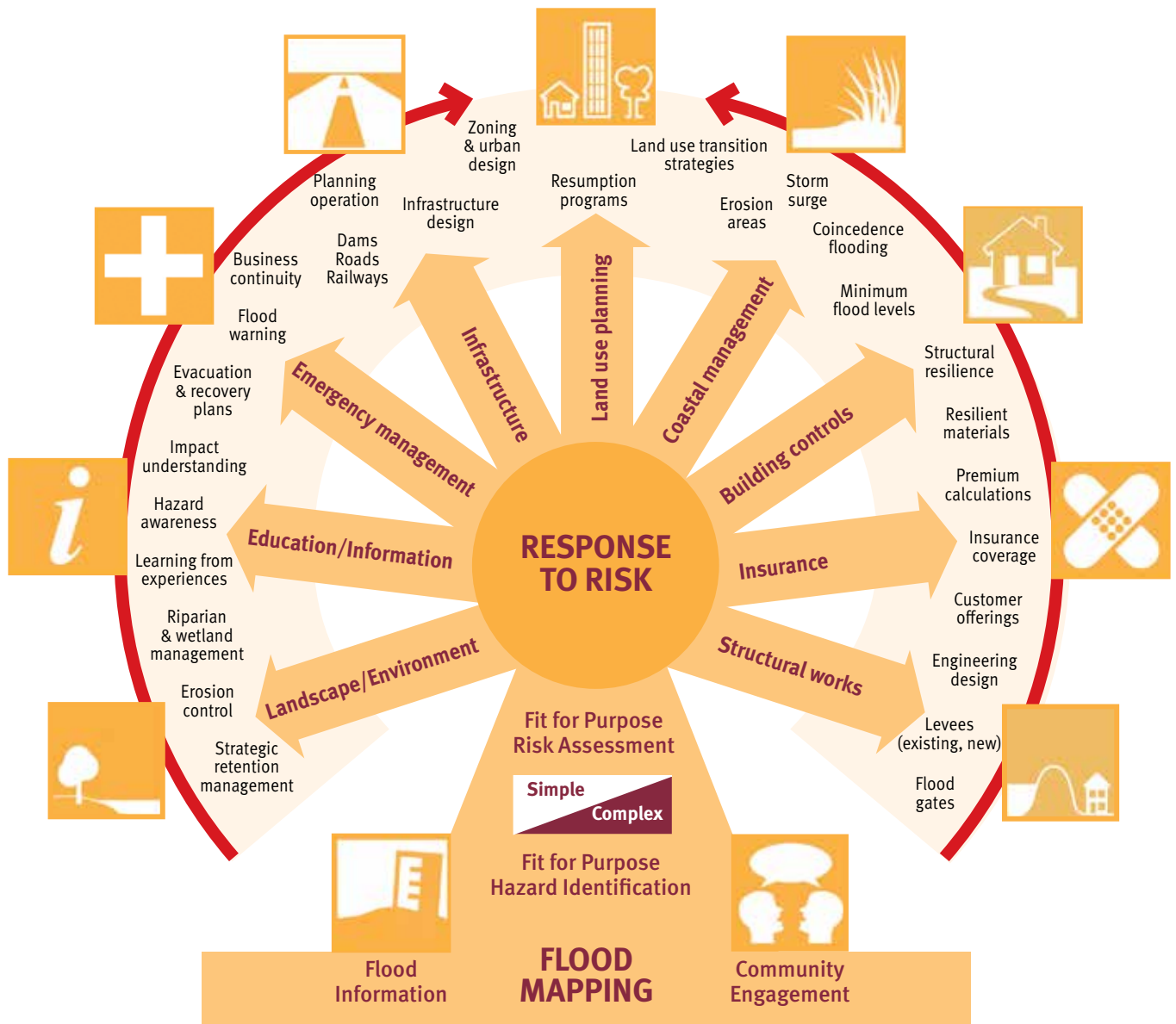
To date, the delivery of level 2 studies has been the QFMP’s key focus. These town-based flood investigations are prioritised on the basis of the Bureau of Meteorology assessment of flood risk for each town and the availability of flood information required to develop effective flood models.

A level 2 study provides a flood study report, flood mapping across at least three different flood events (ie. AEP 2%, 1%, 0.5%) and details regarding depth, velocity and hazard. To date, over 100 towns have been completed through the QFMP. An improvement for phase 3 of the program is the provision of flood maps for additional gauge heights to assist with disaster management.

Economic and community resilience framework

Figure 2 has been developed to allow local government authorities (LGA) and local disaster management groups (LDMG) understand the key areas that benefit from consideration of information derived from the flood studies and their outputs. Each key area is called a theme (e.g. land-use-planning or emergency management) and each theme is examined in more detail in the following section of the kit. It is the coordinated delivery of all these themes that will deliver economic and community resilience.

Figure 2: Economic and community resilience framework



Themes

Each of these themes have been further explored in the table below:

Themes	Area of interest
 <p>Land use planning</p>	<ul style="list-style-type: none"> • Zoning & urban design • Land use strategies • Resumption programs
 <p>Coastal management</p>	<ul style="list-style-type: none"> • Storm surge • Erosion areas • Coincidence flooding
 <p>Building controls</p>	<ul style="list-style-type: none"> • Minimum floor levels • Resilient materials • Structural resilience
 <p>Structural works</p>	<ul style="list-style-type: none"> • Engineering design • Levees (existing, new) • Flood gates
 <p>Infrastructure</p>	<ul style="list-style-type: none"> • Planning operations • Dams, roads, railways • Infrastructure design
 <p>Landscape and environment</p>	<ul style="list-style-type: none"> • Riparian and wetland management • Erosion and sediment control • Strategic vegetation management
 <p>Education and information</p>	<ul style="list-style-type: none"> • Hazard awareness • Impact understanding • Learning from experiences
 <p>Emergency management</p>	<ul style="list-style-type: none"> • Flood warning • Business continuity • Evacuation & recovery plans
 <p>Insurance</p>	<ul style="list-style-type: none"> • Premium calculations • Insurance coverage • Customer offerings



Theme 1: Land use planning

Audience: local government; local disaster management groups; planning agencies

Introduction | **Why is this important?**

Land use planning is the process by which the use and development of land is managed for the benefit of the whole community. Land use planning approaches that anticipate likely risk and vulnerability of the population can reduce the potential impact of future disaster events. Responsible land use planning can therefore prevent or reduce the likelihood of hazards impacting on communities and for this reason; land-use-planning is considered an effective preventative measure to mitigate the impact of floods.

Land use planning that accounts for natural hazard risks has been identified as the single most important mitigation measure in preventing future disaster losses in areas of new development.

The strategic planning system is particularly important in contributing to the creation of safer and sustainable communities. Land use planning policies can be used to reduce the number of people and assets in areas where risk profiles have increased over time or settled when these risks were not fully understood.

Planning schemes must coordinate and integrate the matters they deal with and also the state and regional dimensions of those matters expressed through regional plans and the State Planning Policy (SPP).

Planning schemes guide and manage growth across a local government area. They are required to appropriately integrate state interests that include natural hazards (including floods).

In Queensland, the SPP includes a state interest around all natural hazards. It states that the risks associated with natural hazards are to be avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards.



Download a copy of the Queensland State Planning Policy at <http://www.dsdip.qld.gov.au/resources/policy/state-planning/state-planning-policy-jul-2014.pdf>

While land use planning is an essential part of any overarching mitigation strategy, there are limitations on the capacity of the planning system alone to minimise the adverse consequences of a hazard.

State agency—Department of State Development, Infrastructure and Planning (DSDIP) responsibilities: reviewing all new or amended planning scheme documents to ensure that they are consistent with regional plans and the SPP.

Local government responsibilities: preparation and operation of planning schemes and to ensure consistency with regional plans and SPP.

Benefits

| Why are flood studies important to land-use-planning?

Flood studies can significantly improve the role of land use planning in managing flood risk. This means utilising flood studies, including mapping outputs, to appropriately and effectively support decision making around land use response and incorporating relevant strategies to manage the risk.



Useful information

A supporting guideline to the SPP on natural hazards is currently in draft and under review. The role of the guideline is to help land use planners understand how to appropriately reflect the state interest in planning schemes and development assessment.

This guideline is supported by a number of specific guidance documents including the *Planning for Stronger, More Resilient Floodplains* Guideline by the Queensland Reconstruction Authority (QldRA).



Download a copy from <http://www.dsdip.qld.gov.au/resources/guideline/qra/planning-stronger-floodplains-part-02.pdf>

Case study: Strengthening Grantham Project (Lockyer Valley)

Lockyer Valley Regional Council's Strengthening Grantham Project is a strong example of public, private and community organisations working effectively together to deliver a significant infrastructure project. Grantham, population approximately 360, was devastated by Queensland's floods in January 2011, when floodwater swept through the valley.

In total, 119 homes were significantly damaged, 19 homes were damaged beyond repair and 10 were completely destroyed. Ten Grantham residents lost their lives, while two remain missing, presumed dead. In the days immediately following the disaster, the Lockyer Valley Regional Council met with senior staff, planning experts and residents to address the immediate disaster response and develop a reconstruction plan.

The Master Plan was developed by council in consultation with Cardno, Deike-Richards and QldRA to ensure planning, design and environmental issues were managed appropriately. Cardno was tasked to manage the delivery of the project, managing the process through the planning, engineering and construction phases.

Funding support from the Queensland and Australian Governments, totalling \$18 million, met the costs required to fully fund the voluntary land swap initiative and future development. This allowed council to direct its own financial resources towards other vital services and infrastructure required for the region. The planning process was fast-tracked by QldRA and completed in four months. It continues to be one of the most concentrated reconstruction projects associated with the January 2011 floods.

For flood-affected residents, the benefits of the reconstruction process are numerous – a safe land lot upon which to rebuild, the provision of essential services and peace of mind that the community is now better protected for the future.



Read more: <http://www.dsdip.qld.gov.au/resources/guideline/qra/rebuilding-grantham-dev-scheme.pdf>



Theme 2: Coastal management

Audience: local government; local disaster management groups; planning agencies

Introduction | Why is this important?

Coastal regions in Queensland have the challenge of building resilience in areas where severe weather event(s) can create simultaneously occurring natural hazards (e.g. storm surge and riverine flooding). The state interest in natural hazards for coastal areas is covered by the SPP, however in recognition of the unique nature and importance of Queensland's coast, the Queensland Government has released the Coastal Management Plan.

The Coastal Management Plan complements but does not duplicate the SPP. A supporting guideline to the SPP on guidance on coastal hazards has been issued - in draft form and subject to change. It is the role of the guideline to help land-use-planners understand how to appropriately reflect the state interest in planning schemes and development assessment in their coastal areas.



Download a copy of the Coastal Management Plan (2013) from <http://www.ehp.qld.gov.au> and Draft: State Planning Policy Guideline State interest—natural hazards: Guidance on coastal hazards (December 2013) from <http://www.dsdip.qld.gov.au/resources/guideline/spp/spp-guideline-natural-hazards-coastal-hazards.pdf>

Benefits | Why are flood maps important to coastal management?

Flood studies play an important role in ascertaining the flood hazard and consequences of water flows from the inland catchment systems that integrate with coastal systems. Fit-for-purpose studies can provide modeling required to build a total system view that considers both riverine and storm surge effects.

The Queensland Government has been proactive in developing adaptation-planning guidelines to enable swift integration of the key principles of the plan into local planning instruments.



Download a copy of the Guideline for Preparing a Coastal Hazard Adaptation Strategy (April 2013) from <http://www.ehp.qld.gov.au/coastalplan/pdf/adaptation-strategy-guideline.pdf>

The state interest policy for natural hazards in the SPP states:

The risk of, and the adverse impacts from natural hazards are avoided, minimised or mitigated to protect people and property and enhance the community's resilience to natural hazards.

While a coastal hazard adaptation strategy (CHAS) is not a mandatory requirement, it is considered a practical means for local government to achieve the state interest. An adaptation strategy provides a basis for locating new development away from hazard areas and mitigating risks to existing communities and removes the need to undertake risk assessments for individual development.

Case study: Pilot Coastal Hazard Adaption Strategy (Townsville)

To assist local government in preparing a CHAS, the Local Government Association of Queensland, Townsville City Council and the Queensland Government finalised a pilot coastal hazard adaptation strategy for Townsville (GHD 2012).

The outcomes and lessons learned from the Townsville project have been incorporated into a guideline and local governments are encouraged to consider the recommendations contained in this guideline and the learning's report when undertaking their own CHAS.



Download the pilot coastal hazard adaptation strategy for Townsville on the council's website: www.townsville.qld.gov.au.



Theme 3: Building controls

Audience: local government; local disaster management groups; planning agencies

Introduction | Why is this important?

Building controls are an extremely important preventative measure that works hand-in-hand with effective land-use-planning.

On 26 October 2012, the Queensland Development Code MP 3.5 (QDC MP 3.5) came into effect. The purpose of QDC MP 3.5 is to ensure:

(a) particular buildings located in flood hazard areas:

1. resist flotation, collapse or significant permanent movement caused by flood water;
2. safeguard occupants and other people against illness or injury caused by flood water affecting buildings;
3. are protected from backflow;
4. have utilities that are protected from the effects of flood water; and

(b) that a customer dedicated substation is designed or located so its ability to function effectively is not affected by flood water.

Local governments may make designations and declarations for the QDC MP 3.5 under planning schemes, temporary local planning instruments or by resolution for the following:

- flood hazard areas;
- defined flood levels;
- maximum flow velocity of water;
- inactive flow or backwater areas; and
- freeboard.



Download a copy of the Mandatory requirements for construction of buildings in flood hazard areas from <http://www.hpw.qld.gov.au/SiteCollectionDocuments/Mandatory3.5ConstructionOfBuildingsInFloodHazardAreas.pdf>

Benefits | Why are flood maps important?

Flood studies play an important role in defining the flood hazard and potential consequences in a specific area. The studies enable land-user-planners to zone where building controls need to be implemented and also enable evidence based decisions regarding their designations and the subsequent declarations for Queensland Development Code MP 3.5 under planning schemes or temporary local planning instruments.

Case study: Approval of flood mapping and associated data for use with the QDC

The town of Roma was subject to major flooding in 2010, 2011 and 2012. The events resulted in significant impact to people, property and the natural landscape and highlighted the need to consider and implement land use strategies to improve the resilience of these areas.

As a result, the following resolution was passed by the Maranoa Regional Council to ensure they could effectively assess building work against MP 3.5.

Resolution “That, until the adoption of the new Maranoa Planning Scheme, the attached map titled: “*Adopted Flood Hazard Map for Assessment Against the Queensland Development Code*” and associated flood height and velocity data be adopted as the Defined Flood Event map (DFE), as defined by the Queensland Development Code, for the town of Roma to be used when assessing building work against MP 3.5 of the Queensland Development Code”

Important | Regulatory information

The *Building Act 1975* regulates building development approvals, building work, building classification, building certifiers and pool safety inspectors, and provides particular matters about sustainable buildings. It requires that buildings be constructed in accordance with the *Building Code of Australia* and, where Queensland-specific provisions are necessary, the Queensland Development Code (QDC). Under section 258 of the *Building Act 1975* the chief executive may publish guidelines that help achieve compliance with the Act.

In October 2012, the Department of Housing and Public Works (DHPW) published the guideline for construction of buildings in flood hazard areas. The guide assists compliance with the new part of the Queensland Development Code (QDC) for construction of buildings in flood hazard areas. The new Mandatory Part (MP3.5) commenced on 26 October 2012 and states:

The new part of the QDC addresses the immediate needs associated with constructing new buildings and additions to existing buildings in flood affected areas, and to generally improve the flood resilience of communities across Queensland.



Download a copy of the guidelines for the construction of buildings in flood hazard areas from <http://www.hpw.qld.gov.au>



Useful information

QldRA has developed a number of resilience and rebuilding guidelines to support councils and the community.

- **Rebuilding in storm tide prone areas - Tully Heads and Hull Heads** - provides advice on housing construction and rebuilding in storm tide prone areas.
- **Wind resistant housing** - provides advice on how to improve your home's ability to withstand the impact of cyclonic winds.
- **Planning for stronger, more resilient electrical infrastructure guideline** - electricity distribution, land use planning, emergency planning and management, building and design.
- **Rebuilding a stronger, more resilient Queensland** - the capacity to prepare for, withstand, respond to and recover from disasters.



You can download these guidelines from <http://qldreconstruction.org.au/publications-guides/>





Theme 4: Structural works

Audience: local government; local disaster management groups; planning agencies

Introduction | Why is this important?

Structural works provide a range of potential preventative measures including but not limited to levees, flood gates and on a larger scale, flood mitigating dams. Deciding what role, if any, structural works should play in mitigating flood risk requires quantifying the flood risk and consequences to the population at risk.

Benefits | Why are flood maps important?

Fit-for-purpose flood studies provide extent, depth and velocity information required in the design of proposed structural works. In addition, further modelling provides information required to determine the effectiveness of the proposed structural work (see case study below) at various gauge heights and the impact caused by altering the path of floodwaters, their depth and velocity.

Where structural works already exist, new flood studies can provide additional modelling of the structures effectiveness. Updating flood studies (post event) using new flood intelligence can be extremely valuable, providing a more accurate picture of ongoing flood risk and associated consequences.

It is critical to note, whilst structural works may mitigate the impact of a flood on a community they do not eliminate the flood risk. Not only does the flood event still take place- with its consequences simply altered by the structural works-but equally important, all structural works are built to withstand a defined flood level. Therefore, if this level is breached or the structural works deteriorate over time, then their capacity to mitigate is either compromised or eliminated and inundation will still occur.

Important | Considerations

1. Recognise the importance of maintaining existing structural works integrity through ongoing maintenance.
2. Recognise and communicate the structural works inherent performance limitations,
3. Maintain community awareness of flood risk and the importance of being prepared to act if and when required.



A useful guideline for determining structural work requirements is found in Chapter 9 (Treating flood risk to existing development) of *Managing the floodplain: a guide to best practice in flood risk management in Australia (Handbook 7)* by AEMI from <https://ema.infoservices.com.au/items/HB7-2ND>

Case study: Why build a levee in Bundaberg East and not Bundaberg North? (Bundaberg)

A range of potential levees in Bundaberg North and East were considered as part of an engineering assessment, which found that a levee in Bundaberg East was most viable.

Given the exceptionally high volume and speed of floodwater passing through Bundaberg North, there is little that can be done to block, divert or otherwise displace these flows without causing severe impacts elsewhere. This is in contrast to Bundaberg East, where flooding is caused by backwaters entering the area via Bundaberg Creek.

Modelling shows that a levee and floodgate here will not displace fast-flowing flood waters and hence will not have significant adverse impacts elsewhere.



Read more: http://bundaberg.qld.gov.au/files/Community_Information_Session_-_East_bank_levee_and_floodgate_Fact_Sheet_March_2014_FINAL.pdf

Case study: Integrated project “Room for the River” (Netherlands)

The Dutch have been managing flood waters in the Netherlands for centuries. They have much experience with building levees to protect communities from the North Sea storm surges and river flooding. They need to have this focus as about half of the country is below sea level or prone to flooding. In 1993 and again in 1995 their flood protection systems were tested by major river floods and approximately 250 000 people were evacuated. After significant planning and community consultation, the Dutch government formally approved the “Room for the River” program. This is an integrated package of work that seeks to achieve two interrelated objectives:

1. To bring flood protection for the riverine area to the required level;
2. To contribute to improving the spatial quality (land use planning and amenity) of the riverine area.

Guaranteeing safety is the main objective; improving spatial quality (land use planning and amenity) is the secondary objective.

The €2.3 billion program commenced in 2006 and comprises more than 30 projects, most of which will be complete by 2015. The most ambitious project is taking place in the city of Nijmegen, where the River Waal bottlenecks and makes a sharp turn—and thus renders the city of 150 000 especially prone to flooding. In 1995, heavy rain and snow swelled the Waal, forcing tens of thousands of residents to evacuate. So that future waters can flow more freely, a significant project will move back dikes and dig a new 2.5 mile (4 kilometer) side channel that will create an urban island.

While Queensland communities have different geographical and hydrological situations, the principles of delivering an integrated program of works and activities can be learned from the approach in the Netherlands.



Read more: <http://www.ruimtevoorderivier.nl/english/room-for-the-river-programme>

Case study: Regular budget for disaster preparedness and mitigation works (Cairns)

Cairns City Council has an annual operating budget to cover its Disaster Management Unit, Coordination Centre, volunteer emergency services and community awareness programs. Its annual capital budget has, in recent years, covered allocations for building construction, emergency response vehicles and equipment, new risk assessment software, upgrading flood warning network and drainage and flood mitigation investments – a clear demonstration of the city’s commitment to disaster risk reduction.

This is complemented by investment and partnerships at national level, for instance, through a review of building codes following Cyclone Yasi in 2011, which also involved built environment professionals, private sector and academic institutions.



Read more: <http://www.cairns.qld.gov.au/cyclone-emergency-information/disaster-management-unit>



Theme 5: Infrastructure

Audience: local government; local disaster management groups; transport agencies

Introduction | Why is this important?

Infrastructure is required for a community to function effectively and it can be vulnerable to flooding. As a consequence, a community's resilience or ability to respond to a flood will be influenced by the working availability of essential infrastructure inclusive of roads, railways, dams, bridges, electrical, communication towers, water supply and sewerage systems and the buildings that house essential services (such as communications and health).

In addition, infrastructure may alter the flood path, its depth or velocity and add debris to the floodwaters. Therefore, infrastructure on the path of the flood hazard may have consequences that are either intended or unintended. The location and build quality of any infrastructure assets needs to consider the risk associated with potential flood events within that community.

Benefits | Why are flood maps important?

Flood studies play a valuable role in identifying/quantifying flood hazard and aid decisions regarding infrastructure location and build specifications. In addition, flood studies will assist the improved resilience for the economy and Queensland community by ensuring where it is practical, key infrastructure being restored is fit-for-purpose considering potential floods.

Case study: Investing in measures to reduce risk (India)

Pune, India, has been affected by severe periodic flooding for decades. Anticipating that the impact of climate change may increase the frequency, the city has put programs in place to build capacity, assess hazards and vulnerability, and implement a city-wide action plan that contains structural and planning measures for restoring natural drainage, widening streams, extending bridges and applying natural soil infiltration methodologies.

Watershed conservation techniques, such as afforestation and building small earthen check dams, were undertaken in the hill zone. Property tax incentives were provided to encourage households to recycle wastewater or to store run-off rainwater for domestic use. These efforts were complemented by improvements in flood monitoring and warning systems and social protection for affected families.

The initiative was driven jointly by the elected municipal government, the municipal commissioner and Alert (active citizen groups), and involves many different city departments.



Read more: Briefing Note 02: Adaptation to climate change by reducing disaster risks: Country practices and lessons (UNISDR 2010) http://www.preventionweb.net/files/11775_UNISDRBriefingAdaptationtoClimateCh.pdf



Theme 6: Landscape and environment

Audience: local government; local disaster management groups; environmental and natural resource management agencies.

Introduction | Why is this important?

Ecosystems serve as protective buffers against natural hazards such as flooding and the vegetation cover in a catchment influences run off and flood behaviour. However, traditional methods of flood mitigation have generally focused on structural works, such as levees, floodgates and building controls that ensure buildings have greater resilience. As effective as these measures may or may not be, it is increasingly recognised that non-structural measures including land-use planning and the management of landscapes can play an important role in mitigating the impact of flooding.

Recognising the importance of developing an evidence-based understanding of the use of natural assets in the mitigation of flooding, in August 2012 the Department of Environment and Heritage Protection (DEHP) published a synthesis: *Natural assets for flood and cyclone resilience - synthesis of scientific evidence on the role of natural assets to reduce the human impacts of floods and cyclones*.



Download a copy of the *Natural assets for flood and cyclone resilience - synthesis of scientific evidence on the role of natural assets to reduce the human impacts of floods and cyclones* from <http://www.ehp.qld.gov.au/water/pdf/synthesis-scientific-evidence.pdf>

In summary, good scientific evidence exists to support the use of natural assets to mitigate the consequences of floods. Notwithstanding this, it also notes landscape processes are complex and a whole catchment view is best undertaken where possible to develop the best total solution.



Useful information: Synthesis highlights

- Restoring catchment vegetation reduces the amount of rainfall that forms runoff that in turn will have a flood reduction effect particularly on smaller events;
- Careful design of natural assets interventions can complement other practices (including land-use planning or structural defences). In addition, the reduction provided by a natural assets approach may be more cost-effective than only using a structural approach;
- Catchment, riparian and in-stream vegetation slows down floodwater, reducing the hazard and reducing ecological damage to stream banks from erosion. Slowing and spreading the flood flow can however mean increased localised flooding. As a result, land-use planning around riparian areas would need to be considered and managed accordingly;
- Agricultural practices such as groundcover improvement, slope stabilisation and soil conservation measures can reduce the impact of heavy rainfall events;
- Floodplains can provide natural flood storage and when allowed to flood, provide greater certainty around where flooding will occur and can reduce the impact of flooding on other areas; and
- Land management practices are important to compliment effective land-use planning and target restoration of catchment and riparian vegetation, and the management of wetlands and floodplains.



Download a copy of the *Wetland Management Handbook: Farm Management Systems (FMS) guidelines* from http://wetlandinfo.ehp.qld.gov.au/resources/static/pdf/resources/reports/fms/fms_025_handbook_web.pdf

Benefits

| Why are flood maps important?

Flood studies provide information that enables land-use-planning, through effective zoning to play a vital role in creating a landscape and environment more resilient to floods. Zoning is the first step. Equally important is employing landscape and environment management measures to maximise the potential.

These measures include but are not limited to wetland and riparian zone management, vegetation management, soil conservation activity on farms adjacent to flood prone waterways and river improvement and floodplain drainage programs.

Landscape and land degradation studies can also show connections between landscape and areas susceptible to riverine flood. This information can be incorporated into land-use planning measures.

Case study: Ecosystem-based disaster risk management (China)

In Hubei Province, China, a wetland restoration programme reconnected lakes to the Yangtze River and rehabilitated 448 km² of wetlands with a capacity to store up to 285 million m³ of floodwater. The local government subsequently reconnected eight more lakes covering 350 km². Sluice gates at the lakes are re-opened seasonally and illegal aquaculture facilities have been removed or modified.

The local administration has designated lake and marshland areas as natural reserves. In addition to contributing to flood prevention, restored lakes and floodplains have enhanced biodiversity, increased income from fisheries by 20–30 per cent and improved water quality to potable levels.



Read more: UNISDR Global Assessment Report (Chapter 6.4)

http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/GAR-2011/GAR2011_Report_Chapter6.pdf





Theme 7: Education and information

Audience: local government; local disaster management groups; emergency services

Introduction | Why is this important?

A fundamental principle of emergency management is that communities that have thought about a problem and planned for it beforehand will be able to cope better than those that have ignored it and hoped it will never occur.

Historically, most of Queensland's towns and communities have been established on or near floodplains and as a result the likelihood of flooding that impacts the community remains. Given this exposure, effective understanding of flood hazard and risk can empower a community to become as resilient as practicable to flood events.

Unfortunately, as noted in the 2002 report to the Council of Australian Governments (COAG) on natural disasters in Australia, public awareness of natural hazard issues is one of the least practiced and most poorly funded mitigation measures across Australia.

A community awareness and education program's prime purpose is to:

- remind people in flood risk areas that the threat is real (and to quantify that risk and potential consequences); and
- to identify and communicate things they can do to limit the impact of a flood event.

Benefits | Why are flood maps important?

Flood maps provide a practical tool for:

1. identifying members of the community most at risk to flooding (and therefore most in need of understanding their flood risk and what actions they should take to prepare for and respond to a flood event);
2. providing a visual representation of possible flood consequences (i.e. extent, depth and velocity of flood waters at different gauge heights).

This information is critical in developing and implementing any effective awareness and education program.

In addition, maps can be a useful visual tool to communicate information to the community. They can show flood extent and depth at different gauge heights and allow people to see when key infrastructure becomes inundated or what their evacuation routes are. Notwithstanding this, some community members find reading maps difficult and therefore this critical type of information needs to be delivered in alternative forms to ensure the widest possible audience understands and therefore takes the best preventative and responsive measures.

Case study: Warwick Flood Emergency Action Guide (Southern Downs)

The Southern Downs Regional Council has developed the *Warwick Flood Emergency Action Guide* to be distributed to residents who live in the flood-prone parts of Warwick. It was designed after the 2013 floods with the understanding that flood risk remains.

The guide is comprehensive with historical information, tips on how to prepare for flood events, descriptions of flood warnings, flood severity classifications and what to do before, during and after a flood. The guide contains a series of flood maps which indicate the possible extent of flooding for moderate and major flood events. Local residents can use these maps to identify if they live in an area that may require evacuation in a flood event.

The guide is available on council's website and printed copies were distributed to residents in flood-risk areas through a letter-box drop and mailed to property owners to ensure retail property owners received a copy .



Read more: Warwick Flood Emergency Action Guide
<http://www.southerndowns.qld.gov.au/content/Document/Disasters & Emergencies/Warwick Flood EAG Web Version.pdf>





Theme 8: Emergency management

Audience: local government; local disaster management groups; emergency services

Introduction | Why is this important?

Emergency management is a vital component of an overarching disaster management comprehensive approach (i.e. PPRR) and its focus is effective flood response.

The *Disaster Management Act 2003* (the Act), provides the legislative basis for the Queensland Disaster Management Arrangements (QDMA) including the establishment of disaster management groups for the state, disaster districts and local government areas.

The Act and guidelines detail planning requirements at each level, maintaining the role and operations of the State Emergency Service, establishment of Emergency Service Units and the conferring of powers on selected individuals and groups.

Broadly speaking, flood response operations undertaken by the relevant disaster management group involve the following sequential stages:

- risk assessment to inform planning
- the timely interpretation of flood information including flood warnings, flood watches, severe weather warnings, severe thunderstorm warnings or observations of heavy rainfall or stream rises;
- identification and understanding of potential flood consequences with reference to flood intelligence;
- decision-making and the development of operational action plans about what response strategies are necessary to manage flooding with reference to flood emergency plans and standing operating procedures;
- coordinating the execution of flood response strategies such as warning, reconnaissance, evacuation, resupply, rescue and property protection; and
- the transition to stand down, recovery, and review.

Benefits | Why are flood maps important?

One of the biggest areas of benefit from up-to-date flood mapping is emergency management. The following diagram outlines how each area of the emergency response operation process is better supported through flood mapping products. A number of these elements are then further described in the remaining section.

Sequence of emergency management response	Role of flood study outputs in assisting
<p style="text-align: center;">Flood information</p> <p>Flood warnings, severe thunderstorm warnings, and observations of heavy rainfall or river rises.</p>	<p>Prior to an event, flood studies used in the community awareness and education program to increase individual/household preparedness and businesses continuity planning and situational awareness for disaster response personnel.</p>
<p style="text-align: center;">Identification of possible consequences</p> <p>Identification of possible flood consequences through interpretation of flood information—ideally through flood intelligence.</p>	<p>Flood maps show possible flood consequences in terms of extent, depth and velocity across area at various gauge heights.</p>
<p style="text-align: center;">Deciding objectives and strategies</p> <p>With reference to flood emergency plans and standard operating procedures etc.</p>	<p>Maps provide a visual representation of the potential consequences of an event. Coupled with flood animations (where available) they show the sequence of inundation. They allow extent of event to be understood by a wider audience.</p>
<p style="text-align: center;">Coordination of flood response</p> <p>Coordination of resources to undertake warnings, reconnaissance, evacuation, rescue, property protection and resupply.</p>	<p>Knowing the likely extent, depth and velocity outputs is helpful in issuing the best possible warnings and allocating resources to areas most needed. The use of animation useful in prioritising and sequencing of operational tasks (considering sequence of inundation).</p>
<p style="text-align: center;">Transition to recovery</p>	<p>Simulation/animation useful in prioritising/sequencing operational tasks of transition to recovery (e.g. re-opening roads, re-supply, re-commencement of essential services). Knowing the likely extent helpful in determining allocation of resources to areas most needed.</p>
<p style="text-align: center;">Review</p>	<p>Any review should include updating flood maps and any other the outputs previously produced. What changes should be made to the local disaster management plan moving forward.</p>

Source: Flood response, Manual 2, Australian Emergency Manual Series

Element 1: Flood warnings

Introduction | Why is this important?

Effective warnings are crucial to a community's ability to respond to a flood event. Effective flood warnings require effective messages disseminated via an effective system.

In Queensland, the effectiveness of the flood warning system depends on the cooperative involvement of the Bureau of Meteorology (BoM), state government agencies and local government working with flood-threatened communities.

The Queensland Flood Warning Consultative Committee (FWCC) is a joint Commonwealth, state and local government committee that coordinates the development and operation of flood warning services in Queensland.

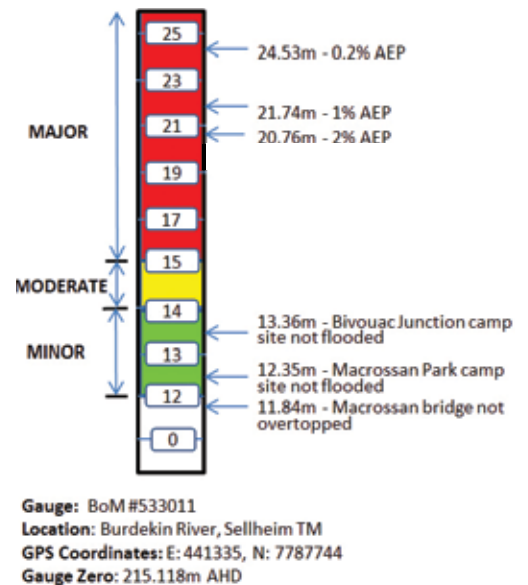
When BoM flood warnings are issued for a flood warning river height station, the severity of flooding is described as minor, moderate or major—according to the effects caused in the local area or in nearby downstream areas. The BoM may also make quantitative forecasts (for example, the specific height at a gauge) and flood mapping relative to a particular gauge height can be particularly beneficial.

Flood classifications

Minor flooding: Causes inconvenience. Low-lying areas next to watercourses are inundated. Minor roads may be closed and low-level bridges submerged. In urban areas inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths. In rural areas removal of stock and equipment may be required.

Moderate flooding: In addition to the above, the area of inundation is more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood-affected areas may be required. In rural areas removal of stock is required.

Major flooding: In addition to the above, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood-affected areas may be required. Utility services may be impacted.



Discussion with floodplain residents also shows they are confused and frustrated by the use of terms such as minor, moderate and major flooding. By themselves, these terms and their formal definitions are not well understood in the community, and they are vague and often unhelpful. They therefore are not persuasive on their own as descriptors of flood severity. (Flood Warning, Manual 21, Australian Emergency Manuals Series, Page 43)

The challenge for local government and local disaster management groups is to ensure the flood warnings they issue contain the information needed by their community at large and those potentially impacted—both directly and indirectly.

Benefits

| Why are flood maps important?

Flood maps provide a practical tool for determining the likely consequences of an alerted flood event, especially when the flood map is related to a gauge height.

Whilst every flood event is different, community members want information they can use to determine what actions they need to take to limit the impact of a flood event. It is practical information about the consequences that allow this to happen (e.g. bridge not accessible or flooding on certain streets etcetera).

Where available, flood simulations/animations also provide a visual representation of the sequence of inundation which can be useful in prioritising what needs to be done and when it needs to be done by.



Useful information

1. Best practice involves investing time in consulting with the community regarding warning content (the message) and when and how it should be delivered (the mechanisms and time to ensure adequate time to respond).

The options available to issue warnings are quite extensive and include SMS, via phone, email, door-knocks and social media. What constitutes the right mix for a community is determined by that community's needs relating to timing, available resources and even physical constraints.
2. Importantly, best practice involves reviewing the warning system from time to time to ensure distribution methods being employed remain the best options—considering the risk flooding presents and the typical time between rain events and eventual flooding, which can vary from hours to days or even weeks.
3. The QDMA includes specific guidelines in relation to emergency alerts and the standard emergency warning signal. LDMGs should consult these guides when developing their public information and warnings sub-plan.



The Queensland Emergency Alert Guidelines and Guidelines for the Standard Emergency Warning Signal (SEWS) and its use in Queensland are available at www.disaster.qld.gov.au/Disaster-Resources/Documents/Queensland%20Emergency%20Alert%20Guidelines.pdf.

Case study: MoretonAlert – a council disaster communication system (Moreton Bay)

MoretonAlert provides warnings about severe weather, possible major dam releases and flash flooding events within the region. The system complements existing warning mechanisms. The BoM issues weather warnings via the radio. These weather warnings are a good source of information and can provide valuable advice about weather conditions. The state government also operates an emergency alert system which may also issue messages to residents during emergency situations.

MoretonAlert is a unique council initiative that enables residents to also share their flood information. Council encourages the community to share their local flood data, including photos and evidence of major flood events in the region, allowing council to verify and improve flood predictions and improve the safety of their floodplains.



Read more: *MoretonAlert* <https://www.moretonbay.qld.gov.au/moretonalert.aspx>

Element 2: Public information

Introduction | Why is this important?

Public information during flood response operations is provided for the advice of those affected and for the public generally. It will include information previously disseminated via community awareness and education programs, however it is important to recognise that during a flood people may not be able to locate previously provided information.

In addition to the issuing of flood warnings, the range of specific issues on which the community at risk should be advised includes, as appropriate to the flood conditions:

- instructions on evacuation, including an emergency kit;
- road closures;
- public health;
- maintenance of essential services and utilities;
- security of evacuated areas;
- damage minimisation;
- how to obtain assistance;
- immediate welfare and recovery arrangements; and
- means of cleaning up as the flood recedes.

Flood mapping outputs will assist in determining specific areas of interest such as road closures, water depth and velocity of water over property and evacuation plans.

Case study: Consistent information for councils through DisasterHub (LGAQ)

Developed and maintained by the Local Government Association of Queensland (with Resolute IT), the *DisasterHub* is available through councils websites and provides a consistent set of tools and information to assist in preparation before and response during disaster events. It enables emergency communication through a central location, ensuring that council's website is the first point of contact for disaster-related issues.

DisasterHub also provides access to specialist information, including factsheets and guidelines, developed by various state government agencies and other organisations. It has been developed to ensure a sustainable approach for the delivery of information in disaster situations, and provides an innovative interaction point between the community and councils. It aims to reduce the vulnerability of local communities by externally hosting the tools and information away from possible centres of disaster.

The information covers all relevant natural hazards that may occur within the state, and focus on residential and business related information. It provides common content to all councils and allows for council-specific content to be tailored to the local catchment area.



Read more: *DisasterHub* <http://www.disasterhub.com.au/>

Element 3: Evacuation and supplies

Introduction | Why is this important?

The evacuation of people at risk may be required for reasons of safety and potential isolation. In addition communities and/or properties can become isolated in the event of a flood. If flood predictions provide sufficient time for stocking up on items prior to the isolation, this measure can provide a better level of resilience to the flood than would otherwise be attained. If not, the safe re-supply or evacuation are important parts of any flood response and crucial for recover.

Benefits | Why are flood maps important?

Flood mapping outputs can assist in determining those at risk to either of these categories, the timing of required evacuation and the best location of the evacuation centres.

Flood mapping studies may help in determining when resupply can occur due to transport routes—rail, road or air—being safely reopened to specified transport.



Useful information

A checklist to assist Disaster Operation Controllers co-ordinate resupply activities provided in Annex A of Flood Response Manual 22 of the Australian Emergency Manual Series.



Download a copy from [http://www.em.gov.au/Documents/Manual%2022-Flood%20Response\(2\).PDF](http://www.em.gov.au/Documents/Manual%2022-Flood%20Response(2).PDF)

Element 4: Property protection

Introduction | Why is this important?

The protection of private property is an important focus during floods, but it will normally be given a lower management priority than the protection of life and the protection of critical infrastructure. In some circumstances the role of agencies in property protection may be limited to the provision of advice to the owners and occupiers of property. The general aim of property protection is to prevent or minimise property damage and there are two general methods of prevention. The first is simply the lifting of items above the predicted peak or the temporary removal and the second is the building of temporary barriers.

Benefits | Why are flood maps important?

Flood study output can help identify what property is at risk and the potential timing of the inundation. This may help in the development of the appropriate strategies to minimise property damage.

Case study: An urban risk assessment framework (World Bank)

The World Bank, with UN-Habitat, UNEP and Cities Alliance, has developed an urban risk assessment (URA) framework based on experiences in many cities. The URA offers a flexible approach that project and city managers can use to identify feasible measures to assess a city's risk. The methodology focuses on three reinforcing pillars that collectively help to understand urban risk: a hazard impact assessment, an institutional assessment, and a socioeconomic assessment.

The assessment is based on four principal building blocks to improve the understanding of urban risk: historical incidence of hazards, geospatial data, institutional mapping and community participation. The URA is flexible in how it is applied, depending on available resources and institutional capacity in a given city.



Read more: <http://go.worldbank.org/VW5ZBJBHAo>



Theme 9: Insurance

Audience: local government; local disaster management groups

Introduction | Why is this important?

In the past seven years, Queensland has experienced natural disasters that have taken 43 lives and cost in excess of \$14 billion to essential public assets. Every year, floods cause millions of dollars of damage across the state to buildings and critical infrastructure, from roads and railways, to agricultural land and crops.

In recent years, insurance premiums have increased significantly, most notably for those living in areas most exposed to frequent natural disasters however; access to insurance that covers flood damage is an important mechanism for households and businesses to manage residual risk.

Benefits | Why are flood maps important?

Flooding occurs most commonly from heavy rainfall when natural watercourses do not have the capacity to move excess water on. However, floods are not always caused by heavy rainfall and many factors influence the risk of flood in each area. Floodplain shape, slope and storage together with man-made structures all have a significant influence on the routing of flood flows.

Insurance companies generally spend substantial time and resources researching all areas of Australia to map flood prone areas and assign risk estimates to each area. The Insurance Council of Australia (ICA) often completes this on behalf of all insurance companies, and then each company considers how to adjust premiums to take into account the fact that some areas and properties are more likely to flood than others.

Flood premium and excess pricing is usually based on the specific flood risk of each individual site. They will use data from a wide range of sources including flood mapping where available, along with terrain data and independent hydrologist reports. In some cases, insurance companies will work with specialists in assessing flood risk that validate and provide additional information to determine the true flood risk.

To be able to provide the most effective insurance cover possible, best-available hazard mapping and property data is needed by the insurance industry. Where flood maps have been produced, this information will be of assistance to insurance companies to encourage more accurate pricing.

Considerations | What should we do?

The Queensland Government has signed a Memorandum of Understanding with the ICA to share appropriate flood mapping products and other data sets to ensure that they are using the best available information to calculate premiums. It is also intended to involve the ICA in future mitigation project planning across the state.

Councils can assist this process by providing the ICA with details of their latest flood studies, the digital data for flood maps and encourage community members and businesses to regularly review their insurance to make sure their information and coverage is up to date. Details like building construction, foundations and roof type can also make a difference to the premium.

ICA has a range of insurance affordability projects including the property resilience and exposure program (PREP). Local governments are encouraged to participate in this program.



Download details on affordability projects from www.insurancecouncil.com.au/affordability.



Useful information

A flood insurance factsheet has been published by Consumer Credit Legal Centre (NSW). The fact sheet provides useful information—but not legal advice—on flood insurance.

One notable inclusion is the transition to a common definition of a “flood”. Historically, insurers could write their own definition of “flood” under their policies and therefore, cover varied widely from insurer to insurer. Insurers had until 19 June 2014 to transition to a common definition which is:

The covering of normally dry land by water that has escaped or been released from the normal confines of any of the following:

- a lake (whether or not it has been altered or modified);
- a river (whether or not it has been altered or modified);
- a creek (whether or not it has been altered or modified);
- another natural watercourse (whether or not it has been altered or modified);
- a reservoir;
- a canal;
- a dam.



Download a copy of the flood insurance factsheet from <http://www.insurancelaw.org.au/wp-content/uploads/2014/02/Flood-Insurance-Guide-2014.pdf>

Case study: Premium reductions from levee in St George (Balonne)

In early March 2014, the successful completion of flood mitigation works in St George (Queensland), including a levee, was projected to significantly cut some property premiums in the area.

The CEO of RACQ, Bradley Heath, stated “with the completion of these flood mitigation works, RACQ Insurance expects those properties previously flood-affected will now achieve, on average, premium savings of up to 32 per cent. RACQ Insurance applauds any measures designed to protect homes and critical community infrastructure from flood perils.”

Suncorp was also proposing to cut renewal premiums in St George since the completion of the work. In areas where levees have been completed, such as St George and Charleville, Suncorp advises that there has been a significant drop in the price of premiums. Since 2008, Suncorp has paid out on almost 170 claims costing more than \$5 million in St George alone.

In Charleville, Suncorp advised that where no mitigation work had been undertaken, the average cost of a home policy was more than \$3000, compared with \$990 now.

When implementing flood mitigation projects, it is important to work with insurance companies (as well as the ICA) to provide access to the flood modelling to determine the new flood risks properties will face and assist in more accurate premium calculations. This will also provide councils with the opportunity to call on insurers to cut premiums through partnership approaches.

Queensland’s Minister for Local Government, Community Recovery and Resilience, David Crisafulli MP, has called for insurers to cut premiums by up to 80 per cent in communities such as Roma, as promised when levees were proposed.



Figure 2: St George levee will reduce premiums

Action Plans

The following action plans outline how each theme can benefit from fit-for-purpose flood maps:

Land use planning

- Have you identified all areas within the local government area that may flood?
- Have you identified all flood prone areas that overlap with areas of the existing and or future settlement plans?
- Does the vision of the strategic framework acknowledge potential flooding impacts?
- Have you undertaken fit-for-purpose flood investigations for each urban area that allows for detailed planning evaluations to be undertaken?
- Has a risk assessment and subsequent implementation of planning provisions been considered?
(Consistent with AS/NZS ISO 31000:2009) note: this not mandatory but is helpful.
- Have you quantified risks to existing and proposed land uses? (Has appropriate zoning occurred based on quantified risk)
- Does the planning scheme map the flood hazard area (with a nominated defined flood event) and address the associated risks to people, property, economic activity, social well-being and the environment?
- Has the acceptable, tolerable and intolerable level of risk for each land use type located in the local government area been determined?
- Does the planning scheme provisions achieve acceptable/tolerable levels of risk throughout the local government area?
- Has the land use planning provision been developed within a broader risk management framework? (i.e. building controls, mitigation infrastructure, disaster management etc)
- Has a flood planning scheme policy been included?



A more comprehensive checklist is outlined in Appendix 1 of the *Draft State Planning Policy Guideline – Guidance on flood, bushfire and landslide hazards*, available from <http://www.dsdp.qld.gov.au/resources/guideline/spp/spp-guideline-natural-hazards-flood-bushfire-landslide.pdf>



This action plan should be used in conjunction with the recommended guidance material *Planning for stronger, more resilient floodplains*, available from <http://www.dsdp.qld.gov.au/resources/guideline/gra/planning-stronger-floodplains-part-02.pdf>



The EMA has also released Handbook No. 7 *Managing the Floodplain – a guide to best practice in flood risk management in Australia*, available from <http://ema.infoservices.com.au/hb7-2nd>

Building controls

- Does the planning scheme map the flood hazard area (with a nominated defined flood event)
- Have you set flood levels, flow velocities and areas of expected low flow—referred to as inactive flow or backwater areas—in the planning scheme.

Coastal management

- Does the planning scheme map the flood hazard including the riverine catchment effects?
- Have you prepared a coastal hazard adaption strategy?

Structural works

- Have your flood studies identified areas where structural works may present a viable flood mitigation measure?
- Are you ready to gather additional flood intelligence after a flood event—to enable existing flood studies to be updated?
- Are additional flood studies needed to ascertain the effectiveness of proposed/existing structural works to determine their impact on flood path flows, depth, etc?
- Does your community understand the performance limits of structural works?
- Have you involved the insurance industry to provide advice on the impact structural work will have on insurance premiums?
- Does the community understand what action is required if forecast flood levels means structural works will not provide mitigation?
- Are your structural works included in your asset register with forward budget for operations and maintenance?

Infrastructure

- Have the flood studies been provided to infrastructure owners to enable them to consider potential floods in their service continuity plans?
- Have the flood studies been shared with all essential service providers so they can ascertain potential consequences on their community infrastructure—through the local disaster management group?

Landscape and environment

- Does the existing planning scheme consider the mitigation potential of the landscape and environment, utilising natural assets?
- Can a cross-jurisdictional approach be adopted to consider the effects across the full catchment(s)?
- Can wetland management play an increasing role in flood mitigation?
- Does a river improvement or floodplain drainage program exist that can benefit from access to the flood studies?
- Have the flood studies been shared with local Landcare and regional natural resource management groups.
- Are best practice or evolving vegetation management/topsoil management techniques being promoted to agricultural properties located adjacent to creeks and rivers?



Useful information

Queensland Regional Natural Resource Management Investment Program 2013–18

Funding is available for projects that focus largely on on-ground activities that protect, improve and restore waterways and rangelands, by addressing weeds and pests, and improving soil, vegetation and water quality.



Read more: <http://www.dnrm.qld.gov.au/land/accessing-using-land/natural-resource-management/nrm-investment-program>

Education and information

- Have you used the flood studies—including the Queensland flood assessment overlay—to identify all areas within the local government area that may flood?
- Have you used the flood studies to help identify who and what (i.e. property, infrastructure etc) are most at risk of inundation?
- Have you used the flood studies to work out the sequence of where and what gets inundated at each potential gauge level?
- Have you used the flood studies to estimate the time it takes for the flood to arrive once certain gauge heights are reached (up-stream)? This has implication on timings noted/issued in warnings.

This action plan is not a comprehensive ‘to-do’ list for all education activities. It is also recognised there is no single flood education method that can or should be employed over all others. Community flood education needs to be diverse (as communities are) and flexible enough to incorporate a range of program, delivery and output options. There are however several factors that should guide. They are:

- Does your community education program involves delivering a range of initiatives to help reach out to different parts of the community? Remember different people learn from different sources and styles of presentation.
- Do you have events that are planned preferably at the beginning of the community’s potential flood season?
- Have you discussed the program with local media? Their cooperation is important to the program’s success. Initiatives could include a flood commemoration, publishing interviews with people who actually experienced the event, with published maps showing the areas which were inundated and highlighting back to the specific places mentioned in the interview.
- Do you plan to regularly repeat your flood education? Repetition should incorporate new and updated material.
- Have you actively engaged the community to participate in the planning and development of future strategies to give them ownership and will enable them to ‘drive’ local flood education?
- Have you investigated the use of flood markers indicating the heights reached by past floods in the area can be installed? The markers may be plates attached to power poles or other convenient, visible and permanent. These should not be ‘hidden’ from view, although some interest groups may argue against them for fear of negative land value effects or raising fear in the community.
- School projects can be established on floods and flood management.
- How have you considered ‘uncertainty and risk’ and how this is communicated to your community?

Emergency management

Flood warning

- Have you used the flood studies and the Queensland Flood Assessment Overlay to identify all areas within the local government area that may flood?
- Have you used the flood studies to help identify the consequences of the flooding (i.e. extent, depth, velocity) and the timing of inundation at certain gauge heights?
- Are the flood categories for minor, moderate and major up to date?
- Have you consulted the community on what information they want disseminated, when and how? (ie. have they been involved in developing the message content)
- Have you effectively translated the flood studies information into local contextualized info?
- Has your warning system (the how, when, what) been integrated into your community awareness and education program?
- Have you identified when you will next review the warning system?

Evacuations

- Have the mapping study outputs been taken into consideration in determining a potential requirement for evacuation?
- Have the maps been used to clearly identify those at risk of inundation? (Therefore potential need to evacuate—as a preventative measure and informed/educated about warnings, processes etc).
- Do those at risk of evacuation know what to do with their pets?
- Do you have a caravan park within the evacuated area? Special considerations should be made as outlined chapter 8, Flood Response Manual 22 of the Australian Emergency Manual Series.
- Is your community protected by a levee? If yes, has its height and design specs been used as the trigger for evacuation recognising time required to evacuate and the time at which routes are cut off.

Insurance

- Where flood mitigation projects are being considered, work closely with the Insurance Council of Australia (ICA), and any specific insurance companies to ensure that the implemented measures will assist in improved premium calculations and insurance affordability.
- Consider council involvement with the ICA's Building Resilience Rating Program, developed as part of the Property Resilience and Exposure Program, to identify where development controls are performing well and therefore where claims are less likely to occur. It also considers where mitigation and development controls may be used to improve insurance affordability outcomes.
- Encourage the local community to complete flood safety checklists or similar documents to ensure they understand all of their risks and issues.
- Where flood maps exist, encourage the local community to understand how flood impacts their property or business, and where appropriate, communicate that to their insurer.
- All local community members should be encouraged to review their home and contents insurance or business insurance regularly and ensure they have adequate cover.
- Has council provided the digital data for the planning scheme and flood hazard overlay to DNRM and ICA?
-

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